CANINE & FELINE SURGERY

HOBDAY

CANINE AND FELINE SURGERY

BY

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PREFACE.

DURING my experience in the Free Out-patients' Department of the Royal Veterinary College I have often thought that a small text-book containing directions with regard to surgical operations upon canine and feline patients would be appreciated by the students engaged in the daily work of the Clinique for small animals, and perhaps also by the busy practitioner. It is with the idea of supplying these directions in as concise a manner as possible that this little manual has been written.

The major portion of the work has already appeared as a series of articles in the "Journal of Comparative Pathology and Therapeutics," to the editor of which, Professor M'Fadyean, I am particularly indebted for much help in revising the proofs, and for many suggestions.

To Messrs Arnold & Sons, Messrs Kröhne & Sesemann, and Mr B. Kühn I am obliged for the loan of drawings of instruments and appliances.

Almost all the operations herein described have been performed in the Clinique during the past seven years, and the ultimate results have been carefully noted as far as possible and summarised. References are given to where the individual cases may be found in detail.

ROYAL VETERINARY COLLEGE,
LONDON, N.W.

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CANINE AND FELINE SURGERY.

CHAPTER I.

GENERAL RULES FOR THE TREATMENT OF THE PATIENT BEFORE AND AFTER A SURGICAL OPERATION.

WHEREVER possible, it is better, though not absolutely necessary, that the patient should be prepared before passing through the ordeals of anæsthetisation and operation. If the animal has been recently removed from its owner and placed amongst fresh surroundings, such as the infirmary of the operator, it is always wise to allow it to get accustomed to the strange place and attendants, and to make sure that the dog or cat has a good appetite and is feeding well. If there is fever, catarrh, or other sign of ill health, the operation, unless the case is an urgent one, should be postponed. The action of the bowels and kidneys should be watched, and if the former are at all constipated a dose of laxative medicine about twenty-four hours, or an enema about two hours, before operating, is a wise precaution. The laxative chosen, however, should not be one which will cause nausea, griping, or loss of appetite. Castor oil or liquorice are suitable, and for the enema either warm water and soap or glycerine and water answer the purpose well.

Immediately before some operations it is necessary to repeat the enema, and to withdraw the urine where possible by the

aid of a catheter. A light meal of finely divided solid food or a quantity of milk is advisable about two or three hours before anæsthetisation. Vomition during, or when recovering from, the application of chloroform, so frequently met with in human patients under similar conditions, is very rare in the dog and cat. The author has only met with it in eight or ten instances out of more than a thousand chloroformisations.

After an operation under anæsthesia the patient should be put in a quiet place where there is plenty of fresh air, and allowed to recover. The eyes, nostrils, and mouth should be sponged with cold water, care being taken that none of it gets into the back of the mouth. On no account should stimulants or other fluids be administered in any quantity down the throat until recovery has taken place, as some of it is likely to find its way into the trachea and lungs. When the animal is able to lap voluntarily, a little cold water may be allowed, but solid food should not be given for at least an hour. A clean place, attention to hygiene and dietary, together with antiseptic dressings as often as necessary, will complete the directions to bring about restoration to health.

PREPARATORY TREATMENT OF THE SITE OF INCISON.

All hair from this and the contiguous parts should be removed a short time before operating, by the aid of scissors or clipping machines and a razor, the skin being thoroughly cleansed with soap and hot water and carefully disinfected. Before an abdominal operation, or a serious one of any kind, it is always a good plan, in addition, to lightly scrub the parts with ether in order to remove all grease. A pad of wadding soaked in some antiseptic, and carefully kept in position over the site for an hour before the operation commences, completes the process by which the parts are rendered aseptic.

If this cannot be applied, owing to the situation of the wound, the temper of the animal, or some other cause, the antiseptic

chosen must be applied with great thoroughness and care at the time of operating.

The choice of an antiseptic must rest with the operator. Probably those which are in most common and general use for surgical purposes are solutions of carbolic acid, lysol, creolin (each of which are used in from 1 to 4 per cent. solutions with water), corrosive sublimate (1 in 1000 parts), chinosol (1 in 1000 to 1 in 500), boracic acid (5 to 10 grains to the ounce), and biniodide of mercury (1 in 1000, solution being aided by the addition of a little more than an equal amount of potassium iodide).

Of these, boracic acid is particularly selected for wounds on the cornea of the eye; solution of carbolic acid must be used with the greatest care when operating on small dogs or cats, as toxic symptoms sometimes ensue even when this drug is applied only to a small area.[1] Solution of biniodide of mercury has advantages over that of the perchloride, in that no precipitate is formed when it becomes mixed with blood, and it does not combine with albumen. Many of these antiseptics can now be purchased in the convenient form of soloids, one of which dissolved in a certain quantity (usually a pint or a quart) makes a lotion of the requisite strength in a few moments.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 361.

CHAPTER II.

METHODS OF SECURING.

In securing canine or feline patients the principal objects of the operator are to place the patient in the safest and best possible position for the operation to be done, and at the same time to ensure the minimum amount of risk for his assistants and himself. Especial care on behalf of the operator or his assistants must always be taken where an animal is known to be vicious, and on behalf of the patient when the latter is known to be nervous, fat, or aged, particularly in those breeds (such as pugs, bull-dogs, Blenheim spaniels, etc.) where the nasal bones are short and depressed. With a quiet animal the head and eyes can be examined by allowing an assistant to hold the patient while the operator lightly grips the throat between the thumb and the forefinger of the one hand, pushing them firmly under the angles of the jaws, the other hand being placed on the top of the head (Fig. 1); all attempts at biting are thus prevented by pressing the head and jaws between the two hands. When the animal is at all inclined to be vicious, the best plan to adopt is to request the owner to grip the patient firmly by the back of the neck, whilst the operator places a tape round the jaws in such a manner as to keep them tightly closed. This tape is best affixed in the form of the clove hitch, having the loose ends underneath, and afterwards passing them under the ears to tie in a bow at the back of the poll.

These loose ends should not be tied round the neck or throat on account of the danger of strangulation. Another method of securing the mouth is to pass the tape twice round the jaws

and tie once on the top of the nasal bones, twisting the two loose ends several times round one another and fixing them to a leather collar previously placed around the neck (Fig. 3).

The clove hitch (Fig. 2), however, is undoubtedly the superior method, as it is very easy to apply, effectually keeps the jaws closed, and can be removed at a moment's notice by simply applying traction to either one end or the other. The method by which it is made is difficult to describe, although it can be readily demonstrated with a piece of cord or tape. Two

FIG. 1.

Photograph of dog held as described.

loops are made in reverse directions and folded on each other so that they fall as illustrated in Fig. 4.

Having thus prevented the animal from biting, the next step is to fix the patient in such a position as will be most convenient for the performance of the operation, and at the same time give the minimum amount of risk of injury. For minor operations, such as the lancing of some abscesses, etc., all that is necessary is to get an assistant to hold the dog or cat, but for

prolonged or delicate operations it is always best to secure the animal by the aid of hobbles or a proper operating table.

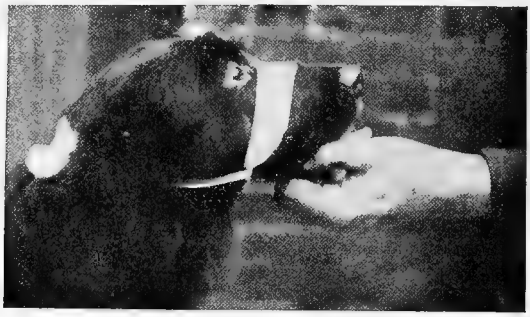

FIG. 2.

A clove hitch applied.

Portable hobbles are made, consisting of clamps which can be placed anywhere on the edge of an ordinary kitchen or

FIG. 3.

Showing tape applied as above.

saddle-room table, a tape to pass round each leg, and adjustable sliding cords by which the length may be graduated as much

as is thought requisite (Figs. 5 and 9). Hobbles can be improvised by doubling four long pieces of tape in each case so as to make a slip noose in the centre (Fig. 6), and then fixing the

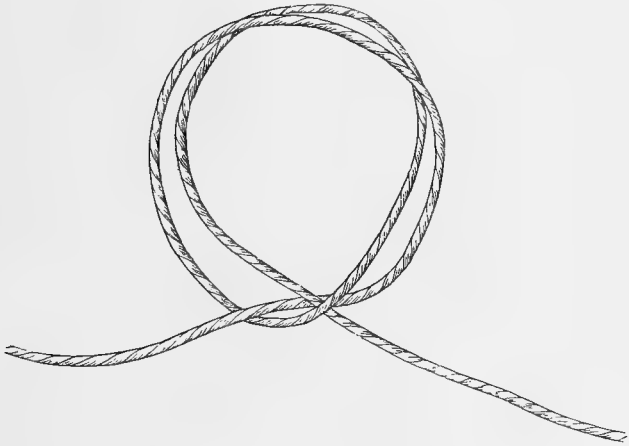

FIG. 4.
A clove hitch ready for application.

loose ends to the legs of an ordinary kitchen or saddle-room table, or to nails or hooks driven in the edge of the table.

An operation table is almost essential in every large canine practice, and even where only a moderate amount of canine

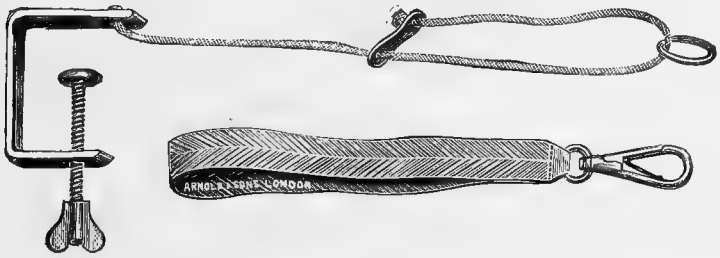

FIG. 5.
The author's pattern of hobble.

work is done its advantages cannot be over-estimated. The top should be made of some hard wood, such as pitch pine, teak, etc., which will bear constant washing without tendency

to shrink, and should consist of a board about 1 inch thick. If expense were not a consideration, it would be better for antiseptic reasons if it were made of metal or some such

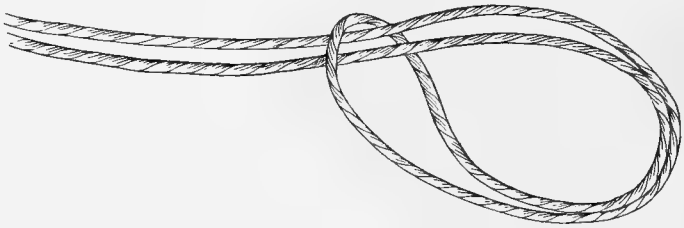

FIG. 6.
Improvised hobble.

absolutely impermeable material. The measurements of the top, to take all classes of dogs, are about $5\frac{1}{2} \times 2\frac{1}{2}$ feet. The front is improved by making the edge in the form of a semi-circle, as this sometimes affords an advantage when operating

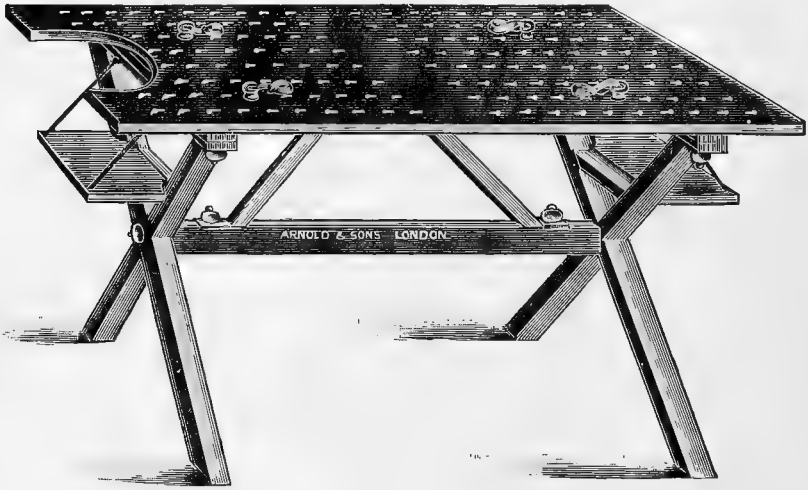

FIG. 7.
The author's pattern of operation table.

upon the parts which overhang it. The keyholes are placed in parallel rows at intervals of about 3 inches, the long part of the hole being made to point towards the centre of the table, as

shown in the diagram. The keys, which fit into these holes, are made of brass or other metal, being shaped like a solid key, but having a shoulder or rim running just underneath the loop in order to prevent them from passing too far into the hole in

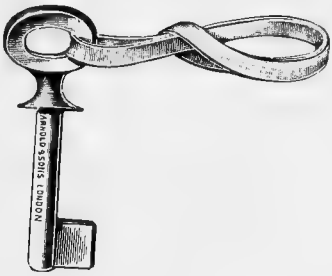

FIG. 8.
Key hobble looped ready for application.

the board. The hobble consists simply of a piece of tape passing through the ring on the key, the two ends being stitched firmly together.

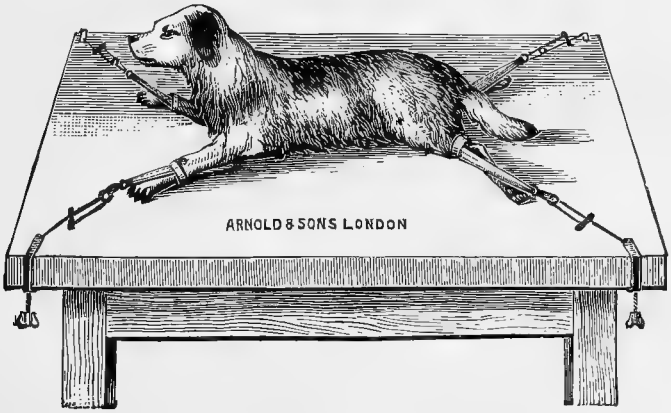

FIG. 9.
Diagram of dog fixed with hobbles on an ordinary table in the "abdominal" position.

The method of securing an animal is to first place the clove hitch on the jaws as previously described, then a hobble tightly round each leg (in the fore leg above the carpus and in the hind

legs above the tarsus); secure the fore legs first by passing the keys through two of the holes in the table and giving them a twist, then the hind hobbles in the same way, pulling the hind legs down together. With very large dogs it is sometimes also a good plan to pass a piece of stout webbing over the back and loins and tie it under the table. The chief precaution to take is to see that the legs are just sufficiently wide apart and well stretched out to allow of no violent struggling. When the hobbling is done properly it is astonishing with what ease an animal can be controlled. This places the patient flat on its abdomen, and for convenience will be referred to, when speaking of positions for operative purposes, as the "abdominal" one.

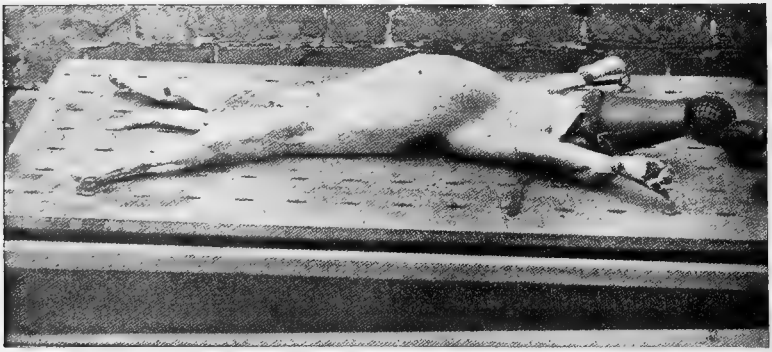

Fig. 10.

Photograph showing animal fixed on the operating table in the "dorsal" position.

When it is necessary to operate upon the abdomen or under parts of the body the animal is turned upon its back and fixed in a similar way, extra care, however, being here taken with the fore limbs, so as not to stretch them out too tightly and thus injure the muscles attaching the fore limb to the chest. This will for descriptive purposes be termed the "dorsal" position.

For operations on the sides or flank the animal can readily be laid on either side. These will be referred to in the text as the right and left "lateral" positions respectively.

Since this pattern of table has been introduced into the Free

Out-patients' Clinique more than 4000 animals have been secured in one or other of the above-mentioned positions without accident.

Another pattern of operating table has been recently devised and described by Mr B. P. Godfray,[1] M.R.C.V.S., in which the legs are secured by tape hobbles to the ends of the table, but in addition the body is held in position by three straps which pass through slits in the table surface and are buckled round the neck, chest, and loins respectively.

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[1] "Veterinarian," December 1896.

CHAPTER III.

THE ADMINISTRATION OF ANÆSTHETICS (LOCAL AND GENERAL).

General Remarks.—Anæsthetics are medicinal agents which produce unconsciousness to pain, and they are used for this purpose very largely when performing operations. They are of very great value on humane grounds, and also on account of the convenience they afford to the operator. They cause relaxation of muscular tissues in some cases (such as herniæ), and allow delicate operations to be conducted with much greater care and precision, when the animal is perfectly still, than could be adopted with a struggling, violent patient. They are divided into two classes, viz., local and general.

By the term "local" anæsthetic is understood "an agent which removes sensation from the parts to which, or contiguous to which, it is applied."

Under this heading, for surgical use, come such agents as cold water, ice, ether, ethyl-chloride, cocaine, eucaine, holocaine, and orthoform.

By the term "general" anæsthetic is understood "a medicinal agent which acts upon the higher centres to produce a complete loss of consciousness in the whole body of the animal to which it is administered."

Under this heading, for surgical use, come such preparations as chloroform, ether, the A.C.E. and other mixtures.

Local Anæsthetics.—Taking the local anæsthetics first, anæsthesia produced by the first four agents mentioned (viz., cold

water, ice, ether, and ethyl-chloride) depends chiefly upon the amount and intensity of the cold produced.

Cold water and ice have a very transient effect and are only suitable for trivial operations, such as the lancing of abscesses, or the removal of small superficial tumours. In order to act efficiently they must be applied for a few minutes directly to the part upon which the operation is to be performed.

In ether and ethyl-chloride we have drugs by the aid of which the parts are artificially frozen and thus deprived of sensation. Ether is applied with a spray as first introduced into human medical practice by the late Sir W. B. Richardson, M.D.

The parts to be anæsthetised should have the hair removed by

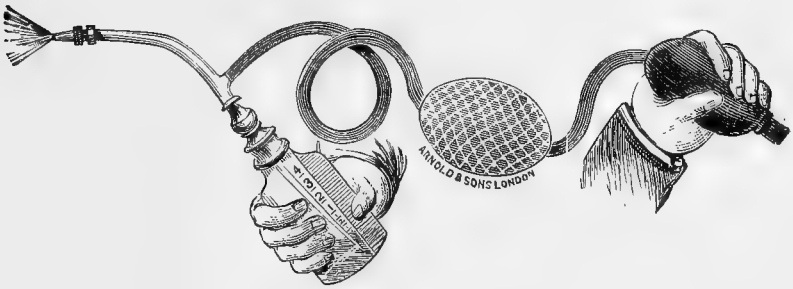

Fig. 11.
Ether spray apparatus.

shaving and be then rendered aseptic and as dry as possible, the ether being forced out of the bottle by the rubber bellows, and falling directly in the form of a very fine spray on the required spot.

Ethyl-chloride, which is also applied in the form of a spray, is sold in a very portable and neat form in small glass or metal vessels.

It is applied directly to the spot at which anæsthesia is to be produced by merely removing the metal cap from the end and holding the bottle in the warm hand.

These two agents are also best suited for minor operations, such as the lancing of abscesses, the anæsthetising of the skin, or

the removal of small superficial tumours, and are not readily applied to thick muscular tissues where a considerable amount of

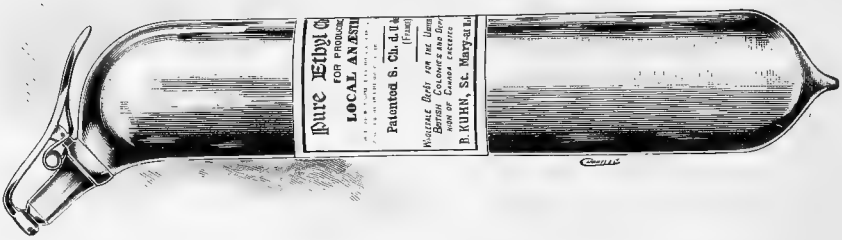

FIG. 12.

Glass tube containing ethyl chloride ready for application.

dissection has to be done; the reasons being that if a thin layer only be frozen the warm blood (when the incision is made) prevents the further application of the anæsthetic, whilst if the whole mass be frozen first it is difficult to cut, and there is the danger of necrosis as a sequel.

As a general rule anæsthesia is produced when the skin has turned white; this occurs in from half a minute to a minute and a half, and the effect lasts for about two minutes.[1] Care must be taken not to keep the parts frozen for too long a time, or necrosis may follow.

The above-mentioned agents have the advantage over other drugs of not being in any way absorbed so as to produce toxic effects unless inhaled through the respiratory passages, and even in that case plenty of warning would be given by the patient.

For operations on the cornea of the eye they are not suitable on account of the amount of irritation set up.

We now come to cocaine, eucaine, holocaine, and orthoform, which owe their special function to their power of paralysing nerve terminals in the tissues to which they are applied.

Cocaine is a vegetable alkaloid obtained from the leaves of the coca plant, whilst eucaine is a chemical preparation possessing exactly the same formula.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. IX., p. 227.

The hydrochlorate of each is the salt generally made use of.

Both of them are toxic, even in very small doses, and great care has to be exercised in their use; they are readily absorbed into the system from subcutaneous, serous, or mucous surfaces, particularly from the first named.

Cocaine hydrochlorate is readily soluble in cold or warm water, but decomposes on boiling; the solutions made use of vary from 1 to 10 per cent. It should always be made fresh when required, as even after a few days the efficacy of the solution is not to be relied upon. If it is absolutely necessary to keep it in solution a small quantity of either salicylic or boracic acid added to it will help to preserve it for a longer time.

After an injection complete local anæsthesia is produced in from three to five minutes, and lasts about twenty or twenty-five minutes; its effect is manifested around the seat of injection for a space of from half-an-inch to an inch-and-a-half, so that where a large tumour is concerned injections must be made in several places. Superficially it can be used to deaden pain when painted on parts (such as the under surface of the abdomen and thighs) where the skin is thin, but on the thicker parts its external use on the unbroken skin is not encouraging. On the cornea of the eye its effect is splendidly shown in from one to three minutes.

Eucaine hydrochlorate, when used alone, does not give such good or rapid anæsthetic results as cocaine, except when applied to the cornea of the eye. It is, however, slightly cheaper than cocaine, a solution of it can be boiled and thus rendered sterile without altering its anæsthetic power, and the toxic dose is a little larger. When anæsthesia is produced, too, the effect lasts longer than that of cocaine. A mixture of the two in equal proportions is very useful, as by it can be produced the better and more rapid anæsthetic effect of the cocaine, and at the same time the more prolonged anæsthesia and greater security from toxic symptoms which follow the use of eucaine. In order to be on the safe side, the operator should never allow of either cocaine or eucaine more than one-tenth of a grain for each pound of the

live body-weight of the patient to be absorbed into the system at one time.[1]

Holocaine,[2] like eucaine, is a chemical preparation and is used in the form of the hydrochlorate. It is antiseptic and does not decompose on boiling. A few drops of a 1 per cent. solution cause, when applied to the cornea of the eye, a temporary burning sensation, which passes off in a few seconds and is immediately followed by a local anæsthesia lasting from about twelve to fifteen minutes. It is not suitable for hypodermic injection or for use over any extent of surface, as it is more toxic than cocaine, producing symptoms resembling those of strychnine. The chief advantage which it is claimed to possess over cocaine or eucaine is that local anæsthesia is produced in ophthalmic cases without causing any intraocular tension or congestion of vessels in the neighbourhood to which it is applied.

Orthoform,[3] a local anæsthetic which has been introduced within the past eighteen months, is very valuable for wounds, mucous surfaces, and places where the skin is abraded. From a canine surgical point of view it is mainly of value in the treatment of wounds that are painful, and, dissolved in collodion in the proportion of 1 to 8, as an application for hermetically sealing an operation wound. For the latter purpose it is most valuable, especially for the closing of such wounds as are made during an abdominal operation. Before application, after the sutures have been inserted, the wound is thoroughly dried and the mixture painted on with a camel hair brush. Its local anæsthetic effect is well marked, and continues for periods lasting even as long as thirty-six hours; in addition, orthoform is non-poisonous and can be used over large abraded surfaces with perfect safety. In the Clinique we have used it at least thirty times in the dog or cat as an application after laparotomy

1 "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 20; Vol. X., p. 80.

2 "British Medical Journal Epitome," 1898, p. 99; "Year Book of Treatment for 1898," pp. 158, 368, 454.

3 "British Medical Journal Epitome," 1898, p. 79; "Lancet," 6th Nov. 1897.

without bandaging, and in no case has the animal evinced irritation or attempted to interfere with the sutures; in other instances of painful wounds, too, orthoform has proved equally valuable, when used alone or mixed in varying proportions with starch or boracic acid.

Having thus disposed of the local, we have next to consider the general, anæsthetics, *i.e.*, those which produce complete loss of consciousness in the whole of the body by their action upon the higher cerebral centres. Of these the best are chloroform, ether, and the A.C.E. and A.E.C. mixtures. They are used for major operations, and in cases, such as reduction of herniæ, where it is desirable to relax various tissues.

The Choice of a general Anæsthetic.—Chloroform is by far the most ideal anæsthetic to choose for the average adult animal. It is much more pleasant to taste than ether, does not produce so much salivation, the stage of excitement is less, and that of anæsthesia more prolonged, besides which the after nauseating effects are by no means so well marked. If given slowly and properly diluted the risk to adult canine patients is very slight. In the cat, however, and in the young of very delicate breeds of dogs, greater care must be exercised, and it is safer to choose either ether or the A.C.E. mixture. The last named consists of a mixture of 1 part of alcohol, 2 parts of chloroform, and 3 parts of ether. These opinions are based on the fact that (mainly in the Out-patients' Free Clinique of the College) chloroform has been administered within the past five years, by the pattern of inhaler shown in Fig. 14, to more than 800 consecutive canine patients with only three fatalities, two of which were satisfactorily accounted for on *post-mortem* examination; in the third case unfortunately no *post-mortem* was made. As, however, the latter was a pug I was not altogether surprised, this breed of dog being usually risky to anæsthetise on account of the shape of the nose. The operations were of all kinds, some very trivial and some very severe, the animals not being (except in a very few instances) in any way prepared or selected, of all ages, sizes, breeds, and conditions. The periods of anæsthesia

varied from a few minutes to four hours.[1] Of the three fatalities two patients were pugs and the other an aged fox terrier; the latter was found to be the subject of a generalised tuberculosis which involved very extensively both the heart and pericardium. In the case of the first pug the animal was very old and very nervous, and death was due to rupture of a large abdominal vessel whilst struggling in the stage of excitement. In cats 120 consecutive cases were chloroformed with three deaths—a much larger proportion. Since these experiences we have used A.C.E. mixture or ether for all short-nosed delicate breeds of dog and for cats, up to the present with satisfactory results in about eighty cases.

Indications for Especial Care in the Use of General Anæsthetics.—Extra care must always be exercised in very young animals, those of delicate breeds, those which are very fat, and those suffering from any respiratory or cardiac trouble.

Any impediment to the respiratory functions must always be looked upon with especial caution; with regard to some cardiac affections, it is worth noting that in five or six instances in the Clinique, dogs, whose *post-mortem* examinations, when made shortly afterwards, revealed large vegetations on the valves of the heart, had taken chloroform for a prolonged period without showing the slightest sign of danger.

Preparation of the Patient.—It is a good plan, although by no means absolutely essential, to diet the animal carefully for one or two days, and to allow only a small meal about two hours previous to the administration of the anæsthetic.

It is not necessary to make use, as is sometimes recommended, of subcutaneous injections of atropine or morphia a short time before anæsthetising, or to administer either ammoniacal or alcoholic stimulants. In fact, from observations made in order to test this point, the author is inclined to consider that when morphia and atropine (or either) are previously used, the result is rather to increase than diminish the risk.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 287; Vol. XI., p. 114; Vol. XIII., Part I. "Veterinary Record," Vol. IX., p. 284; Vol. X., p. 163.

Method of Fixation.—The object in fixing must be to place the animal in such a manner first, that the organs contained in the thorax are allowed full play, and secondly, that relief from restraint can be effected at a moment's notice. These points are very important, and, in fact, absolutely essential.

The safest position is undoubtedly that which is described in the chapter on methods of securing as the "abdominal" one,

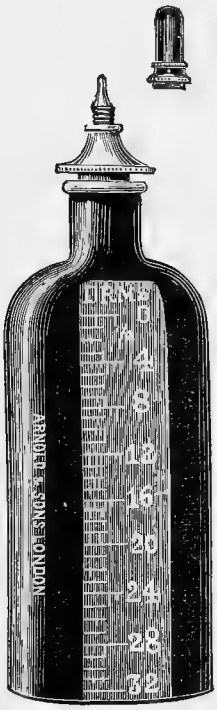

Fig. 13.
Diagram of drop bottle.

the patient being anæsthetised in this position, and afterwards turned about as required to suit the convenience of the operator.

If the animal is merely held in the arms of an assistant, care must be taken not to in any way compress the chest or hinder the breathing during the stage of struggling which usually precedes anæsthesia.

Methods of Administration, Apparatus, etc.—There are two chief methods of administering general anæsthetics. One is known as the "open" method, and the other "administration by the aid of an inhaler."

For the "open" method, the best and safest results can be attained by the aid of an ordinary wire muzzle, a thin duster, and a drop bottle; or, in place of the duster, a piece of thin flannel or calico may be previously sewn around that part of the patient's muzzle which covers the nostrils and lips.

The great secret of success with chloroform is to allow plenty of air, and only just a sufficiency of well diluted chloroform vapour for the purpose required. The duster must on no account be folded upon itself, one thickness of the cloth being ample, and the anæsthetic applied *gradually* from the drop bottle.

The wire muzzle is useful, because it forms a framework upon which to rest the duster, and protects the face from the irritant effects of any chloroform which would otherwise come in contact with the skin or eyes. For small animals an improvised apparatus can be made by placing a piece of blotting paper or cotton wool soaked in chloroform at the bottom of a tumbler or gallipot, and holding it over the animal's nose; or the animal may be placed under a bell jar, or in an air-tight box with a glass lid, into which there is placed some material soaked in the anæsthetic.

The two latter methods, however, require great care, and are not very convenient for prolonged operations.

The inhalers suitable for canine work are of three patterns, varying somewhat in their construction and in the amount of vapour which they give off.

The advantages of an inhaler are, that only the vapour comes in contact with the patient's nostrils (there being thus no fear of irritant effects), the anæsthetic is well mixed with air in tolerably constant proportions before being breathed, the amount allowed can be adjusted with great delicacy, and the risk of overdose is thus minimised; the quantity, too, of chloroform used is considerably less, as the amount wasted is exceedingly small.

The first apparatus is so devised that it allows six or eight drachms of chloroform to be placed in the bottle; by means of the bellows a current of air is sucked over the surface of the anæsthetic, the mixed vapour being forced onwards into the mask (Fig. 14).

When eight drachms are in the bottle and the temperature of the air about 60° Fahrenheit, each full compression of the bellows sends over chloroform vapour well mixed with air in the proportion of about 1 in 2500. In order to produce anæsthesia, the bellows must be worked as hard as possible,

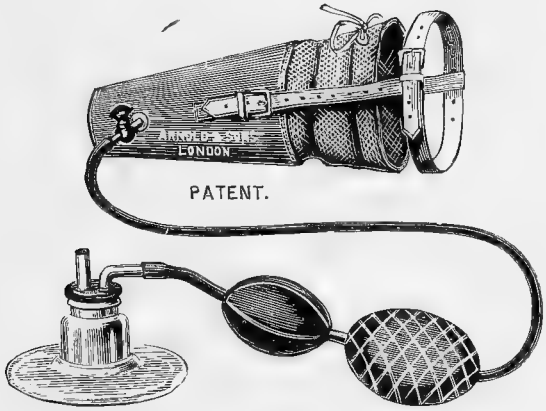

Fig. 14.
Diagram of author's anæsthetic inhaler (first pattern).

the end of the mask being closed at the discretion of the anæsthetist.

With strong dogs of the larger breeds it is sometimes necessary to assist anæsthesia by placing a little chloroform on wadding in the end of the mask. For very delicate or young animals the vapour can be very much more diluted, either by putting less chloroform in the bottle, by only partially compressing the ball, by regulating the amount admitted by means of the tap, or by leaving the end of the mask uncovered.

The second pattern, known as Junker's, which has been modified to suit the smaller animals by Messrs Kröhne & Sesemann,

allows a stream of air to be forced through a quantity of chloroform, and so sends into the mask the vapour of air and chloroform mixed (Fig. 15).

With this it has been estimated that (at a temperature of 62° Fah.) with eight drachms of chloroform in the bottle, each full compression of the bellows sends over an average of one minim of chloroform vapour well mixed with air, in the proportion of 1·869 per cent. This apparatus is suitable for large dogs, but with small ones and cats great care must be exercised, or an overdose may easily be given. When used for these

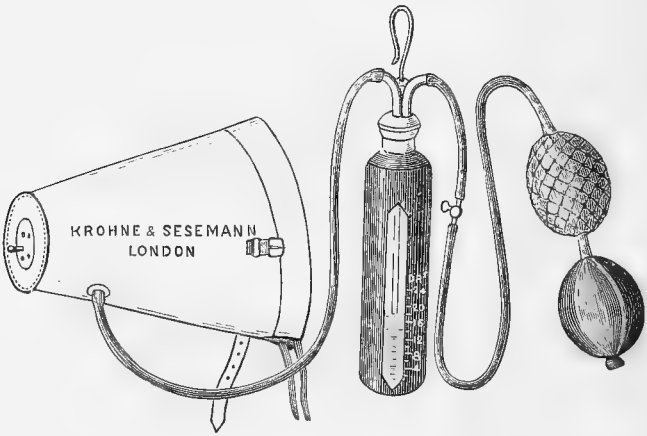

Fig. 15.
Diagram of Junker's inhaler (Kröhne & Sesemann's pattern).

animals the bellows must not be compressed to their fullest extent, and the end of the mask must be left open.

The anæsthetist should commence by pressing the ball very lightly, and not to more than about one-sixth of its extent, the pressure being gradually increased until sufficient vapour has been given to produce anæsthesia.

The third pattern of apparatus plays a medium part between the other two, as its object is to force a current of air over the surface of the chloroform (Fig. 16).

The vapour sent over is stronger than that of the first pattern, but less concentrated than that of Junker's.

Another modification, suitable for hospitals or infirmaries where operations are constantly being performed, consists in an arrangement whereby all pumping by means of the bellows is done away with, a cylinder of compressed air with a regulating valve being attached to the bottle in such a way that the current (when turned on) passes either over or through the chloroform, and so forces the mixed vapour onwards into the mask (Fig. 17).

Whichever inhaler is used, care must be taken to produce anæsthesia slowly, and to administer the vapour as regularly and steadily as possible. The average length of time required

Fig. 16.

Diagram of author's second design of inhaler.

in which to produce the safe stage of unconsciousness for a cat or small dog is from one to two minutes; for a dog the size of a terrier, about three or four minutes; and for the larger breeds, six or eight minutes.

Stages of Anæsthesia.—During the process of complete anæsthetisation an animal passes through four stages. The first one is a stage of surprise and alarm, during which the patient sometimes holds its breath as if unwilling to receive the strong vapour. This is especially noticeable in cats and rabbits, and care must be taken to allow the respirations to become regular

before proceeding. The second stage is one of excitement during which the animal is in a semi-conscious state, and appears in an almost frenzied condition, yelping and struggling violently, and often involuntarily relaxing the sphincters of the rectum and bladder. After this we get the third or safe anæsthetic stage, in which the animal is ready for the operation; and lastly, the fourth or dangerous stage, in which there is risk of permanently paralysing one or more of the great vital centres. When the anæsthetic is administered very gradually it is often possible to cause the animal to pass into the third stage without

Fig. 17.

Diagram of author's third pattern of inhaler showing another form of mask.

becoming in any way frenzied or excited; one can frequently succeed in quietly anæsthetising small dogs whilst they are held in the arms of the owner without being secured in any way and without any struggling, the animal passing tranquilly into the stage of unconsciousness.

The first signs of the approach of the stage of safe anæsthesia are that the struggling becomes less, the efforts being weaker, and the tail becomes limp; then the hind quarters become powerless, and ultimately the head cannot be raised. When the whole body is totally limp and respirations are regular the

operation should be performed. Dilatation of the pupil of the eye, especially in the cat, is always well marked, and is by no means, as stated by some, a sign of danger. To maintain the patient in this stage with safety the anæsthetic must be carefully administered in small quantities from time to time at discretion, and it is a good plan to release the animal from restraint as much as possible in order to be thoroughly prepared to administer antidotes in case of accidents. An animal may be kept in this stage for any reasonable length of time. In the College Clinique the longest period in which we have kept a dog under chloroform has been four hours, but very few of the operations of daily practice require an anæsthesia of more than half-an-hour.

The anæsthetist must devote his whole time and attention to his work, and not be watching the operator. He must note particularly the efforts of respiration; should these become weak, shallow, irregular, or in any way spasmodic, or should they cease suddenly, the mask must be at once removed and antidotal measures adopted. The pulse is not such a good guide to danger, but extra care must be taken if it becomes irregular, jerky, intermittent, or feeble. The temperature of the body must be taken into consideration in very prolonged operations; the effect of the anæsthetic, combined with the stillness of the body, causing a fall below normal. This should never be allowed to get below 95° Fahr. Another sign which is dangerous is a convulsive twitching of the extremities, especially marked in the paws of the hind legs, and in the cat it invariably means death if the hairs of the coat suddenly turn the wrong way.

The respiration, however, is the chief and also the easiest thing to watch. Out of an experience of a very large number of dogs and cats destroyed with chloroform gradually administered, in fully 95 per cent. the respiration has perceptibly been the first to fail. Occasionally the heart has appeared to cease first, or the two have appeared to stop together, these being particularly noticed when the vapour was rapidly administered

in a concentrated form and insufficiently diluted with air.[1] The phonendoscope, an instrument devised particularly for listening to chest sounds, is of great service in demonstrating these points.

Remedial Measures and Antidotes. — In all cases where general anæsthesia is practised antidotes should be placed beforehand in a position where they can be obtained and used at a moment's notice.

Upon the first signs of danger at once tear off the mask and remove all restraint; carry the patient carefully into the fresh, cool air, place in a horizontal position, lowering the head slightly in such a way that the lumen of the trachea is not at all lessened; open the mouth, withdraw the tongue, either with the fingers or forceps, continually pulling it forward in a jerky manner; apply some medicinal antidote and immediately commence artificial respiration.

The latter can be done in several ways. We may copy the method known in human practice as Sylvester's, which consists in placing the patient on its back and slowly endeavouring to imitate normal respiratory movements by extending the fore limbs well over the head, and then pressing the elbows and bent limbs against the sides of the thorax.

A second, which appears to bring greater success in the dog and cat, consists in laying the animal on the right side and emptying the thorax by means of a number of short, sharp efforts, the natural elasticity of the ribs causing the chest to again expand.

Whichever way is adopted, the mouth at the same time should be held open and the tongue drawn well forward by short, sharp jerks, in order to raise the larynx and allow as free a passage as possible for the entrance and exit of air.

A third method which will cause the lungs to be filled is performed by taking hold of each elbow and jerking the body

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 287; Vol. XI., p. 101.

upwards into the air several times. This is certainly a very effective method of filling the thorax, but there is always danger of rupturing some large abdominal vessel in fat animals, and in the large and weightier breeds it cannot always be managed.

A fourth method which sometimes brings success is to force air or stimulant vapour (such as that of amyl nitrite) by means of a special form of bellows (Higginson's enema syringe can be improvised for the purpose) up the nostrils and so into the lungs. This is done in a jerky manner and the air is then forced out again with a succession of short, sharp compressions on the ribs.

In practising any of these ways care must be exercised, as rupture of the liver or mesenteric artery is an occasional sequel to performing artificial respiration too energetically, especially in fat and aged animals.

Recovery will sometimes follow simple inversion or swinging the animal round by the hind legs, these acts being performed with the idea of causing a flow of blood to the head and thus relieving the over-congested heart. These methods are, however, open to the objection that they tend to diminish the capacity of the chest by throwing the weight of the abdominal organs against the diaphragm.

Cold affusions to the head and chest, and striking the body with a wet cloth are also recommended, but certainly must not be trusted to alone.

Tracheotomy is sometimes advisable, but in cases of this kind, where whatever is done must be done immediately, this operation is often a matter of difficulty, especially in the smaller and long-haired breeds.

Venesection has been practised, but cannot be relied on.

The medicinal antidotes found to be of the most value are: strong ammonia vapour, amyl nitrite, hydrocyanic acid (Scheele's), and subcutaneous injections of ether, saline solution, or strychnine.

Whatever antidote is chosen it is obvious that the chances of success are enormously increased if the agent can be admin-

istered before respiration actually ceases. If this could always be done the proportion of deaths during anæsthetisation in the dog and cat would be infinitesimal.

Since chloroform is an agent which destroys life by paralysing either the respiratory or cardiac centres, and sometimes both apparently at once, the objects sought for in an antidote are those which will act as a stimulant and restorative to either or both. It is important then that the anæsthetist shall select the one which seems most nearly to fulfil these objects.

In ammonia vapour, such as is evolved from liq. ammon. fort., we have an agent whose therapeutic actions are those of general stimulant, both respiratory and cardiac, but we dare not give it in the form of a draught, because the patient is unable to swallow, and we cannot inject it hypodermically on account of its slowness of absorption and irritant action, whilst its intravenous injection is difficult, so that it is usually given in the form of a vapour inhalation. It is needless to remark that the respiratory apparatus must be artificially induced to work if it has ceased to do so, in order that the effect of the vapour may be shown on the body. This is sometimes a source of difficulty, and when once the respiratory organs have recommenced to work the vapour must not be too suddenly applied, or the reaction is apt to be too severe. It must be used at intervals with discretion, holding the bottle under the patient's nostrils for a few moments and then withdrawing it.

With amyl nitrite the chief action is that of a cardiac stimulant, and it has the advantages of being non-irritant and readily absorbed from mucous surfaces, so that it can be administered on the tongue. The necessary dose, too, is very small, and it can be given undiluted. For the dog or cat about one quarter of a minim for each pound body-weight is a fair average dose.

Hydrocyanic acid[1] first suggested itself as an antidote to chloroform whilst watching the powerful respiratory efforts

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. XI., p. 101. "Lancet," 1st Jan. 1898.

which it so rapidly causes when given to produce toxic effects, and when used as an antidote the object must be to give just sufficient to attain a temporary stimulating effect on the respiratory centre without causing over-stimulation and consequent arrest. Its rapidity of action is unquestionable, and it can be given either subcutaneously or by the mouth. With the former there are no local irritant effects as a sequel; and with the latter there is no danger of any entering the trachea and producing choking, because the dose is so small.

FIG. 18.
Antidote drop-tube and bottle for hydrocyanic acid.

The method of administration which is advised consists in placing a small quantity by the aid of a drop-tube on the back of the tongue, from whence it is absorbed readily by the moist mucous membrane. A full medicinal dose should be given, Scheele's acid acting quicker than that of the British Pharmacopœia strength, although, of course, it must be used with greater caution, one reason being that the evanescent vapour is drawn into the lungs by the performance of artificial respiration, and is thus more rapidly absorbed into the system.

Hydrocyanic acid is of especial value because it not only stimulates the respiratory centre to recommence if once it has ceased, but if given in full medicinal doses it maintains the efforts until they are able to look after themselves, and at the same time, by the deep inspirations produced, it causes the entrance of a large amount of fresh air into the system. Its effects, too, on the heart-beats is beneficial. The dose recommended, of Scheele's strength, to be placed on the tongue averages about one-eighth of a minim for each pound of body-weight (*see* Fig. 18). Subcutaneous injection of ether is advised on account of its rapidity of absorption and powerful action as a general and diffusible stimulant. Saline solution (one ounce of salt to the pint of distilled water) has certain action upon the blood plasma which assists the engorged and enfeebled heart to recover itself. It acts more rapidly when heated to a temperature of from about 105° to 110° F. before being injected.

Strychnine is used because it is a respiratory stimulant, but its action is decidedly slower than that of hydrocyanic acid, and besides that there is always the great risk of overdosage, as in order to get rapid antidotal action a full dose must be given, and dogs and cats seem to have most peculiar individual susceptibilities to this drug.

In the Clinique we have had opportunities of trying each of these different methods and agents, and the plan which we have found to yield the best results has been to immediately release from all restraint, clear the nostrils and throat of mucus, draw the tongue well forward in a jerky manner, apply artificial respiration by the second method described, as quickly as possible place a few drops of Scheele's hydrocyanic acid on the back of the tongue, and cautiously apply the ammonia vapour to the nostrils.

Symptoms of Recovery, Bad Omens, etc.—After respiration has actually ceased, the good signs to be looked for when resuscitative measures are being adopted are:—

Recommencement of respiration, the efforts becoming gradually more regular; increase in force and regularity of the heart's

action; side to side movements of the lower jaw and voluntary retraction of the tongue; moaning or yelping; and movements of the head, ears, or limbs.

When breathing has recommenced artificial respiration should be carefully continued until the patient is well out of danger, or, if this precaution is not followed out, the breathing may again cease and death ensue.

When an animal is recovering plenty of time should be allowed to elapse before fluid restoratives or foods are administered forcibly by the mouth, as there is danger of some of the material getting into the trachea and causing choking or pneumonia; care must also be taken, particularly when dealing with the cat, to avoid being bitten, as sometimes an animal when recovering will involuntarily make a vicious bite at any object near its mouth, and not unclose the teeth until forcibly made to do so.

Bad omens are to be gathered from relaxation, during the stage of danger, of the sphincters of the bladder and rectum; erection of the hairs of the coat, especially well marked in the cat; stoppage of the heart, and no sign of returning animation after five minutes' continuous and careful attempt at resuscitation. Hope should not be given up for at least ten minutes after respiration has ceased, and above all never so long as the heart is beating. In several instances we have observed from two and a half to four minutes to elapse before there was any sign of a return to life.

In case of a fatal termination, a *post-mortem* examination should always be made where possible, as this often gives a satisfactory explanation of the cause of death.

Differences between the Administration of Chloroform, Ether, and A.C.E Mixture.—When desirous of using ether, either by the open method or with the aid of an inhaler, air must be excluded to a very much larger extent than when chloroform is chosen.

The mixed vapour should consist of fully 70 per cent. of ether, whereas with chloroform the proportion admitted even

for a large dog need not in the majority of cases be more than 1 in 1000, and for very young animals and those of the smaller and more delicate breeds 1 in 3000 or 1 in 4000 parts of air is not too small a percentage, especially at the commencement.

If using a wire muzzle and towel the latter should be folded two or three times after the anæsthetic has been put on it and the ether allowed to flow much more rapidly from the drop bottle or measure; with an inhaler air must be excluded at the end of the mask as much as possible, always of course at the discretion of the anæsthetist. With this drug the stage of excitement is longer, and that of anæsthesia shorter, than where chloroform is used.

The A.C.E. mixture is particularly useful for small, delicate dogs and cats. With it there is not so much risk of producing dangerous symptoms as when chloroform alone is used by an inexperienced anæsthetist, and the mixture does not produce so much salivation as when ether alone is used; besides which, the stage of anæsthesia lasts longer, and that of excitement is shorter, than when ether is used. It thus occupies a middle place between chloroform and ether.

CHAPTER IV.

PREPARATION OF INSTRUMENTS, DRAINAGE TUBES, SUTURE MATERIAL, SPONGES, ETC.

BEFORE entering upon a surgical operation it is essential that the operator bestows care upon the instruments which he is about to use.

One of the most important secrets of the successful healing of a surgical wound consists in seeing that injurious germs are not introduced by means of the instruments, and it is very essential that the latter shall be first rendered aseptic. This can be readily attained by boiling for about ten minutes in some form of steriliser (for which purpose an ordinary clean saucepan or fish kettle can be suitably improvised), or by placing for at least half-an-hour previous to use in an antiseptic solution of reliable strength. To merely plunge them in an antiseptic solution, as is frequently done, about a minute before operating is of no value at all.

For the antiseptic solutions trays or dishes made of glass, earthenware or metal are necessary. A clean pie-dish or an enamelled iron bowl can be improvised for the purpose very well.

The solutions usually chosen are those already mentioned when dealing with the preparation of the site of incision; most of them have some minor disadvantages although the advantages far outweigh these. For instance, solutions of carbolic acid and lysol made the handles slippery to take hold of and have an astringent effect on some operators' hands. Solutions of chinosol, biniodide of mercury, and corrosive sublimate dis-

colour the steel; solutions of creolin are opaque and hide the instruments; and each of them has more or less action upon the edge of the blade. During the operation the greatest care must be taken that the instruments do not come in contact with anything which has not been thoroughly cleansed and rendered aseptic, and when finished with they should be carefully cleaned, dried, and put in a dry, clean place until required for future use.

Scalpels with metal handles, and forceps, scissors, etc., that take to pieces in order that the joints may be thoroughly

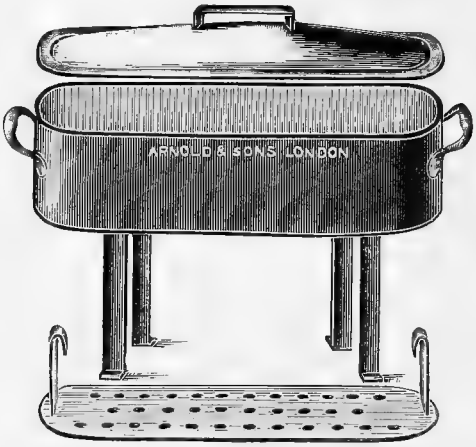

Fig. 19.
Instrument steriliser.

attended to, are always preferable. The nickel-plating of parts which can be so treated is also an advantage both as regards cleanliness and for the sake of appearances.

Instrument cabinets, with tight-fitting doors to exclude dust and with glass shelves, can now be obtained at a comparatively small cost, and if placed in a dry situation nothing further is necessary than to lay the instruments inside.

In the event of the absence of a proper cabinet the instruments should be wrapped in clean lint or wadding and put in a thoroughly dry and dust-proof place.

Preparation of Silk and Wire.—Silk and wire for suture purposes should be clean and carefully boiled for at least ten or fifteen minutes before use, or placed for at least half-an-hour in some reliable antiseptic solution. Silk is conveniently prepared in various sizes known as 00, 0, 1, 2, 3, 4, etc., and can be kept ready for immediate use by being wound on glass reels and kept in glass stoppered bottles.

Catgut and Kangaroo Tendon will not bear boiling; they

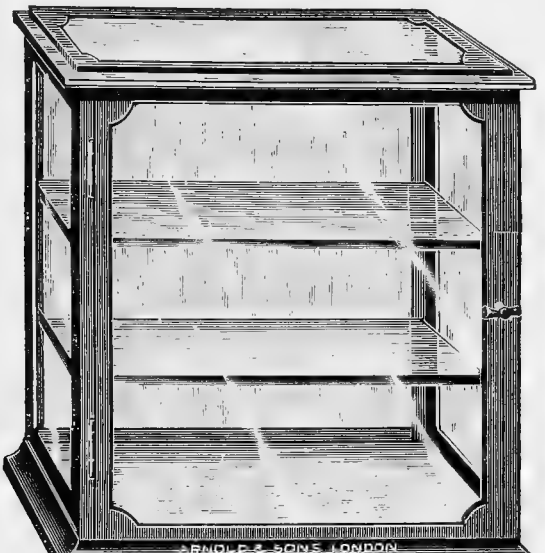

Fig. 20.
Instrument cabinet.

require lengthened immersion in antiseptic solution, and, to be thoroughly sterile, a proper method of preparation. Mr C. B. Lockwood, F.R.C.S.,[1] speaks very highly of the sterile property of catgut prepared according to Esmarch's[2] directions, which are as follows: "The ordinary commercial catgut, Nos. 1 to 3, is vigorously cleansed with a brush in soft soap and water, and

[1] "Aseptic Surgery," p. 180.
[2] "The Surgeon's Handbook," translated by Curtis, 1888, p. 15.

after washing in pure water, is wound on glass spools and laid in bichloride of mercury solution (1 to 1000) for twelve hours; then in an alcoholic (1 to 200) solution of bichloride for twelve hours, and it is then preserved dry in tightly closed glass vessels. Just before it is used it is laid in a vessel filled with an alcoholic (1 to 2000) solution of bichloride of mercury."

Catgut, ready prepared by the above or some similar method, can be purchased at a reasonable price, being conveniently arranged in dust-proof bottles in such a way that the gut is kept in the solution until a portion of it is required, and then only that portion is exposed which is to be used. If in oil it must

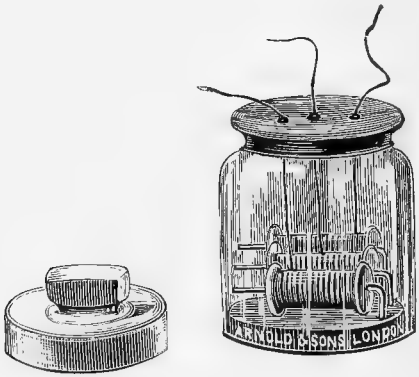

Fig. 21.
Diagram of glass ligature bottle (Clarke's).

be well washed with ether or soaked in a strong antiseptic for some hours before using.

Silkworm Gut or Fishing Gut, particularly useful for suturing the abdominal wall because of its not possessing capillary properties, is readily sterilised by boiling. It is also made in different sizes.

Drainage Tubes, either of glass, metal, or rubber, are readily sterilised by boiling and afterwards immersing them in an antiseptic solution; the chief trouble with our patients is to keep them clean when in position, and in reality the less they are used the better, a plug or tent of antiseptic cotton wool being usually an efficient substitute.

Sponges are very useful for the purpose of soaking up blood, etc., when operating, but as it necessitates a lengthy and troublesome process to cleanse and render them sterile, it is the wisest plan to avoid their use whenever it is desired that immediate union shall take place.

Tampons of Cotton-wool which have been boiled for about fifteen or twenty minutes and afterwards placed in a reliable antiseptic solution are much better, and as they are cheap they can be used freely. They are made either by merely screwing up some cotton-wool into little balls or, better still, by stitching small pieces of clean gauze around small masses of wadding. If required to be used dry they can be sterilised by being placed in a glass stoppered jar and kept in an oven at a temperature of 160° C. for about an hour. Sponges, to be rendered sterile, have to pass through a complicated process of washing and soaking in solutions of hydrochloric acid, boiled water, soda, sulphurous acid, boiled water again, and lastly some antiseptic lotion.[1]

PREPARATION OF THE OPERATOR'S HANDS.

This part has been placed second to that of the treatment of the instruments, because in these days of aseptic and antiseptic surgery it seems hardly necessary to say that the operator should pay particular attention to the condition of his hands, nails, etc.

If an excuse is necessary for alluding to the subject it must be that the student does not easily understand the importance of always going through a regular routine before operating. Again, in veterinary operations it is not at all times possible to get the assistance and spotless surroundings which accompany the surgeon in human practice.

The operator in veterinary practice has to attend personally to the securing of the animal, and in doing so is compelled

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[1] "Aseptic Surgery," C. B. Lockwood, p. 184.

to touch parts of the latter's body which are far from clean according to bacteriological ideas. Before operating, the hands, and particularly the nails, should be thoroughly scrubbed with soap and hot water (containing some antiseptic) by the aid of a clean nail brush, and then held for a few minutes in some clean antiseptic solution. In abdominal, and some of the more serious operations, it is a wise precaution in addition to scrub the fingers with a little ether or methylated spirit, and then again in antiseptic wool, in order to remove all grease. During the operation care must be taken not to touch anything which has not been rendered aseptic, and if by accident this is done the hands must be again carefully disinfected before touching either the wound or the instruments. The wound should be touched with the fingers as little as possible. The choice of the antiseptic must be left to the operator, care always being taken to make it of sufficient strength. Any of those mentioned in the previous paragraphs are suitable, the only precautions necessary being taken in the cases of carbolic acid, lysol, and creolin, which have an irritant effect on the hands of some, especially when the solution is very concentrated.

CHAPTER V.

THE TREATMENT OF WOUNDS.

General Remarks; Methods of Allaying Hæmorrhage.—In the dog and cat wounds, as a rule, heal very well when properly attended to, and the animal is prevented from causing undue irritation by constant licking. In the cat, particularly, this licking of the wound is often a source of trouble, and greatly retards healing, owing to the roughness of the tongue. The chief principles to observe are those of thorough cleanliness, the application as often as necessary of some antiseptic dressing, and the avoidance of all sources of irritation.

The hair at the edges of a wound should always be removed either by being clipped close with scissors or, better still, by shaving; the wound and its surroundings being thoroughly cleansed with soap and water, and dressed with antiseptics.

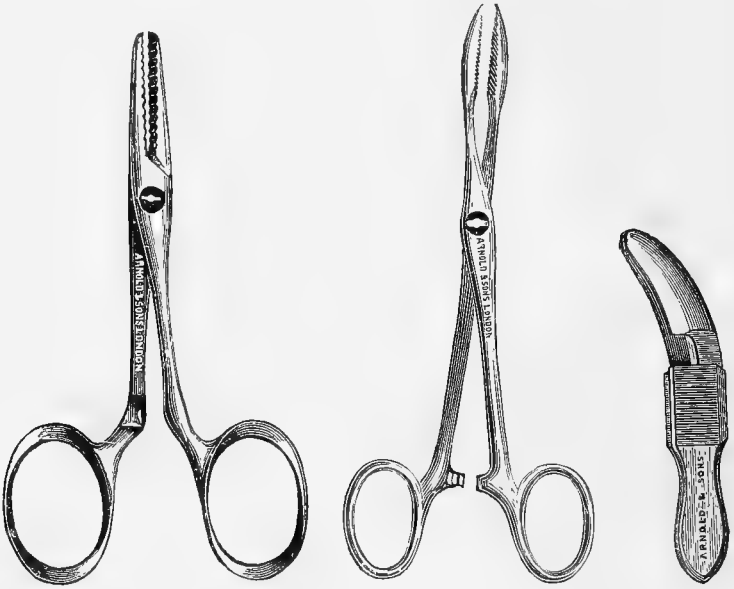
If freshly made all blood clots and foreign bodies should be removed from between the edges, the latter being drawn together by sutures, and then bandaged or not at the discretion of the surgeon.

Hæmorrhage is arrested by means of pressure applied above or immediately around the bleeding part; this can be done by the aid of a tourniquet made of tape or elastic. The cut ends of the vessels are then sought for and secured by artery forceps, of which there are several patterns in common use. In extreme cases it may even be necessary to cut down upon the vessel above the original wound and here ligature it.

When secured, the forceps are left on for some little time, or

else the end of the artery is ligatured with some aseptic material such as boiled silk.

In cases where the edges cannot be drawn together, or in which it is not considered advisable to adopt such a course, the thorough application of antiseptics must be resorted to, either by application on clean wadding or with a syringe. Syringes should be made of some material which can be rigorously cleaned.



Spencer Wells' *Pean's.* *Dieffenbach's or Bull-dog.*

Fig. 22.

Artery forceps of different patterns.

Dry antiseptic dressings are applied usually by being dusted on the parts with the aid of a piece of wadding, or, if at all deep seated, by means of an insufflator of some pattern or other.

The list of fluid antiseptics commonly used for wounds is the same as that already mentioned when speaking of those used for instruments. Dry antiseptic dressings include such agents as boracic acid, zinc oxide, iodoform, thioform, orthoform, starch, alum, tannic acid, etc., either alone or mixed together

in various proportions. Those that are at all toxic, such as iodoform, must be used with great caution, as absorption may take place, and particularly if on a part which the animal can reach with its tongue, as poisonous effects are apt to ensue.[1]

For operation wounds, after applying sutures and thoroughly drying with aseptic cotton wool, a useful dressing is formed either by iodoform and collodion (1 to 10 or 12), or orthoform and collodion (1 to 8 or 10). Both of these mixtures allay irritation and protect the wound effectually for a short time from dust and dirt.

Möller[2] recommends a wound gelatine which has the advantage of adhering equally well to moist or dry surfaces. It is prepared by soaking ordinary sheet gelatine in sufficient quantity of a one per cent. sublimate solution to cover it. After it

Fig. 23.
Insufflator for the application of dry dressings.

has become quite soft it is melted by gentle heat and a quantity of glycerine equal to one-tenth of the dry gelatine added. When required for use it is melted over a slow fire and painted over the wound.

To prevent the animal from licking the wound an Elizabethan collar (see fig. 70) is very useful.

The Suturing of Wounds.—Various forms of sutures are used for drawing together the edges of wounds, the two chief divisions being the "interrupted" and the "continuous."

The principal subdivisions of interrupted sutures suitable for canine work are: simple interrupted, pin, button, or quill sutures, and Lembert's.

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1 "Veterinary Record," 8th July 1899.
2 Möller's "Veterinary Surgery" (Dollar's translation), p. 2.

The principal continuous sutures are: simple continuous, furrier's, and Halstead's.

The materials used are: silk, Chinese twist, horse hair, wire, cat-gut, kangaroo tendon, silk-worm gut, and thread. Each of these can be obtained in various sizes.

Whatever material is used, it must be rendered aseptic before being used, or pus is liable to form in the suture holes and retard the healing process. Catgut and silk-worm gut, especially the latter, do not become absorbed for a considerable length of time, and are valuable in cases where it is required that the sutures shall remain in for a long period; silk-worm

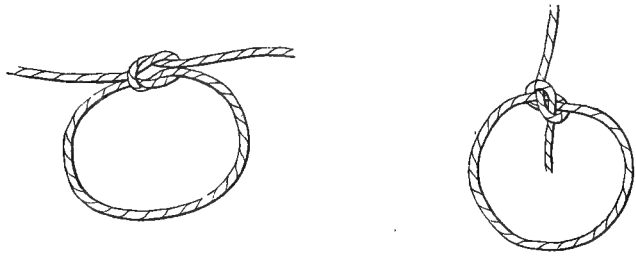


FIG. 24.

Showing how the ends of the silk fall in a "surgical" and a "granny" knot respectively.

gut is particularly good for the abdominal wall, because it does not possess capillarity.

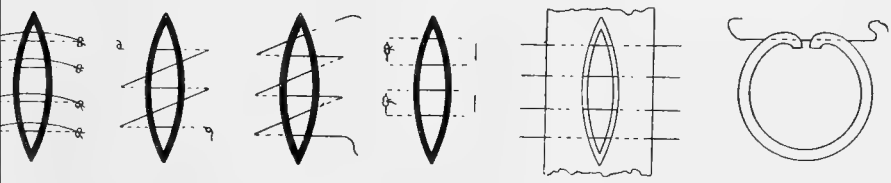
Simple interrupted sutures are those in which each suture is complete in itself and entirely separated from the others. They are made by passing the needle and suture material through the edges of the wound and tying the suture carefully in some form of knot which is not liable to slip. The best pattern of knot for this purpose is variously known as a "surgical," "Staffordshire," or "reef" knot, and is so arranged that when completed the loose ends fall opposite to one another at right angles to the wound, and directly over the suture itself. The knot may be left directly in the centre, or, what is probably a better plan because it causes less irritation, pulled to one side. When the loose ends fall in the same line as the wound and at right angles

to the suture the knot is apt to slip or give way; this is termed a "granny" knot.

Simple interrupted sutures are suitable for many kinds of surgical work, and should be inserted from a quarter to half-an-inch apart.

FIG. 25.
Suture button (Pugh's).

Pin Sutures are not so commonly used in the surgery of the dog and cat as in that of the larger animals. They are made by passing clean pins through the two edges of the wound, and afterwards twisting aseptic silk, tow, hair, or some such material over the pin in a figure of 8 fashion. They should



Interrupted sutures. *Simple continuous suture.* *Furrier's suture.* *Halstead's suture.* *Lembert's bowel suture.*

FIG. 26.[1]
Showing different patterns of sutures.

not be inserted quite so close to one another as in the case of ordinary interrupted sutures.

Button Sutures are particularly useful for large wounds, where the edges are thin and apt to tear away. In making them, button-shaped pieces of bone (or some hard easily-

[1] For this drawing I am indebted to Mr D. Crole.

cleansed material) are used, the suture being passed through the edges of the wound, then through a hole in the button on

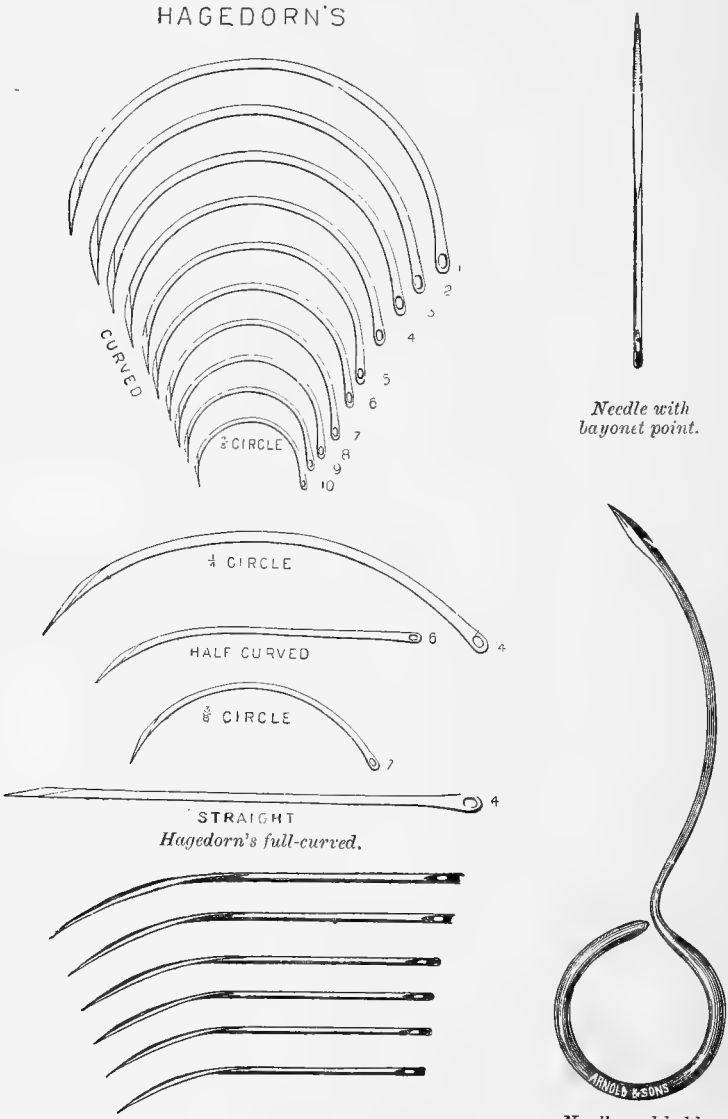


FIG. 27
Showing various patterns of needles

the opposite side, and fastened in some way suitable to the special pattern of button used.

Quill Sutures are similar in principle to button sutures, with the exception that an ordinary quill or piece of wood of that shape is fixed on either side of the edges of the wound by the silk or thread. It is suitable for similar wounds to those in which the button suture is applicable.

Lembert's Sutures are used when suturing the bowel, bladder, or uterus. They are made by passing interrupted sutures through the serous and muscular coats, great care being taken to avoid puncturing the internal or mucous coat, and to ultimately bring the two serous surfaces well into contact with one another. Small round sewing needles are the best ones to use when inserting these sutures, as if a flat or bayonet-pointed needle be used the sutures are apt to tear out.

The **Simple Continuous Suture** requires no explanation; it is particularly used for suturing the peritoneum where considered necessary after abdominal operations, and for the skin where the sutures are only intended to be temporary, and where the wound is to be re-opened.

The **Furrier's Suture** is not a suitable one where quick healing is desired, as the suture material passes between the edges of the wound, thus causing irritation.

Halstead's Suture is very useful for some wounds, and is made by passing the suture through the wound, then returning it and tying off on the proximal side. Care must be taken that it is not drawn so tight as to wrinkle the skin, or healing will be retarded.

The **Needles** used for suture purposes are of various sizes, shapes, and patterns. They may be straight, curved, half-curved, round, flattened either from above to below or from side to side, bayonet-pointed, with chisel-shaped ends or merely sharpened. They may or may not be fixed in a handle, according to the fancy of the operator and the kind of work required of them.

For carrying wire an improved pattern is that designed by

Mr H. C. Reeks, M.R.C.V.S., which has a tubular end and two hollow spaces, so arranged that the wire falls into a slot prepared for it, and does not in any way interfere with the passing of the sutures.

A needle-holder, of which there are several patterns, is often

Fig. 28.

Wire suture needle (Reeks').

a useful accessory ; a pair of Spencer Wells' artery forceps form a fairly efficient substitute.

Bandaging.—It is frequently necessary to bandage a wound, and different forms of bandages are used for different parts of the body. For the limbs an ordinary roll bandage, either broad or narrow, is suitable. Tape forms one of the best materials for a narrow bandage, especially when a wound of the digits has

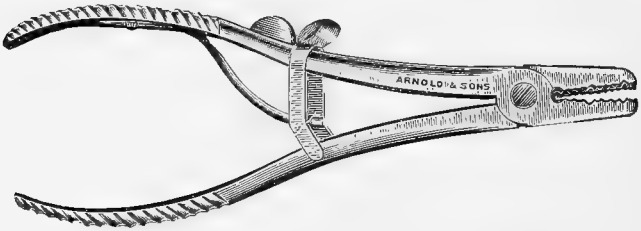


Fig. 29.

Needle holder.

to be attended to, and it can be purchased in different widths. For the body the roll bandage, especially a broad one, is again useful, and if inclined to slip over the hind quarters it must be attached to a collar placed round the neck.

A convenient body bandage can be made out of a broad piece of linen by cutting holes through which the legs are

passed, and sewing up or tying the edges with tapes along the centre of the back. Holes are made in the neighbourhood of the penis or vagina and anus in order to prevent soiling, and pleats are taken in where requisite in order to make it comfortable and fit tight to the body.

CHAPTER VI.

SURGICAL TREATMENT OF ABSCESSES.

An abscess when just ripe and ready to open, should be lanced in its softest and most dependent part, the blade of the knife being protected by the fingers (or by some tow or wadding wrapped round it) from entering too deeply, and the cutting action made in a direction away from the animal's body. This operation, which is a very simple one, requires the aid of a sharp scalpel or lancet, the pattern of blades known as Syme's or Paget's, being especially adapted for the purpose (Fig. 30). A bold incision should be made, sufficiently large to enable the interior to be thoroughly cleansed and examined after the contents have been evacuated.

If there is doubt about the contents an exploratory puncture may be made with a small trocar and canula (Fig. 31) or an exploring needle; the latter consists of a needle with a fixed handle, and having a groove down one side of the blade, the groove being for the purpose of retaining a small quantity of the contents, in order that the nature of them may be examined before deciding whether the swelling is to be lanced or not.

The wound is afterwards treated with antiseptics either applied in the form of fluid injections or dry powder, a drainage tube or tent of antiseptic material being inserted for a few days in order to insure free drainage. If necessary a local anæsthetic may be used over the spot where the incision is to be made, the ether spray or ethyl-chloride being easy of application and very effective.

EXPLORING, OPENING, AND CLEANSING OF SINUSES.

For exploring sinuous wounds in order to ascertain their depth, a probe, usually made of metal or whalebone, is care-

Fig. 30.
Abscess knife (Syme's and Paget's blades).

fully inserted into the orifice and passed inwards as far as possible. This must be done in a very delicate manner, especially in the case of wounds in the neighbourhood of joints or of any vital organs. Having ascertained the depth,

Fig. 31.
Exploring trocar and canula.

if thought desirable to open it up and so make a clean open wound, a director (Fig. 32) is inserted and the sinus laid bare by means of a bistoury; the latter instrument may have either a sharp or a blunt point (*see* Fig. 33).

Fig. 32.
Director and blunt needle combined.

If, instead of laying the sinus open, it is considered desirable to scrape the interior, this is done by the aid of a curette or Volkman's spoon (*see* Fig. 34).

Curettes are made in different sizes, and the spoon-shaped part may have its edge sharp or blunt.

REMOVAL OF CYSTS.

The removal of a cyst is best effected by completely dissecting around its external wall, and so endeavouring to remove it in its entirety without evacuating the contents.

Fig. 33.
Bistoury with sharp and blunt pointed blade.

In some cases, however, the contents, or a portion of them, have to be removed on account of lessening risk of injuring surrounding structures, but care must always be taken to remove the whole of the surrounding membrane. If the pre-

Fig. 34.
Curette or Volkman's spoon.

caution is neglected the cyst is apt to form again and refill. Cysts are met with in various parts of the body, but particularly in the intermaxillary space, where their complete obliteration is often a matter of great difficulty.

Fig. 35.
Ecraseur with wire.

REMOVAL OF TUMOURS.

Tumours in the dog and cat are often of very large size; they may appear in any region of the body, either externally

or internally, and they may be malignant or benign, single or multiple.

In the case of malignant growths the benefit accorded by operative measures can only be temporary; whatever the variety the principles of removal by surgical methods are the

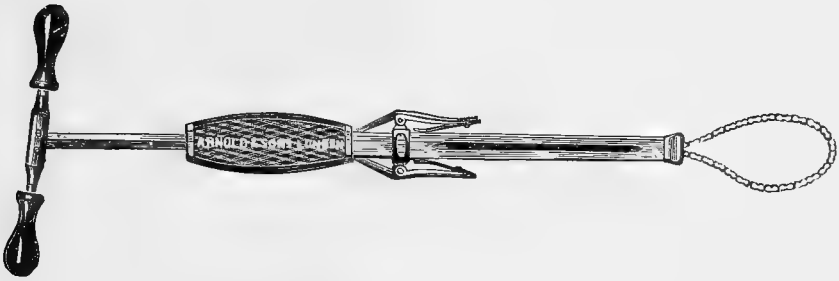


FIG. 36.
Ecraseur (Chassaignac's) with chain.

same. In those which have a distinct pedicle a ligature of silk, catgut, horsehair, or some such material may be tied firmly around this part and the tumour removed at once with a sharp knife, or the ligature may be allowed to remain on for two or three days before removal. In some cases resort is made to the actual cautery and clam, or the écraseur may be

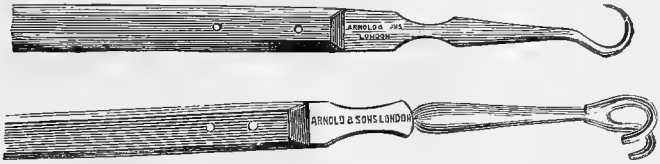


FIG. 37.
Tumour hooks of different patterns.

used. When the latter instrument is employed the skin should first be cut through, as, if left, the traction on this caused by the chain or wire gives excessive pain unless an anæsthetic is used, and in addition damages the edges somewhat severely.

In removing large tumours the hair over the line of incision is removed by shaving, the parts being thoroughly cleansed

and washed with some antiseptic, and an incision made over what is thought to be the most convenient part. Cutaneous hæmorrhage is arrested by the application of artery forceps (for which purpose the Spencer Wells or bull-dog patterns are the most convenient), and the skin carefully dissected off around the growth, the latter being raised by a tumour hook or by passing a needle and strong silk through it in order to make a loop to take hold of.

Having kept the parts neatly cleansed with tampons of aseptic cotton-wool, and taken up the vessels wherever necessary with artery forceps, the tumour should be carefully dissected to its base; here, as a rule, will be found the main blood supply, which needs to be secured either by a ligature or by torsion in order to prevent hæmorrhage. A cut with a scalpel completes the removal, or if the écraseur is to be employed, the chain is now put on and tightened very slowly until excision is complete. The edges of the skin are trimmed and sutured, a drainage tube inserted in position if considered necessary, and the parts treated antiseptically as an ordinary surgical wound.

CHAPTER VII.

OPERATIONS ON THE SKULL AND FACE.

Trephining.—The operation of trephining the skull or face is occasionally resorted to after severe injuries, in order to remove foreign material from underneath or to raise depressed pieces of bone. It is also of value in some dental cases.

The instruments required are a sharp scalpel, dissecting forceps, artery forceps, a curved piece of metal to use as an elevator, a small sized trephine (Fig. 38), and a strong gimlet.

The operation is performed as follows :—

The animal is secured in the abdominal position and anæsthetised, the hair having been previously removed by shaving from the seat of operation and the parts thoroughly disinfected. A crucial or T-shaped incision is made over the spot, and all tissues between that and the bone carefully removed by cutting or scraping. A hole, intended for the insertion of the central pin, is bored with a gimlet in the middle of the spot to be operated upon and the trephine applied. This instrument is worked steadily and carefully to and fro in a rotatory manner until it is felt to have almost penentrated the bone. One side is then slightly depressed in order to cause the piece of bone in the trephine to become elevated on one side, and so attach itself to the instrument when the latter is withdrawn, instead of falling into the cavity underneath. The foreign body is then sought for, or the purpose of the operation accomplished, the skin afterwards being sutured over the part, and the whole covered with antiseptic dressings and bandaged or left open according to the discretion of the operator.

OPERATIONS ON THE EAR.

Examination of the Interior before, and Application of Dressings after, an Operation.—A cursory examination of the interior of the ear can be made with the fingers, but a speculum of some pattern or other is always an advantage, as by its aid dressings can be much more easily applied and any irritant matter more easily removed. There are several patterns which are convenient for canine work, the two most useful being Kramer's and Avery's.

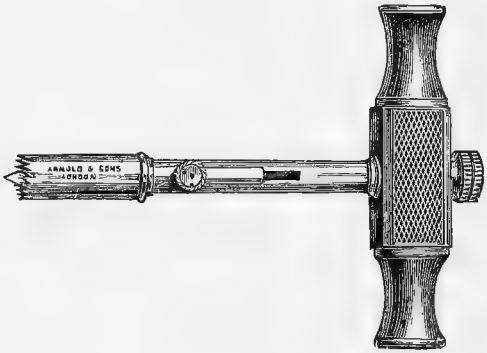


Fig. 38.
Trephine.

Dressings may be applied on wadding by the aid of a slender pair of forceps or on the end of a fine probe; for fluids a syringe with a curved and protected nozzle has been devised or an ear sponge can be used, whilst for powders after the cavity has been rendered thoroughly dry an insufflator is very useful.

Whatever method is adopted, dressings for the interior should always be applied as gently as possible, because, especially when wounded or irritated, it is extremely sensitive.

Removal of Polypi, Tumours, or Enlarged Ceruminous Glands.—Abnormal growths in this region are best removed by ligature if they are so situated that one can be successfully applied. In other cases the scalpel must be resorted

to and the subsequent hæmorrhage checked by the application of astringents and pressure. Subsequent treatment must be left to the discretion of the operator, as frequently these growths are very troublesome and reappear larger than before after a short period of time.

Fig. 39.
Kramer's speculum.

Operations for Hæmatoma or Tumefied Flap.—This condition is sometimes spoken of as serous cyst, abscess, or blood tumour, of the ear.

A common method of treatment consists in merely lancing the under surface of the ear-flap, carefully pressing out its contents, and treating the wound antiseptically. Some practitioners

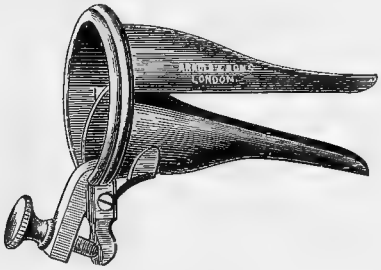


Fig. 40.
Avery's speculum.

afterwards insert a plug of cotton-wool or tow, in order to prevent too rapid healing by keeping the edges of the wound apart, or inject concentrated solutions of iodine.

Another method consists in inserting a seton tape through the swollen under part, and so endeavouring to keep up a continual drainage until all the fluid has escaped, and a certain

amount of adhesion has taken place between the skin and cartilage.

A third operation,[1] which seems to give by far the best and quickest result, is performed as follows: The ear is carefully washed and dried with antiseptic precautions, the hair being removed, and a plug of dry wadding placed in the aural orifice; the parts are painted with a strong solution of cocaine, or the animal is anæsthetised, and a good longitudinal incision made in the under surface. Every particle of clot or fluid is then most carefully removed, and the edges and interior of the wound are dried with aseptic wadding. Suture material is passed at intervals of about a quarter of an inch right through the flap from above to below, across the incision and again to the upper surface, upon which each suture is tied in a surgical knot. The object of this is to produce a firm pressure on the internal surfaces, and at the same time to bring the edges of the incision in contact with each other. This having been completed, and the parts again carefully dried, the whole ear is placed in a pad of antiseptic wadding and bandaged firmly to the head; a cap or net placed over this is of advantage if the animal attempts to remove it.

After-treatment consists in examining the wound once or twice daily, pressing out any fluid which may be present, carefully drying and bandaging again with antiseptic wadding.

The average length of time required to effect a cure is about ten days; in some cases the bandage can be left off within a week, in other cases it will be found necessary to keep up the treatment for a fortnight or even three weeks.

Whichever method of operating is adopted, it will always be found of advantage in the dog to utilise the bandage or ear-cap in order to protect the animal from shaking the head and again bruising the ear. Proper caps or nets for the purpose can be purchased, but an improvised one can readily be made from a piece of linen and a few pieces of tape, which tie underneath the throat and jaw.

[1] This operation was first suggested to me by my colleague, Professor M'Queen.

In the cat this is not absolutely necessary, as the comparatively short, upstanding, ears of this animal do not allow of the flap being injured so readily as that of the dog when the head is shaken; even here, however, a bandage or cap is often useful, as it gives a certain amount of protection against scratching and rubbing. In applying a bandage care must be taken that it is not put on too tightly, or necrosis of the extremity of the flap will ensue through interference with the circulation.

In some cases the flap is bandaged flat on to the cheek; in others it is laid back over the forehead or poll; when recovery is protracted it is a wise plan to alternate between the two.

The sequel mostly to be feared is a permanent thickening, or shrinking and consequent deformity of the flap of the ear.

Amputation of the Ear-flap or a portion of it.—This operation is sometimes necessary when the ear gets severely injured or has on it ulcerating wounds which cannot be made to heal. A general anæsthetic is used, and the offending parts are removed either with a sharp pair of scissors or by the aid of a scalpel and some solid substance (such as a clean block of wood) upon which the ear is laid.

In days gone by, when the cropping of dogs' ears was not considered a cruel and unfashionable operation, the usual method adopted was to fix a metal clamp of the required shape to the ear-flap, the projecting parts being removed with a sharp scalpel or razor.

Any cartilage which protrudes should be carefully snipped off, the parts being afterwards treated antiseptically.

Operations to Cause the Ears to Droop.—Although an operation for this purpose is illegal, and would therefore not be done by a professional man, it is of the greatest importance that he should be acquainted with the manner in which it is performed, in order that, when called as an expert, he may know where to look for evidences of this form of "faking" having been practised.

The object desired is a proper carriage of the ears in a certain direction varying slightly with the breed of dog. Some animals,

for example, have "prick" ears when the ears should droop; to effect this "droop" temporarily pieces of leather or weights are affixed, usually by the aid of some adhesive substance such as cobbler's wax; absence or disarrangement of hair on the surface of the ear gives rise to suspicion of this having been done. To effect a permanent droop the cartilage is nicked in one or two selected places on its under surface, care being taken not to wound the upper skin. Close examination of the under surface will reveal a scar or several scars the cicatrised tissue being whiter than the other part.

Another method adopted consists in incising the skin at the edge of the upper surface almost at the base of the ear; a fine probe pointed bistoury, the blade of which is introduced flatwise, is then inserted subcutaneously and has its sharp edge drawn across the muscle which is pulling the ear in the objectionable direction. When neatly done this is very difficult, and in some cases quite impossible, to detect, as even if a small scar is found it may readily be passed over as being due to a bite or other injury.

CHAPTER VIII.

OPERATIONS ON THE EYE AND ITS APPENDAGES.

Examination for, and Removal of, Foreign Bodies.—The removal of foreign bodies from the eye can be accomplished quite painlessly under the influence of cocaine, eucaine, or a mixture of the two. A small quantity of a 2 to 4 per cent. solution, applied with a camel-hair brush, will produce a very effectual anæsthesia in from one to three minutes. The eyelids are then separated with the fingers or by the aid of a speculum, the foreign body being sought for, and, when found, removed either with forceps, a blunt probe, or some sharp instrument, the choice of which must be determined by the operator. In using anything sharp great care must be taken that the instrument is held in such a way that the cornea will not be injured if the patient unexpectedly moves. A few drops of castor oil are often of great assistance as a lubricant.

Removal of Dermoid Growths from the Cornea.—In operating upon dermoid growths very great care has to be exercised in order to avoid rupturing the cornea; sometimes the growth is very vascular, and gives trouble on account of hæmorrhage, in which cases cold compresses wrung out in boracic solution (about 8 or 10 grains to the ounce) should be applied.

The operation itself consists, after anæsthetising in the usual way with cocaine or eucaine, in carefully dissecting off the growth with a small and very sharp scalpel. It is rarely of permanent value to merely pluck out the hairs, as they almost invariably reappear and cause more irritation than before.

Tapping the Cornea.—This operation is very useful in some cases of staphyloma and ulceration of the cornea where healing is prolonged. It is very simple, and, if done carefully under aseptic precautions, need give rise to no bad results; the object is to relieve the tension produced on the cornea by the aqueous humour, and to thus facilitate the commencement of the healing process. It may have to be done two or three times at short intervals. After the thorough application of cocaine or eucaine solution and some solution of boracic acid or chinosol as an antiseptic, the patient's head is held firmly by an assistant and the lids forced gently apart by the forefinger and thumb or by

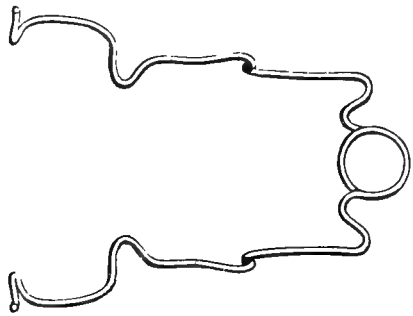


FIG. 41.
Eye speculum (Bowman's).

a speculum. The operator then plunges a bayonet-pointed or broad-bladed needle through the cornea at its outer margin, and, whilst the thin part of the blade of the needle is in the wound, applies gentle pressure upon the eyeball so as to force out a quantity of the aqueous humour. The needle is withdrawn, and the cornea carefully wiped with boric acid solution. Care must be taken to keep the needle in a direction approximately parallel with the cornea and to avoid injuring the other side of the eyeball, the lens, or the iris.

Operation for Staphyloma.—Staphyloma of the cornea is sometimes conveniently treated by ligature of the protruding portion. For this purpose a very fine thread of silk is passed

over the staphyloma, carefully drawn just sufficiently tight to act as a ligature without cutting into the protruding part, and left in that position for one or two days, when the staphyloma is excised.

Previous to the operation the eyeball is prepared by the application of a solution of some antiseptic and local anæsthetic. It is often a matter of difficulty in our patients to keep the ligature in position. In very persistent cases benefit is also derived from allowing the escape of some of the aqueous humour by the operation of tapping the cornea already described.

Operation for Strabismus.—Strabismus or "squint" is not a common deformity in veterinary patients. One case came under observation in the Free Out-patient's Department in March 1895,[1] the animal being a very fat collie dog with a well-marked internal squint in each eye, the pupils appearing

FIG. 42.
Strabismus hook (Walton's).

to be looking at the nose all the time. The appearance of the animal's face was most ludicrous. The deformity was congenital, the animal being then about three years old. No defect of vision had been observed until during the last three months, when the owner stated that the dog appeared to see imperfectly, and when crossing a crowded thoroughfare had been almost run over on one or two occasions; this latter fact led him to seek professional advice.

The operation for the relief of strabismus is not a difficult one, although requiring a certain delicacy of manipulation of the instruments. Either local or general anæsthesia may be used, the latter being preferable, because the head can be kept

1 "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 250. 'Veterinary Record," Vol. VII., p. 688.

perfectly still. The object in operating is to divide the muscle, either the external or internal rectus, which is producing the squint. A speculum is applied to the eyelids, and the conjunctiva at the canthus carefully incised with a pair of fine scissors; a fine blunt hook is passed underneath the rectus muscle, the latter being raised and cut through.

It may also be advantageous when operating upon the inside to first remove the membrana nictitans. The eyeball is then pulled outwards or inwards, as the case may be, as far as possible.

After-treatment consists in the daily application of some non-irritant antiseptic solution, such as boracic acid (10 grains to the ounce), or chinosol (half a grain to the ounce).

The prognosis as to complete return to normal appearance must be guarded, as frequently the improvement is only temporary. In the instance above mentioned, the condition of one eye was decidedly ameliorated, but in the other there was not much alteration; the animal, however, became restored to usefulness as a drover's dog, and the owner noticed a marked improvement in the way it went about its work.

Cataract.—Operative treatment for cataract does not give such successful results in veterinary patients as in those of the human surgeon. A very guarded prognosis should always be given as, although the result may be a restoration to partial vision, it more often leads to disappointment. In the human subject the sight may after the operation be still further improved by spectacles, but in the dog, although these adjuncts have been affixed, there are certain difficulties to be overcome which prevent their general application. The object sought after is the removal of the opacity of the lens. There are several methods of operating, two of which will be described here. A general anæsthetic is advisable, as it is essential that the patient shall keep perfectly still. The eye, the pupil of which has been dilated with atropine, is carefully disinfected with boric acid, perchloride of mercury, or chinosol solution, and a speculum inserted to keep the lids apart. In the first

operation an instrument termed a cystotome is passed into the anterior chamber at the margin of the cornea in the direction of the lens, which it scratches several times in such a way as to lacerate its capsule. This procedure may have to be repeated two or three times at intervals of a month or six weeks, the lens itself ultimately undergoing a process of absorption.

The second operation consists in the removal of the entire

FIG. 43.
Graefe's cataract knife.

lens. A special pattern of knife (usually Sichel's or Graefe's) is used in order to puncture the cornea, an entrance being effected on its conjunctival margin, and the point pushed through some distance further along, the intervening portion of cornea, together with a thin slice of the conjunctiva, being incised. The aqueous humour is allowed to escape, and the capsule of the lens is scratched with a cystotome as described above; gentle pressure with the finger and thumb is put upon

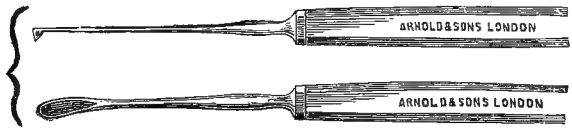


FIG. 44.
Cystotome and curette (Graefe's).

the eyeball, and by the aid of a cataract spoon or curette the lens is slowly and carefully forced out through the corneal orifice. More antiseptic lotion is then applied, the eyelids being kept closed and covered with an antiseptic pad.

After-treatment consists in keeping the patient in a darkened kennel, and as quiet as possible for about a fortnight or so, the antiseptic pad being changed once or twice a day.

Excision of the Eyeball.—As this operation is a very painful one, some general anæsthetic should always be chosen, except in cases where the eyeball has been forced out of the socket and the posterior portion is exposed. In such instances solution of cocaine (5 to 10 per cent.) answers very well. After having applied the anæsthetic the eyeball itself and its surroundings are washed with some non-irritant antiseptic. The only instruments absolutely necessary are a fine scalpel and forceps, with a sharp hook or pair of toothed forceps to seize the eyeball with; the latter can be improvised by a needle and silk which is passed through the structures of the eyeball and tied in the form of a loop. A fine pair of curved scissors and a wire speculum are also of advantage.

The lids are held apart and the conjunctiva is divided along its upper and lower borders, the eyeball is pulled out and the recti muscles are divided as low down as possible; the last structures to be cut are the optic nerve and vessels at the back of the orbit. Care must be taken to clear out the cavity as neatly as possible

A solution of some styptic, such as liq. ferri. perchlor. is applied on a pad of wadding, the after-treatment consisting merely in the application of antiseptics, a bandage being used where it can be kept on. False eyes of glass, celluloid, vulcanite, etc., of the necessary colour and size can be obtained through an instrument maker or a naturalist, some having a hollow posterior surface and others being solid. The choice must be made in accordance with the condition of the orbit; sometimes granulations occur and almost completely fill up the cavity, in which case an eye with a hollow back is not so likely to cause irritation. The false eye should not be inserted for at least three or four months after the eyeball has been removed in order to allow for complete healing and also for a certain amount of contraction of the orbit which usually takes place. During the first few days upon which it is inserted the artificial eye should only be allowed to remain for

about an hour or so, the time being gradually extended. In all cases it is necessary to remove it each evening for cleansing purposes, as if left in altogether it causes a watery, catarrhal, or even purulent, discharge. The improvement in the appearance of the animal when the false eye is inserted is very great.

Excision of the Membrana Nictitans.—Having secured the patient, cause the head to be held as still as possible in a convenient position for the operation. Paint the upper and lower surfaces of the membrana to be removed with some suitable anæsthetic; allow time for this to act, secure the membrana firmly with a pair of forceps or by passing a fine silk thread through it, and excise with a small pair of curved scissors or sharp scalpel as close to the inner canthus as possible. The slight hæmorrhage which follows is easily arrested by the application of a cold wet compress, and no bad sequelæ need be feared. In several cases which were kept under close observation for three or four years the animals did not in any way appear to be inconvenienced by the removal of their membranæ.[1]

Operation for Entropion and Trichiasis.—The term entropion is given to a condition in which the edges of the eyelids turn inwards; the term trichiasis is applied when the eyelashes turn inwards. The patient should be secured in the abdominal position and the head held firmly by an assistant. The hair is removed as closely as possible from the external surface of the eyelid; and the parts are then anæsthetised with cocaine, or the animal is placed under the influence of some general anæsthetic. An elliptical piece of the offending eyelid is then removed either with a pair of scissors or a scalpel, great care being taken to remove only the skin and not to injure the mucous membrane lining the lid. The wound is then sutured with fine silk or catgut, covered with iodoform (or orthoform) and collodion, and treated as an ordinary small surgical wound; when only a

[1] "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 248, "Veterinarian," Vol. LXVII., p. 337.

very small piece is taken out there is no absolute necessity for the insertion of the sutures. The only unfavourable sequelæ to be feared are when an ugly sore occurs as the result of continual rubbing or scratching,[1] or when too great an ellipse is made and the eyelid becomes a little everted; neither are, however, of anything more than minor importance. A second method of operating which is sometimes adopted consists in the application of a red hot needle or wire to the eyelid, the resulting contraction and scar causing the skin of the eyelid to be shortened. In cases of trichiasis it is sometimes necessary in addition to the above operation to pluck out the offending hairs by the roots; this is done with a pair of tightly closing forceps.

Ectropion.—This term is applied when the eyelids turn outwards, exposing the conjunctival mucous membrane; it is a much more rare condition than entropion or trichiasis. It can be treated by the removal of a V-shaped piece of the eyelid, the incision being carried through the whole thickness of the lid, more of the mucous than the cutaneous being excised. The wound is then carefully sutured and treated antiseptically. Another method of treatment consists in the application of the galvanic cautery to the mucous surface in fine lines, a bone spatula being used to protect the eyeball itself; the object is to cause contraction of the mucous membrane by the formation of cicatricial tissue.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 247.

CHAPTER IX.

OPERATIONS ON THE MOUTH, PHARYNX, AND TONGUE.

Examination.—For a superficial examination, a good view can readily be obtained in canine patients by placing the finger and thumb of the right hand over the upper jaw in such a way as to press the loose, pendulous, skin of the upper lip inwards between the molar teeth; the left hand serves the lower jaw in a similar manner, and the two are then drawn gently apart so as to expose the interior.

The under surface of the lips can be examined in most cases without difficulty, but in an animal of uncertain temper it is always a wise precaution to first put on an ordinary tape muzzle. Where a prolonged examination is necessary it facilitates matters very much if the patient is placed on an operating table in the abdominal position and the services of some form of mouth speculum are called into requisition. The accompanying figures show different patterns, their method of use hardly needing any explanation.

Gentle traction applied to two pieces of tape, one looped or tied round the upper jaw, and one round the lower, is also very effectual.

For the cat, if neither an operating table nor a set of hobbles is at hand, the best plan is to wrap the animal's body in a roller towel or strong cloth in such a way as to just leave the head exposed. The mouth may then be opened in one of the ways mentioned above, but if attempting to open it with the fingers alone, the best plan is to secure the upper jaw firmly

with one hand and depress the lower jaw by pressing the ball of the thumb on the top of the lower incisor teeth or by taking hold of the hair below the symphysis of the jaw.

Removal of Foreign Bodies.—The choice of an instrument for the purpose must depend somewhat upon the foreign body itself; the most common ones met with are bones and needles. A strong pair of curved throat forceps will do in the majority of cases, being applied when the mouth is held open. Sharp pieces of bone frequently get wedged across the mouth, each

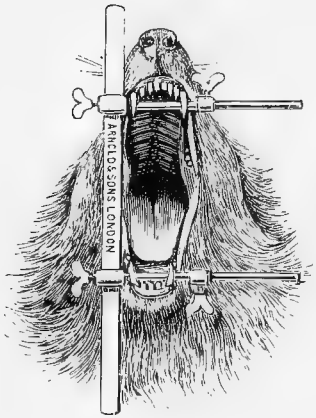

Fig. 45.
Mouth speculum (Gray's pattern).

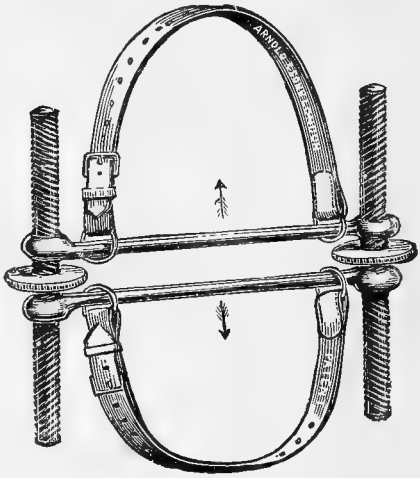

Fig. 46.
Mouth speculum (author's pattern

end becoming inserted between the molars, and occasionally the hollow shaft of a long bone becomes fixed longitudinally on the molars, causing the mouth to be propped open.

When removing a needle, care must always be taken to see in which direction the point has entered, as neglect of this precaution may lead to the breaking of the needle and unnecessary laceration of the mucous membrane.

Operation for Ranula.—By the aid of a speculum the mouth is fixed open, the tongue being drawn to one side or so arranged as to place the ranula in the most suitable situation

for removal. The swollen sac is then punctured with a scalpel or sharp pair of scissors, the whole of the wall being dissected away as closely as possible. Great care must be exercised about this latter point, as if any portion is left the ranula will reappear after a short interval.[1]

Scarification of the Tongue.—This treatment is advisable in some cases of glossitis, and consists in scarifying the tongue freely but not deeply in a longitudinal direction in several places. The under or lateral surfaces are usually chosen, and the operation is performed with a small gum lancet or scalpel, the blade being protected from entering too deeply by being wrapped with cotton wool or tow.

Amputation of the Tongue or a Portion of it.—This operation is only undertaken as a last resource, as an animal which

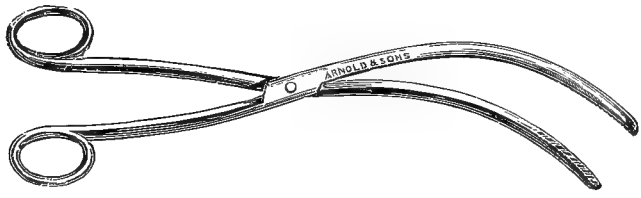

FIG. 47.
Throat forceps.

has lost a large piece of its tongue has difficulty both in eating and drinking. If the tip and edges are necrotic (a condition which was frequently seen during the epizootic which occurred amongst dogs during 1898 and 1899), these parts can be readily removed with a pair of scissors or sharp scalpel, being first seized with an ordinary pair of toothed or vulsellum forceps. If a large portion has to be removed chloroform should be administered. When the animal is deeply under its influence the tongue is drawn well forward, the mucous membrane and external muscles are snipped through with scissors, and a double thick silk ligature is passed through the centre of the remaining portion and tied off on either side; the parts below this are

[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 358.

then excised. A small écraseur, worked very slowly, answers the same purpose, or the ligature may be dispensed with and the lingual artery secured and twisted with forceps. Care must always be taken to keep the head in a horizontal or dependent position, in order that blood may not run down the larynx and trachea. After-treatment consists in the application of some antiseptic, such as solution of permanganate of potash, chinosol, or boric acid.

OPERATIONS ON THE TEETH.

Scaling and Cleaning.—Removal of tartar from the teeth is frequently necessary in old animals, both in the dog and cat, in order to keep the breath from becoming offensive, and in some instances, when neglected, tartar has been known to collect in

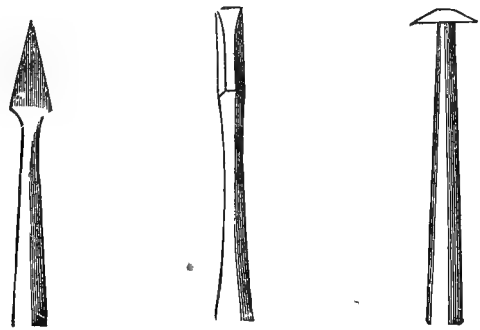

FIG. 48.
Scaling instruments of different patterns.

such quantity as to prevent the animal from closing its mouth, and to cause a great deal of pain.

Scaling is performed by the aid of certain steel instruments specially designed for the purpose; there are numerous shapes for use in human dentistry, but, for all ordinary purposes, in canine practice two, or at most three, patterns will be found sufficient. The method of application consists in securing the patient's mouth with a tape muzzle, obtaining the services of an assistant to hold the head, and removing the tartar around the teeth by the firm, steady application of one or other of the

instruments; when the interior is affected a speculum must be used. As a rule the tartar shells off quite easily. The teeth are then cleansed by the application of some tooth powder or mouth wash on cotton wool or on an ordinary tooth-brush.

Extraction.—In extracting a tooth care must always be taken to get a firm grip as far up the fang as possible, pushing the points of the forceps well under the gum into the alveolar cavity. The offending organ is then loosened in its socket by a few lateral movements, and withdrawn by being pulled in a direction which is continuous with the fang or fangs. If pulled in a direction out of this straight line, unless the tooth is very loose, the crown is apt to be broken off. Canines are

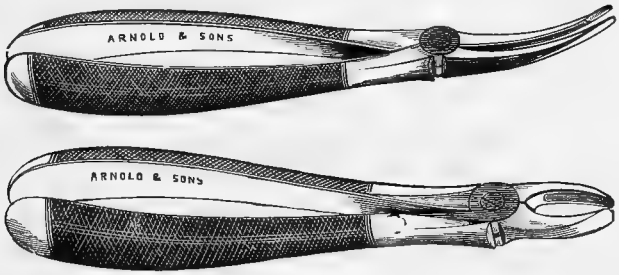

FIG. 49.
Showing different patterns of tooth forceps.

probably the most difficult to extract, and milk teeth always require very delicate handling, or they will break off and a portion be left in the gum. A mouth speculum may or may not have to be used, depending upon the position and condition of the tooth to be extracted. When a general anæsthetic is administered, care must be taken that no blood or other foreign body finds its way down the trachea.

The insertion of false teeth has been successfully attempted by Mr Edward Mosely, L.D.S., in conjunction with the author,[1] the subject being an aged Schipperke whose teeth had almost all disappeared. The only remaining ones were four canines,

[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 362.

the four carnassial molars, and a few very loose incisors. The latter were extracted, and impressions taken of the mouth. A false set of teeth was made and fitted in with springs and wires in the same way as in human dentistry. The animal tore the meat off a mutton chop very shortly after they had been put in, whereas before this it had taken nothing but liquid or finely cut food. The teeth were worn regularly for about eighteen months, when, unfortunately, one evening the animal was stolen and has not since been heard of by the owner.

CHAPTER X.

OPERATIONS ON THE THROAT.

Passing the Probang.—The probang is passed whenever a foreign body is suspected in the throat or œsophagus out of reach of the forceps. The mouth is fixed open with a speculum, whilst the probang, after being carefully lubricated and the stilette twisted a little so as to compress and stiffen the horse-hair portion, is passed lightly and carefully down the œsophagus, care being taken that it does not enter the trachea and so cause asphyxia. If the foreign body is a large one, such as a piece of bone or gristle, gentle and continuous pressure must be applied; on no account must undue force be exerted, or laceration and rupture of the œsophagus may result as a sequel. If the obstruction is a small one it may either be forced onwards or withdrawn with the probang; needles and fish bones are often removed in this latter way, becoming fixed either in the sponge at the extremity or in the horsehair brush portion.

Before being withdrawn the handle of the stilette is pulled upwards out of its socket and, if thought necessary to stiffen it, slightly twisted; it is then taken out and examined, or it may be passed gently up and down the œsophagus for a few times. Probangs are made of different sizes, and especial care must be taken to use a sufficiently small one, as otherwise the œsophagus is apt to become injured when violent pressure is put upon it. In inserting it, too, there is occasionally difficulty in guiding it past the larynx.

Œsophagotomy.—When a foreign body becomes so firmly lodged in the œsophagus that it cannot be moved by forceps

or probang, the œsophagus must be incised. If this is not done ulceration may take place, or the foreign body may cause dilatation and form a pouch for itself, the result usually being great pain, emaciation, and, ultimately, death. The most common seats at which obstructions occur are just before the gullet passes into the thorax, and in the thoracic portion just before the œsophagus passes through the diaphragm. In the latter case it is sometimes necessary to perform laparo-gastrotomy, and, by the aid of a pair of thin forceps passed through the cardiac orifice of the stomach to reach the foreign body from behind. The operation upon the upper portion of the œsophagus is performed as follows.[1]

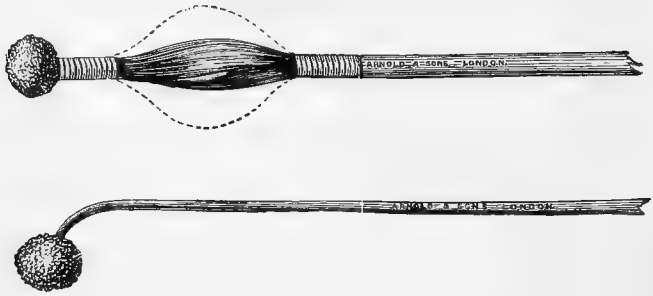

Fig. 50.
Showing two patterns of probang.

Place the patient in the dorsal position with the neck well extended so as to expose the throat; anæsthetise with some local anæsthetic, and incise the skin directly over the obstruction as near the centre as possible; apply pressure forceps to allay hæmorrhage, push aside any vessels in the vicinity, and expose the œsophagus. This organ is then incised longitudinally by a clean, bold cut, and the foreign body removed with forceps. At this stage vomiting sometimes occurs. The wound and surrounding parts are then thoroughly cleansed and disinfected, and the œsophagus is sutured through all the coats at the same time, the muscles and skin being then closed

[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 358.

separately, and the whole covered with some antiseptic. The after-treatment consists in that usually applied to a wound, whilst particular attention is paid to diet; milk or soups containing small quantities of some non-irritant antiseptic such as boric acid or dilute chinosol may be given during the first three or four days, or rectal feeding may be resorted to entirely. When commencing again with solid food this should be cut up very small and given as slowly as possible. The bad sequelæ to be feared are tardiness of healing, the formation of an abscess, and ultimate formation of a stricture or fistula; but on the whole, if antiseptic measures are rigorously attended to, reports show that the results are very satisfactory.

FIG. 51.
Tracheotomy tube.

Tracheotomy. — This operation is performed to relieve asphyxiating symptoms caused by acute laryngitis or pharyngitis, by the presence of some foreign body in the pharynx or larynx, and in some cases if dangerous symptoms become manifested during the administration of some general anæsthetic.

The prognosis is usually good, particularly in cases where the tube is only to be worn for a short time.

The patient is placed in the dorsal position with the head well thrown back and the skin of the neck held as tight as possible; after the usual antiseptic precautions an incision is made in the upper third of the neck about an inch below the larynx, at a spot where the trachea can be felt most superficially; the latter is picked up with a sharp curved hook or

bent needle and thread, and an elliptical or circular piece excised to make a hole sufficiently large for the insertion of the tube. The tube is then placed in the trachea and fixed in position.

For temporary purposes a piece of bent glass tubing, held in position by tapes tied around the patient's neck, answers very well.[1]

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. IX., p. 155.

CHAPTER XI.

OPERATIONS ON THE THORACIC AND ABDOMINAL WALLS.

Paracentesis Thoracis (tapping the chest).—Unless absolutely necessary, it is not advisable to fix the patient before performing this operation, but to merely have it quietly held in the standing position. Any pressure on the throat or chest is dangerous, and death is very apt to suddenly ensue from asphyxia if the patient struggles or falls heavily to the ground. The operator carefully removes the hair from, and disinfects, a spot about an inch above and behind the point of the elbow on the right side; a fine trocar and canula are introduced subcutaneously for a short distance, and the point passed between two of the ribs (usually the sixth and seventh, or seventh and eighth). The trocar is then withdrawn and the canula inserted as far as necessary, the fluid contents of the chest being allowed to escape slowly. Any material blocking the end of the canula and retarding the flow must be removed by the careful re-introduction of the trocar or a sterilised blunt probe.

Symptoms of collapse must be watched for, and the amount of fluid withdrawn left entirely to the discretion of the operator.

Solution of iodine, chinosol, or some antiseptic may or may not be injected, after which the canula is carefully and slowly withdrawn.

The seat of puncture is dried with aseptic cotton wool and covered with iodoform (or orthoform) and collodion.

The prognosis of these cases is usually unsatisfactory, as

the relief given is only temporary, and more fluid is again formed within a comparatively short time. Potassium iodide administered internally is supposed to have a beneficial effect in preventing the re-formation of fluid and in aiding the absorption of any that may be left, quinine and strychnine being also recommended to give tone to the system; but cases of complete recovery are few and far between.

Paracentesis Abdominis (tapping the abdomen).—The best situation to choose for this operation is the linea alba, or as close to it as possible, an inch or so behind the umbilicus. The patient is fixed on its side, and, after the removal of the hair and thorough disinfection of the part, a small trocar and canula are introduced subcutaneously for about half an inch

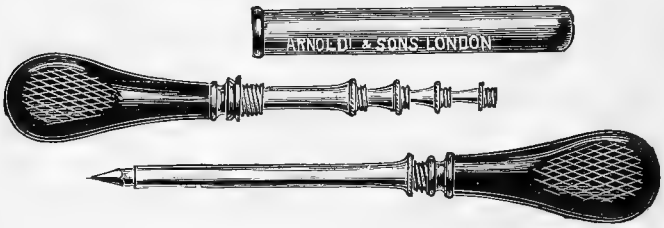

Fig. 52.

Trocars and canulæ, various sizes, nested.

and turned cautiously into the abdomen. Care must be taken not to injure any of the abdominal organs. The method of procedure is the same as already described in the preceding paragraph (paracentesis thoracis); very large quantities are sometimes removed.[1]

Prognosis must be guarded, but the prospects are much better than in the case of removal of fluid from the chest. The life of the patient may be saved for a much longer time, and occasionally permanent benefit results.

Laparotomy. — This consists in opening the abdominal cavity either with a view to exploring or operating upon

"Journal of Comparative Pathology and Therapeutics," Vol. XII., p. 262.

some of its internal organs, or as a treatment for tubercular peritonitis.[1] On the day preceding any major abdominal operation the patient should be bathed and washed in some disinfectant solution, no solid food being given for about twelve hours before. After carefully shaving, removing grease from the skin with ether, and rigidly disinfecting the parts, administer an anæsthetic and fix the animal on its back with the limbs well extended. Incise the skin in the median line, the actual situation chosen depending upon which organ is to be operated upon. Carefully arrest all hæmorrhage either with artery forceps or tampons of aseptic wadding, puncture the peritoneum, insert a director, and, with the aid of a scalpel, make an incision of the required length.

After doing whatever is necessary to the internal organs, carefully remove all blood from the neighbourhood of the wound, suture the peritoneum with fine silk, the muscles with silkworm gut, and the skin with silk or catgut. The peritoneum and muscles may be taken together, and some practitioners suture all three layers (peritoneum, muscles, and skin) at once, but this method cannot be as safe as if they are taken separately. A continuous suture may be used for the peritoneum, but interrupted sutures are unquestionably the best for the muscles and skin, as, if septic infection takes place, it is much more convenient for the cleansing and dressing of the wound.

In order to complete the operation the exterior is carefully dried with aseptic wadding and covered with iodoform (or orthoform) and collodion.

Occasionally in large dogs, where a long incision has been made, a bandage is useful over this to give support to the edges of the wound, but in the majority of cases this is not necessary and only forms a source of annoyance and irritation to the patient. Care must be taken to keep the animal perfectly quiet for about ten days, and on no account to allow

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[1] Watson Cheyne, "British Medical Journal," 23rd December 1899.

it to go up and down steps, or to jump from a height; neglect of these precautions is liable to lead to the re-opening of the wound and escape of the intestines.

Prognosis is excellent, provided rigid attention is paid to antisepsis; and, as a general rule, beyond the removal of the cutaneous sutures four or five days later, the wound requires no further attention. Hernia may result in about four or five per cent. of cases, but is generally traceable to some neglect of detail, and now and then a buried silkworm gut suture gives rise to irritation, and requires to be removed. These conclusions are based upon more than 120 consecutive cases.

The median line is preferable wherever it can be conveniently used, because, (1) there is less tissue to cut through; (2) less hæmorrhage, the blood-vessels here being few and small; (3) if, unfortunately, pus does form in the abdomen, it has a better chance of draining away; and (4) healing is very rapid, provided that septic infection does not take place.

Operation for Obstruction of the Anal Glands.—The anal glands frequently become filled with purulent and semi-solid material which cannot escape, and gives rise to symptoms of irritation and annoyance on the part of the animal.

Temporary relief can be afforded by the application of pressure, the contents being squeezed out, but as a rule they refill in a very short time.

In such cases the parts should be painted with solution of cocaine (four or five per cent.), the gland freely opened with a Symes' knife or fine scalpel, and the interior scraped with a small, sharp curette. The parts are then treated antiseptically like an ordinary wound.

Recovery is usually uninterrupted, although sometimes a little prolonged.

Anal Tumours are treated as already directed under the heading of tumours. Unfortunately they are often of a malignant nature.

Operation for Fistula of the Anus.—True fistula of the anus is comparatively rare in the dog; enlarged anal glands and

other discharging sinuses in this region are not uncommonly confounded with it. Foreign bodies, such as needles and pieces of sharp bone, are the usual cause. Careful examination should always be made by passing a blunt pointed probe up the suspected fistula, and at the same time feeling for the internal orifice with one finger in the rectum. The probe must be passed very carefully, and not in any way forced, as there may be several sinuses, some of them being blind ones. Treatment consists in opening up each sinus freely, carefully curetting the walls or treating them cautiously with some caustic to destroy their indurated lining, and afterwards applying antiseptics in the same way as to an open wound. In cases where ulceration of the bowel has not taken place the wound generally heals up and brings about a satisfactory termination, although progress may be slow.

Operation for Hæmorrhoids.—A dilated and very troublesome knotty condition of the veins around and just within the anus is not infrequent in fat old dogs, especially pugs, and gives rise to a good deal of pain and irritation, especially when fæces are passed, and when the animal is at all constipated.

The enlarged veins should be picked up with forceps, and either ligatured, by passing a curved needle and silk around them, the intervening portion being excised, or clamped and removed with the actual cautery.

CHAPTER XII.

OPERATIONS ON THE INTESTINES AND ABDOMINAL ORGANS.

Gastrotomy.—This operation, consisting in the opening of the stomach, is performed for the removal of foreign bodies such as meat skewers, sticks, stones, hat pins, etc., which cannot be got rid of by the aid of an emetic or a purgative, for ulcers of the stomach wall, and for the removal of foreign bodies from the lower part of the œsophagus. The patient is prepared and laparotomy performed as already described, the site of incision chosen being on the median line, just about 1 or 2 inches below the extremity of the sternum. The stomach is drawn into the wound and surrounded by lint or cloths soaked in antiseptics, the foreign body being brought close up against a portion of the wall where blood vessels are small or absent, and an incision made directly over it. Usually, as soon as the stomach is punctured a certain amount of gas rushes out and carries with it some of the contents; this may be guarded against by making a preliminary puncture with a fine trocar and canula. Any fluid that does escape must be immediately soaked up before it reaches the peritoneum.

The foreign body is extracted, the internal edges of the wound are carefully cleansed with antiseptic solution, and a double row of sutures inserted. The first row passes through the whole of the coats, the second sutures being of Lembert's pattern and inserted through the serous and muscular coats at some little distance from the edges of the wound, so that when drawn together they completely hide the latter, and thus

act as a double protection against the exit of fluid from the stomach.

With a gastric ulcer the chief trouble lies in the difficulty of making an accurate diagnosis; the operative procedure consists in making an elliptical incision so as to remove all the necrosed edge and drawing the sound portions of the wall together as already described. The abdominal cavity must be examined for any material which may have escaped, this being removed with antiseptic swabs.

Foreign bodies in the lower part of the œsophagus usually consist of large pieces of bone, gristle, etc., which have been greedily swallowed, and which cannot enter the cardiac orifice of the stomach and cannot be pushed down with the probang or brought up by an emetic. In one case we were successful in removing a very large piece of gristle by means of a strong slender pair of dressing forceps passed up the œsophagus through the stomach wall when all attempts to move it with the probang had failed.[1] The method of opening the stomach and closing the wound is as already described.

The after-treatment consists in keeping the patient as quiet as possible, allowing nothing but a little water, or milk and water, containing three or four grains of boric acid, during the first forty-eight hours, nutrient enemata of beef tea or mutton broth being given per rectum every six or eight hours. On the third day a little milk or beef extract may be allowed in addition, and at the end of the fourth or fifth day some finely minced meat or fish. Care must be taken during the first fortnight that the stomach never becomes distended, on account of the risk of tearing out the sutures.

As regards sequelæ, the prognosis must always be grave, as the operation is a major one, but if the diagnosis is certain and the patient not too debilitated it ought certainly to be adopted as giving an otherwise doomed patient another chance.

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1 "Journal of Comparative Pathology and Therapeutics,' Vol., XII., p. 262.

It is really wonderful how little inconvenience dogs appear to suffer from wounds caused by meat skewers, hat pins, needles, etc., in the stomach, even when no antiseptic or surgical precautions are taken. During the past few years quite a number of cases have been recorded by Wolstenholme, Perryman, Brookshanks, Tutt, R. Gillard,[1] Woodruff,[2] and others,[3] in which foreign bodies have been carried for a length of time in the stomach of the dog or cat, without causing any more alarming symptom than the formation of an abscess in the side.

Operation for Intussusception of the Intestine.—Intussusception of the intestine is most commonly met with in young animals, although it is by no means of very rare occurrence in adults. It is diagnosed without much difficulty in thin patients, being perceptible through the abdominal walls as a soft tumour-like swelling along the course of the intestine, but in fat animals it is very difficult to differentiate between this and other obstructions, the symptoms being very similar. The surgical method of affording relief consists in the performance of laparotomy, and the replacing of the gut into its natural situation by means of the fingers. If the intussusception is of recent origin this can be done without any difficulty, but if it has existed for some time adhesions will have formed and the outlook is much more serious. If these adhesions can be broken down without materially injuring the bowel wall, this should be done; if not, the whole piece must be excised (*see* enterectomy).

Operation for Impaction of the Intestine.—An obstinate impaction of the intestine is particularly met with in shooting dogs, being usually ascribed to their over-indulgence in game bones. Three cases have been met with by the author during

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1 "Veterinary Record," Vol. VII., pp. 187, 295; Vol. X., p. 206; Vol. XI., pp. 376, 434.

2 "The Veterinary Student," Vol. I., No. 2, p. 2.

3 "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 254; Vol. X., p. 360.

the past twelve months, in two of which the animals (retrievers) had passed no fæces for at least three weeks.

The obstruction usually occurs in the colon, and it may extend upwards for a considerable distance into the small intestine. In one of the retrievers above-mentioned fully a foot of intestine was involved by a mass as hard as a stone, the small intestine in front being enormously dilated and full of semi-fluid fæculent material.

Surgical aid is rendered after all efforts to remove the impaction by medicines given by mouth or rectum have failed. The simplest plan consists in the injection of melted lard or warm oil per rectum, and the removal of as much as possible, bit by bit, with the fingers or a blunt spoon. This can be done to a certain extent, but often the lump is out of reach, and matters become more serious. Laparotomy must be performed and the obstructed bowel massaged and kneaded gently but firmly, until its contents break up into fragments of sufficiently small size to be passed on into the rectum; they are then removed by an assistant.

The process of kneading must be done very patiently with the ends of the fingers and thumb, great care being taken to avoid injury from the nails; it is a good plan to try first at one end and then at the other, gradually working towards the centre, or any place that feels softer than its surroundings.

A third plan consists in opening the bowel and removing the obstruction in that way (*see* enterotomy), the operation being rendered more risky than in an ordinary case on account of the large accumulation of fluid fæculent matter, and the lax, debilitated condition of the serous and muscular coats of the intestine; the latter in particular rendering the insertion of sutures without tearing a matter of very careful and delicate manipulation.

The prognosis when the hardened fæces can be removed by the spoon alone is good, the only after-treatment necessary being the injection for a few days of some emollient antiseptic. When the case has progressed so far that laparotomy or entero-

tomy have become necessary, the prognosis is grave,b ecause, as a rule, the patient is debilitated from inability to take proper nourishment and from absorption of septic materials. Death from collapse may occur within a few hours afterwards, and in one case met with death suddenly occurred four days afterwards from invagination and strangulation of the bowel, a large piece of the healthy portion having tunnelled its way into the dilated portion where the obstruction had existed, before the latter had had time to contract and recover its tone and normal size.

Enterotomy.—This operation, which consists in opening the intestine, is performed in order to remove any foreign body which may have lodged there. The animal is prepared, secured, and anæsthetised in the same way as for laparotomy; the abdomen is incised, the piece of intestine containing the foreign body brought into view, the bowel being lightly clamped above and below in order to prevent exit of intestinal matter when the incision is made. Pieces of rubber tubing held tightly around the bowel with artery forceps improvise very well for the clamps. Aseptic lint or cloth is placed around the bowel to prevent it from touching anything dirty, and an incision is made in a longitudinal direction over the foreign body in that part of the intestine which seems to be the least congested. If thought desirable an attempt may be made to pass the foreign body along to a more favourable spot for the operation. The obstruction is then extracted, the edges of the wound and the intestine above and below as far as the clamped portion being cleansed and disinfected. Lembert's sutures (*see* Fig. 26, p. 53) are inserted, and the wound in the abdominal wall treated as after an ordinary laparotomy.

Careful dieting and after-treatment is necessary, as already described after gastrotomy. If the patient has not already become weak, the prognosis, although always grave, may be considered fairly good.

During the last two years, cases of recovery have been re-

ported by Vennerholm[1] and Pauer,[2] both being cases in which the foreign body was situated in the rectum.

Enterectomy and Anastomosis of the Intestine.—In certain cases in which the bowel has become gangrenous or injured, owing usually to the presence of a foreign body or some abnormal growth, the only chance of saving the patient's life depends upon the excision of the diseased portion and the union of the cut ends. This operation, although of course a very serious one, has now regularly taken its place in human surgery, and that it can be successfully performed in healthy dogs and cats has been demonstrated many times. The chief difficulty in veterinary practice seems to be to make a sufficiently accurate diagnosis early enough, *i.e.*, before gangrene has set in or the patient has become exhausted. In my own experience the results have not been good, but in each case

Fig. 53.
Bowel clamp (Makin's).

the patient was very much exhausted when brought for treatment.

For an enterectomy the preliminary preparations are the same as for laparotomy; for the intestinal anastomosis careful suturing alone may be done, or resort may be had to certain mechanical aids such as those afforded by cones, discs, buttons, bobbins, etc., made of metal, decalcified bone, carrot, turnip, potato, etc.

The abdomen is opened in the usual way on the median line or flank according to the position of the obstruction, and the offending portion of intestine sought for and withdrawn, being

[1] "Veterinary Record," Vol. X., p. 327. Mayall's Translation.
[2] "Veterinary Record," Vol. XII., p. 110.

pulled through a hole in a cloth which has been carefully soaked in warm antiseptic and packed around with antiseptic lint or wadding. The contents of the bowel are forced back by pressure with the fingers and thumb for about 6 inches above and below the diseased part and clamped. Special instruments are designed for the purpose; they can be improvised by fixing pieces of rubber tubing around the gut, or (Dr Maunsell's suggestion) by safety pins padded with sponge or wadding.

The branches of the mesenteric artery supplying the region to be excised are taken up with artery forceps and ligatured, the bowel being cut through with scissors held at right angles to its lumen. The lumen is then swabbed out as far as the

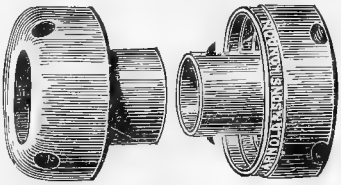

Fig. 54.
Murphy's button.

clamps with wadding soaked in some fluid antiseptic. The two serous surfaces are brought into contact by interrupted sutures of Lembert's pattern inserted about a fifth of an inch from the edge and a sixth or an eighth of an inch apart, particular care being taken not to penetrate the mucous coat of the bowel. A very fine round needle and silk No. O or OO should be used.

Of the various mechanical devices for facilitating the anastomosis of the divided ends of the intestine after enterectomy, the metallic button invented by Murphy of Chicago is probably the one which has attracted the most notice amongst surgeons during the past few years. The advantages claimed by Dr Murphy are that: (1) the button dispenses with the need of sutures; (2) the possibility of non-apposition is prevented;

(3) the danger of sloughing is avoided; (4) the too rapid digestion of the catgut sutures is prevented; (5) the operation being more rapid, prolonged anæsthesia is avoided; (6) the great ease of the operation renders the instrument as safe in the hands of the everyday practitioner as in that of the most dexterous specialist.

All who have used it have not found these advantages. After a course of experimental work on dogs, Jordan speaks of "the danger arising from the presence of the large metallic button, and the risk of gangrene spreading further than is necessary, in Murphy's operation." Harrison Cripps[1] speaks very strongly against its use in human surgery, his experience leading him to directly opposite conclusions to those of Murphy.

It is placed and fixed in position as follows: The male half of the button is placed in the distal end of the bowel, and the female half in the proximal end, being held there by an assistant; a continuous running thread is passed in and out completely around each end of the intestine in a manner similar to the "puckering string" or "draw string" of a bag; the silk is then drawn up around each stem of the button and tied securely. The two halves are steadily and firmly pressed together, so that the two serous surfaces come in direct contact. In from a week to a fortnight sloughing occurs of the parts included within the button, and the latter is passed through the bowel, union of the two serous surfaces having occurred in the meantime.

Jordan,[2] in India, performed enterectomy experimentally upon fifty-nine pariah dogs by various methods, the one which gave the greatest percentage of success being as follows: Two hollow cylinders, each three-quarters of an inch long, were made either from the decalcified femora of geese or turkeys, or from fresh carrots, turnips, or potatoes, and bevelled off at one end so as to form a hollow truncated cone, the apex being less than, and

[1] "Ovariotomy and Abdominal Surgery," p. 281.
[2] "The Lancet," October 1897, p. 1098.

the base the diameter of, the lumen of the bowel. Each cone was furnished with two sutures, which were passed through its wall from the apex to the base, one on each side, a big knot at the apical end preventing the suture from being pulled

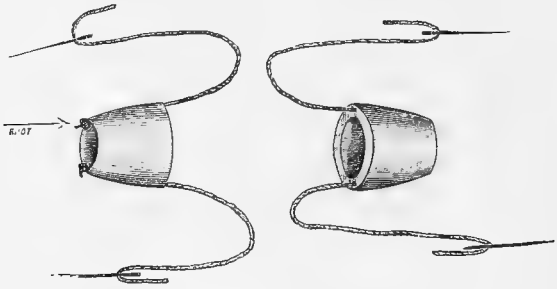

FIG. 55.[1]

Cones with sutures and needles attached.

through the cone. The apex was then inserted and the "cone sutures" passed through all the layers of the bowel an eighth of an inch from the cut margin, one at the mesenteric attachment and the other at the opposite side of the gut. The

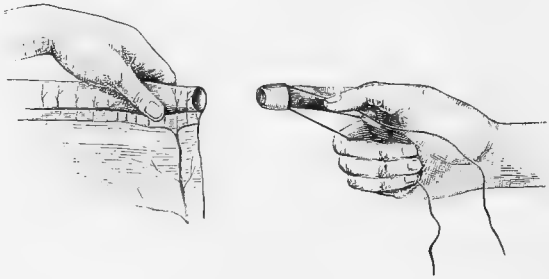

FIG. 56.

Mode of insertion of cone.

other cone being similarly passed, an assistant approximated the ends of the bowel, and the corresponding pairs of sutures were tied moderately tightly. The ends of the sutures were cut as short as possible. The cut ends of the gut were thus

[1] For this and the following two figures I am much indebted to "The Lancet."

fixed in contact, slight inversion of the ends occurring at the sutures. A continuous "double turned" suture (*see* Fig. 57) was now commenced on the under surface of the bowel about one-third of an inch from the mesenteric attachment; especial care was paid to the first four stitches to ensure that the knot of the "cone sutures" was buried beneath the line of the continuous suture, the needles here being inserted a little farther from the cut margins. The assistant, holding the bowel at the

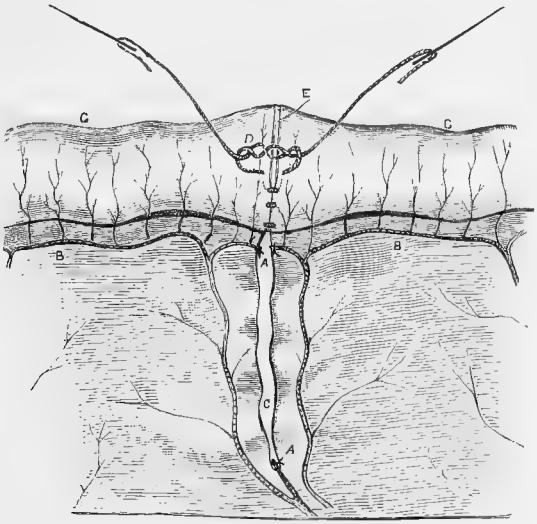

FIG. 57.

Operation half completed (dog's bowel).

AA. Arteries ligatured; BB. Arterial loops; C. Gap in mesentery; D. Double turn; E. Cut margins of gut; GG. Gut.

apex of each "cone" between the thumb and fingers, kept the cut ends of the gut in view (otherwise excessive inversion occurred during the suturing), and gradually rotated the bowel back to its original position as the suturing proceeded. Especial care must be taken to bury the "cone suture" knots, or peritonitis is apt to ensue. As each "double turn" (*see* Fig. 57) of the continuous suture was in process of being tightened, the assistant, with the closed blades of a pair of scissors applied on

the flat, or other instrument, inverted the margins of the bowel and kept them so until the double turn was drawn sufficiently tight to invert them permanently. When the gut had been sutured all round, the two ends of the suture were tied with a reef knot; the bowel was carefully cleansed and the line of resection inspected, to ensure that the edges were everywhere inverted. The mesentery was drawn together with a continuous suture. The gut was then bathed in hot antiseptic water and returned, the abdominal wall being treated as already described for an ordinary laparotomy.

Thirty-two dogs were operated upon by this method, pieces of from 4 to 13 inches being excised. Only two deaths occurred, and one of these might reasonably be attributed to other causes than the enterectomy. It must not, however, be forgotten that these were comparatively healthy animals, none of them suffering at the time from disease of the intestine.

The sequelæ as reported were excellent, the animals afterwards rapidly putting on flesh, but Mr Jordan does not appear to have kept them under observation for more than about six months to see whether or not stricture resulted.

The after-treatment consisted in dieting with milk for the first two days, the dogs being allowed as much as they would drink; for the next four days minced meat and boiled rice were substituted, and they were then allowed to eat anything.

Excision of the Spleen.—Occasionally large tumours are met with in the spleen, necessitating, if the patient's life is to be prolonged, complete or partial extirpation of that organ.

Removal of the whole of the organ is a very serious operation, both at the time of operating and as regards its sequelæ, death from marasmus often following within twelve months.

Mr Martyn Jordan, however, has shown [1] by an experimental research into the effect of partial excision upon healthy dogs that excellent results can be obtained.

The chief untoward results to be looked for at the time of

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[1] "The Lancet," 22nd January 1898, p. 208.

operating are those of death from hæmorrhage or shock; the former must be guarded against by careful clamping and ligaturing of every vessel along the splenic omentum or those which supply the portion to be excised, and to avoid the latter the operation should be performed as rapidly as possible, hypodermic injections of stimulants being at hand for immediate use if required.

For extirpation of the whole organ, the patient is prepared, secured, and operated upon as in an ordinary laparotomy, the incision being made on or near to the median line, about an inch behind the sternum. The spleen is then sought for and brought as much out of the orifice as necessary, each vessel, however small, being clamped or ligatured in two places before being cut through, after which the organ is removed.

In six cases in which Mr Jordan removed the whole spleen, "all the dogs suffered greatly from shock and there were three deaths," one being from marasmus and two from shock.

For partial excision Jordan recommends the following method of continuous ligature, by which he obtained a practically bloodless section: "A long needle threaded with fairly coarse silk twist 1½ ft. long is inserted on the inner or under surface about half an inch from the edge or border and passed through the thickness of the spleen, emerging on the outer or upper surface about the same distance from the edge; the ligature is drawn through until the ends are equal; the free end is brought up round the border of the spleen and a double turn made with the two ends and drawn as tightly as possible, this turn being kept over the exit of the needle. The needle is then passed back through the spleen on the occluded side of the organ as close to the line of ligature as possible and an eighth of an inch from the edge or border side of the turn; this being done in order that the next loop shall include the spleen where the needle has previously passed through, so that any oozing along this track should be stopped when the loop was drawn tight. The needle is then re-passed through the spleen from the under to the upper surface half an inch further on, and a double turn

again taken and drawn tight. Continuing in this way the spleen is traversed. A reef knot is then tied and the ends cut short. The occluded end of the spleen is then cut through close to the line of the ligature."

Interrupted, instead of continuous, interlaced ligatures are sometimes used.

Following out his method of continuous ligature, Jordan had twenty-one successes out of twenty-two cases, the animals being Indian pariah dogs varying in ages from a month upwards. In nineteen of them the lower half of the spleen was excised without a single fatality or noticeable disturbance afterwards; in the remaining three, in which the upper half was excised, all the animals showed great constitutional disturbance, and one death occurred from shock. This authority concludes that it is the removal of the upper half of the spleen which is full of danger on account of the risk of shock and after hæmorrhage, and that it is much more difficult to operate upon than the lower half.

Removal of Tumours from the Abdominal Organs.—Diagnosis of tumours of the abdominal organs can usually be made with certainty in thin emaciated patients, but in fat animals it is often a matter of difficulty. The liver and spleen, and the uterus in the case of the bitch, are the organs most commonly affected.

Tumours of the liver are usually very vascular, and their removal is accompanied by hæmorrhage.[1] If of any size and without definite pedicle, the clam and a fine sharp iron or heated knife used very carefully form the best instruments for their removal; the results are not satisfactory if the tumour is at all imbedded in the liver structure. With tumours of the spleen and uterus, as a rule, it is the wisest plan to excise the whole of these organs if their structures are at all deeply involved. These operations are described later.

In all cases the principles of operation are the same. Rigid

[1] "Journal of Comparative Pathology and Therapeutics," Vol. XI., p. 251.

antiseptic precautions must be adopted, and laparotomy performed under anæsthesia; the tumour is then sought for, and removed by ligature and the knife, or whatever way is deemed advisable by the operator, in order to get as little hæmorrhage as possible, the abdominal wound being sutured and treated in the usual way.

Excision of the Omentum.—A portion of omentum is frequently included amongst the contents of the hernial sac, and its return is often a matter of difficulty. If considered necessary, its excision may be practised without the slightest fear, provided due attention be first paid to any blood vessels in its meshes, these being carefully ligatured. We have repeatedly had occasion to remove large portions of omentum, and, in at least one case, we have taken away practically the whole of the organ with the best of results.

Prolapse of the Rectum. Reduction.—Reduction of a prolapsed rectum should be effected by careful manipulation with the fingers, covered by a thin cloth soaked in cold antiseptic solution, care being taken to avoid injury from the nails; a blunt instrument (such as a metal thermometer case) manipulated up the lumen of the rectum is often of material help. When returned, sutures may be put across the anus, or, as recommended by Müller,[1] a tobacco pouch suture may be inserted. This consists of thin tape or fairly stout silk passed through the skin in and out completely around the exterior of the anus, the two ends being drawn together tolerably tight, like the strings of a purse or bag, and tied. Stockfleth[2] advises a similar procedure for constricting the rectum, by placing pins at intervals around the anus and uniting them with threads. Pessaries introduced into the rectum usually do more harm than good, and act as a continual source of irritation. Gray[3] and Liénaux[4] have successfully treated cases by laparotomy, the prolapsed bowel being withdrawn with the fingers and

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1 "Diseases of the Dog" (Glass's translation), p. 73.
2 Idem.
3 "Veterinary Journal," Vol. XL., p. 401.
4 "Veterinary Record," Vol. XI., p. 561.

sutured to the abdominal wall, and care being taken only to pass through the serous and muscular coats of the bowel.

The chief trouble to be dealt with is the straining which often takes place afterwards, and causes a return of the prolapse. This is to be guarded against by keeping the animal as quiet as possible, resort being had to the medicinal use of morphia, given hypodermically or in the form of suppository, if necessary. After-treatment consists in careful attention to the diet, which should be sparing and of a kind likely to influence the consistency of the fæces and keep them soft and pultaceous.

When the rectum has been out for some days and adhesions have taken place it is often impossible to return it, and excision must be practised.

Excision.—This can be done under the influence either of a general or a local anæsthetic, the patient being placed on the operating table in the abdominal position. Antiseptic solutions are thoroughly applied to the exterior and interior of the rectum, and the protruding portion is allowed to rest on a thoroughly clean cloth soaked in antiseptic. A round metal sound or probe (an ordinary clinical thermometer case answers very well) is inserted into the lumen of the rectum, and four or five catgut interrupted sutures are passed through the bowel down on to this and back again, close to the sphincter of the anus, in order to prevent the intestine from disappearing completely into the abdomen when the everted portion is cut off. A circular incision is then made with a sharp scalpel below the sutured portion, and the prolapsed part removed. After-treatment consists in the application of antiseptics to the anus, the patient being kept on soft, sloppy diet in order to avoid constipation, and care taken that no violent exercise is indulged in for at least a week or ten days. The results are excellent if the animal is not too weak to stand the operation.[1] In one case which came under our notice a young bull-terrier had

[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 174; "Veterinary Record," Vol. X., p. 213.

three separate portions excised by this method within a month, and ultimately made a good recovery. A stricture may sometimes follow, but as a general rule the case terminates satisfactorily.

Operation for Imperforate Anus. — This condition is one occasionally met with in the newly-born puppy or kitten, there being no visible anal opening. The operation for its relief is very easy if a rectum is present, consisting simply in making an incision through the skin covering the end of the intestine in the seat where the anus ought to be, cutting a portion out so as to separate the two edges of the wound, and keeping them from uniting by the application of nitrate of silver or some other caustic until defæcation has become fairly established. If the intestine is normal a satisfactory termination may be looked for.

CHAPTER XIII.

SURGICAL TREATMENT OF HERNIA.

General Remarks.—The hernias commonly seen in the dog and cat are umbilical, abdominal, and inguinal. Scrotal, perineal, and femoral are met with, but are comparatively rare. Care must be taken to differentiate between tumours and abscesses occurring in these regions and hernia. In some cases this is by no means an easy matter, even to those who have had considerable experience. In hernial sacs one must endeavour to trace the form of the herniated organs by careful manipulation between the finger and thumb, and if there is any doubt about the matter the patient should be again examined after a course of purgative medicine and fasting.

Möller[1] states that inguinal hernia only occurs in bitches which have already borne young, but between the years 1896 and 1899 we have met with five cases in females which have never been lined by the dog. It is most frequently met with on the left side. As a rule, in these cases, the contents of the sac consist of one or both horns of the uterus; frequently, in addition, one finds intestine and omentum. In one case met with in April 1896,[2] a small Manchester terrier bitch, with a double inguinal hernia, had in the right sac a portion of the small intestine, the pancreas, omentum, bladder, right horn of the uterus, the cæcum, and even a portion of the rectum. Sometimes a single horn of the uterus is found to be herniated in each inguinal region, and occasionally one or two fœtuses are present. In one instance met with by the author a fox-

[1] Möller's "Surgery" (Dollar's translation), p. 258.
[2] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 171.

terrier bitch was operated upon for an inguinal hernia containing a pregnant horn; the fœtus was removed, and the horn afterwards excised, the animal suffering so little disturb-

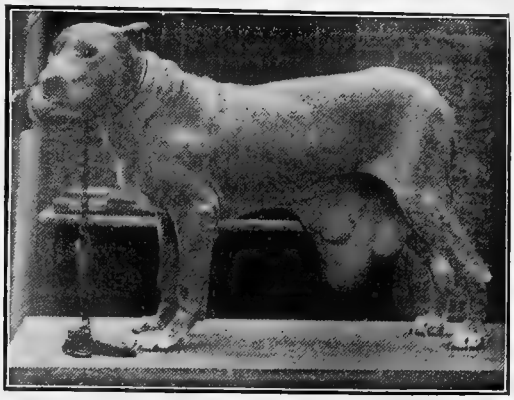

FIG. 58.
Tumours in inguinal region (for comparison with next figure).

FIG. 59.
Inguinal hernia.

ance that she gave birth to a puppy in the ordinary way seventeen days later.[1]

[1] "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 153.

The principles of surgical treatment are the same in all cases, and consist in the return of the organs to their normal situation, and the adoption of steps necessary to retain them there. If a general anæsthetic is used the patient is placed on the operating table in the abdominal posture, and afterwards turned on to its back or side as the operator may consider the most convenient; if a local anæsthetic is sufficient the animal is at once placed in the most convenient position for the performance of the operation, and the anæsthetic applied. Rigid antiseptic precautions are always necessary with regard to the instruments, the parts to be incised, and the operator's fingers.

In **Umbilical Hernia** the organ most commonly out of place

Fig. 60.
Photograph showing suitable position for operating upon inguinal or umbilical hernia.

is the omentum; if return is possible this is done after the skin has been incised directly over the centre of the swelling. The edges of the dilated umbilical ring are lightly scarified, and then drawn together with silkworm gut sutures, the skin being united with aseptic silk, and the wound coated with collodion and orthoform or iodoform. Strappings of adhesive plaster or a bandage may be applied if extra support is considered necessary. In cases where the omentum has become adherent to the edges of the ring, a separation must be effected by the scalpel. Sometimes a simple solution of the difficulty consists in excising a portion of the omentum, and returning the remainder into the abdomen before suturing the ring as mentioned above.

With an **Abdominal Hernia** an incision is carefully made down to the protruding organs, which are returned by gentle pressure, the muscles being lightly scraped at the edges and sutured with silkworm gut, and the skin wound being sutured with silk and treated as in the case of the umbilical variety. A bandage is always advisable if the rent in the abdominal wall has been at all a large one.

With **Inguinal Hernia** there is sometimes a little trouble. An attempt should always be made to reduce the hernia by gentle pressure under a general anæsthetic when the parts are thoroughly relaxed. Whether this can be effected or not, an incision is made through the skin directly over the hernial sac, care being taken not to penetrate this, in order to avoid making an opening into the peritoneum. If the organs have not been returned another attempt may now be successful, particularly if the exterior of the sac be carefully separated from the surrounding skin by means of a scalpel handle or some blunt instrument. The extremity of the sac is seized with a pair of pressure forceps (Spencer Wells' or Pean's artery forceps answer admirably), and the sac itself twisted slowly round until it forms a kind of pedicle, around which a ligature of aseptic silk or gut can be placed. The lower portion of the sac is then cut off, and the external wound is sutured and treated on aseptic lines. If very much dilated the inguinal ring should also have several sutures drawn across it.

In some cases of inguinal hernia, however, the sac has to be opened and its contents exposed before reduction can be effected. The greatest care must now be used to avoid septic infection. After the organs have been returned the inguinal canal must be sutured with silkworm gut, a pressure pad of aseptic wadding being applied or not according to discretion, and the external wound sutured.

At times it is found necessary to incise the inguinal ring before the organs can be returned, and for this purpose a special bistoury with only a very small portion of its edge sharpened is cautiously used. At other times some portion

of the herniated organs, particularly in the case of omentum or uterus, has to be excised; this is best done with the scalpel after applying a ligature, the stump being sutured to the inguinal ring or returned into the abdominal cavity.

The decision as to whether a bandage should be applied here or not must be left to the operator's discretion; in some cases it is necessary, in other cases, where the patient is of an irritable temperament or the weather is very warm, it is apt to do more harm than good.

Scrotal Hernia is fortunately rare, as it is a condition which it is very troublesome to permanently relieve unless castration is allowed to be performed at the same time. If this is done matters are greatly simplified, as the prolapsed intestine is carefully returned, and an incision made into the scrotum; the spermatic cord is ligatured as high up as possible and

Fig. 61.
Hernia bistoury.

the testicle removed, the orifice of the inguinal canal being sutured.

If castration is not to be practised and the hernia keeps returning after being repeatedly reduced, the best method to adopt would be that practised by Gray in cases of prolapsed rectum, *i.e.*, to perform laparotomy, withdraw the herniated intestine and suture it to the abdominal wall, taking care to pass the stitches only through the serous and muscular coats of the bowel.

Perineal Hernia occurs as a soft swelling at the side of the anus; it is not common when compared with the umbilical or inguinal varieties. The herniated organs are usually omentum or bowel; Müller states that the bladder may also be included. Two methods of operating may be adopted, viz. (1) to cut directly down on to the swelling,

remove a certain part of omentum[1] (if this be present), return the bowel, and excise an elliptical piece of the pendulous skin before suturing the wound, in order to get greater contraction when cicatrisation takes place; or (2) to follow Gray's method as already advocated in scrotal hernia, *i.e.*, to perform laparotomy and suture the prolapsed organs to the interior of the abdominal wall.

Femoral Hernia is of such extremely rare occurrence as to only merit a passing allusion to it. Although each of the other forms of hernia has been recognised and treated, no case of the femoral variety has been seen in the College Out-

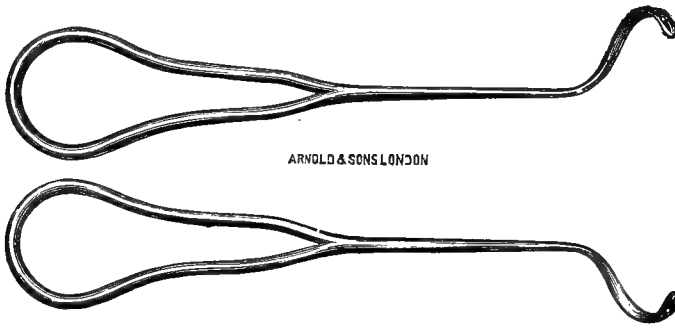

FIG. 62.
Curved hernia needles, MacEwen's, for suturing the inguinal ring.

patients' Clinique during the past seven years. According to Müller it is occasionally seen after fractures of the pelvis, occurring as a soft painful swelling in the inner fascia of the thigh. The principles of operation are the same as with other herniæ, very great care being necessary on account of the close proximity and size of the blood-vessels in this region.

The sequelæ of the operative treatment of hernia are as a rule satisfactory, provided the displaced organs have not become strangulated. The chief mishaps likely to occur afterwards are, (1) violent removal of the sutures by the patient, and subsequent descent of the bowel or other organ; (2) hæmorrhage either at

1 "Journal of Comparative Pathology and Therapeutics," Vol. XII., p. 260.

the time of operating or afterwards. All arteries and veins should be ligatured during the progress of the operation. Two of our most promising patients (inguinal cases) slowly bled to death within three days after the operation, through injury to some veins at the time of operating. (3) Peritonitis, which can only be avoided by absolutely following out the principles and details of aseptic surgery.

These statements are based upon thirty-nine consecutive cases,[1] of which twenty-five were inguinal, nine umbilical, two abdominal, two scrotal, and one perineal.

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[1] "Veterinarian," March 1896; "Journal of Comparative Pathology and Therapeutics," Vol. VIII., p. 151, Vol. X., p. 170; "Veterinary Record," Vol. X. p. 282.

CHAPTER XIV.

OPERATIONS ON THE URINARY ORGANS.

Examination of the Prepuce or Vagina, and Removal of Foreign Bodies.—The interior of the prepuce or vagina can be examined for some distance from its orifice by the aid of the fingers or by the insertion of a speculum of similar design to that already described for the ear. The female can be examined in the standing posture, unless very restless, in which case the dorsal position on the operating table with the hind legs raised and held over the body will be found to be the most convenient, whilst in the case of the male the animal should be held or fixed on its back with the hind legs spread well apart.

Foreign bodies, other than tumours, are removed by the aid of forceps. Tumours are often a source of great trouble, and some varieties re-occur very rapidly.

In the prepuce of the dog and the vagina of the bitch one frequently meets with a species of ulcerating papilloma which is communicable when the animals are used for stud purposes.[1] If left, these tumours grow very large, causing an offensive, fœtid, and continuous discharge. To effect their removal, the knife and curette must be used freely, the parts having been anæsthetised by cocaine solution or the animal placed under chloroform. The return of the growth is usually rapid, and the animal is valueless for breeding purposes; as a rule a dog

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[1] Smith and Washbourn, "Journal of Comparative Pathology and Therapeutics," Vol. XI., p. 41.

will not copulate with a bitch suffering from these tumours. Their vascularity is much increased at time of œstrum.

In the bitch their growth can be very much retarded if oöphorectomy is performed in addition to the curetting[1]; these operations, however, should be done on separate occasions.

As a sequel to the curetting, death has been known to ensue from inflammation of the bladder, owing to the retention of urine consequent upon a swollen condition of the mucous membrane of the vagina around the urethral orifice.

Passing the Catheter.—In the smaller varieties this operation is one of extreme difficulty, and in many cases quite

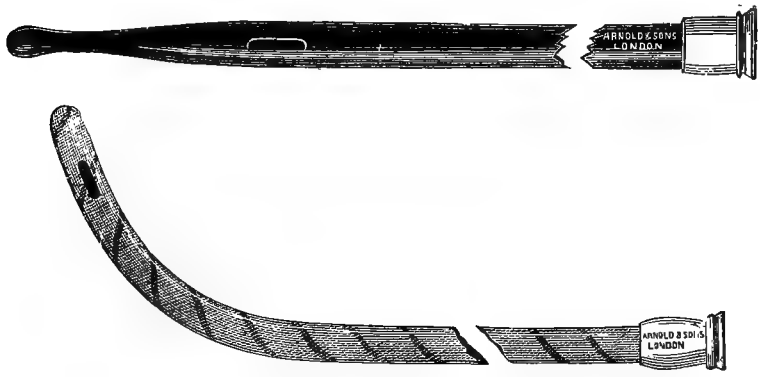

FIG. 63.
Catheters.

impossible on account of the small size of the urethral canal. In cats and small dogs a bougie can often be passed, and will frequently answer the same purpose. Both catheters and bougies are made in sizes known according to the diameter as No. ½ to 12. For canine and feline work Nos. ½ to 5 answer in the majority of cases.

In the female of the larger breeds, the instrument can be passed whilst the animal is standing, but in smaller ones it is often of advantage to place the patient in the dorsal position and introduce a speculum as an aid to finding the urethral

[1] "Veterinary Record," Vol. X., p. 30.

entrance. The catheter, which in the female may be of elastic gum or metal, is guided gently by the forefinger into the orifice of the urethra, this being found as a small opening on the floor of the vagina, and carefully introduced in a slightly downward and backward direction into the bladder.

To pass the catheter in the male, the animal should be placed on its back or side, the operator having both hands free to manipulate the instrument and penis. The penis is forced gently but firmly out of the prepuce, the latter being pushed back at the same time and the catheter carefully introduced into the urethra. Gentle pressure is then exerted, and the catheter slowly passed into the bladder. Sometimes resistance is met with when the instrument reaches the perineal arch, but this can be readily overcome by withdrawing the stylet for a short distance, and thus allowing the more flexible canula to go forward by itself.

Having thus introduced the catheter into the bladder, the only remaining procedure is to carefully withdraw the stylet and allow the urine to come away.

Attention must always be paid to the cleanliness of the catheter, and, before being introduced, the instrument should be lubricated with some antiseptic, such as pure vaseline, boracic acid ointment, or oil containing some antiseptic.

Operation for Imperforate Urethra or Vagina.—An imperforate urethra or vagina is occasionally met with ; if the stoppage occurs at its extremity, an incision with a scalpel will give immediate relief. Precautions must be taken to prevent union of the edges of the wound, either by making a fairly large orifice, or by the application of the cautery.[1]

Removal of Calculi from the Urethra; Urethrotomy.—In the dog and cat, particularly in male animals, small calculi are occasionally met with in the urethral canal. They cause acute pain during their passage through the urethra, and frequently give rise to cystitis and even rupture of the bladder. They

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. IX., p. 155.

can readily be diagnosed when an attempt is made to pass the catheter, as they form an obstruction which prevents the instrument from going beyond a certain point. In the majority of cases the calculi become lodged in that portion of the canal which runs through the *os penis* or immediately behind that bone. Sometimes the catheter can be so manipulated as to dislodge the stone, when, if it is not of too large a size, it may be washed out of the urethra with the next outflow of urine. In large dogs a pair of long thin urethral forceps can be passed up the urethra and the stone removed, but this is rendered exceptionally difficult in small patients on account of the narrowness of the groove in the bone of the penis. Failing these, the operation of urethrotomy must be performed.

For this operation in the male the dorsal position is the

FIG. 64.
Urethral forceps.

best, but struggling must be avoided as much as possible on account of the risk of rupturing the bladder; this latter accident is indicated by the sudden collapse of the patient. A local or general anæsthetic is made use of, the parts are thoroughly cleaned with some antiseptic, and a catheter is passed up the urethra as far as the obstruction. An incision is made in the median line directly over the calculus, which is then removed together with any others within reach, and the parts are thoroughly washed with a fluid antiseptic. Sutures may or may not be applied, according to the size of the wound and the discretion of the operator. We have been in the habit of using them, suturing the muscles and skin separately without touching the mucous membrane of the urethra; Müller[1] recom-

[1] "Diseases of the Dog" (Glass's translation), p. 179.

mends that the wound be left open. The catheter should be passed right into the bladder to make sure that the passage is clear, as the presence of a small stone in the urethra usually indicates that there are others higher up; on two occasions we have counted more than fifty small calculi in urethra and bladder. In some cases it is a wise plan to leave the canula of the catheter *in situ* for some hours after the operation. The wound itself is treated with antiseptics in the usual manner.

The prognosis of these cases must always be guarded, especially where the patient has been left until almost in a state of collapse before surgical aid is attempted.

In the female the shorter urethral canal does not offer quite so many difficulties. A calculus lodged in it can sometimes be grasped and crushed or withdrawn by a pair of fine forceps, or if necessary a fine blunt pointed tenotome or Paget knife may be used to enlarge the orifice. Material assistance in removing calculi from the urethra of the bitch can often be obtained by manipulation with the finger through the rectum.

Operations for Renal Calculus, Nephro-Lithotomy, Nephrectomy. — Although calculi of the kidney are by no means common, they are not infrequently met with by those who have a large number of canine patients to deal with. As a general rule, they are not diagnosed until the *post-mortem* examination is made, and it is the difficulty of making a certain diagnosis which is at present so hard to overcome.

By the term "nephro-lithotomy" is indicated the operation of cutting into the kidney in order to remove a stone. A laparotomy is performed in the usual way in the flank on the side suspected to be affected, and the kidney is exposed to view. As a rule, the calculus is situated in the pelvis. An incision is made directly down on to it, it is removed, and the wound is drawn together with fine sutures. The peritoneal wound is treated in the usual way.

Nephrectomy (removal of the kidney) has been performed many times experimentally on healthy animals, and in human surgery it has taken its place amongst the useful operations.

In canine practice, in addition to the difficulty of diagnosing tumour, calculus, or other disease of the kidney necessitating its removal, we have the fact that (in the case of calculus at all events), as a rule, when one kidney is affected the other has also become affected before professional aid has been sought.

In thin animals the kidney can be removed by an incision made in the median line, and this gives a little advantage when uncertainty exists as to which is the diseased side. In larger patients an incision is made in the flank just below the lumbar region. The operation is not difficult; the kidney is carefully separated from its situation under the loins, two silk ligatures are passed around its pedicle, and an incision is made between them. The peritoneal wound is sutured and treated in the usual way.

Puncture of the Bladder.—This operation is most commonly required for cats and the smaller varieties of dogs in which it is impossible to pass the catheter. It is performed in order to evacuate the contents of the bladder when this organ is over-distended.

The most convenient situation for operating is a spot in the linea alba from about 1 to 3 inches (depending chiefly upon the size of the patient) behind the brim of the pelvis, the object being to pierce the bladder in a part where it is tense and yet fairly close to the neck. The patient is very gently placed on the back or side, the bladder being grasped carefully but firmly through the walls of the abdomen with one hand and held as near the seat of operation as possible. Having carefully applied antiseptics, a trocar and canula (which should be of a fine bore) are inserted subcutaneously for a short distance and then directly into the bladder. The trocar is withdrawn and the urine allowed to escape. After-treatment consists in withdrawing the canula carefully, drying the surface of the wound and covering it with iodoform, or orthoform, and collodion.

It is risky to administer a general anæsthetic in the majority

of these cases, or even to fix the patient firmly, as if the bladder is much distended rupture or sudden collapse is apt to occur; two such cases have occurred in the College Out-patients' Clinique during the past two years. As regards sequelæ, in so far as the operation itself is concerned, if antiseptic precautions are observed no evil results need be feared; it can be depended upon to give great relief, and, if the patient is not too much exhausted, or the cause of the distension is not some permanent obstruction in the urethra or neck of the bladder, the benefit is usually immediate and permanent.

Lithotomy and Lithotrity.—Both these terms are applied to the operation whereby calculi are removed from the bladder, the first term being used when the bladder is incised and the stone or stones extracted, and the latter when the calculi are first crushed or broken up into fragments sufficiently small to be removed through the urethra.

Lithotomy is performed as follows. After the bladder has been emptied with a catheter, and carefully washed out with solution of chinosol, boric acid, or some other antiseptic, the patient is anæsthetised and placed in the dorsal position, laparotomy being performed as already described. The site of operation in the male is either on the median line immediately in front of the penis, or else in the flank a little to the right or left of that organ, and in the female on the median line immediately in front of the edge of the pelvis.

The bladder is carefully raised and drawn into the wound where it is packed round with antiseptic lint; a longitudinal incision is made down its centre in the least vascular portion, as near as possible directly over the stone. This is carefully removed with forceps, after having been first broken up with a lithotrite, if at all a large one. If, as is not uncommon, it is adherent to the interior, care must be taken to loosen it very gently from its attachments. If a number of small stones are present they must be removed with a blunt scoop or forceps. The interior is then carefully washed with some trustworthy non-irritant antiseptic, and the edges drawn together with

sutures. In four cases[1] in which we have sewn up wounds of the bladder Lembert's sutures of silkworm gut were used, but catgut or silk have been used, and some operators suture through the whole of the coats at once in the ordinary way with interrupted sutures. As a rule, the wound in the bladder

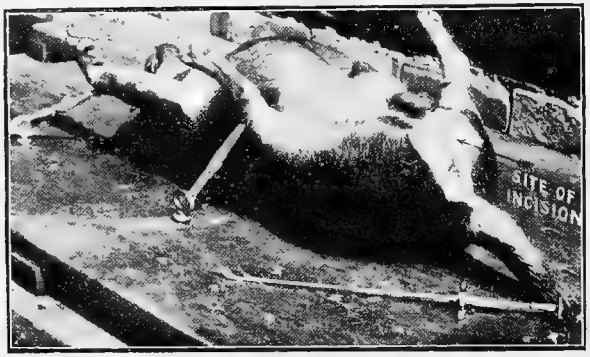

FIG. 65.
Photograph of dog secured for posterior pubic lithotrity.

heals very satisfactorily if antiseptic precautions have been rigidly carried out. Sewell[2] records two cases in which calculi were removed in this way, in one of which the stone weighed over 3 oz., the patient herself only weighing 14 lbs.

In lithotrity the abdomen is not opened, the stone or stones

FIG. 66.
Lithotrite.

being reached through the urethra. In the male, after anæsthesia has been established, the animal is fixed on the operating table in the position illustrated in the photograph, the hind legs being drawn forward so as to efficiently expose the seat

[1] "Journal of Comparative Pathology and Therapeutics," Vol. XII., p. 263.
[2] "Veterinary Record," Vol. XI., p. 509.

of operation, which has already been shaved and rendered thoroughly aseptic. The urine having been previously drawn away, and the catheter left in position in order to clearly define the outline of the urethra, an incision is made directly on to this in the perineal region, about midway between the testes and the anus. An aperture of sufficient size to introduce the lithotrite is made in the urethra, and the catheter steadily withdrawn. The curved end of the lithotrite is introduced, passed round the pelvic border, and into the bladder. Search is made for the calculus, which must be manipulated until it is firmly fixed between the jaws of the instrument, when steady pressure is exerted upon it, in order to break it up into small pieces, care being taken not to include the mucous membrane of the bladder. Some of the larger pieces may require a second

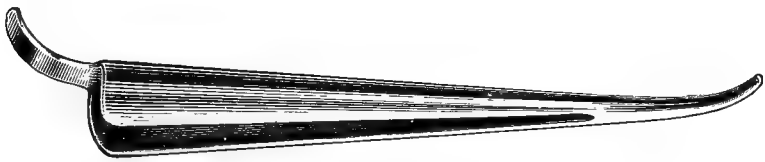

FIG. 66A.
Urethral Dilator (Sewell's).

application. The fragments are then got rid of, either by forceps or by continual irrigation with an antiseptic fluid, such as solution of chinosol. The wound is then sutured, the urethra itself with fine silk, and the muscles and skin separately, the whole being covered with iodoform or orthoform and collodion. In small patients it is sometimes impossible to suture the urethra, and even in the larger ones some operators prefer to merely suture the skin and muscles. Where the animal is of a quiet disposition a catheter may be left in the urethra for two or three days with advantage, but if it gives rise to irritation and consequent continual efforts to lick the parts its continued use is best avoided.

After-treatment must depend a little upon the progress made; diet should be of an easily digestible character and sparing in

quantity, the supply of fluids being limited for the first three or four days.

If a little urine finds its way through the wound extra care must be taken as regards cleanliness, but no alarm need be felt so long as the lower part of the urethra remains open. If much pain is shown morphia should be given hypodermically, or some sedative to the mucous membrane of the bladder (such as hyoscyamus) administered by the mouth.

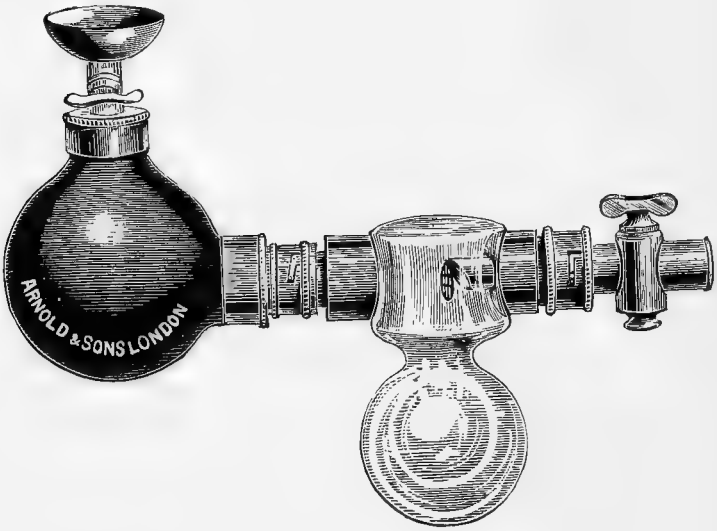

Fig. 67.
Thompson's evacuator.

In the bitch the vaginal method recently described by Sewell[1] is one which has given excellent results in cases where the patient is of sufficient size to allow it to be done. The method of fixing is the same as already described for urethral lithotrity in the male.

A conical shaped dilating speculum (Avery's or Kramer's answer well, *see* Figs. 39 and 40) is forced into the vagina to dilate the passage as much as possible, then withdrawn, and a

[1] "Veterinary Record," Vol. XI., page 510.

urethral dilator pressed into the urethra until the latter is sufficiently large to admit the little finger. This is withdrawn and replaced by a small pair of stone crushing forceps or a lithotrite, which is passed directly on to the stone in the bladder. Care is taken to make sure that the mucous membrane of the bladder is not included, and the stone is broken up into small pieces. The pieces are then removed by means of Thompson's evacuator.

Sewell records one case in which he was able to remove a stone about the size of a hazel nut from the bladder of a bitch without breaking it after enlarging the urethra with a small bistoury. Gray[1] has had a similar experience. The after-treatment is the same as already described for the dog.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 87.

CHAPTER XV.

OPERATIONS ON THE GENITAL ORGANS.

Removal of Tumours from the Prepuce and Penis.—Tumours are frequently found inside the prepuce and around the base of the penis; they are usually very vascular, bleeding upon the slightest provocation. In stud dogs their presence is to be regarded with great suspicion, as one variety, at all events (sarcoma), is capable of being communicated to the bitch during copulation, the vagina of the infected bitch again being capable of infecting the penis of a healthy dog. The experiments of Smith and Washbourn[1] clearly demonstrate these facts.

Ordinary pedunculated tumours can be ligatured and readily removed with scissors or actual cautery, but the infective venereal tumours are exceedingly troublesome. If incompletely removed the remains of the growth increase very rapidly, and soon become larger than before. Smith and Washbourn obtained successful permanent results by snipping the mucous membrane around the base of the tumour and stripping it off with the attached growth from the underlying tissues, the wound in the mucous membrane being drawn together afterwards with fine silk.

Paraphimosis.—In cases of paraphimosis it is sometimes necessary, when all other means fail, to slit the extremity of the prepuce. This is done with a fine blunt-pointed bistoury, care being taken not to incise further than is absolutely

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. XI., p. 41.

necessary, on account of the risk of subsequent adhesion or stricture. Scarification of the penis may have to be resorted to in cases of extreme congestion. This is a very simple operation, and is done lightly in a longitudinal direction around the penis with a fine scalpel or small lancet, the wounds being afterwards covered with some antiseptic.

Castration.—This operation is performed in order to keep the animals from wandering; also in certain diseased conditions, such as orchitis and enlargement of the prostate

FIG. 68.
Showing method of holding cat for castration.

gland; and in cats, in order to diminish the unpleasant odour possessed by the urine. Although it should be done under an anæsthetic, this is not always employed, as the operation is very simple, and completed within a few seconds. Before making the incisions the hair should be clipped or shaved off and an antiseptic used, particularly in the varieties of cats which have long hair; neglect of these precautions has been known to lead to septicæmia and death.[1] The dorsal

[1] W. R. Clarke, "Veterinary Record," Vol. VIII., p. 449.

position on the operating table is the most convenient. A cat, when no anæsthetic is used, may either be rolled up in an ordinary towel (care being taken not to cause suffocation), with the parts to be operated upon left exposed, or held by an assistant, as shown in the photograph. An old-fashioned way used to be to put the animal head downwards in a top-boot or the sleeve of an overcoat.

In the method illustrated above the cat is lifted up by the shoulders, the fore and hind limbs on each side being crossed over one another and grasped tightly. The first fingers are then crossed under the throat, and the thumbs are pressed firmly at the back of the head in such a way that the cat cannot get its mouth down or even sideways to use its teeth. The tail is pulled out of the way and the hind legs are held widely apart. The operator should never stand immediately behind, as the animal is apt to eject a stream of urine in that direction.

The operation is performed as follows: An incision is made over each testicle separately, the organ is withdrawn, and the cord is twisted several times and slowly scraped through. Another method commonly adopted is to employ traction on the cord until it gives way; with either of these methods the hæmorrhage is very slight.

In old dogs, those of large breeds, and those which have diseased conditions of the cord, more care must be used. For these cases an anæsthetic should always be administered, as the operation is necessarily to some extent prolonged. The testicle is exposed in the usual way and removed either by slow scraping after twisting the cord several times, by excision after the application of an aseptic ligature, by an emasculator, by the clam and iron, or by torsion forceps and clam. Each method is good in its way, and the choice must be left to the discretion of the operator.

When aseptic precautions have been rigidly adopted the scrotal wound may be sutured and covered with iodoform or orthoform and collodion, the sutures being removed in four or

five days. To prevent the animal from licking the wound the device known as an Elizabethan collar, made of some stiff material such as wood, leather, or tin, is very useful.

If asepsis has not been properly carried out the best plan is

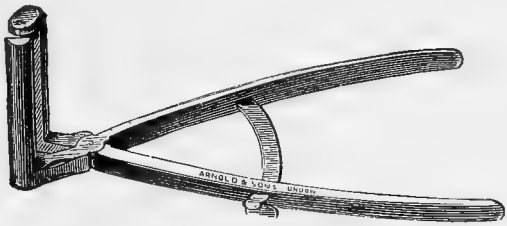

FIG. 69.
Torsion forceps.

not to suture but to treat the part as an open wound, antiseptics being freely applied two or three times a day. Exercise is always beneficial, and the prognosis given may in the majority of cases be favourable. The chief precautions to take are: In

FIG. 70.
Elizabethan collar.

the dog, to guard against hæmorrhage either at the time or afterwards; and in the cat, to carefully clip off the hair before making the incisions, to avoid asphyxiating the animal when holding it, and to be careful not to excise the penis by mistake. When the latter is done death invariably ensues.

Castration of Cryptorchids.—Cryptorchids are not uncommonly met with in dogs and cats, particularly cases in which one testicle is hidden. On account of the small size of the inguinal canal, unless the hidden organs happen to be close at hand, the best method of reaching them is to perform laparotomy and remove them through the abdominal wound.

The necessity for operating upon two such cases has occurred during the present year, in each instance both testicles being situated in the abdomen.[1] Under a general anæsthetic the incision is made either in the flank, at the side of the penis, or in the median line about half an inch in front of the prepuce, under the usual aseptic precautions. The operator inserts his middle finger and searches in the lumbar and pelvic regions for the missing testicles, withdrawing each one in turn, and excising it after the application of a ligature. The abdominal wound is then treated as already described (*see* laparotomy).

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[1] "Veterinary Record," Vol. XII., p. 298.

CHAPTER XVI.

OPERATIONS ON THE FEMALE GENITAL ORGANS.

Amputation of Prolapsed Vagina.—In cases of prolapse of the vagina it is customary to try various remedies, such as the application of a pessary and sutures, together with certain internal remedies, before resorting to amputation, the object being to get recovery without injuring the vaginal walls. When, however, all hope of permanent return has been given up the prolapsed parts have to be excised. The operation is not a difficult one, and rarely gives rise to bad sequelæ if performed properly and the animal is not very much exhausted.

The patient is secured on the operating table in the abdominal position, or may be held securely in the standing posture by an assistant. The parts, having been thoroughly cleansed with some antiseptic solution, are dried carefully with cotton-wool and painted with a five per cent. solution of cocaine (unless the patient is already under the influence of some general anæsthetic). Amputation is performed either by the clam and iron, the écraseur, or the ligature and knife, according to the will of the operator.

Judging from several experiences of each way the ligature seems to be the best if it can be used, the écraseur being the least preferable on account of the amount of laceration caused. In all cases care must be taken not to include the opening of the urethra in the part excised.

After-treatment consists in plugging the vagina with wadding, or syringing with solution of liq. ferri perchlor. and water until

hæmorrhage has ceased, and afterwards using an antiseptic solution as long as may be considered necessary.

Gray obtained permanent success in one case by performing laparotomy, replacing the prolapsed part and attaching it to the abdominal wall with sutures.

Oöphorectomy and Ovariotomy.—This operation, commonly spoken of as "spaying," is performed for certain diseased conditions of the genital organs and also with the object of preventing pregnancy and œstrum. Its effect upon the latter is by no means absolutely certain, as upon several occasions we have observed signs of œstrum in bitches and cats whose ovaries have been wholly removed, the animals even copulating with the male.[1] Leeney has also observed the same.[2] The term "oöphorectomy" is applied when the ovaries are healthy, and the term "ovariotomy" when they are diseased.

Animals may be operated upon at any age, but from six to twelve months for the bitch, and from three to nine months for the cat, seem to be the most favourable. The method of operating is as follows:—

Having previously had the abdominal wall around the seat of incision carefully cleansed and shaved, a pad of antiseptic material is put over the part and the animal placed on the operating table to be anæsthetised; when unconscious the patient is turned over and fixed on its back with the limbs well spread apart. The antiseptic pad is removed, the skin being lightly scrubbed with ether and again washed with antiseptic lotion. A longitudinal incision of from about half-an-inch to an inch long is made through the skin and muscular tissue on or close to the median line just behind the umbilicus, all blood vessels being carefully taken up with artery forceps before the peritoneum is pierced. The latter is done with the point of a scalpel, the incision being completed with the aid of a director. At this stage a blunt probe or flexible catheter

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[1] "Veterinary Record," Vol. XII., p. 15.
[2] "Veterinary Journal," Vol. XXXI., p. 11.

is inserted by an assistant into the vagina; this generally penetrates as far as the *os uteri*, occasionally passing into one of the cornua. The operator introduces the fore or middle finger of his right hand, or a blunt hook, into the abdomen, keeping it close to the abdominal wall and pushing the intestines on one side, the object being to find the probe which an assistant is moving cautiously about. Having found this it becomes an easy matter to follow up each horn in turn until the ovary is reached.

In young animals the latter may be simply scraped off with a blunt scalpel, but in older ones it is advisable to ligature above and below the ovary with aseptic catgut or silk before excising. In either case care must be taken to see that the whole of the ovary is removed, or the animal will still be liable to become pregnant,[1] thus defeating one of the main objects of the operation. The cut ends of the cornua are returned into the abdomen, the wound in the abdominal wall being treated as already described (*see* laparotomy).

The percentage of successful results is high[2] if antiseptic precautions are observed. The chief unfavourable sequelæ to be feared are those of collapse, peritonitis, descent of the bowels, hernia, and persistent disinclination to feed. The first and last mentioned have given us considerable trouble in feline patients, several having refused to feed although apparently all right in every other particular, and *post-mortem* examinations have given no clue as to the cause of death. Iodoform powder and other dressings which are at all poisonous should always be used very cautiously for wounds on small dogs and cats, and we have had good reason to suspect that iodoform dressings were sometimes at the root of the mischief. Peritonitis can be avoided by rigid attention to antiseptic precautions, and by putting the animals in a clean place after the operation. To avoid hernia and descent of the bowels

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1 "Veterinary Record," Vol. XII., p. 15.

2 "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 175; Vol. XI., p. 254. "Veterinary Record," Vol. XII., p. 14.

the patient should be kept quiet, and not be allowed to jump from any height or go up steps for at least three weeks after the operation.

Hysterotomy. — In this operation, commonly known as "Cæsarean Section," the uterus is incised and the contents removed. The subject is prepared in the same way as for oöphorectomy, the abdomen being incised and the uterus exposed. The latter organ is then drawn to the edge of the wound or withdrawn altogether from the abdomen, being placed on a warm cloth which has been boiled or otherwise rendered aseptic. The uterus is incised in a longitudinal direction, the situation chosen being one as free from blood vessels as possible, and the fœtus or fœtuses (with the placentæ) are removed. After their withdrawal the interior of the womb must be swabbed out with antiseptic solution, particularly near the wound. The edges of the latter are then drawn together by two or in some cases three rows of sutures; the first row consists of silkworm gut and is passed right through the wall of the uterus, the second and third are made of silk or fine catgut and are of Lembert's pattern, thus completely burying the first row and so lessening the risk of septic infection. When more than one fœtus is present the womb may have to be incised in several places, and this increases the danger. Before this is done an attempt should always be made to pass the fœtuses along towards the first wound and extract them in that way. The abdominal walls and skin are sutured and treated as in laparotomy. The chief sequelæ to be dreaded are collapse and peritonitis, and the percentage of successes is very low compared with those of hysterectomy. Successful cases have, however, been recorded, pregnancy afterwards taking place and successful delivery being effected without difficulty.[1]

Hysterectomy and Ovaro-hysterectomy. — By the term "hysterectomy" is meant the removal of the entire uterus,

[1] Mathis, "Journal of Comparative Pathology and Therapeutics," Vol. II., p. 277.

and the term "ovaro-hysterectomy" is employed when the ovaries also are included. The operation is occasionally performed for the same purpose as oöphorectomy. It may be necessary in some cases of dystokia, or where dystokia is to be feared, as when the female of a small breed has become pregnant by a male of some larger variety. The patient is prepared in the same manner as for oöphorectomy, the incision in the abdomen being of sufficient size to allow the gravid uterus (if this condition is present) to be withdrawn. Two catgut or boiled silk ligatures are placed above each ovary, and two others around the body of the uterus just below the junction of the two horns. The parts between are excised, and the uterus and contents lifted out of the abdomen, the ligatures effectually preventing any of the contents from escaping into the latter. The stump of the uterus is carefully disinfected and returned into the abdomen. It is not necessary to in any way fix the stump to the external wound. The external wound is sutured and treated exactly as already described (*see* laparotomy).

The prognosis of this operation, if the patient is not too poor or exhausted, is excellent,[1] recovery being very rapid.

As after oöphorectomy, œstrum has been known to occur and even copulation to take place when the two ovaries and the whole of the uterus as far as just above the junction of the horns with the body have been cleanly taken away.[1]

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1 "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 176; Vol., XI., p. 252. "Veterinary Record," Vol. XI., pp. 463 and 652.

CHAPTER XVII.

OPERATIONS ON THE LIMBS AND TAIL.

Operation for Overgrown or Ingrowing Nails.—In dogs that have insufficient exercise it is common to find the nails very long, the animal suffering a good deal of pain and becoming lame in consequence. The dew claws, in particular, if neglected, grow to considerable length and often curl round so that the points become embedded in the flesh. They are shortened by merely cutting a portion off with instruments similar in pattern to bone forceps or wire nippers. The instruments should always be applied in a vertical direction, not transversely, as there is less danger of splitting the nail. The claws should not be cut too short or they will bleed and remain sore for several days; when cut to the sensitive structures the application of fomentations containing some sedative or antiseptic drug is beneficial.

Removal of Dew Claws.—In some dogs the dew claws are continually becoming injured and require to be amputated. Sometimes the nail has no bony attachment, being united to the limb merely by a piece of skin. In these cases, after removing the hair and thoroughly cleansing the part, the claw is snipped off with a strong pair of scissors, and the edges of the skin united by sutures. When there is a distinct bony union the skin is drawn down towards the nail and incised by a circular sweep; it is then pushed back and the protruding bone removed as high up as possible. The skin is sutured and the wound treated antiseptically.

In the majority of cases a local anæsthetic is all that is

necessary, and for securing on the operating table the abdominal position (*see* Fig. 9) is the most convenient.

Amputation.—For this operation a general anæsthetic should always be given. Wherever possible the parts around the site of incision are carefully shaved, cleansed, disinfected, and bandaged an hour or two before the animal is secured for the operation. The position in which the patient is placed must be arranged according to the discretion of the operator.

In cases where one leg is injured it is a good plan to secure the three sound legs with hobbles, and instruct an assistant to

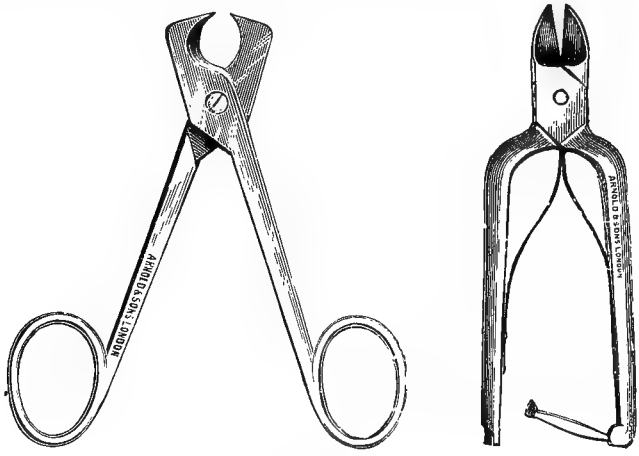

FIG. 71.
Two Patterns of Nail Forceps.

gently, but firmly, keep hold of the injured one above the seat of the accident until anæsthesia is complete. When this has taken place the bandage is removed and the injured leg placed on a cloth which has been boiled or otherwise rendered aseptic.

After having placed a tourniquet of tape or elastic above the seat of operation, the skin is pulled downwards as far as possible and incised with a sharp-pointed scalpel or long thin-bladed amputation knife. The incision may be either circular or flap shaped, the latter being the one which has given us the best results. The circular incision is made with one sweep of the

knife all around the limb, the flap method being done by incising the skin in the form of a wedge. The skin is pushed back and the muscles are treated similarly, being dissected off the bone so as to expose the latter as high up as possible. The bone is then removed with a saw.

If the sharp-bladed amputation knife is used the point is thrust through the skin and muscles alternately on each side of the leg, and the flap made by two rapid downward incisions.

FIG. 72.
Amputation Knife (Liston's).

The vessels are sought for and twisted or ligatured; the edges of the wound are drawn together with boiled silk or aseptic catgut, the muscles and skin being treated separately.

After-treatment consists in carefully keeping the parts clean by the aid of antiseptics and bandages, or, if the stump is too short for these to be put on, the wound may be covered with iodoform collodion. The stitches should be removed

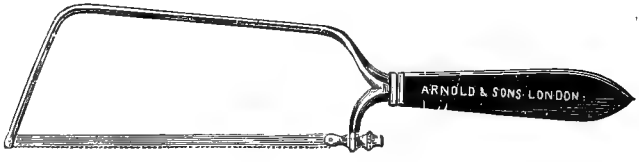

FIG. 73.
Amputation Saw.

about the fourth or fifth day, or sooner if it is suspected that pus is present.

False legs consisting merely of a plain leather socket or a more elaborate arrangement, as shown in Fig. 74, can be fitted afterwards, but it is astonishing to see how soon an animal can reconcile itself to the loss of a limb and how well it soon learns to walk about on the remaining three. In one case which occurred last year a very valuable whippet's life was

saved at the expense of the two fore-legs, which were becoming gangrenous owing to compound complicated fractures, the wounds being completely healed within ten days.[1] The animal

FIG. 74.[2]
Showing two Patterns of Artificial Limb.

soon learned to hop about like a kangaroo, and has since been used successfully several times as a stud dog.

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. X., p. 362.
[2] This figure has already appeared in the "Veterinarian," Vol. LXVIII., p. 400.

Tenotomy.—A contracted condition of one or more tendons in connection with a fore paw is occasionally met with, the paw being deformed and the animal lame in consequence. This can be remedied by tenotomy, performed at the most convenient and superficial place of whatever tendon is supposed to be contracted. The operation is not a difficult one and gives very satisfactory results. An anæsthetic is used, the parts are shaved, and strict attention paid to antiseptic precautions, the patient being secured on its side or back. An incision is made through the skin at the side of the tendon, and a blunt-pointed tenotome is introduced flatwise whilst the leg is flexed; the cutting edge is turned towards the tendon, the leg is straightened and the tendon cautiously cut through. Care must always be taken not to wound any of the blood vessels and not to cut through the skin at the other side or back of the tendon, on account of the trouble which is likely to ensue from excessive granulations. The wound is then sutured and covered with iodoform collodion and a bandage.

The most common situations for tenotomy are just above and behind the carpus and the under surface of the deformed toe.

Suture of Divided Tendon.—After severe injuries, especially wounds and cuts on the legs, some of the tendons are frequently found to be severed. Unless the divided ends are re-united the animal is apt to become a permanent cripple. The ends must be carefully sought for and brought into apposition, being first lightly scraped or roughened. They are then united by fine sutures of catgut or silkworm gut, the latter being the most suitable as they remain in position for years without becoming absorbed. The limb must be fixed so that no strain is put upon the tendon for some weeks until firm union has taken place, and antiseptic dressings are applied to the wound. Occasionally, although such cases must be comparatively rare, a ruptured tendon will be met with when there is no external wound of the skin. An instance of this was met with a short time ago, the patient being a fox terrier dog whose gastrocnemius tendon was found to be completely divided,

without any history whatever of injury. The animal showed no sign of pain, but walked on its tarsus like a rabbit. Under chloroform and antiseptic precautions an incision was made through the skin, and the divided ends were sutured; after-treatment was the same as already advised above, and the result was a complete and permanent success.[1]

Dislocations.—A dislocation is distinguished from a fracture by the fact of the swelling occurring at a joint, the absence of crepitus, and, as a rule also, of pain during movement. The limb is also perceptibly shorter than the other. The most common dislocations met with are those of the elbow, stifle, shoulder, and toe joints. They are most frequently seen in young dogs and are most troublesome conditions to deal with on account of the tendency to relapse after reduction has been effected. The prospects of cure are much better if treatment is adopted immediately after the injury has occurred. The principles of treatment are as follows: Chloroform or some general anæsthetic is of service in severe cases because it relaxes the tissues and because after reduction it is easier to keep the parts in their proper places until external supports are affixed to keep them in position. The patient is placed in a lateral posture on the operating table, three legs being fixed and the injured one placed in the most convenient position for the application of traction. An assistant takes a firm hold above the dislocation (when the shoulder joint is affected a broad bandage or handkerchief is passed under the axilla and held from either side), the operator then grips the limb just below the injury with one hand and employs steady traction in whichever direction he deems necessary to replace the affected parts in their normal situation; at the same time with the fingers and thumb of the other hand he endeavours to adjust the joint. In old standing cases a successful result is often impossible but in recent cases reduction can generally be effected. The most difficult task is to retain the parts in

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[1] "Veterinary Record," Vol. XII., p. 310.

position, and the attempt to do this frequently ends in failure. Bandages and strappings of different kinds covered with gum, plaster of Paris, starch, some preparations of pitch, etc., are most commonly used, but the difficulty is to get them to fit closely without causing gangrene, and especially with the elbow joint. Poroplastic felt, cardboard, brown paper moulded to the limb, are each sometimes used with success, but with each the prognosis as to a complete cure should always be guarded.

In one very troublesome elbow dislocation which occurred this year in a toy Manchester terrier, we attained a successful result so far as the dislocation was concerned by wiring the radius and ulna into place, but the patient never satisfactorily regained full use of the leg. Under chloroform and strict antiseptic precautions holes were made through the radius and ulna with a fine gimlet. Fine wire was passed through these and the skin wound treated in the ordinary way.[1]

Fractures are termed *simple* when there is no external wound, *compound* when the skin is broken, *comminuted* when the bone is broken into several fragments, and *complicated* when there is serious injury to some artery or the structures in the vicinity. The term "greenstick" is applied to a fracture such as frequently occurs in puppies or kittens in which the bone is bent and only partially fractured. In a *simple* fracture reduction is effected and the ends brought into apposition by grasping the limb firmly with one hand above the seat of injury and placing the lower portion into position with the other hand, the animal being held firmly by an assistant or placed under the influence of a general anæsthetic. The divided ends are then maintained in place by the application of bandages and splints, the latter being made of wood, metal, leather, cardboard, or poroplastic felt. In order to prevent chafing of the skin the limb is first covered with lint, wadding, or a bandage, especial attention being paid to all bony prominences; the splints (also carefully protected) are then laid

[1] "Veterinary Record," Vol. XII., p. 344.

on in such a way as to keep the limb rigid. One or two narrow bandages which have been smeared with solution of gum, glue, pitch, starch or plaster of Paris, are then neatly wound round the whole. Gum is particularly valuable on account of the objection the animal shows to attempting to bite it off. Solutions of those substances should be made thick, care being taken that the external bandage dries and is hard before the patient is allowed to put the limb to the ground. It is always a wise precaution, if the severity of the case needs a tight bandage, to include the foot, as if this organ is left free and circulation is impeded above it the result is that the toes become swollen and, if not attended to, gangrenous.

FIG. 75.
Photo showing characteristic attitude when both fore legs are broken.

With a compound fracture, particularly in the cat, much difficulty is often experienced; in many cases the quickest way to recovery is to amputate the limb above the seat of injury. When an attempt is made to treat it otherwise, the wound is carefully cleansed with an antiseptic and dried thoroughly, a bandage and splints being applied as for a simple fracture, but a window being left in it in order that the wound may be dressed; this "window" can be formed by placing a pill box lid over the wound when bandaging and afterwards removing it by cutting out the parts above with scissors. Particular care must be taken to dress the wound

frequently, and to see that none of the discharge runs downwards underneath the bandage.

Fractures of the ribs are treated by placing a broad bandage around the chest and abdomen as tightly as possible without causing inconvenience to the patient.

Fractures of the jaw necessitate a special splint cut or moulded to the required shape, and kept in position by tape or a wire muzzle,[1] the patient being fed artificially by mouth or rectum on liquid nourishment.

Fractures of the tail are treated in a similar manner to those of the limbs, particular care being taken that the bandage is not put on too tight.

Fractures in the region of the shoulder, pelvis, and hip, when too high up for bandaging, are treated by the application of a "charge" or plaster, consisting of some such mixture as: Resin, one part, Venice turpentine, three parts, Burgundy pitch, five parts, and put on with a spatula whilst hot. The layers may or may not be interspersed with tow cut up very fine. The exterior should always be covered with a piece of calico or some material to prevent it from sticking to the ground when the animal lies down.

The time for which a permanent bandage requires to remain in position varies from three to six weeks. The patient should be kept as quiet as possible, on no account being allowed to run up and down steps or to jump from any height. The principal untoward sequelæ to be feared are:—

1. That the limb may not be straight afterwards. This frequently happens when the bandage is not sufficiently stiff and the patient attempts to bear weight on it too soon.

2. That union may not take place, or that the union may be a fibrous instead of a bony one. The latter condition gives rise to what is termed a false joint, and not infrequently happens after comminuted fractures or when the injury has not been attended to during the first few days. The internal

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[1] Hodgkins, "Veterinarian," Vol. LXIX., p. 902.

administration of phosphate of lime in the form of Syr. Phosphat. Co. is beneficial.

3. Gangrene, owing to severe injury to the principal vessels or to the bandage having been put on too tightly or insufficiently padded. A fœtid, sickly smell from the bandaged leg must always give rise to suspicion of this, and the bandage should at once be removed.

4. Septicæmia, especially in compound fractures.

Amputation of the Tail.—This is performed in full-grown dogs in a similar manner to that described for amputation of a limb, the flap method giving the most successful results. When performed at the root of the tail healing usually takes place without much trouble, but when performed near the extremity the healing process is apt to be very slow, and much retarded by the action of the animal in licking or biting the parts, or by banging the tail against the walls, floor, etc. In amputating near the end, it is better to take the end of the tail off at a joint rather than to go through one of the coccygeal vertebræ.

In order to prevent undue irritation by the tail being banged against the external surroundings, the patient should be tied to the centre of a rope placed across the middle of a loose-box or large room, sufficient length of rope being allowed for the animal to lie down without its being able to reach the hind quarters. Another plan adopted is to place a strap round the loins or ribs and another round the neck, a stick being firmly fixed between the two in such a way that the body cannot be bent; the tail itself may be ensheathed in a case of leather or tin. The Elizabethan collar (Fig. 70) is also useful here.

Very often, especially in large breeds, such as boarhounds and St. Bernards, all methods adopted to preserve the tail are unavailing, amputation at the root having to be resorted to before healing can be effected.

In puppies the operation is a very simple one, the tail merely being snipped off with a pair of scissors when they are a few days old.

CHAPTER XVIII.

VALUE OF THE ROËNTGEN RAYS IN DIAGNOSIS.

The Application of the Roëntgen Rays. — In cases where diagnosis of fracture or location of suspected foreign body is difficult, the Roëntgen Rays can be utilised in canine and feline practice with almost as great a success as in human surgery.[1]

The main difficulties in the way are the expense and the securing of the patient in order to ensure steadiness. The former is comparatively small when the use of the "X" Ray apparatus can be obtained on the spot, and in most large towns the human hospitals have a complete outfit, or there are private firms who will make the radiogram for a fee. The latter is easily got over by the aid of the operating table (Fig. 7) or hobbles (Fig. 9), or, in very troublesome patients, by the administration of a general anæsthetic.

Many parts of the body, such as the bones of the limbs or tail, can be skiagraphed in quiet patients without the application of any restraint, the owner merely holding the patient in position, as the time taken over the process is merely a matter of seconds. Frequently, instead of taking a skiagraph, a fluorescent screen may be used, and the damage ascertained in that way in a few moments.

A description of the apparatus is scarcely necessary here,

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[1] "Journal of Comparative Pathology and Therapeutics," Vol. IX., p. 58; "Veterinarian," September 1896.

as, for the present at all events, its manipulation must of necessity remain in the hands of an expert.

FIG. 76.[1]

Skiagraph of cat's leg containing a foreign body in the soft textures a little below the elbow joint.

[1] This figure has already appeared in the "Journal of Comparative Pathology and Therapeutics," Vol. IX., p. 59.

PRESCRIPTIONS,

THE EXCIPIENT FOR THE LOTIONS SHOULD BE BOILED OR THOROUGHLY CLEAN WATER.

Antiseptic Lotions.—*For Instruments*—After boiling for ten minutes place in creolin, carbolic acid, or lysol, and water (2 to 4 per cent.).

For Ligatures, Etc.—Chinosol (one grain to the ounce), carbolic acid or lysol (5 per cent.).

For Wounds—Chinosol (half a grain or a grain to the ounce).

Corrosive sublimate (1 in 1000 to 1 in 2000).

Biniodide of mercury (1 in 1000 dissolved by the aid of potassium iodide).

Chloride of zinc (five to ten grains to the ounce).

Formalin ($\frac{1}{2}$ to 2 per cent.).

Creolin or lysol (2 per cent.).

For Eye Cases—Chinosol (half a grain to the ounce).

Boracic acid (five to ten grains to the ounce).

Silver nitrate and distilled water (two to five grains to the ounce).

Dry Antiseptic Dressings.—Iodoform, 1 part; boracic acid or oxide of zinc, 2 parts; starch, 4 parts.

Iodide of starch.

Chinosol, 1 part; boracic acid or oxide of zinc, 2 parts; starch, 4 parts.

Alum, 1 part; oxide of zinc, 2 to 4 parts.

Tannic acid, 1 part; starch, 4 parts.

Orthoform, 1 part; boracic acid, 4 parts; starch, 4 parts.

Dressing for Operation Wounds.—Iodoform, 1 part; collodion, 10 or 12 parts.

Orthoform, 1 part; collodion, 8 parts.

Charges for some Fractures.—Resin, 1 part; Venice turpentine, 3 parts; Burgundy pitch, 5 parts.

Resin, 1 part; Venice turpentine, 1 part; diachylon, 1 part; block pitch, 8 parts.

A.C.E. Anæsthetic Mixture.—Alcohol, 1 part; chloroform, 2 parts; ether, 3 parts.

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