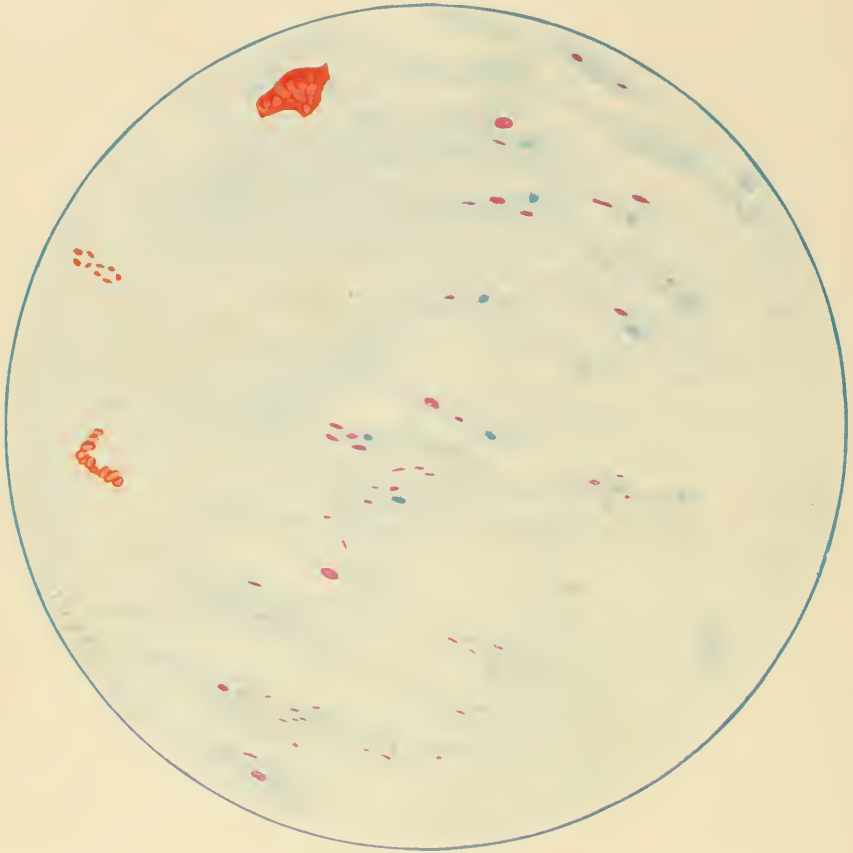NEGRI BODIES (HIPPOCAMPUS.)

Section stained, following the method of O. Lentz, Berlin.

Carmine : Negri bodies.   Light blue : Ganglion cells.
Red : Red blood corpuscles.   Blue : Nuclei of cells.
                    Deep blue : Nucleoli of cells

DISEASES OF THE DOG

AND

THEIR TREATMENT

BY

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AND

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THIRD ILLUSTRATED EDITION
REVISED AND ENLARGED

NOTE TO THIRD EDITION.

THE present edition of this work has been entirely re-written, a large amount of new material added, and every endeavor has been made to bring the work up to the standard of the present day. While preparing the manuscript of this edition the second edition of Dr. Müller's work has appeared and has been closely scrutinized and all valuable additions incorporated in this work. One portion of this work that differs materially from the German is that of therapeutics. In the practice of Canine medicine, where we must necessarily administer medicine by force, concentration of the dose is very essential; the writer cannot impress too strongly on the practitioner and student that the constant aim must be to administer all drugs in doses as small and compact as possible, for it frequently happens that the excitement caused by the repeated administration of large amounts of decoctions and infusions in nervous or highly bred animals does more harm than the original disease.

The writer is under great obligation to Dr. Preston Hoskins for his suggestions and his careful reading of the proof; to Drs. Spang, Sommer and Jureasu for their assistance in translation, and to Dr. Meyer for his aid in the chapter on rabies.

PHILADELPHIA, PA.,
September, 1, 1911.

ALEXANDER GLASS.

PREFACE.

In writing these pages the author has endeavored to give a short, accurate, and clear definition of the modern knowledge of diseases of the dog, and to adapt his treatise to the requirements of the profession.

Speculations and hypotheses have been studiously avoided, while, on the other hand, plain facts have received careful consideration.

Diagnosis has been given the most prominent place, as it deserves in a work of this kind, and the author has endeavored to establish the symptoms with their relation to the disease and to confine their therapeutic treatment to a knowledge of normal and pathological anatomy and physiology, for he believes that it is on a clear and accurate knowledge of the normal and pathological structure of life the fundamental base of clinical science lies.

The writer has also included some selected formulæ which he considers of practical value to the reader.

Due consideration has been given to modern literature whenever it appeared consistent, and a glance at the contents will also show that the author has added the results of his own researches and observations. These have been derived from his experience as director of the clinic of small animals in this locality.

His space has been somewhat restricted, and he has had to dispense with the details of the bibliography of our literature, but this is not of much consequence when we have such works as Friedberger and Fröhner's, Hoffmann's, Vogel's, and others at our disposal.

The illustrations in this work are nearly all original. Some, however, have been obtained from other works, principally from Ellenberg and Baum's *Anatomy of the Dog*, edited by Paul Parey, and the author expresses his thanks for their use.

The author would feel gratified if his work be favorably received by those who are interested in the diseases of the dog.

<div align="right">G. MÜLLER.</div>

NOTE.

WHILE lecturing on the diseases of the dog the writer recognized the fact that there was not in existence a work that could really be called a text-book for the student and the practitioner; there were then, and have been issued since, a number of "popular" works that endeavored to fill the dual rôle of text-book for the veterinarian and a "Dog Book" for the layman; these, as a rule, have been inadequate for the former and confusing to the latter. With the purpose of supplying this want the writer, several years ago, began to write a book on the subject, but two years ago read this work by Professor Müller, and instantly recognized its value as a text-book: every detail in the diseases of the dog being carefully considered, and the whole so admirably arranged that the student can readily find and study any subject in a clear and condensed form.

He secured from the author the right of translation, and has made it as exact as possible, perhaps in some parts too literal, but has done so in the endeavor to closely follow the original. He has also added, in the proper places, the results of his own observations, and also everything of value that has been added to veterinary science since the appearance of Dr. Müller's work, thus making a second and much enlarged edition.

The metric system, as in the German work, has been followed, with the hope that its use may be a slight aid to the general adoption of what may be the future international system of measurement.

ALEXANDER GLASS.

NOTE TO SECOND EDITION.

Knowing that many active and enthusiastic observers are working constantly in the line of diseases of direct contagion this edition has been delayed in the hope that some new and important discovery of original research would be made, and to a certain extent we have been rewarded by the work of Babes and of Negri in respect to the quick diagnosis of Rabies. It has been thought possible that some one might be able to make a culture of Distemper in dogs that would by inoculation of the young animal render it either immune or at least slightly susceptible to this disease. This, however, has not yet been accomplished.

While the plan of the work, the admirable arrangement of which is due to Dr. Müller, has not been changed a great number of alterations have been made. The articles on Distemper, Rabies and Tuberculosis have been remodeled, and the therapeutics throughout the work have been brought up to the standard of the present day, the tendency of which appears to be, and rightly, to use as little medicine as possible and in small and convenient doses; and to pay particular attention to hygiene, good nursing, and sanitation in kennels.

I am indebted to Dr. John Reichel for assistance in the pathology of Rabies, and to Walter McDougall for drawings. Plates in color after my own photographs have been added.

<div align="right">ALEXANDER GLASS.</div>

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DISEASES OF THE DOG.

GENERAL EXAMINATION.

In making an examination of the dog for the purpose of diagnosis it is best to class it under two heads: a general and a special examination.

The general examination, used when the organism is considered as a whole, is the method generally followed in surgical diseases, as in the case of an injury where we first carefully examine the injured region and then direct our attention to the other parts of the body.

The special examination is made when we consider single special organs of the body, particularly those of secretions and excretions. If our attention is called to some specially striking symptom, we at once examine a certain organ or group of organs. Frequently, for more certain diagnosis, it is necessary to make a microscopical examination of the blood, urine, or fæces; or by means of a trocar obtain some of the contents of certain cavities or tissues of the body to ascertain their true character and composition. The Röntgen rays are also used to obtain a photograph of some foreign body or pathological alteration of the inner structures; or the skin examined to detect the presence of parasites or their embryos; and it may be necessary in some instances to inoculate another animal or series of animals with the virulent material of some disease to confirm a diagnosis.

In making a general examination the following points have to be observed: 1. The physicial condition; 2. the structure and constitution; 3. the nutritive condition; 4. the mucous membranes of the head; 5. the skin and subcutaneous membranes; and 6. the temperature of the body.

THE PHYSICAL CONDITION.

The physical condition of the dog suffering from any bodily ailment presents more rapid and marked changes than any other animal. Even in slight indispositions, such as disturbances of the stomach and digestive apparatus, the animal will be downcast, irritable and nervous, and often

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show a disinclination to move, or may change constantly from one place to another. Nervousness, a staring look in the eyes, great restlessness, constant barking or howling point to beginning of congestion of the brain. But these symptoms may also be found in a number of other diseases; for instance, in cases of pentastomes in the nose or cavity of the forehead, in cases of parasites of the intestines, in rabies and distemper.

Howling is observed in a great many of the various painful diseases, particularly in disorders of the stomach and intestines. Colic of the intestines may present great nervous excitement; a nervous animal sometimes will swallow indigestible substances, foreign bodies, show a tendency to bite, but that does not necessarily mean that the animal has rabies; but if this is accompanied by a hoarse, howling bark and a staggering gait, it will change the existing suspicion to a certainty.

Symptoms resembling rabies may appear from the presence of pentastomes in the nasal cavities, from tænia ecchinococcus in the intestines, foreign bodies between the teeth, in the pharynx, stomach and intestines, or as the result of continuous sexual excitement. Further, we may may have uncontrollable movements which are caused by changes in the physical condition; they appear in certain circumscribed diseases of the cerebrum and cerebellum or from cysts, tumors, abscesses, hemorrhages of the brain and in certain forms of poisoning or from distemper, slight convulsions, etc., but this subject will be taken up in detail later on.

Dulness or total indifference to external influences, staring expression of the eye, a slow staggering gait, sleepiness or coma (entire unconsciousness), are seen in the various diseases of the brain and its coverings, from injury to the skull, or to shock, in serious infectious diseases, such as distemper, septicæmia and infectious hemorrhage, gastroenteritis, in poisoning by some narcotics, or uræmia, acute jaundice, acute anæmia and in all diseases that are terminating fatally.

In some cases we see short attacks of unconsciousness brought on by great excitement and pain, as in surgical operations, cysts in the brain, anæmia, continued hemorrhage, abscess or tumors in the brain, effects of certain poisons, etc.; for further information on this subject see article on the examination of the nervous system. In making an examination of the physical condition of an animal, we must always take into consideration the fact that the symptoms may be very much modified by the presence of strangers or the veterinarian; on the other hand, pet dogs may often hide certain symptoms, or from fear may present symptoms that are very much exaggerated.

Very sick animals will not rise when called by a stranger or even by the owner when a stranger is present, while a healthy animal will rise or bark, and show its presence in various ways. The position of the

animal when lying down is to a certain extent a diagnostic symptom. Dogs which are affected by lateral or one-sided diseases of the chest, for instance, lateral pneumonia, pleurisy, or pneumothorax, will take a sitting position or lie on the sternum with the legs under the body.

THE STRUCTURE AND CONSTITUTION OF THE BODY.

The development of the skeleton may be used as a basis for determining what sort of constitution an animal has, at the same time taking into consideration the great difference there is in form between the different breeds of dogs in the strength and shape of the bones; we can frequently obtain some diagnostic information concerning a defective constitution from the following indications: of softness of bones, there are flat non-arched ribs, a narrow chest, a marked change in the shape of the skeleton, the swelling of the ends of the ribs at the union of the bone to the sternum, by the contortions of long bones, and a swelling of the joints as seen in all rachitic animals. For further information on this subject see the article on the examination of the respiratory apparatus. In rare instances there is a marked deformity of the spinal column, an upward curvature (kyphosis), a lateral curvature (skoliosis), an upward and lateral curvature (kyphoskoliosis), and a downward curvature (lordosis).

THE NUTRITIVE CONDITION.

The general condition may depend, to a large extent, on the age of the animal, how he has been fed, and the amount of exercise he has had, but, as a general rule, if the animal's condition is poor, it is due to the presence of some disease. The skin, to a certain extent, is a diagnostic guide; if the animal is healthy the skin will be loose and pulled easily from the different parts of the body, whereas in disease it is tight and loses its softness and smooth feeling to the fingers. The body loses its symmetry, the eyes are sunken in their sockets. In slight cases of emaciation we must depend, to a certain extent, on the history of the cases from the owner. Weighing the animal is also useful to determine whether an animal is gaining or losing during the course of treatment; this is especially valuable where the animal is being reduced in cases of plethora, or in convalescence from acute disease; the gain shows that the animal is improving; but at the same time we must not lose sight of the fact that we may have an increase of weight from œdema, or any dropsical condition. A rapid emaciation is seen in diseases of the digestive apparatus, in all acute and chronic feverish affections, in certain cases of poisoning, and in rabies. A gradual loss of flesh may be seen in cachexia, as a result of chronic infectious and constitutional diseases, such as tuberculosis, leu-

kæmia, diabetes, carcinoma, and in chronic nephritis. A slight loss of flesh is also seen following surgical operations. As an opposite to emaciation, we may see a rapid accumulation of adipose tissue; this may occur from laziness, a disinclination to take exercise or resist it when forced to do so, or to close confinement where the animal is the pet of a sick person. Disturbances of the respiratory and circulatory apparatus have a tendency to produce accumulations of fat in the abdominal and thoracic walls, in the pericardium, and in the heart.

THE MUCOUS MEMBRANES OF THE HEAD.

In making a general examination, the first thing to do is to examine the visible mucous membranes, to see the color of them, the conjunctiva, and also of the mouth and throat. It is best to examine more than one mucous membrane, as the examination of one only may lead to an error in diagnosis. Rapid exercise, particularly in hot weather or in high wind, may produce a temporary congestion of the mucous membranes. Reddening of the eyes is often a perfectly normal condition in some breeds of dogs. Abnormal paleness of the mucous membranes may be due to decrease in the amount of blood in the system from severe internal or external hemorrhage, or from slight but frequent hemorrhage internally. It may be due to decrease in the amount of hæmoglobin in the blood corpuscles, in diseases peculiar to the blood, as in anæmia, leukæmia, pseudo-leukæmia, and in all diseases producing great loss of fluids, such as disease of the kidneys, disease of the stomach and the bowels, in tuberculosis, carcinoma and also in slow pus formations that are accompanied with or without fever, in defective heart action, as in collapse, where the heart's action is, to a certain extent, paralyzed for the time, as in many acute diseases or violent poisons, or from depressing drugs; also in diseases of the heart and its covering, the pericardium. A blue or cyanotic coloring is sometimes seen where there is defective oxygenation of the blood and it is loaded with carbon dioxide. This is also seen where the blood in the lungs does not come in contact with oxygen, as in contraction of the trachea or larynx, or by the inflammation or swelling of these parts, foreign bodies, internal or external tumors, pressing on the airpassages; also in acute bronchitis, in the various forms of pneumonia, in large pleuritic exudates, in hydrothorax, in severe ascites where the diaphragm is pressed on, in rigidity of the muscles, as in eclampsia in bitches, in strychnine poisoning, and in some heart affections; in cases of defective blood circulations in the capillaries, from disease of the heart, especially if there is fatty degeneration; from defective valvular action, from deposits on them; from pericardiac exudates; from the action of poison acting directly on the heart; or from some injury or pressure on the jugular; in

diseases where there is a great accumulation of blood in the head, as in acute hyperæmia of the brain and inflammation of the brain. In the latter case the redness of the mucous membrane is lighter in color or more of the arterial tint. A yellow color (icteric) generally denotes some disorder of the liver, such as gastro-duodenal catarrh, causing a swelling and obstruction of the ductus choledochus; occasionally, from calcareous deposits or foreign bodies in the bile-ducts or the presence of tumors that press on the bile-ducts. In rare instances these yellowish discolorations may be due to disturbances of the liver cells, or from such poisons as phosphorus and, in extremely rare cases, from mycotic meat poisoning and infectious diseases. The icterus which appears in phosphorus poisoning is due to biliary engorgements, and decomposition of the blood. Various spots or red patches known as petechial spots are seen on the mucous membranes of the head. These are a valuable aid to diagnose certain internal diseases, such as phosphorus poisoning, scurvy, meat poisoning, and in septicæmia.

The nasal and buccal discharges are treated fully under the head of Examinations of the Digestive and Respiratory Apparatus. We will only consider here such discharges from the eye as seen in very sick animals and are due to acute febrile disturbances. In some cases the pad of fat that fills the posterior part of the orbital cavity is very rapidly absorbed and the eye has a sunken look; the fever may produce an irritation of the mucous glands surrounding the eye and cause the accumulation of a profuse mucous discharge, varying in color from gray to grayish-yellow, seldom pure yellow. This accumulates about the corners of the eyelids, or may even close and glue up the eyelids entirely; this is not a symptom of true conjunctivitis, but some acute disorder involving the entire system. For further information see chapter on Diseases of the Eye.

SKIN AND SUBCUTANEOUS MEMBRANE.

The skin presents a number of conditions which are diagnostic. Of course, there are a number of local diseases of the skin which are treated in detail in section on Skin Diseases. The skin-changes in color are seen mainly on the belly and inner fascia of the thigh; a reddened or slightly yellow color is to be classed under the same head as if it had been present on the mucous membrane; that is, if the skin is very red it indicates a high temperature or the commencement of some sympathetic skin eruption; or if it is yellow it indicates some disturbance of the liver or portal system. In cases of distemper we often see a pustular eruption on the abdomen and inner fascia of the thigh (the exanthema of distemper—dog-pox); this is a very prominent diagnostic symptom of the disease. The skin of a sick dog is very dry and hard, it is very hot in cases of intense

fever, and cold in animals that are very much debilitated, or after severe external or internal hemorrhage, or collapse from shock. In fat dogs the skin has a very unpleasant greasy feel to the touch. An unfavorable symptom of disease is when a fold of the skin is lifted by the hand and remains in the same position when released. Profuse perspiration is rarely seen in dogs except where they may have been badly frightened. Dogs do perspire constantly, but it is insensible perspiration.

The hair is also a useful guide in diagnosis. In sick, badly fed, or neglected animals, or if they are infested with parasites, it loses its gloss, becomes dry and brittle, breaking easily, and in some cases falls out partially or entirely. As a rule, in all dogs that have undergone a severe illness, the hair falls out to a large extent; in bitches that have nursed a large litter of puppies, the hair falls out in large quantities after weaning.
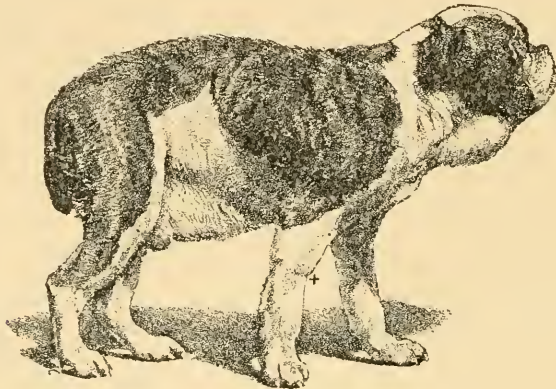
Fig. 1.—Dog with œdema of the skin. + marks indentation made by the pressure of the finger.

The odor of the skin is sometimes very offensive, especially in dogs suffering with distemper and septicæmia, meat poisoning, infectious hemorrhagic gastro-enteritis, and certain skin affections, and in animals that are neglected and filthy.

Œdema and emphysema of the skin are very important diagnostic points. By œdema or dropsy of the skin (anasarca) we understand it to be an abnormal accumulation of fluids in the skin and the subcutaneous cellular tissues. This condition is caused by the fluids not being reabsorbed by the lymph vessels in the same proportion that they come out of the blood vessels. We recognize œdema by a swollen or bloated, painless, cool condition of the skin, with the obliteration of all wrinkles; if the swelling is pressed with the finger, the indentation remains visible for some time (Fig. 1); this may come from a number of diseased conditions, and it is seen sometimes over the entire body, but chiefly in the lower

portions of the body and extremities, testicles, prepuce, scrotum, abdomen, and chest. It occurs as a complication in diseases of the heart, especially where there is imperfect valvular action, in acute and chronic disorders of the kidneys and cirrhosis of the liver and in the majority of prolonged acute affections. In rare instances it is caused by true diseases of the blood—anæmia, leukæmia, and pseudo-leukæmia, abdominal dropsy, hydro-thorax, and dropsy of the pericardium.

The œdema which appears in the locality of an inflammation (collateral œdema) is of special interest to the surgeon, as it is the only visible symptom of the inflammatory process that is going on under the skin. Œdema may be also seen as a result of the pressure caused by tight or improper bandaging.

Emphysema of the skin is where the skin looks as if there was air in the subcutaneous tissue. As a rule it is confined to small circumscribed parts of the body, but it has been observed by the author where the whole body has been involved. There is an intense swelling of the parts, and on pressure with the finger the indentation, unlike œdema, immediately disappears. On rubbing over the parts with the hand a slight crackling sound can be heard and felt; on pressure, the air can be driven from the affected portion into the subcutaneous or other tissues beyond the border-line. This condition may be caused by the admission of atmospheric air from the outside into the subcutaneous tissues, by means of small wounds in the skin, especially in the neck, wall of the chest, and the head, and gas or air from some of the internal organs by a perforation of their walls, such as the larynx, trachea, œsophagus, the bowels, or stomach. In cases where there are perforating wounds of the chest, wounds of the larynx or windpipe, or from fractures of the ribs, with complicated injuries of the lungs. Emphysema may also occur from gas formed by breaking down the contents of abscesses or hemorrhagic infiltrations. In malignant abscesses, we find the swelling is doughy and painful, the enlargement becomes crackly and septicæmia develops.

Increased Temperature of the Body.

The normal temperature of the dog taken at the rectum differs from 37.5 C. to 39; as a rule, younger animals have a higher temperature than adults. The normal temperature in young animals is generally about 39.2 and 39 in older animals. The vaginal and rectal temperatures are practically the same. The prepuce temperature is about 1.5, and the skin temperature at the warmest places on the body about 1° lower than the rectal temperature.

The author, after a series of observations covering over a large number of animals, finds the above to be correct and particularly as far as the prepuce, vagina and skin temperature is concerned.

The following averages were obtained from a series of temperatures taken from both normal and feverish animals: 1, in the bitch the average difference between the rectum and vaginal temperatures was about 0.06 and 2, in the male the difference between the rectum and prepuce was 1.43; some cases when the animal became nervous or excited, when the prepuce temperature was taken and the penis became erected, this increased the temperature up to 40, so that it will be seen that it is not advisable to take the temperature from the prepuce, as the difference may range from 2 to 3 degrees.

The average difference between the axilla and the rectal temperature is 0.93 and between the inguinal temperature and the rectal is 0.81. The method for taking these temperatures is as follows: Place the thermometer in the so-called axillary groove (arm-pit) and inguinal groove (the hollow between the thigh and scrotum in males and between the thigh and mammary glands in the bitch), firmly hold the thermometer for five minutes so that the mercury end of the thermometer will be covered by the folds of the skin. Where you have to take the temperature in these two localities one degree should be added to the thermometer reading. As a rule the temperature of the normal animal is higher in the evening, and slightly higher after a hearty meal, violent exercise, lying in the sun or near the fire. The rectal temperature, so-called body temperature, is taken by means of a maximum or clinical thermometer, the thermometer is slightly oiled, or the anus may be oiled and the thermometer placed as far as possible into the rectum (allowing a small portion of the instrument to protrude to facilitate removal); allow it to remain for at least five minutes. Hard dry pieces of excrement or a highly inflammatory condition of the bowels may prevent the thermometer from giving the exact temperature of the body. In severe cases it is always advisable to take the temperature at least three times daily, morning, noon and in the evening, and care must be taken to carefully note any change in the reading of the thermometer. The temperature must be kept on a temperature chart, and can be watched with a great deal more certainty than trusting to the memory. Any change in the temperature as indicated on the chart, either rise or fall, indicates some change in the animal's condition, and should be considered a symptom. As soon as we detect an increase of the temperature of the body above the normal that we know is not due to overheating or too great exertion, we define it under the name of fever.

The course and severity of a fever are regulated according to the amount and character of the fever-producing substances (pyrogenes), which have penetrated into the blood-circulation. In some cases we may have a rapid increase in the temperature (fever-paroxysm); this is often observed in the early stages of distemper or where some tissue has com-

menced to suppurate. In cases where the temperature remains the same it is called a continuous fever, and if it does not change more than 1° (celsius) it is known as a remittent fever; but when it is found that it varies greatly, oscillating between a very low, subnormal and a very high abnormal temperature, it is called irregular or atypical fever.

A constant and prolonged high temperature is very rarely seen in the dog. The temperature, as a rule, in early stages of all acute diseases rises very quickly, but it generally falls slowly as the disease advances, notwithstanding the complications, and may reach a normal or frequently a subnormal condition. In cases of septicæmia, which is rather a common disease in the dog, we may see an abrupt lowering of the temperature below the normal and continue so, the animal falling into a state of coma and death follows in a short time.

A fever, as a rule, begins with a chill or a number of them; this is a shivering or quivering of the muscles and skin and finally of the whole body. These chills come on at intervals. The rise in the temperature is not always an accompaniment of the fever, as has been shown in cases of septicæmia; we must, therefore, always take into consideration the other symptoms of fever. These are: shivering, cold, increase in the number of the pulse and respirations; the digestion is immediately impaired and the urine is changed in quantity and composition. All the secretions and excretions are altered from the normal and the nerve-centres show increased irritability. The changes in the pulse and respiration are fully described under the head of Examination of the Circulatory Apparatus. The changes in digestion are seen in the entire loss of appetite, constipation, and increased thirst. The kidneys show the effects of the disturbance by the decrease in the amount of the urine secreted, a much higher specific gravity, and a decreased amount of the chlorides in the urine, an increase in the amount of urates, and a high acid reaction. In nursing bitches the milk is much lessened in quantity, the skin becomes dry and firm, and the sebaceous glands almost cease secreting. The nerve-centres show the effect by the dulness of the animal and the indifference to surrounding objects or persons, and great restlessness and twitching of the muscles. If the temperature is high, the animal becomes weak and falls away in weight very rapidly.

A Temperature Below Normal (Subnormal) of the Body.

A subnormal temperature is often observed in cases where the crisis or highest temperature has passed and the animal is going on toward recovery or convalescence. In the majority of cases, as the temperature goes down the pulse lessens, the respirations become even and regular, the appetite begins to return, and the animal shows more

interest in its surroundings.   In collapse there is a rapid fall of temperature, and the heart's action, as shown by the pulse, becomes weak and fluttering and soon imperceptible; the mucous membranes are pale, and the animal weak and even paralyzed.   There is also a subnormal temperature in great hemorrhage, in acute and chronic diseases, in icterus gravis (acute congestion of the liver, with yellowness of the mucous membranes), in all acute diseases of the brain, in various cases of poisoning, in latter stages of distemper, and in septicæmia, in infectious hemorrhagic gastro-enteritis.

In increase or decrease of the local temperature; increased heat of the part is generally due to some injury or some surgical disease, and, as a rule, has with it tenderness to the touch and swelling.   A local heat can also be felt in all inflammations that are not located too far from the surface of the body.   Coldness of any part indicates an impaired circulation in the part. In all cases of collapse the extremities are the first to become cold, because of the impaired action of the heart.   In cases of compression of an artery by ligatures, or tumors, pressing on the blood vessels, an embolus, or thrombus, the part of the body that has thus lost its circulation becomes cold from impaired circulation.   Paralyzed extremities are always slightly colder to the touch than active parts.

DISEASES OF THE DIGESTIVE APPARATUS.

EXAMINATION OF THE DIGESTIVE APPARATUS.

In making an examination of the digestive apparatus we have to consider the following points:

The appetite; the method of giving the food in different animals varies very much, also is influenced to a large extent by the quality of the food, the way in which it is presented to the animal. The age, the use to which an animal is put, such as a hunting dog or the laboring dog of Belgium and other European countries, the breed; size also has an influence on the amount of food eaten by the animal and the quantity of water it drinks. Some animals have a strong appetite, eat large quantities, digest it well, whereas others are dainty eaters, eat small quantities, and are easily satisfied.

A loss of appetite may result from a number of causes; mainly, from the presence of a fever in the system, by disorder of the stomach and digestive apparatus, lack of food, cold, chilliness, poisons, and in consequence of such diseases as distemper, infectious hemorrhagic gastro-enteritis and septicæmia. An abnormal increase of the appetite may be seen in diabetes mellitus and by the presence of tape-worm. A depraved appetite is seen in rabies, when the animal will eat straw, wood, stone, rags, and fæces, but we must also take into consideration the fact that young animals, particularly in puppies, when they are teething, between the ages of four and ten months, will pick up small indigestible objects, such as buttons, pieces of tape, muslin, coal, wood, etc. All dogs, particularly if the stomach is upset, will eat grass, and also in some cases they show a depraved appetite by eating horse droppings or decayed objects, and the well-known habit dogs have of chewing bones. When the animal has great thirst, drinking large quantities of water, it may indicate diabetes insipidus, and mellitus, chronic nephritis, dropsy (ascites), or exudative pleuritis. As a result of acute and prolonged diarrhœa, decayed meat poisoning, catarrh of the stomach and in cases of irritation of the stomach, the animal drinks large quantities of water and immediately vomits it again.

In certain diseases, particularly of the mouth and throat, such as irritations of the mucous membrane of the mouth, stomatitis, decayed

teeth, tumors or foreign bodies in the cavity of the mouth, ranula, in diseases of the masseter muscle, buccal membrane, maxillo-temporal articulation, the animal is unable to eat large pieces of food, taking only small finely cut-up food or liquids.

Difficulty in swallowing may be present in all the conditions already mentioned and in some cases the animal will drop the food out of the mouth after it has taken it up. Inability to swallow may be seen in
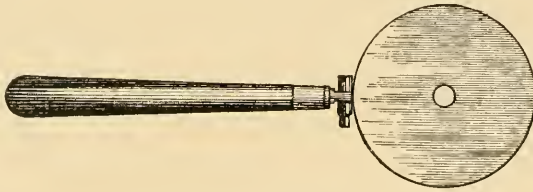
Fig. 2.—Laryngoscope.

inflammation of the pharynx and larynx, in the paralytic stage of rabies, as the result of certain poisons, such as meat poisons, in periods of brain disease, injury to the mouth and throat, tumors or foreign bodies in the throat or larynx, contraction or ossification of the larynx, in tetanus, large swelling in the region of the neck and goitre.

Fig. 3.—Pocket electric light.

Condition of the Mouth and Throat.

The examination of these parts requires a good light such as daylight, or a clear lamp when the posterior part of the throat has to be examined. This can be accomplished by means of a perforated laryngeal mirror or any reflecting mirror (Fig. 2), or a portable electric lamp (Fig. 3). The best method of opening the mouth with the hands is to grasp the upper jaw with one hand, pressing the cheeks between the teeth, which forces the mouth partially open and prevents the animal closing the mouth, and with the other hand pull down the lower jaw. Another method to obtain a good view of the interior of the mouth is to put two strings or tapes around the lower and upper jaws (Fig. 4); lay the

dog on his side or, what is better, directly on his back and throw the light into the cavity of the mouth. The mouth and a large part of the throat can then be easily examined. In nervous or uneasy animals we can use a speculum (Fig. 5) or a gag if the mouth has to be kept open for some time; it is best to use a gag which can be placed between the teeth on one side, or by means of a wedge-shaped piece of wood. In certain
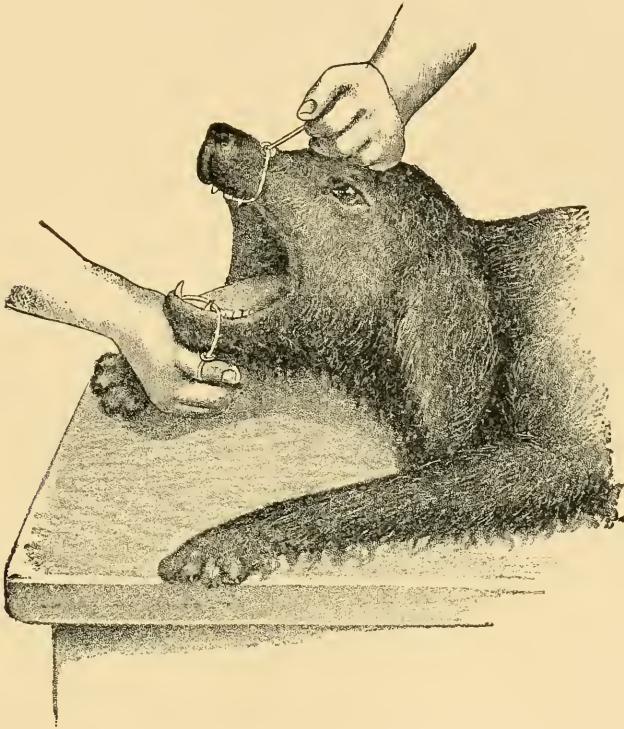
Fig. 4.—Holding the mouth open with tapes.

operations of the interior of the mouth and teeth a wooden bar held in place by means of a chain is used (Fig. 6). When the deeper portions of the mouth and throat are to be examined the mouth is opened, and by means of the finger, a spatula, or the handle of a spoon, the tongue is depressed. A good view of the posterior of the throat can be obtained by grasping the tongue with forceps and pulling it forward.

In cases where the mouth remains partially open, the animal being unable to close it, we must examine it very carefully, as it may be a symptom of rabies; of some brain disease; secondary stages of distemper; in some bacterial poisons, severe injury of the mouth or in fracture of the

inferior maxillary. It may also be due to some foreign bodies located between the teeth or some strain of the articulation of the inferior maxillary. In paralysis of the jaw, the mouth can be closed by putting a stick
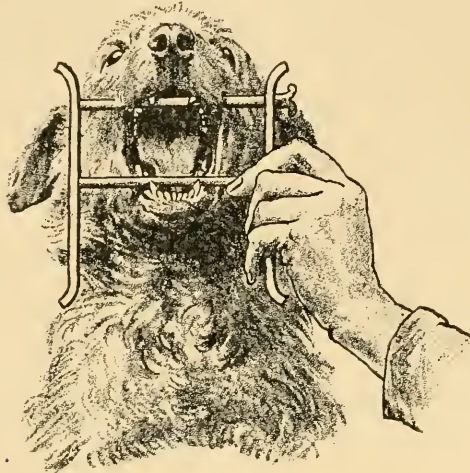
FIG. 5.—Mouth speculum.

under the jaw and lifting it; this cannot be done in cases of luxation of the articulation or where there is some foreign body between the teeth, such as bones or pieces of wood. The mouth cannot be opened completely in trismus (tetanus) or in partial anchylosis of the articulation; the
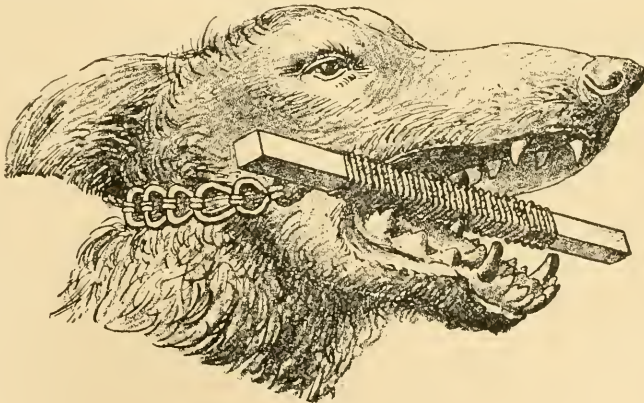
FIG. 6.—Gag.

introduction of the speculum being very painful in some cases of toothache. In injuries of the various masticating muscles, disease of the articulation of the jaw and infectious hemorrhagic gastro-enteritis. If the speculum is introduced frequently, the mouth may remain partially open.

On opening the mouth, if there is a very offensive odor coming from it, it indicates either an ulceration of the mouth, due to ulcerative stomatitis, which has erroneously been called scurvy, disease of the teeth and in certain diseases of the stomach, in dyspepsia, foetid bronchitis, or in gangrene of the lungs; it is frequently noticed in animals which are very sick, where the mouth is filled with unhealthy mucus or where particles of food lie in the mouth or throat. In infectious hemorrhagic gastroenteritis, a very offensive odor is noticed. In cases of poisoning, by phosphorus, or prussic acid, the odor of the drug is frequently detected in the breath. On examining the teeth and gums we may see large ossific deposits of the alveolar process (dental alveolar periostitis) causing separation of the gums and loosening of the teeth. An intensely inflamed state of the gums, where they are bleeding and ulcerated, indicates ulcerative stomatitis, mercurial poisoning, or scurvy; very often tumors (epulides) are found on the inner border of the incisors and interfere more or less with eating. Very frequently foreign bodies lie between the teeth, causing increased flow of saliva. The cutting of the milk (temporary) teeth and a change of dentition (cutting of the permanent teeth) may cause intense inflammation of the entire mouth. The tongue is examined; it may appear dry, paralyzed, and in some cases shrunken and lie on the floor of the cavity of the mouth; from paralysis of the tongue as a result of distemper, disease of the brain, or infectious hemorrhagic gastro-enteritis. The author has noticed paralysis of the tongue in acute convulsions. The tongue may be greatly swollen and enlarged in acute inflammation of the mouth, or from parenchymatous inflammation of the tongue. Foreign bodies, such as needles or sharp objects may penetrate the tongue. Sometimes wounds and scars may be noticed on the edges of the tongue in dogs suffering from paralysis of the masseter muscle and by biting the tongue when the animal is in a convulsion. The color of the tongue is a deeper red from fevers, inflamed conditions of the mouth, and certain heart affections. A cyanotic (reddish-blue color) is seen when the animal is partially suffocated. The tongue is coated as a result of most fevers, but it is also observed in animals which are perfectly healthy. A heavy coating of the tongue is noticed in stomatitis, gastric catarrh, and in acute internal diseases; also in acute cases of distemper. In infectious hemorrhagic gastro-enteritis, the tongue is frequently covered with a dirty-brown coating. As a rule, a paralyzed tongue lies on the floor of the cavity of the mouth. In gangrene of the tongue that organ is swollen bluish-gray. The tip of the tongue may sometimes be bluish-black, caused by being bitten or being maliciously tied with a string. A bluish-red discoloration around the edge of the tongue may be due to distemper, stomatitis, infectious hemorrhagic gastro-enteritis and various other causes.

After administration of violent poisons the mucous membranes of the cheeks and inferior surface of the tongue are found to be gray in color, hanging in shreds, and intensely inflamed, and later abscesses form on the sloughed parts.   This is observed in infectious hemorrhagic gastro-enteritis, stomatitis, and distemper, as a result of decayed teeth and formation of abscesses on the mucous membrane of the cheeks.   Ranula appears on the floor of the mouth-cavity on one side of the tongue; it is long and oval, sometimes the shape of a goose egg; the sac is a fluctuating swelling with a thin wall.   Small whitish enlargements resembling warts frequently appear on the mucous membrane of young dogs.   They are, however, of little or no importance.   The salivary glands are frequently swollen and abscesses form in their structure.   As a result of these irritations we may have colloid infiltration of the glands, and after inflammation, they become indurated, the secretion of saliva is sometimes greatly increased and runs out of the mouth in long, thready strings; this is also seen in all inflammatory conditions of the mouth or where there is an abscess located in the mouth or throat during teething; in cases of mercurial poisoning, and from some caustic poisons, and after the hypodermic injection of pilocarpine.   From inflammation of the pharynx, rabies, and by certain parasites burrowing through the tissues of the body.

The secretion of saliva is lessened during all fevers, and from the effects of some poisons, fevers, diarrhœa, and after the injections of atropia.

The saliva is bloody after injuries of the mouth.   It may be slightly stained with blood from stomatitis, scurvy, infectious hemorrhagic gastro-enteritis, and gangrene of the tongue.   The soft palate and pharynx are sometimes the seat of acute or chronic inflammations, and sometimes we find abscesses of these parts from the presence of foreign bodies (needles, splinters of bone or wood).   It is well to feel these parts when making an examination.   The tonsils are affected, as a rule, in all cases of pharyngitis.   It generally protrudes from the side of the base of the tongue in a dark-red, sausage-like formation.   The subparotid lymphatics are invariably found to be swollen, in all cases of inflammation of the pharynx.

Examination of the Œsophagus.

The œsophagus protrudes from the pharynx on a level with the first cervical vertebra.   The anterior part of it lies between the windpipe and the longus colli in the median line of the neck.   It extends from there to the left side of the windpipe and passes to the right side of the aortic arch between both membranes of the mediastinum, in the shape of a flat arch, and perforates the diaphragm at the twelfth dorsal vertebra

and reaches the stomach at the left side. The width of the œsophagus is not regular in its entire length, being narrower at the region of the pharynx and at the cardiac and just before it unites with the stomach.

The œsophagus is examined externally by the hand (palpation), or internally by the pharyngeal sound or probang, and we may find traumatisms, tumors, foreign bodies (pieces of bone, wood, large pieces of food) which become lodged in the œsophagus generally just beyond the pharynx in the region of the neck, where they can be easily felt by the hand. The thyroid gland is sometimes enlarged from local inflammation, struma, or carcinoma and care must be taken not to mistake this for a foreign body. Very frequently we find the lymphatics of this region are enlarged. Carcinomas or sarcomas are sometimes found along the course of the œsophagus.

The introduction of the laryngeal probang is comparatively easy in the dog. The best probang is one less than the size of the little finger and it must not be too flexible, the length should be from 20 to 30 cm.; this size, of course, is for the ordinary sized dog; in very small animals the ordinary sized urethral catheter can be used. Care must be taken to have the probang perfectly smooth and uniform in diameter. If the probang is very stiff it may be made more flexible by rubbing it briskly with a towel or putting it in warm water for a few seconds. The **method of introducing the probang** is as follows: The mouth is held open as described on page 12; the head is extended and it is introduced along the upper wall of the throat, keeping it high up so as to avoid the larynx. If the probang should slide into the trachea instead of the œsophagus and cause dsypnœa, the instrument must be instantly withdrawn. The animal will attempt to swallow it, but that will assist the sounds. It will glide along easily until the obstruction is reached, or glide directly into the stomach. In cases where there is a foreign body in the œsophagus the probang will come against it, preventing the instrument going any farther. Great care must be taken at this juncture not to push the probang too hard as it may lacerate the walls of the œsophagus, particularly if there is a stricture or a tumor; or if it is a foreign body, it may cause it to be more firmly imbedded or the probang may rupture (perforate) the walls of the œsophagus.

Examination of the Stomach.

Baum, who has made a careful study of the position of the dog's stomach, finds when the stomach is filled with food, its outlines can be easily recognized by palpation (Fig. 7). It lies in the left side of the abdominal cavity, the inferior portion resting on the liver and the anterior portion against the diaphragm, the left surface going toward the

abdominal wall, but between that and the wall lies the left lobe of the liver. This left lobe extends as far as the pelvis, coming close to the left kidney; the left or cardiac end of the stomach extends as far as the ninth rib and posteriorly as far as the thirteenth rib and the anterior border of the left kidney. The right or pyloric end of the stomach is directed on the median line to the right. The larger part of the stomach is enclosed by the liver and the diaphragm coming in contact with the anterior side. The cardiac end of the stomach is directed toward the median line and the pyloric toward the right. The empty stomach (Fig. 8) extends anteriorly as far as the left pillar of the diaphragm and toward the chest as far forward as the tenth rib and posteriorly as far as the twelfth rib,
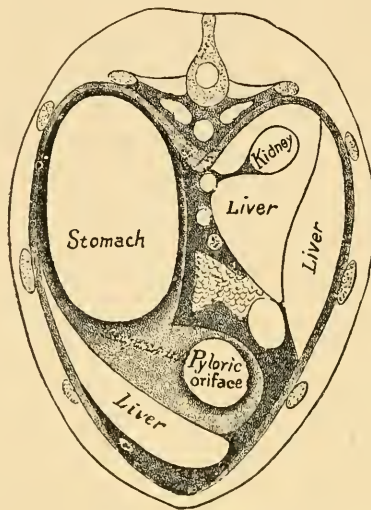
Fig. 7.—Section through centre of abdomen.

and is completely covered by the liver on the left side. Only a very small part of it comes in contact with the diaphragm and the inferior face of the ninth and tenth dorsal vertebra. The pyloric opening is directed toward the right and very slightly forward (Fig 9). When the stomach is very much distended with gas or food, it comes almost directly in contact with the abdominal walls, and when greatly distended it extends as far as the umbilical region and lies against the ribs and the left abdominal wall and the left and ventral lobes of the liver being pushed almost entirely away from the surface of the stomach, depending on the amount of the distention.

From the above anatomical details it can be readily seen that it is nearly impossible to make a reliable examination of the stomach when it is empty or even when it is fairly well distended. The cardiac and pyloric

openings are so deeply seated they are extremely hard to examine. To make a manual examination of the stomach, the animal must be placed
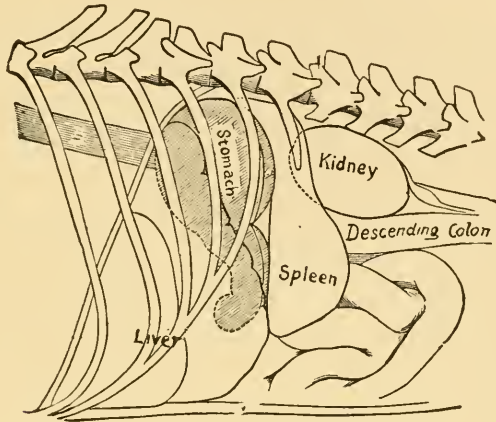
Fig. 8.—Position of stomach when empty.

in a standing position or sitting in the favorite position of the dog, that is, resting on the hind legs. The finger is pressed into the abdomen back of the xiphoid cartilage or on the right side beneath the cartilaginous ends of
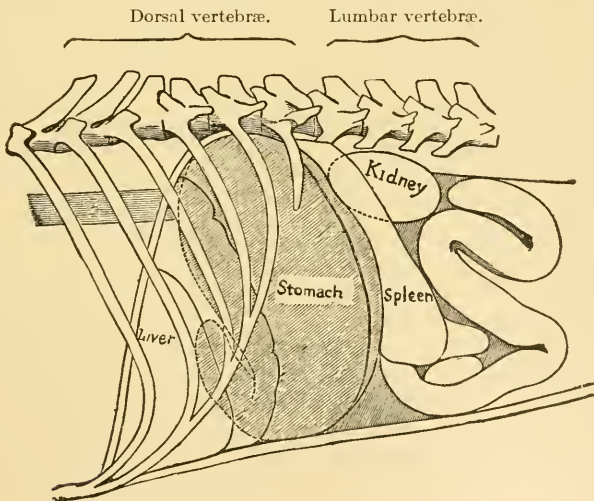
Fig. 9.—Position of stomach when full.

the ribs; the digital pressure at first may be gentle, but this can be increased until the stomach is outlined.

When a very careful examination has to be made to detect the

presence of foreign bodies or tumors in the stomach, the author proceeds in the following manner: Place the dog on his back and if difficult to handle, or vicious, narcotize it, and press the fingers on the abdominal walls; at the same time an assistant can bring the front and hind legs together, bending the spine as much as possible. This position relaxes the abdominal muscles and the stomach can be easily outlined and its size felt. A distended or engorged stomach can be recognized by palpation or when the abdominal walls are relaxed the stomach can be easily detected lying in the umbilical region and extending under the false ribs. If the distention is due to gas it can easily be recognized by the tympanitic sound on percussion; if the distention is due to the presence of some fluid it will be indicated by fluctuation. Great distention of the stomach by gas is found as a result of certain poisons, stenosis of the bowels and in alteration of the normal position of the stomach. Great accumulation of gas is seen in the stomach in gastric catarrh, but it may also be present in an entirely healthy stomach. The contents of the stomach may feel soft or doughy according to the quality of the food, and how it was prepared, when eaten. The normal condition of the stomach after eating is that of slight distention. Pyloric stenosis may also cause distention of the stomach. Tumors on the wall of the stomach are extremely difficult to diagnose, except perhaps in small animals where the tissues are more elastic and less dense. Foreign bodies of moderate size and of some dense structure can be felt in the stomach, by manipulation. Certain foreign bodies, such as needles, stones, etc., can be detected in the stomach by means of Röntgen or X-rays (see description of foreign bodies in the stomach). Pain on pressure of the stomach may be produced by manipulation, but it is not always present; it may be noticed in acute gastric catarrh, toxic gastritis, infectious hemorrhagic gastro-enteritis. It must be remembered, however, that it is only the filled or distended stomach that can be felt, due to the lobe of the liver lying between the stomach and the abdominal wall and pain on pressure may indicate some disorder of the liver and not of the stomach. Consequently, in making a diagnosis we must include other observations, particularly an examination of the contents of the stomach.

Fig. 10.—Stomach-pump.

We can obtain the contents of the stomach either by the substance which the animal may vomit itself or by means of the stomach-

pump. This has been recommended by Frick, and only for therapeutic purposes.

The stomach-pump is operated in the following manner: In large dogs an ordinary horse catheter is used and in small dogs a large male human catheter or a small rubber hose. We pass the catheter, as described in the examination of the œsophagus, into the stomach and to the free end of the catheter or rubber hose, which should be about 30 cm. long, we put a small funnel at the other end of the tube (Fig. 10). Pour a certain amount of water into the stomach through the tube, at the same time holding the tube high, and then manipulate the region of the stomach and next depress the tube, and the siphon which has been formed will soon empty the stomach of its contents. This method is to be used
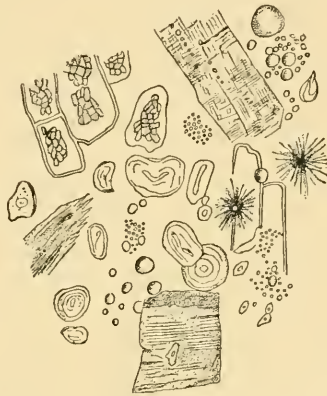
Fig. 11.—Contents of the stomach (four hours after eating): Muscular fibre, starch cells, fat crystals and cells, round cells, epithelium, vegetable cells, fungus.

in very urgent cases where poison is suspected, but as a rule is very hard to do except in very quiet animals and where there is a trained assistant, such as in a hospital; but in private practice the easier way is the better, that is, to administer an emetic. The best means is to give a dose of apomorphia hypodermatically.

R   Apomorphia hydrochlorate,   0.04
     Aqua distil.,   4.00
     Sig.—Ten to twenty drops hypodermatically.

In a few minutes free vomiting occurs and the contents of the stomach can then be examined. Of course, you must take into consideration the time which has elapsed since the animal has taken the food and the character of the alimentary matter. It would be well, therefore, that you know the following facts concerning (Fig. 11) digestion in the dog's stomach:

Digestion of a Meat Diet in the Stomach.

After taking a full meal of meat cut in small pieces the digestion in the stomach is very active and free; it increases until the third hour and slowly decreases until the ninth, and is nearly over at the twelfth hour. After eating a very large meal the digestion is somewhat slower and lasts considerably longer, the different kinds of meat also vary in the time of their digestion. Pork is the easiest to digest and others are classified in the following order: mutton, veal, beef, and lastly the flesh of other animals (Astley Cooper); skin, tendon, sinew, cartilage, and bones are very hard to digest; the latter are digested from their surface and are reduced as the gelatinous parts are acted upon and dissolved and the lime salts remain unchanged. Fat meat is harder to digest than lean; fat undergoes no change in the stomach, but passes on and is digested in the intestines. The gastric juice acts on and reduces roasted meats and if raw meat is chopped up in small pieces the gastric juice acts on it much more quickly. It has never been satisfactorily settled whether raw or cooked meat is easier to digest.

The Digestion of Milk in the Stomach.

Milk is comparatively slow in digestion. After an animal had taken 249 grammes of milk he was destroyed four hours later and 13 grammes of cheese and 1 gramme of fluid was found in his stomach.

Action of Digestion on Hydrocarbonaceous Food.

Five hours after a meal consisting of rice and potatoes the mass was liquefied and softened; the mashed portion of the potatoes had disappeared but the lumps remained. After a meal of rice, the following observations were made: After one hour 10 per cent. was digested, after two hours 25 per cent., after three hours 50 per cent., after four hours 82 per cent., after six hours 90 per cent., after eight hours 99 per cent., and at the end of ten hours it had entirely disappeared (V. Hofmeister).

Both Ellenberger and Hofmeister have come to the conclusion that rice is chiefly digested in the intestines, as there is so much muriatic (hydrochloric) acid in the stomach immediately after eating that saccharation cannot take place; and also that the dog swallows his food with so little mastication that the saliva has no time to make any change in the starch.

The effect of the disturbance of gastric secretion on digestion is as follows: When, from any cause, the secretion of gastric juice is lessened or altered the following changes are observed: The digestion of albumin, and the antiseptic and antizymotic action of the gastric

juice is much lessened, for there is no doubt that gastric juice can destroy the infectious bacteria that are carried into the stomach by the food; consequently, the secretion thus being much less acid, with the lessened digestion of albumen, fermentation is easily started. When the gastric secretion is subacid it irritates the mucous membranes of the intestines and lessens the peristaltic action. Subacidity is frequently seen in all anæmic diseases, in fevers, in erosion of the mucous membranes, from the effects of corrosive poisons, in cancer of the stomach, and in chronic catarrh of that organ.

The digestion of starch is impaired by an oversecretion of hydrochloric acid; this condition, according to the researches of Ellenberger and Hofmeister, is not of great importance, although in man it is frequently seen in ulceration and in acute and chronic catarrh of the stomach. "Nervous dyspepsia," so common in man, does not seem to occur in the dog.

In testing the contents of the stomach for free hydrochloric acid the best reagent is red paper and phloroglucin-vanillin solution. Moisten a small piece of this paper with a few drops of the filtered fluid-contents of the stomach. If free acid is present the red color of the paper will turn blue. This reaction may also occur if lactic acid is present. This, however, is rarely present in the contents of the stomach. In testing with phloroglucin (vanillin) place a few drops of the following solution: Phloroglucin 3 parts; vanillin 1 part; alcohol 30 parts; with equal quantity of the filtered fluid of the stomach. Put in a porcelain dish and heat but do not bring to a boil. If there is free hydrochloric acid present, it will produce a dark red precipitate; if it is present in a small amount, the precipitate will be bright red; if the acid is not present, the precipitate will be brown or reddish-brown. If methyl-violet solution is used, if a trace of free acid is present, it will color the solution sky-blue. The test is made in the following manner: Make a certain quantity of the solution, diluting the water until it is light violet. Divide this into equal parts putting into two test-tubes. To one of the tubes add a few drops of the filtered gastric fluid and if any free acid is present, the solution changes to sky blue and by comparison with the other tube the amount of free acid can be approximated, being guided by the change in the color.

Testing with lactic acid is much easier and more certain. The best method is that of Uffelman: 100 grammes of a 2 per cent. solution of carbolic acid are to be mixed with one drop of chloride of iron solution, which makes the mixture deep blue; if a few drops of the filtered contents of the stomach are added and muriatic acid only is present, it becomes clear as water; if lactic acid is also present, it becomes greenish-yellow in color.

In summing up the preceding investigations it is readily seen that

the stomach may not be digesting all that the animal eats, but still the animal be in fairly good health; while, of course, it must also be understood that in fevers or any general disturbance, the digestive powers are greatly impaired.

Albumin is almost entirely digested in the intestines, the stomach merely preparing it; fat and starch are digested only in the small intestines; muscular tissue must have a previous preparation in the stomach, or, if it reaches the small intestines without becoming saturated with gastric juice, it is not digested in the intestines. No digestion whatever takes place in the large intestines.

No animal vomits more easily than the dog, and it may be produced from a number of causes, as a reflex irritation of the stomach, viz.,

1. By irritation of the mucous membranes of that organ by emetics, poisons, splinters of bone, or even by overloading. Vomiting frequently is caused by the animal eating grass.

2. By sympathetic irritation from other organs, intestinal parasites, uræmia, peritonitis, irritation of the intestines, or uterine inflammations.

3. Vomiting may result from serious coughing spells, as a result of laryngitis, bronchitis, or liquids getting into the larynx.

4. In obstruction of the bowels, foreign bodies blocking up the bowel, hernia or twisting of the intestines. In some cases of the latter condition excrement is vomited.

5. In the early stages of distemper and infectious hemorrhagic gastro-enteritis, persistent vomiting is almost invariably present.

6. From various brain-affections (meningitis, commotio cerebri). Very often in certain diseases of the pharynx and where foreign bodies have become imbedded or fixed about the root of the tongue, pharynx or œsophagus and in pharyngitis, movements of the throat resembling vomiting are frequently noticed.

The amount of vomited matter depends to a certain extent on the density of the material in the stomach, what it is composed of, and the quantity present in the stomach at the time of the vomiting. In cases where the animal vomits, when the stomach is full, the vomited material will either be the food in a uniform pulpy mass, or the mass may be largely fluid, with the food lying in it, with little alteration from when it was swallowed. It depends largely on how long it has been in the stomach and whether the stomach has digested it. When an animal vomits when the stomach is empty, there generally is a small quantity of water mixed with the mucus; the color varies greatly according to the circumstances, white, yellowish-gray, yellow or yellowish-green; this latter condition depends on staining from bile pigment. Other colors may also appear. It may be green from eating grass; violet as a result of licking a wound or eruption that has been treated with pyok-

tannin. The vomited material may be streaked with traces of blood, due to rupture of some capillary vessels of the stomach. For further particulars see the article on Hæmostases.

The vomited material varies according to the pathological conditions, from a thin watery fluid to thick mucus. In acute or chronic catarrh of the stomach it is stringy and glassy. The presence of blood in the vomited material may be due to the animal swallowing some sharp foreign body, the action of some corrosive poison, from infectious hemorrhagic gastro-enteritis, ulceration of the stomach, gastric ulcer, or we may see it in hemorrhage of the mouth, trachea or pharynx, where the animal swallows the blood and vomiting it again may lead to a mistaken diagnosis of infectious hemorrhagic gastro-enteritis. This may also occur when an animal licks a wound and thus swallows a large amount of blood and then vomits it. In hemoptysis (bloody cough from the respiratory organs) it is frothy and a bright color. In hematemesis (vomited blood), the blood is dark, varying from a dark red-brown to a dark brown. In rare instances where abscesses form in the pharynx, œsophagus, stomach, or the region adjacent to that organ, when they break they may cause vomiting and the material vomited is stained with blood. Fæcal material is sometimes vomited up in the latter stages of obstruction of the bowels and in acute diffuse peritonitis.

Vomited material is generally acid in reaction but it is alkaline in poisoning by alkalies, and in severe hematemesis. Vomited material is generally pungent and unpleasant, particularly when there is a collection of fatty acids in the stomach, and very offensive when fæcal material or putrid meat is vomited. This also occurs in rare instances, from violent poisons, and in carcinoma of the stomach, etc. A foul odor may be given to vomited material in cases of injury of the pharynx and œsophagus. In cases of certain poisons, the characteristic odors of the drug can be detected, as in the case of phosphorous, carbolic acid, iodoform, or hydrocyanic acid. Internal parasites are frequently found in vomited material.

Eructation of gas (belching) is frequently seen in perfectly healthy animals, particularly when they rise and stretch themselves. It is also seen in catarrh of the stomach.

Physical Examination of the Bowels (Intestines).

The examination of the intestines can either be made through the abdominal wall or the rectum. The situation and size of the various abdominal organs can be seen approximately in Fig. 12.

The manual examination of the intestines is made in the following way: The animal is put in a standing position and placing one hand

on the abdominal wall and the other hand on the other side of the body directly opposite, a steady pressure is brought to bring the hands together and the ends of the fingers are moved from one position to another and thus outline and palpate the different portions of the intestines. While doing this, attention must be paid to see if the animal winces or evinces pain, and whether it is slight or intense. By this means we discover abnormal accumulations of fæcal matter in the large intestines, also whether there are any foreign bodies or tumors in the intestines. Intense pain is shown in the early stages of diffuse peritonitis, and in a milder degree, but still very acute, in toxic enteritis, complete obstruction or stenosis of the bowel, and in infectious hemorrhagic gastro-enteritis.
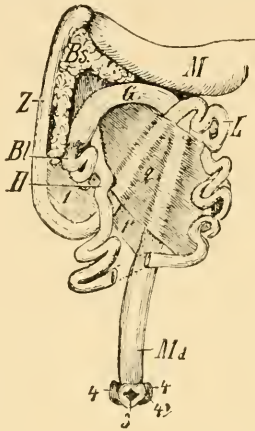
FIG. 12.—Intestinal canal of the dog. *Bl*, Cæcum; *Bs*, pancreas; *G*, colon; *H*, ileum *L*, jejunum, *M*, stomach; *md*, large intestine; *Z*, duodenum; 1, curve of the duodenum; 1′ flexures of the large intestine; 2, convolutions of the small intestine; 3, anus; 4,4, anal glands; 4′, opening of glands.

If the bowels are pressed very hard, pain is evinced when there is acute or chronic catarrh of the intestines. A circumscribed or localized pain is seen in intestinal stenosis, tortion or volvulus of the intestine and from the presence of foreign bodies. One must remember in making such an examination that certain painful conditions of the abdominal muscles or even the pain that severe pressure may produce, when the muscles are stretched or compressed, must not be mistaken for intestinal pain. In certain long standing cases of chronic intestinal catarrh, the writer has found a certain amount of pain on pressing the finger tips between the loops of the intestines.

An increase in the periphery of the abdomen may indicate collections of adipose tissue in the abdomen, pregnancy in bitches, overloading of the stomach with food, or great accumulation of fæces in the large intestines. The same condition is observed from accumulations of gas in the stomach and intestines as a result of catarrh of the stomach and

intestines, certain poisons, stenosis of the intestines, peritonitis, paralysis of the intestines, escape of gas from the stomach and intestines into the abdominal cavity (meteorismus peritonis), and also when these organs are punctured by foreign bodies, from accumulations of fluid in the abdominal cavity, in peritonitis exudata, rupture of the bladder, or ascites. Particularly relaxed and flabby abdominal muscles may often make an animal look as if it had dropsy of the abdomen.   In great accumulations of urine in the bladder, large tumors or cysts in the abdominal cavity, dropsy of the uterus and in hydronephrosis.   Lateral (one-sided) distention of the abdomen may be caused by hypertrophy of the liver, distention of the stomach, various tumors, abscesses of the abdominal walls, herniæ and other surgical diseases.   A decrease in the periphery of the abdomen may result from continued diarrhœa, lack of proper or sufficient food, or consumption.

Large accumulations of fæcal matter in the colon and rectum is indicated by a large sausage-like mass the consistency of putty and is pitted by pressure.   These obstructions cause painful irritation and swelling of the mucous membrane.   These swellings are found under the spinal column.   Foreign bodies that have been mixed with the food or if an animal in play catches certain objects in his mouth, such as glass, stones, hard or soft rubber balls, cork, etc., and accidentally swallows them and they become lodged in the intestines they are easily outlined by palpation by the same means we outline tumors on the abdominal wall.   Soft foreign bodies, such as hair balls, overloading of the intestines, or slight invagination are rather hard to diagnose.

The rectum is examined in the following manner: The animal is placed either in a standing position or on his side, and the index finger (or in small animals, the little finger), having been dipped in oil, is inserted into the rectum, the other hand being used to hold the tail to one side, or to keep the animal quiet.   It is frequently necessary to muzzle the animal and in almost all cases an assistant holding the animal greatly facilitates the examination.   Very frequently after an examination, the finger is stained with blood, or even blood in large quantities is observed.   This is generally due to the venous engorgement of the rectal mucous membrane and the capillary vessels are easily ruptured.   We examine the rectum when certain symptoms are shown in defecation or the fæces indicate some abnormal condition of the rectum, such as inflammation, abscesses, tumors, or dilation or contraction of that organ.   Or we may examine the rectum to remove foreign bodies or particularly hard pieces of fæces or to diagnose abnormal conditions of the neighboring organs, or structures, such as the prostate gland, vagina, uterus, neck of bladder, or if tumors or abscesses are suspected in the pelvis.   In very small animals the examination of

these organs can be made easier by palpation of the abdominal wall.

In certain cases where light has to be thrown on the rectal mucous membrane the necessary examination can be made by means of a speculum and then a mirror or an electric torch can be used to throw the light into the cavity. Inflammation of the rectum from any cause, such as hemorrhoids, fistulæ, foreign bodies, or abscesses, can be readily examined by this means.
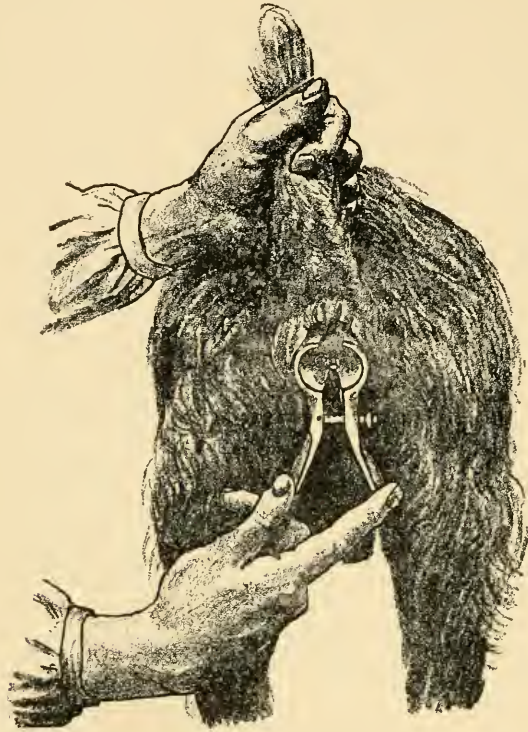
Fig. 13.—Examination of the lower bowel with speculum.

The Fæces.

The number of times that an animal has an evacuation of the bowels depends on the two circumstances: The quantity and character of the food and the rapidity with which it passes through the bowels. Normally, an animal has two or three passages daily; sometimes even less. Diarrhœa, as a result of catarrh of the intestines, may be due to a variety of causes, such as irregular diet, cold, or to some infectious disease (distemper), latter stages of infectious hemorrhagic gastro-enteritis,

septicæmia, or some irritant in the food; but it may also be caused by a laxative independent of the catarrh.

Constipation is common in all old dogs and in starved animals, in animals weakened from exhausting diseases, in animals that have not had sufficient exercise, or fed with constipating food, icterus, peritonitis, in the onset of all diseases with rise of temperature, in the majority of chronic affections of other organs, in all cases of obstruction of the bowels, such as collections of dry fæces in the large intestines, atresia ani, from large collections of internal parasites, tumors in the intestines or adjacent structures, hypertrophy of the prostate gland, too much hair around the anus, swelling of the anal glands, or from tumor of the anus. Animals suffering from lumbago frequently do not attempt to defecate on account of the pain evacuation of the bowels causes them.

Constipation alternated with diarrhœa is frequently a symptom of chronic intestinal catarrh—due to twisting of those organs—or invagination, hernia, foreign bodies, loss of the vermicular motion and in all copious exudations from the peritoneum. Pain during evacuation of the bowels (tenesmus) is seen in inflammation or obstruction of the lower bowels and in inflammation or ulceration of the rectum, or rheumatism of the abdominal muscles. Involuntary evacuation of the bowels is seen in prolonged attacks of diarrhœa, paresis of the cord, and when an animal is dying, from the presence of an abscess, from enlargement of the prostate, from splinters of wood in the lower bowel, or from enlargement of the rectal glands.

The amount of excrement passed by an animal in a given time depends on the quantity and quality of the food that the animal has taken. A vegetable diet produces much more fæces than a meat diet. In an ordinary sized dog fed on bread, the amount of fæces passed amounts to 20 per cent. of the amount eaten; but if the same animal is put on a meat diet the amount of fæces is only about 12 per cent. (Ellenberger). In diarrhœa the relative amount is changed, for in this condition the intestinal juices secreted to aid digestion are not reabsorbed, but remain with the fæces and are thrown out.

After an obstinate constipation the amount of fluids is also greatly increased, and with it there is also a very offensive odor, due to decomposition of the fæces and to the various excrementary matters that have remained in the bowels.

The shape, size and color of the stools are a rather important matter to consider. In normal health they are cylindrical in form, hard or soft, according to the diet; in meat diet they are black or brownish-black and of pitchy consistency. The fæces of sucking puppies resemble thick green pea soup; these are rarely seen as the mother invariably licks them up. Medicine changes the color of the fæces. Calomel and bismuth

stain them greenish-black and iron preparations turn them black; on meat and fat mixed they are dark gray-brown, and on bread and milk diet they are yellow-brown or almost clay color. If the animal has eaten much bones, they are whitish. The alimentary matter cannot be distinguished with the naked eye, except in the case of bread, which is passed almost as it is taken into the stomach. Bodies, such as wood, bones, hair, straw, earth, etc., can also be seen in the fæces. Under the microscope (Fig. 14) we can see numerous particles of food that have passed without digesting in animals that have good health. In impaired digestion we see pieces of muscle, connective tissue, etc., with the naked eye.

The following deviations in the appearance of the fæces may be observed:

If the fæces contain large quantities of food that is ordinarily very easily digested, or of food that shows little or no evidence of having been

Fig. 14.—Microscopical examination of the fæces. Vegetable matter, starch cells, muscular fibres, epithelial cells, and fungoid growths.

digested, disorder of the stomach or intestines is indicated. This condition may also result from fevers, gastro-intestinal catarrh, from increased peristalsis, forcing the food through the intestinal canal before it has had time to digest, from fright, the presence of irritants in the food, from the administration of laxatives or in old, exhausted or weakened animals. Biliousness will produce a stool that is yellow colored. Continuous diarrhœa produces a mucous or watery appearance of the fæces. In catarrh of the intestines the fæces contain a large quantity of mucus and have a peculiarly foamy appearance. Grayish-white, or clayey, with a dull gloss indicates a plugging of the bile duct or some stoppage of the flow of bile (retentious icterus). The presence of pus indicates the bursting of some suppurative foci into the intestinal track, such as abscesses or ulceration of the large intestine, or the rectum. Bloody stools are frequently passed after a digital examination of the rectum, inserting the thermometer, from certain poisons, so-called hemorrhagic en-

teritis, from proctitis (inflammation of the rectum), in rare instances, from distemper, infectious hemorrhagic gastro-enteritis, septicæmia, and in cases of mycotic meat poisoning. Blood may be found on the surface of the stool or mixed with the pus. Which portion of the intestinal track the blood comes from can be arrived at in the following way: If the blood is found to be mixed all through the material in the fæces it comes from the stomach or small intestines. But if the blood is in clots or streaks and lying on the surface of the stool, it has come from the lower part of the large intestine or the rectum. The color of the blood is diagnostic; when the blood has escaped into the intestine in the anterior portion, it is dark brown, a greenish-brown, or even black; but from the lower intestines the blood is hardly changed in color and in proctitis the

Fig. 15.—Eggs of intestinal parasites in fæces (round worm). Magnified 70 times.

blood is normal in color, and is easily detected in the fæces, either in the form of pure blood or bloody mucus.

The odor of the fæces is unpleasant, nauseating or offensive, especially when the animal has had a meat diet, and particularly so in cases of long-standing constipation from mycotic meat poisoning; or in the latter stages of septicæmia, in distemper, diarrhœa, toxic enteritis, or infectious hemorrhagic gastro-enteritis. Free bile in the fæces gives them a particularly offensive odor.

The presence of the following objects in the fæces may aid in diagnosis by giving an important clue to certain disorders; stones, sand, pieces of bone, straw, grass, splinters of wood, hair, portions of sloughed tissue, whole or portions of parasites (ascarides, oxyuris, tænia) (Fig. 15), and more minute examination by means of the microscope may determine the nature and some of the above-named objects if they should be in a state of fine division.

Physical Examination of the Liver.

The liver covers the posterior surface of the diaphragm and extends as far back on the abdominal wall as the umbilical region. On the right side it extends posteriorly and laterally along the ribs. The gall bladder lies at about the height of the cartilage of the ninth rib, but does not extend as far as the abdominal wall.

The physical examination of the liver is very difficult to make. Fortunately, the diseases of the liver in the dog are very rare and can be detected by symptoms other than the direct examination of the gland. The liver is examined by percussion and palpation (Fig. 16). The percussion area of the liver is where the liver lies against the abdominal wall and
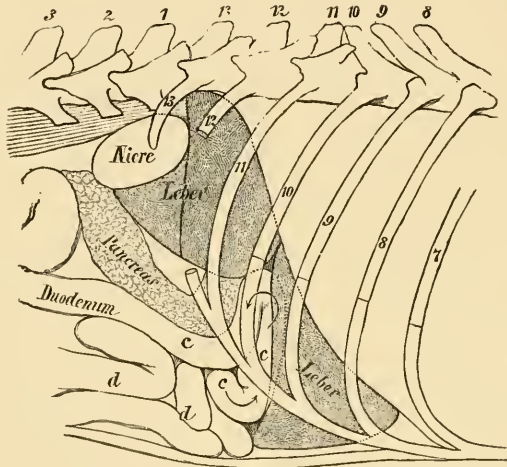
FIG. 16.—Right side of the abdomen, showing the position of the organs.

the ribs; this takes in on the right side the lower third of the eighth, ninth and tenth ribs and upward and backward over the twelfth and thirteenth ribs, and on the left side the twelfth rib. Under normal conditions a dull hollow sound is heard on the percussion over the region of the liver. The liver, however, may vary a great deal in the different breeds of dogs and also in individual animals.

The liver very frequently is in an abnormal position from various diseases, as a result of exudative pleuritis, emphysema of the lungs, pneumothorax, etc., also when the stomach and intestines are filled with gas from accumulations of fluid in the abdominal cavity. Increase in the size of the liver may indicate hyperæmia, fatty liver, amyloid degeneration, abscesses, carcinoma, parenchymatous hepatitis, or biliary engorgement. A decrease in the size of the organ is found in cirrhosis of the liver.

The palpation of the liver is made in the following manner: the hand

is placed on the chest wall and the thumb extends back of the curvature of the ribs and is pressed in the region of the liver or the thumb can be placed on the last rib and with the tips of the fingers the region of the liver palpated. The usual position of the animal is to place it on its side. The palpation of the liver is particularly easy in an animal having very flabby abdominal walls, or where a collection of fluid, such as ascites, has just been removed. Pain on pressure of the liver is seen in cases of parenchymatous hepatitis, in hyperæmia of the liver, and in early stages of cirrhosis of the liver. In cases of carcinoma of the liver, large uneven nodules are felt on palpation and in the latter stages of cirrhosis, small uneven nodules are detected on the surface of the liver. The liver is particularly firm and inelastic in cirrhosis, hyperæmia, and biliary engorgement. Abscesses may be detected by fluctuation, but only when they have attained a great size.

The Spleen.

The spleen is situated in the left hypochondriac region, is very diffi-cult to examine through the abdominal wall. Certain definite swellings or engorgements of the spleen may result from various affections of the liver, lungs, and heart, from tumors in the region of the porta hepatica, in various infectious diseases, such as distemper. When large splenitic tumors are present, in fat animals they are almost impossible to detect; in thin animals they are easily detected by palpation. Percussion in such cases can also be made about the last two intercostal spaces at the curvature of the ribs.

The Pancreas.

The pancreas, on account of its twisted right-angle position, makes a direct examination almost impossible (Fig. 16); enlarged pancreas may occur as a result of tumors, carcinoma or adenoma; they may be detected by palpation in the region of the twelfth dorsal to the third lumbar vertebra. But it is generally unsatisfactory, and a diagnosis is better made of diseases of the pancreas by finding undigested food in the fæces and the presence of sugar in the urine.

3

DISEASES OF MOUTH, TONGUE AND SALIVARY GLANDS.

Inflammation of the Mucous Membrane of the Mouth. Stomatitis.

Clinical Symptoms.—The first symptom the animal will show will be the slow, careful way in which it eats; it will leave any large, or hard pieces of food untouched, and swallow small pieces without mastication. The saliva is greatly increased in amount and frequently runs out of the corners of the mouth in thin, glass-like threads or strings. On making an examination of the mouth, all of the mucous membranes will be found swollen, red, and inflamed; the gums are especially so during dentition (gingivitis); the inner surface of the cheeks, the tongue, and soft palate are also inflamed; as a rule, the tongue is coated and covered with thick mucus and saliva. Ulcers sometimes appear in the different parts of the mouth and particularly on the tip and edge of the tongue.

The duration of the disease depends largely on the causes producing it; as a rule, it is not of much importance and disappears without any medical interference. In some cases, where it is caused by diseased teeth, it is more obstinate, and if it becomes chronic it is apt to become a case of stomacace.

Therapeutics.—The animal should be fed lightly, the principal diet being soup or liquid foods, beef extracts or juice of fresh meats, and the animal given plenty of fresh water to drink. This washes out the thick saliva and mucus off the tongue and between the teeth. Common salt, carbonate of soda, or Carlsbad salts or some such saline waters as Hunyadi, Apenta or Veronica, can be used with good results, and the mouth should be washed out with any of the following disinfectant and astringent solutions: 1 to 2 per cent. solution of boric acid, potassium chlorate, 5 per cent. solution of alum, 5 per cent. solution of permanganate of potassium, sol. of peroxide of hydrogen or red wine. Inflamed gums can be rubbed with tincture of myrrh, tincture of catechu, or with a solution of 15 per cent. tannin in glycerine.

Ulcerous Inflammation of the Mucous Membranes of the Mouth. Ulcerative Stomatitis (Stomacace). Necrotic Stomatitis.

Etiology.—This is an inflammation and necrotic ulceration of the mouth, and is generally seen in delicate, weak and anæmic house dogs and is associated with the presence of decayed teeth (tartar, caries). It is seen, however, in a small proportion of cases where the teeth are perfectly sound, and where the animal seems to be in fairly good health,

STOMACACE *(necrotic gangrene of the jaw.)*

especially when they are recovering from acute or exhausting diseases. This condition in some cases seems to be due to some bacterial infection of the mucous membrane and the tissue directly surrounding the teeth; the true nature of this hypothesis has not as yet been settled. It is also a question if it is infectious, but if not, it certainly affects a certain number of animals at a time. Ulcerative stomatitis is also seen as a symptom in scurvy, infectious hemorrhagic gastro-enteritis, and in certain cases of poisoning, particularly mercurial. A simple case of stomatitis either from improper treatment or a weak nutritive condition, may become an acute case of stomacace.

Clinical Symptoms.—At first the gums are swollen and red in the neighborhood of certain teeth, generally the incisors and more rarely the molars. The gums are very red and painful to the touch and bleed readily. After a few days the inflamed portion becomes green and dark purple on the dividing line (line of demarcation) with the other tissues. The hemorrhage from the affected parts is constant and deep abscesses form, involving the alveolar processes. This gangrenous inflammation extends and the teeth become very loose and fall out. In extreme cases, the jaw becomes affected and necrosis sets in and large portions of the jaw exfoliate. This condition may also involve the neighboring tissues; but as a rule the tongue is rarely affected to any great extent. The odor of the stomach is very offensive; there is a bad-smelling, sticky mucus running from the corners of the mouth. Generally the appetite is fairly good, although it is very difficult for the animal to masticate or swallow, and bolting the food whole, while affected with this disease, has a tendency to upset the stomach.

A favorable termination of this disease is only to be expected in young, strong, healthy dogs, provided it has not become too far advanced. With proper treatment and favorable conditions the ulcers clean up gradually, and after two weeks they are usually all healed up; but sometimes the fever keeps on increasing and the disease becomes septic in character from absorption of the dead tissues, causing blood-poisoning and collapse, followed by death. The author has noticed a gangrenous lobular pneumonia from the aspiration of the purulent matter.

Therapeutics.—The animal must be fed liberally, but with easily digested food and soft as possible. Remove all the diseased tissues as soon as possible and prevent the spread of the ulcerated portions of the mucous membrane; wash the mouth frequently with deodorizing or antiseptic mouth washes such as have been mentioned in the previous disease, being careful not to let the animal swallow any of the preparations. This is done by holding out the animal's head in such a position during the application of the medicine that the fluid will run out of the

mouth.   The purulent ulcerations are to be painted with tincture of iodine or touch the ulcers with any of the albuminous preparations of silver, which are better than the stick of nitrate of silver.   As soon as the ulcerated surface begins to granulate, milder astringent mouth washes may be used, such as tincture of myrrh, or permanganate of potassium. Syringe the mouth with a solution of tannin and glycerine, 1 to 20. The general symptoms of septicæmia will be found under the head of that disease.

Foreign Bodies in the Tongue.

Foreign bodies, such as pins, needles, fish hooks, etc., frequently find their way into the tongue.   It is always well to examine the mouth carefully, when an animal appears to have **ptyalism,** where it is constantly moving the jaw as if it were chewing, swallowing or making efforts like vomiting or does actually vomit, or where the animal rubs the mouth with the paws, as if to drag something out of the mouth.   We may find foreign bodies, sticks, needles, splinters of wood in or under the tongue.   It is sometimes very difficult to find a foreign body, particularly when the tongue is greatly swollen and the animal keeps it constantly moving, and at the same time the mouth filled with thick saliva; too great care cannot be used to detect a foreign body.   Go all over the body of the tongue with the finger.   The writer has found needles, some of them threaded, at the base and on the ventral side of the tongue. In some cases the needles were completely reversed, the point being toward the tip of the tongue.   To remove the foreign body, imbedded in the tongue, the free portion of the tongue should be pulled out as far as possible by means of a pair of forceps.   In some cases such as fish hooks, the foreign body should be pulled out in the direction it enters the tongue, so that the barb will not further lacerate the tissues; in cases where the fish hook is ringed in the shank, it must be cut by means of a wire cutter.   No treatment is required after the foreign body is successfully removed.

Gangrene of the Tongue.

This may occur from bandaging the tongue or rubber bands put on the tongue, maliciously or otherwise, or if some of the larger blood vessels of the tongue are cut transversely.   The tongue is greatly swollen and the gangrenous portion is separated from the healthy part by a sharply defined line of demarcation.   The gangrenous portion is dark bluish-red or bluish-black and covered with more or less pieces of necrosed tissue mixed with thick mucus and saliva.   This is cold and non-

sensitive (see Fig. 17). In some cases if we forcibly pull out the tongue
the gangrenous portion becomes detached. Experience shows that
the loss of a portion of the tongue does not interfere very much with
the prehension of the food. The only evidence is seen in the animal
eating and drinking more slowly. Generally these cases heal very
rapidly, as soon as the gangrenous portions of the tongue either slough
off or are amputated. It is remarkable that in cases where the tongue
is bluish-black and cold, the animal will make a good recovery with
little or no treatment other than the removal of the diseased portion.
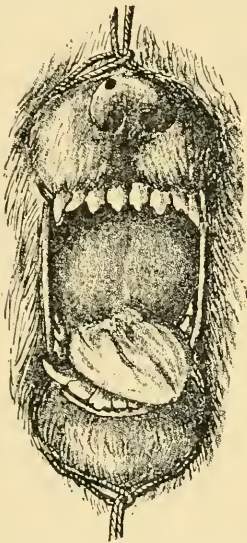
FIG. 17.—Gangrene of the
tongue.
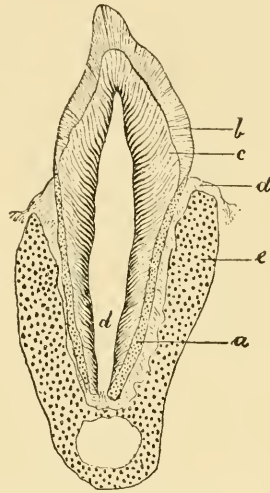
FIG. 18.—Longitudinal section
through an incisor tooth; *a*,
cement; *b*, enamel; *c*, ivory or
dentine; *d*, pulp cavity and alve-
olar dental membrane; *e*, maxill-
ary bone.

For further treatment see page 34, under Treatment for Inflammation
of the Mucous Membrane of the Mouth.

DISEASES OF THE TEETH.

Dogs are frequently subject to various dental disorders, such as ac-
cumulations of tartar on the teeth, alveolar periostitis; rarely caries of the
teeth, and still more rarely fistulæ of the gums.

We understand by tartar of the teeth, a calcareous deposit on the
neck of the teeth at the border of the gums. This is gray, yellowish-
gray, or greenish-gray and sandy or chalk-like in structure. This tar-
tarous substance is deposited chiefly around the canine or molar teeth
and gradually pushes the gums back and often loosens the tooth, which,
acting as a foreign body, causes great irritation. Furstenberg found

tartar of the teeth of a dog contains calcium carbonate 50.79 per cent., calcium phosphate 41.43 per cent., sodium chlorate 1.02 per cent., potassium sulphate 1.02 per cent., mucus and food débris 4.05 per cent., water with traces of magnesium carbonate 2.71 per cent. The tartar can be removed by scraping it off with a small cup-shaped instrument or a sound with a leaf-like tongue. Some remove it with a hook-shaped pair of pincers. If there is a large quantity of tartar on the teeth, it is best to put the dog under ether and avoid struggling on the part of the animal, and also facilitate the removal of the tartar without injuring the soft structures of the mouth. The teeth can then be cleaned with such tooth powders as chalk, charcoal, using a tooth brush or a coarse cloth. Albrecht advises in cases of tatar formation to take a blunt stick, cover the end with a cloth, and dip it in pumice stone and alcohol and rub on the teeth.

Alveolar Periostitis.—Inflammation of the alveolar periosteum or the so-called alveolar dental membrane in combination with suppurative periostitis alveolaris purulenta (periodentitis purulenta) is a very important disease, as it has a very important bearing on the value of certain breeds, particularly the terrier class. If it affects very young animals, it is apt to destroy portions of the enamel and leave the teeth unsightly and discolored. This condition is very apt to follow diseases of the blood in very young animals, particularly those that are anæmic, have persistent diarrhœa or have distemper at that period when the permanent teeth are just about or are coming through the gums.

Caries of the Teeth.—This condition has been observed by a number of authors (Moller, Hoffman), but is of very rare occurrence.

Caries of the teeth may result from the teeth being broken by animals in play catching hard objects, stones, coal, etc., sharp bodies running into the gums or becoming imbedded between the teeth.

By caries dentum, we define an active process of molecular destruction of the enamel and bone of the teeth. This process always begins on the surface and mainly in the cavity of the crown of the tooth forming a grayish or blackish spot. This spot, which is the decayed part of the tooth, advances deeper into the tooth, going on toward the pulp. This penetrates into the tooth until it reaches the nerve, and thus exposes it to the atmosphere, inflames it and makes it very sensitive.

There are certain microbes found in carious teeth, but whether they are directly connected with the decay of the teeth is not definitely known. True dental caries is very rare in the dog. Necrosis of the teeth is frequently mistaken for caries. In old dogs we often see an acute inflammation of the periosteum and the alveolar process becoming inflamed, the tooth is lifted out of its socket, and finally forced out entirely.

In these cases the alveolar periosteum is destroyed, and a necrotic condition of the tooth causes it to become yellow; this is generally termed false caries of the teeth. Alveolar periostitis commences with the formation of an abscess at the root of the tooth, and the pus formed finds its way to the outside of the gums through the alveolar process. It forms a fluctuating swelling on the gums (abscess of the gums); the opening generally remains so, and if it is in the superior maxillary open fistulous tracts may form under the eye just below the lower eyelid, and unless carefully examined may be mistaken for a lachrymal fistula. By means of a flexible probe the diagnosis can be made with certainty.

In all these cases the animals seem to have a more or less severe toothache; they are irritable, eat very slowly and irregularly, drop more or less saliva, refuse to have the mouth examined, and, if the affected tooth is struck with something (a key is the best), howl and evince great pain, keeping the mouth open for some time afterward. When the mouth
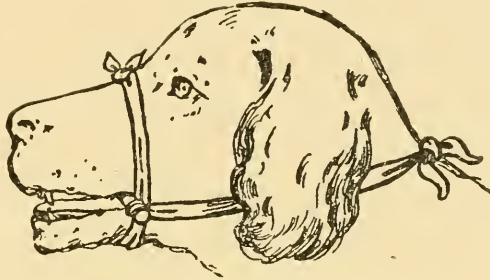
FIG. 19.—Improvised gag (*French*).

is examined, the gums are swollen and painful, and there is a very fœtid unpleasant odor from the mouth.

When there is more or less pus present, the radical treatment is to remove the offending tooth. For this purpose open the mouth by means of the method described on page 12, using the mouth speculum (Figs. 4, 5 and 6), or Fig. 19, which shows a mouth gag that is particularly useful where the incisor or canine teeth are to be examined as it can be easily improvised and allows the mouth to be examined and at the same time the animal does not open the mouth and move around the tongue and interfere with the examination and an assistant can hold the head steady and with an ordinary molar-forceps extract the tooth, being careful to avoid breaking the crown. The tooth is seized with the forceps as far down on the root as possible; it is first loosened by twisting it several times from side to side and then drawn out with a strong pull. The mouth must be thoroughly cleansed with warm water and the gums pressed firmly together, so as to keep the cavity, if possible, from filling up with a blood clot. This should be done immediately after extraction. In cases of caries of the teeth, the tooth can be filled by first scraping

out the cavity with the dental cutter then disinfect the cavity by means
of a plug of cotton soaked in creosote, and washed out with alcohol or
ether and plugging it with amalgam, cement or gutta-percha. Hobday
has described a case where an artificial tooth has been bridged between
two teeth. In the United States this bridge-work and filling is done
frequently.

Dentition.—Newly born puppies do not have any teeth through the
gums. The first or temporary incisors appear about the third or fourth
week and the first permanent teeth appear about the fifth month. The
temporary canines appear about the fourth or fifth week after the tempo-
rary incisors are all in. The permanent teeth begin to come through
about the third or fourth month; the lateral and middle incisors
appear about the end of five months, and at the same time the second,
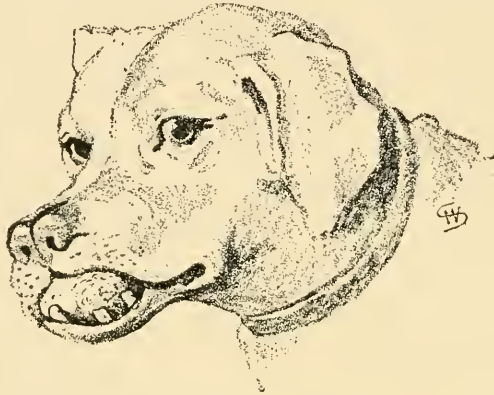
FIG. 20.—Tumors of the gums.

third, and fouth molars, the fifth molar about five months, the sixth
about six months, and finally the seventh about the end of the seventh
month, so that the dog has his full masticatory apparatus at the end of
seven months.

Change from the normal rotation of temporary to permanent teeth
varies; sometimes the permanent teeth will come through the gums and
push the temporary teeth to one side, but the latter remain in the jaw.
This is particularly noticeable in the very small breeds. This is gen-
erally avoided by pulling out the temporary incisors as soon as possible.
Very frequently this allows the permanent teeth to come through the
gums at once and assume their normal position. This irregularity is
particularly noticeable when the animals are affected with some acute
infectious disease, such as distemper.

During the process of teething, the gums become very red and in-
flamed, and there is an increased amount of saliva; in some cases the in-
flammation is intense, with complete loss of appetite. Convulsions may

occur from reflex nervous irritation. This nervous irritation may produce a cramp of the lower jaw that is very similar to the paralysis of the jaw in rabies.

These cases are best treated by simple sedatives, and if the gums seem to be tough, they should be lanced with an ordinary gum lancet, and thus assist the tooth to come through to the surface.

Malformations of the Cavity of the Mouth.—Malformations or growths on the buccal membrane are frequently seen in the dog, located about the

FIG. 21.—Wire écraseur.

edge of the gums and on the inner cheek. They are generally classed as **epulides**. They vary in size from a pin-head to a walnut. They are invariably pedunculated; very rarely they are seen with an extended base, irregular on the surface; they are, as a rule, hard and elastic and deep red in color; they may occur in various characters—fibroma, carcinoma or sarcoma. The author observed a melanotic sarcoma in one case. These epulides grow sometimes to be very large, pushing the teeth to one side, making mastication very difficult, and preventing closure of the mouth (see Fig. 20).
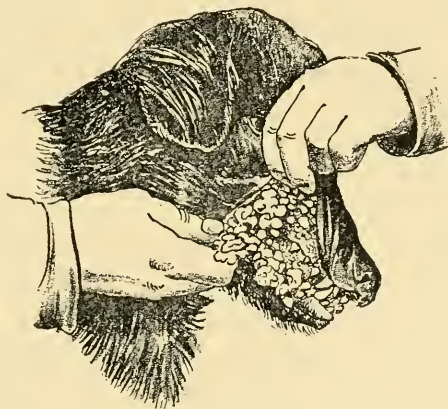
FIG. 22.—Warts of the mouth.

These tumors can be removed by écraseur of wire (Fig. 21) or by cutting them out with a probe-pointed bistoury. The hemorrhage can be checked by the thermo-cautery or by a solution of chloride of iron, but the hemorrhage is generally so slight as not to require any styptic. Loose teeth, or teeth that are firm but interfere with the removal and eradication of the tumor should be extracted. If the tumor is firmly attached to the bone or directly in the bone substance itself, the affected bone should be removed with the knife or bone forceps and scraped with

a curette so as to prevent, if possible, the recurrence of the growth; but frequently they return in spite of every precaution.

Warts in the Mouth.—In young dogs, generally under twelve months, we frequently find on the lips, buccal membrane, and under the tongue numbers of papilloma; these sometimes occur in enormous numbers. These are small whitish-gray, pink or pinkish-black, wart-like proliferations (see Fig. 22). These growths are generally of little importance. They may appear in a few days and cover the surface of the mouth and disappear as rapidly as they appear. No treatment is regarded unless they are in such masses as to interfere with mastication. If so, remove the largest with a curved pair of scissors and dress the mouth with some astringent wash, and administer, liq. potassii arsenatis (Fowler's solution) internally in the food.

Ranula.—Besides these tumors of the membranes of the mouth we find a growth called ranula. It generally occurs under or on the side of the ventral surface of the tongue and rarely painful to the touch, thin walled, and more or less cylindrical. Often an animal will become very slow in eating, and if the mouth is examined, we find on one side of the tongue and under it a large-sized body, varying from the size of the little finger to a chicken's egg, a fluctuating swelling, reddish-blue in color and when opened with a knife it is found to be filled with a thick creamy glue-like liquid (see Plate, page 42). Many theories have been advanced as to the cause of this disease; some consider it to be the formation of an ordinary cyst and others contend it is due to the plugging of the ducts of one or more of the salivary glands at the base of the tongue. In some cases the cause of the trouble is due to the obstruction of the duct of Wharton, which has its entrance into the mouth at the base of the lingual ligament, and in other cases it is a cystoid degeneration of a few glands at the base of the tongue, probably due to a plugging of the opening of their ducts and a consequent inflammation of the glands themselves. It therefore seems best to call all the cystoid formations under the tongue ranula.

It is always advisable to operate on these cysts; cut down on the cysts with a lancet and make a good-sized opening, and by means of a pair of curved scissors remove a portion of the upper part of the wall and cauterize the inner walls of the cysts with the thermo-cautery or stick of caustic silver. If Wharton's duct is involved, be guarded in the cauterization, confining it only to the anterior part of the cyst toward the point of the tongue. The injection of pilocarpine, which has been used with success in man according to Soffintini's method, has been tried in animals by Hoffmann. It consists in creating a great amount of the salivary secretion, and the force of the collected fluid from the inside breaks the obstruction of the duct.

RANULA (*salivary cyst of the tongue.*)

Inflammation of the Salivary Glands.

(*Parotitis; Mumps.*)

Inflammation of the glands of the ear (parotiditis) appears either as a consequence of some mechanical cause, or by infection from the cavity of the mouth, from some existing inflammation of that part, as a disease, due to the presence of a micrococcus which develops in the saliva in the form of a diplostreptococcus or by direct infection from the blood itself in the form of a diplococcus or from metastasis (septicæmia, pyæmia, or, in rare instances, distemper). The latter requires special mention as
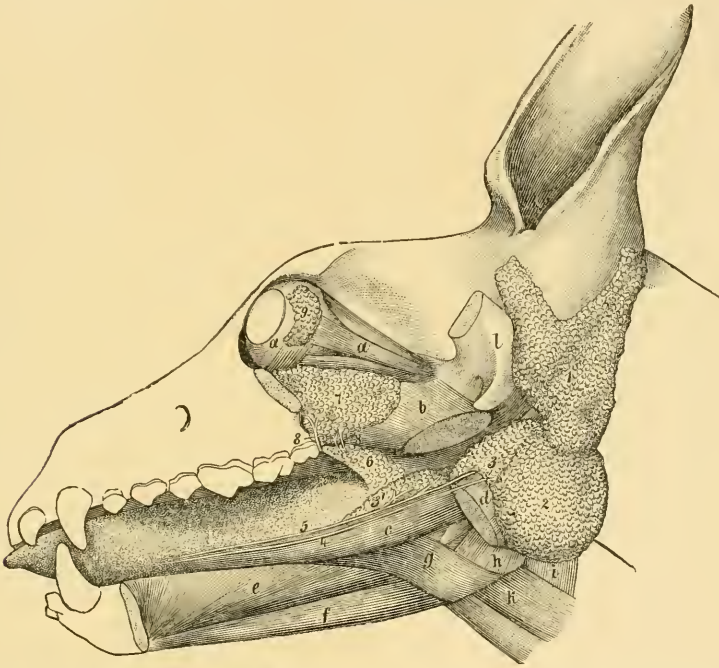
FIG. 23.—Glands of the head: 1, parotid gland; 2, submaxillary gland; 3, subzygomatic gland; 4, Wharton's duct; 5, Bartholin's duct; 6, palatine gland; 7, orbital gland; 8, Nuckian duct; 9, lachrymal gland.

a primary idiopathic parotitis (mumps). The writer has frequently seen the gland in the region of the ear affected, more rarely the glands of the lower jaw, and, least of all, the glands of the eye.

Etiology.—This disease is rather rare in the dog, but sometimes it may take the form of an epizootic (Hertwig, Schussele). In these cases it is probably due to some infecting virus that gets into the gland through Steno's duct. The exact nature and time of incubation of this disease are not known.

Symptoms.—The disease begins with a swelling of the gland and the adjacent structures on one side or both sides of the ear. The location of these glands is seen in Fig. 23. They swell rapidly and are very tender to the touch, changing the whole appearance of the head and neck. The animal is very droopy, carries the head and neck in a fixed position, eats with great difficulty, and will swallow only very small pieces. The saliva is very thick and forms tenacious bubbles at the corners of the mouth. The fever is seldom high, and in the majority of cases in from five to eight days the swelling decreases and disappears entirely in fourteen days (Hertwig).

In rare cases an abscess is formed in the gland, **(abscess of the parotid,)** and invariably in one only. The gland swells as in mumps, only is much quicker and surrounding tissues are much swollen and œdematous. Soon a fluctuating portion is felt, which later opens in one or more places and a thick, creamy pus escapes; the œdema of the surrounding tissues disappears quickly, and the fever, which is rarely of much consequence, goes down entirely and the wound closes in a short time.

The inflammation of the glands of the tongue and lower jaw generally forms abscesses which open in the month, the pus escapes, and the sore heals up in a short time. The submaxillary generally breaks through the skin and the sublingual into the cavity of the mouth. There is never any consequence in any of these cases.

Therapeutics.—In the primary form of parotitis, where we do not have the formation of an abscess, we obtain good results with warm applications. Keep the animals as quiet as possible, and then rub on ointments, such as vaseline and lanoline, or paint with tincture of iodine.

As soon as we see that the swelling is not going down within a certain time, but increasing gradually, we must try and open the abscess as soon as possible and allow the pus to escape. If fluctuation can be felt, cut down on that point, but if not, a portion of the skin and fascia have to be carefully cut in the dependent portion, making a good-sized opening. The gland is now exposed, the pus can be detected and opened, a drainage-tube inserted and sewed to the tissues—if not sewed, the animal will shake it out—and cleanse daily with an antiseptic solution. It is better not to bandage the neck, as it interferes with the tube; in some cases it is not necessary to insert the tube, but to clear the opening daily and dilate it, if necessary. These abscesses heal rapidly if there is exit for the pus.

Inflammations of the other salivary glands should be treated in the same way. The abscess of the submaxillary should be opened from the outside through the skin, and sublingual from the inside of the mouth cavity. In the submaxillary, it is not necessary to put in a drainage-tube, but simply to keep the wound clean. Frequently we have develop-

ing in this region intense localized inflammations and great œdema from traumatisms, such as fights, blows or contusions. The swelling may extend to the head and neck (Fig. 24). The treatment in such cases consists in making a free opening to allow the pus to escape and heal it
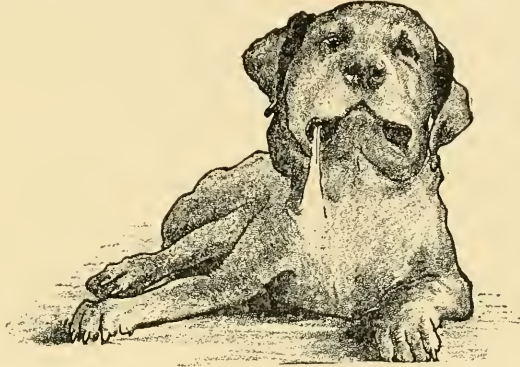
Fig. 24.—Abscess of the neck. Œdema of the right side of the head.

as an open wound or dress it with an antiseptic held in place by means of a Priessnitz compress.

Occasionally we find cysts form in the glands of the tongue. These were first described by Siedamgrotsky as **honey cysts.** They are seen on the lower side of the mouth in the region of the larynx, and are covered by the muscles of the neck; or they may be on both sides of the larynx and

Fig. 25.—Mucous cyst.

appear as a conglomeration of small, crowded vesicles with thin, coarse walls filled with a thick, honey-like fluid (see Fig. 25). In some instances it is very thick, like cheese, and yellow or reddish. They originate in the glands of the tongue, and as the cyst walls extend into the tissue of that organ they must be classed under the head of ranula.

In treating these cysts the only practical method to pursue is to remove them entirely, for if they are simply cut into they return in a short time; but to cut out entirely a cyst located in this region is a rather dangerous operation, as the base of the tongue and the region of the larynx contain a large number of important blood vessels and nerves and even if the entire cyst is removed, we may injure the submaxillary gland, causing a salivary fistula that is impossible to heal. Consequently it is only advisable to attempt to remove the smaller cysts; the larger ones can be treated in the following manner: Make an incision into the cyst, then inject into it some mild corrosive such as diluted tincture of iodine, a weak solution of corrosive sublimate, or Lugol's solution of iodine. These solutions act as irritants to the walls of the cysts, break them down, and destroy the secreting membrane and they soon heal up; the cicatricial contraction draws the tissues together and only a trace is left. Another method is to use an aspirator or ordinary syringe, draw off the contents of the cyst, and inject into the cyst a 3 to 5 per cent. dilution of Lugol's solution, injecting an amount equal to the original contents of the cyst. The object of this injection is to stimulate the formation of pus in the sac. If it does not produce the desired effect, inject it again. After the pus has formed, make a long incision through the cysts and treat it as a simple surgical wound. Frick advises after opening the cyst to cauterize it with the thermocautery and sew up the opening. This causes that portion to slough off, and the wound to heal by granulation. The method suggested by Siedamgrotsky has been very satisfactory to the author. It consists of making a good, big opening in a dependent part and injecting the parts freely with mild caustic solutions, such as caustic potash or tincture of iodine.

Inflammation of the Mucous Membrane of the Throat.

(*Pharyngitis; Angina Catarrhalis; Sore Throat.*)

This disease in the dog is not by any means as important as it is in man, and as yet there have not been recognized any cases in the dog that could be compared with diphtheria, angina tonsillaris, and retropharyngeal abscess of man; at least such is the experience of the writers. The general affections observed have been common catarrhal inflammations which involve the whole or part of the throat.

Etiology.—The same causes that would produce stomatitis would bring on inflammation of the throat. The most common cause of angina catarrh is a continuation of the inflammatory processes from the neighboring organs; for instance, in catarrh of the nose, or in laryngitis, and it may appear as a complication of distemper and stomatitis. The chief cause is cold, particularly in hunting dogs, such as setters or pointers getting wet, when very warm, plunging into very cold water, or in house pets that run from very warm rooms into the cold and lie on cold bricks

or flag stones. This disease is very much more common in winter than summer and is more frequently seen in small or particularly fine bred delicate animals. Friedberger and Frohner describe an epidemical infectious pharyngitis that affects young animals when they are from one to two weeks old, and sometimes goes through an entire kennel, attacking all ages.

Pathological Anatomy, Clinical Symptoms and Cause.—The changes of the mucous membranes of the pharynx and soft palate are the same as are recognized in all catarrhal inflammations. The mucous membrane is a diffused red, sometimes spotted, and coated with a dirty yellow mucus, giving it a dull glairy appearance. The membrane purulent on its surface, except in very grave affections, when especially on its dorsal surface there may be seen a number of small, irregular granulations. As a rule, if the inflammation is at all severe, the tonsils are also swollen and protrude out of their membranous pouches in the shape of brownish-red enlargements, and occasionally the subparotid glands may be involved by the formation of an abscess. We very rarely see any fibrinous (croupal) membranes in any of the severe inflammations of the throat.

Clinical Symptoms.—The clinical symptoms of catarrh of the throat are similar to acute stomatitis, and it is only by making a careful examination of the throat that we can make a correct diagnosis. In more severe cases, beside increase and alteration in the saliva, which is thick and tenacious, on manipulation in the region of the pharynx, it is painful. The subparotid lymph glands also are swollen and painful, and there is a certain stiffness of the neck. The mucous membrane of the pharynx should be examined and its changes from the normal considered. The author has found, as a rule, that catarrh of the stomach accompanies all these cases. Catarrh of the nasal passages and pharynx, and slight fever is also seen in these cases, and in rare instances vomiting. The course of the disease, as a rule, is favorable, but Frohner says if the inflammation of the pharynx extends into the Eustachian tube it may cause deafness. Chronic pharyngeal catarrh is rarely or ever seen, but sometimes an ordinary case of catarrh of the pharynx may last three or four weeks and cases have been known to recur from time to time.

Therapeutics.—First examine the larynx and see if there are any foreign bodies present. This can be done by forcing open the mouth and by means of a spoon handle or a spatula the tongue is depressed and the fauces examined. Always be sure, however, to determine that the animal is not suffering from dumb rabies. In these cases the owners are very apt to imagine the animal has something stuck in the throat or eaten something that is poisonous. In a mild case give the animal milk, thin soup bouillon; in more severe cases, an external liniment, such as camphorated

oil or soap-liniment, should be rubbed on the throat or the mouth held open and by means of a brush or an atomizer sprayed directly on the throat; apply such astringent and antiseptic throat washes as lime water, tannic acid 1 to 3 per cent., potassium chlorate of borax 2 to 3 per cent. solution. In more acute or chronic cases, wash the mouth out with a solution of permanganate of potassium, boric or salicylic acid, or paint the throat with nitrate of silver, 1 to 2 per cent., or tannite of glycerine, 5 to 10 per cent.

DISEASES OF THE ŒSOPHAGUS.

Foreign Bodies in the Œsophagus.

The foreign bodies that become fixed in the pharynx or œsophagus of the dog in play or by gulping down their food as fast as possible, if another animal is near, are numerous and varied; they consist of portions of food, such as hard, irregular-sized pieces of meat that have been taken in one gulp; long, sharp pieces of bone, such as mutton or fish, pieces of wood, needles, or small stones; sometimes objects are swallowed by accident, such as stones, buttons, glass, or india-rubber balls, corks, etc., and lodged in the pharynx at the entrance of the œsophagus; or if the object is small, it may go a certain distance into the tube and lodge there.

The symptoms may come on very suddenly and vary according to the general character and position of the foreign body. As a rule, the animal is restless and keeps the head and neck extended; it scratches itself on the throat with the paws over the spot where the obstruction is located. If it is in the pharnyx, the animal shows signs of choking or may vomit, from time to time, small quantities of mucus and saliva, which is dirty and frothy and may be stained with blood, and later pieces of undigested food which in the later stages becomes fœtid. It coughs frequently, and if the obstruction is large, it refuses to eat or drink. If water is forced on the animal, it passes down the throat very slowly and evidently with difficulty, or may be vomited immediately after it is swallowed. If the foreign body is in the œsophagus, it may be felt externally with the finger or, opening the mouth and depressing the tongue, it may be seen lodged in the pharnyx; if it is in the cervical portion of the œsophagus, it can be detected by making a careful examination along the course of the tube or by the probang introduced into it, as has been described on page 17. The latter method is the only way to positively determine the presence of a foreign body when it has lodged in the thoracic portion of the œsophagus. In introducing the probang it must be carefully inserted, and if it should come in contact with the foreign body too great pressure must not be made on it, as it is apt to pack the object more firmly or even cause perforation

of the tube. When making an examination of the tube externally, should we find a part that is painful, we must not consider it the obstruction unless we find a hard swelling with it, as foreign bodies such as sharp splinters of bone or wood often go down the tube, lacerate the mucous membrane in its passage, and do not become imbedded. Needles, pins and small pieces of wood may not be detected, even with the probang; in such cases the Röntgen or X-ray can be used to detect objects of certain density, such as metals, coins, etc., with the greatest certainty.

The object, if it goes into the stomach, passes through the intestines and is passed through the rectum and causes no further trouble. Some authors have observed needles passed per rectum in the fæces. It may, however, lodge in the stomach and cause irritation and finally convulsions and death. If it is a sharp body, it may perforate the stomach, even find its way out again by perforating the abdominal wall. If it is in the thoracic portion of the tube, it may penetrate the wall, cause an abscess and escape, or it may penetrate the wall of the thoracic portion and set up septic pleuritis and result fatally. It is also probable that death may occur from the foreign bodies if they are sharp, by penetrating either the heart or one of the large blood vessels in the vicinity, and causing a hemorrhage, or it may also occur from septic inflammation of the œsophagus.

Therapeutics.—The treatment differs according to the character and situation of the foreign bodies. If the foreign body is in the pharynx or at the entrance of the œsophagus, it must be removed immediately either with the finger or a pair of curved forceps. If the obstruction is located in the lower portion of the tube, and it cannot be pushed down into the stomach with the probang, it is advisable to attempt to get it up by an emetic—a subcutaneous injection of apomorphia muriate, as per page 21. If that is not successful, then perform œsophagotomy as soon as possible, before the intense swelling interferes with the operation. If this operation cannot be performed on account of the foreign body being situated too deeply in the thorax, it is best to give the animal small quantities of lubricating substances, such as olive oil or any fatty oil. It is better to do this than to use any great force to push the object into the stomach. If the foreign body goes so far into the œsophagus that it lodges in the cardiac portion of the stomach and by manipulation it can be detected, gastrectomy can be performed and the foreign body removed in that way. Porcher and Morey performed this operation successfully.

In very rare instances we also find an inflammation of the œsophagus (œsophagitis), with or without any ulceration. In the latter case it is due to the irritation of caustic poisons or lacerations of the foreign bodies going down the tube. This is best treated with lubricating oils, such as almond or sweet oil. We may see, occasionally, a constriction of the œsophagus (stenosis œsophagi) or a dilation (ecktasia and diverticulum),

but these conditions are impossible to improve by any surgical means that we know of at present.

Œsophagotomy.—This is not a very difficult operation to perform in a dog. The animal is laid on his right side, and if not too weak, is narcotized or the locality sprayed with chloride of ethyl. The œsophagus is now exposed and examined to see if any portion is gangrenous from the injury. After having shaved off the hair, and washed the surrounding tissues with antiseptics, the foreign body is located, and an incision is made in the skin parallel with the jugular vein and over the foreign body. The incision is now carried through the subcutaneous tissues and muscles, and the œsophagus is exposed. Where the foreign body is located in the lower portion of the cervical region, the incisions can be made on the median line and by separating the muscles the œsophagus which lies on the left side of the trachea can easily be distinguished. The incision made in the œsophagus should only be large enough to allow the removal of the foreign body. After the extraction of the foreign body, the wall of the œsophagus should be sewed up with cat-gut, and the muscles sewed with silk and the skin either left open or a drainage-tube placed in it. The opening is then treated as an ordinary wound. No food must be given for 48 hours, then only water or milk. The animal should be kept on liquid food for at least two weeks. When a large portion of the œsophageal wall is lost, that which is sloughed from necrosis, and the edges of the wound in the œsophagus cannot be brought together, the case is hopeless.

Other Diseases of the Œsophagus.

In very rare instances we find inflammation of the œsophagus (œsophagitis). In this case it is due to the action of caustic poisons or a laceration caused by foreign bodies going down the tube or from foreign bodies becoming imbedded in the tube for a time and then dislodged, by injuries to the wall from the probang, and in still more rare instances from swallowing hot or scalding food, by spread of inflammatory process from the pharynx, or the presence of parasites (spiroptera). Œsophagitis is recognized by great salivation, difficulty in swallowing, attempts at or true vomiting and great pain shown by the animal on manipulation of the œsophagus. The treatment consists in giving liquids, gruel or rice water and in severe cases, small pieces of ice at frequent intervals.

Obstructions of the Œsophagus.

(*Stenosis Œsophagus.*)

This may result from the subsequent irritation and cicatricial contraction of the wall as a result of laceration by a foreign body. Occasionally we may find malformation of the wall by an inflammatory process of the same, from cyst formations, due to presence of spiroptera sanguinolenta,
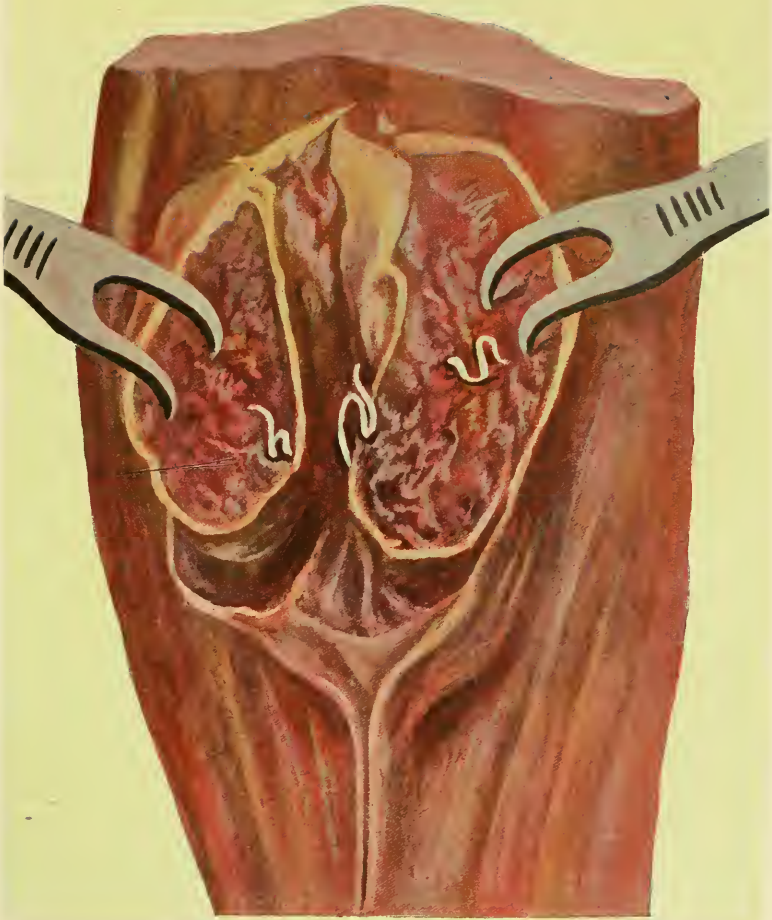
SPIROPTERA SANGUINOLENTA (*encysted in the oesophagus.*)
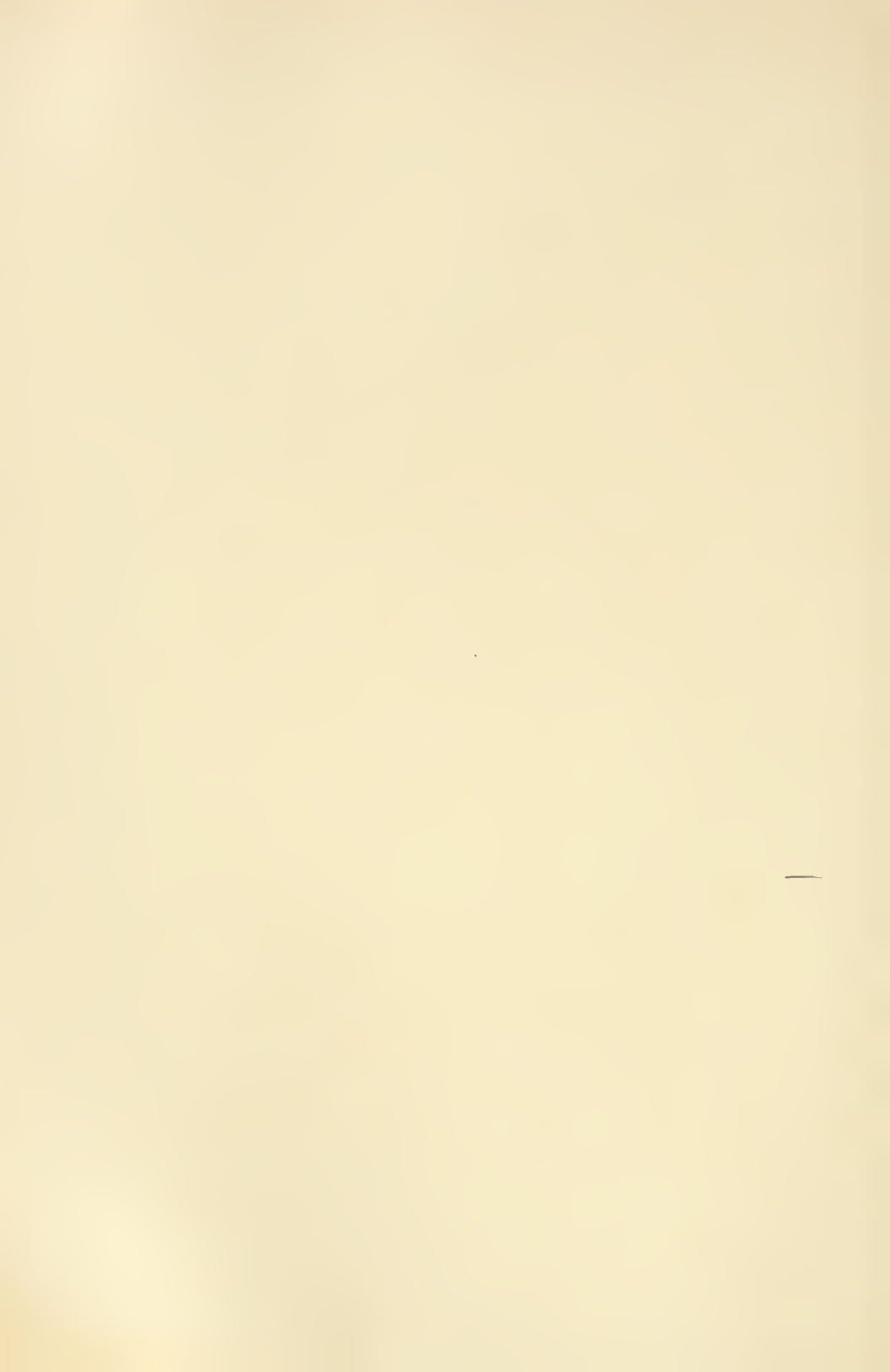
which grow between the muscles and muscular coat of the œsophagus (see Fig. 26 and Plate), or by a compression stenosis, from malignant goitre, and still less frequently by cicatricial contraction as a result of injuries, inflammations, etc., in the cervical region. The symptoms of such injuries have been already described on page 49. In cases where the stenosis gradually develops, the animal has more or less difficulty in swallowing. This becomes more and more difficult until finally food collects in a sausage-like mass, against the constriction. Examination by means of a probang makes a diagnosis more certain. The successful treatment of such a condition can only be expected if the cause is due to

Fig. 26.—Spiroptera Sanguinolenta.

the obstruction of the œsophagus by foreign bodies or the removal of tumors if they should be the cause of compression in the region of the œsophagus.

Dilatation of the Œsophagus; Ectasia and Diverticulum.

This has been described by a number of authors and is indicated by great difficulty in swallowing, vomiting, etc. If the dilatation is in the cervical region, along the line of the œsophagus, we find round elongated lumps, varying in size, and by manipulation this collection of food can be worked down into the stomach. The probang may be used to start it. Great care, however, should be taken not to use too great force, as it will only pack the food and fix it. The prognosis, as a rule, is unfavorable, but if the animal is kept on liquid food exclusively, it will live for a long time.

Paralysis of the Œsophagus.

(*Dysphagia Paralytica*.)

This is due to the paralysis of the nerves that supply the region of the neck, seen particularly in conjunction with paralysis of the larynx. It may occur as a result of certain brain diseases, from certain poisons, from intestinal mycosis, and also as a symptom of rabies. It is recognized by constant dribbling of saliva from the mouth. The animal may make efforts to drink water, but while the movements of the muscles of the neck would lead you to think the animal was doing so, on close observation of

the vessel from which the animal was drinking, it shows little or no diminution in the contents.

DISEASES OF THE STOMACH.

Acute Catarrh of the Stomach.
Gastritis Catarrhalis; Gastricismus; Acute Dyspepsia.

Etiology.—The following are generally the causes of this very common disease: hot, frozen, fermenting or decaying alimentary matters, overfeeding or gorging after a long fast, foreign bodies, such as sand, stones, buttons, splinters of wood, and undigestible food that is not adapted or intended to be eaten by dogs, and also from the presence of parasites. As regards toxic gastritis, that will be taken up later on. We find also that some diseases, such as distemper, some affections of the liver, and intestinal catarrh have acute gastritis accompanying them. Very often acute catarrh of the stomach is developed from simple colds, or clipping the animal, too frequent bathing, and not drying it properly.

Pathological Anatomy.—The mucous membranes of the stomach are hyperæmic and swollen; the folds of the membranes are distended and covered with a thick tenacious mucus. At times there are seen small, hemorrhagic erosions on the membrane.

Clinical Symptoms.—The first symptom of acute catarrh is loss of appetite. The animal will be very dainty and pick out certain pieces, generally meat, and eat them slowly, or, as is generally seen, refuse food altogether. The animal is always very thirsty, drinking large quantities of water. The animal vomits frequently, especially after eating or drinking, but may vomit without anything on the stomach. If after eating, it consists of masses of undigested food mixed with a tenacious mucus and saliva; if after drinking water, the water is tenacious and forms bubbles of thick mucus—this may be streaked with blood or more or less tainted with bile, according to the condition of the liver. The tongue is coated with a thick, white mucus and on pressure in the region of the stomach the animal evinces pain, and the stomach may be distended with gas (see page 20). The animal is irritable and wants to keep in the dark or in cool places and not be disturbed, or may give sharp short cries, change from place to place, and give every indication of stomachache. The nose is dry and the body temperature uneven, that is, body hot, extremities cold, and there may be some rise of temperature. If the symptoms are of an alarming character, they are generally caused by some toxic condition, due to the formation of poisons, generated in the stomach (ptomains). With this we have a putrid smell from the mouth, great depression, or even complete coma, and evidences of acute narcotic

poisoning. See chapter on Mycotic Stomatitis, Catarrh of the Intestines, and Inflammatory Hemorrhagic Gastro-enteritis.

There are always some intestinal complications. There is increased excretion of fæces, generally diarrhœa, and occasionally icterus of a catarrhal nature. The animal, as a rule, makes a good recovery. In very rare cases the condition becomes chronic, but death never occurs except where some complication other than true catarrh of the stomach, is present.

Therapeutics.—The treatment differs according to the exciting cause, and also the severity of the symptoms. If the cause has been the eating of some putrid matters and if you suspect some to be present in the stomach, it is best to give the animal an emetic, such as the hypodermatic injection of apomorphia, as described on page 21; such emetics as tartar emetic, ipecacuanha or antimonial wine are not advised, they are all very depressing. After the animal vomits and the vomited matter is putrid and offensive matter, it is well to give the animal 8 to 10 ounces of warm water with a small quantity of bicarbonate of soda in it. It is good practice to add a little creolin to the warm water. If it is not advisable to administer emetics in such cases where the animal is greatly depressed, calomel or Glauber salts can be given to sweep the intestinal tract. Keep the animal on a low diet in the beginning; let the animal do without food for a day, and then give small quantities of milk or finely cut-up meat, soup, or beef tea, a stomachic, such as tincture of rhubarb or nux vomica in small doses; if there is vomiting, carbonate of sodium or magnesium is to be given in small doses several times daily. Essence of pepsin is also useful to settle the stomach; it must be given in teaspoonful doses three times daily.

Chronic Catarrh of the Stomach.
Gastritis Catarrhalis Chronica; Chronic Dyspepsia.

Etiology.—Chronic dyspepsia is rather common in the dog, especially if the animal has had several attacks of acute dyspepsia. It may also appear as a secondary complication of various diseases, such as chronic disease of the liver, lung or heart, cancer of the stomach, gastric tumors, and parasites.

Pathological Anatomy.—The mucous membrane is covered with a tough, glassy mucus, dirty-white in color. In the early stages the mucous membrane is red, and as the disease continues the membrane becomes dark gray in color, due to pigment stains and more or less swollen, especially if the gastric glands become atrophied and indurated from the constant irritation.

Clinical Symptoms.—They are similar to those of the acute catarrh

of the stomach; but the appetite, while it may be very irregular, is not entirely absent—one day very good and the next absent. Vomiting occurs generally a short time after eating, and consists of undigested food covered with quantities of tough, glassy mucus, sometimes streaked with blood, and the tongue is more or less coated. There is pain on pressure in the region of the stomach, especially after eating, although this is not a constant symptom by any means. The animal becomes thin and shows every symptom of poor nutrition.

We must always take into consideration that the mere loss of appetite does not always mean acute or chronic catarrh of the stomach, but is a symptom present in a number of pathological conditions, and every symptom must be carefully examined before coming to a definite conclusion.

Therapeutics.—The washing out of the stomach, so often resorted to in man, is fully explained on page 21. This treatment is not to be employed in all cases of this disorder; for in some cases it produces great irritation, and if persisted in does more harm than good. Try to get the animal to drink small portions of water, with some lime water in it, at frequent intervals; if it will not drink, pour fresh water down its throat; in anæmic animals, use tepid water, with a small quantity of a solution of bicarbonate of sodium, a pinch or a teaspoonful of Carlsbad salt, in warm water, on an empty stomach. Hydrochloric acid well diluted can be given after meals and the treatment described on page 53. In very acute cases give naphthaline, salicylic acid, resorcin, menthol, or thymol. As a rule, however, it is advisable not to do this unless you suspect some irritant or poisonous material to be present. If the chronic catarrh occurs as a result of other diseases, we must treat the original cause, as very frequently when the other disease is treated successfully, the gastric mucous membrane returns to its natural condition without any other treatment.

℞	Extracti rhei;	2.0
	Sodii bicarbonatis,	100.0
	M.	

Sig.—A small pinch twice daily.

℞	Mentholis,	2.0
	Sacchari lactis,	
	Gummi arabic, āā	1.0

M. Et fiat pulv., No. x.

Sig.—Give one twice daily.

Other Disorders of the Stomach.

Expansion or Dilatation of the Stomach (*Gastrectasis, Dilatatio Ventriculi*).—This condition may occur in the acute or chronic form. In acute it is due to overloading the stomach with dry food and particularly when

the food is of a poor indigestible character. If the stomach is not emptied by an emetic, the abdomen becomes greatly distended, particularly in the epigastric region. The animal is restless, moving from one place to another, the expression is haggard and indicates pain, there is quick catchy respiration, and the pulse greatly increased in number. In severe cases the animals die with dyspnœa. In less acute cases the animals slowly recover or it is followed by an attack of acute gastric catarrh.

The treatment consists in administration of an emetic, such as a hypodermic of apomorphia.

A chronic dilatation of the stomach is frequently seen in dogs that are fed on poor food and in animals that gulp down their food, particularly when they are only fed once daily. It may also occur from contraction of the pyloric end of the stomach or duodenum, from cicatricial contraction, the presence of carcinoma, or from weakness of the walls of the stomach; this latter condition is rarely seen. In chronic dilatation of the stomach there are all the indications of chronic catarrh with more or less distention of the abdomen, particularly in the epigastric region. On percussion of the region of the stomach a dull tympanic sound is heard, which disappears when the animal eats any food; then palpation of the stomach produces a splashing sound.

The treatment consists in giving the animal smaller quantities at shorter intervals and the same medical treatment as is advised under chronic dyspepsia. If it is suspected or diagnosed that there is pyloric stenosis, you should try to remove it by surgical means.

Reversion or Inverted Stomach, Torsio Ventriculi, Volvulus Ventriculi.—This is observed where the stomach is turned on its axis and, as a rule, occurs in the larger breeds of dogs. The stomach is completely reversed, so that the pyloric end is found in the left epigastric region instead of the right, and the large curvature, instead of being on the left, is found on the right and the œsophagus has a twist in it. On making an abdominal incision the stomach is found to be greatly distended and the spleen is greatly enlarged. The causes that may produce this condition are violent exercise, particularly running up and down steps with an empty stomach (Cadiac), or the same exercise with a greatly distended stomach (Jensen). The symptoms come on very quickly, great distention of the abdomen, dyspnœa, cyanosis, pain on pressure of the region of the stomach, colicky pains and vomiting. Death generally occurs in from 30 to 40 hours, either by suffocation or paralysis of the heart. The treatment recommended by Cadiac is to gradually remove the gas from the stomach by means of a trocar and opening the abdomen and returning the stomach to its original position.

Foreign Bodies in the Stomach.—By this we mean stones, glass,

balls, pieces of money, rubber balls, needles, hair balls. These produce the following symptoms: vomiting, loss of appetite, restlessness, animal screaming with pain or howling, animal attempts to bite all who touch him, colic and in the later stages great depression; where foreign bodies become lodged in the pyloric portion of the stomach (see Fig. 27) there may be no other symptom than acute catarrh of the stomach. We may detect the foreign bodies by palpation or by means of the Röntgen or X-rays.

Fig. 27.—X-ray picture of coin in the stomach.

Therapeutics.—If the foreign body is diagnosed, give an emetic. Moller advises giving a good meal before the emetic is administered so as to assist in holding the foreign body when the emesis occurs and this prevents it doing any harm to the tissues. If the emetic does not succeed in removing the foreign body, laparogastrotomy must be performed. This is described in detail under that head later. In performing that operation for this particular case, the incision should be made on the linea alba close up to the xyphoid cartilage and thus bring the incision close and parallel to the great curvature of the stomach; or, as Frick advises, on the diaphragmatic position of the stomach directly on the great curvature. In this operation, great care must be taken not to cut any of the large arteries of the stomach, which are located on the great curvature.

The animal must be fed on the lightest of liquid food for at least a week after the operation.

Ulceration of the Stomach (Ulcus Ventriculi).—When bleeding occurs from the stomach as the result of some acute inflammatory condition of that organ, it always leaves an erosion of the mucous membrane. As a rule, this heals up very rapidly in the dog, rarely leaving any cicatrix on the membrane; abrasions of the mucous membrane from sharp pieces of bone, splinters, or caustic agents also heal up very rapidly.

Ocasionally, however, we see true ulceration of the stomach. The real cause of this condition has not yet been satisfactorily explained, although many investigations have been made on the subject.

The ulcer in the beginning is an inflamed circular spot, from which the mucous membrane peels, and gradually disappears, extending to the deeper tissues where it forms a yellowish-red, unhealthy surface, with an irregular, hard, indurated border. Very often they heal up, leaving an irregular cicatrix, usually circular in shape.

In the dog, as in man, we find that in rare instances the ulceration is so extensive as to perforate the stomach to the serous membrane and form adhesions to the adjacent organs.

This condition may be present without presenting any symptoms that can be recognized, and it is only on post-mortem that it is recognized, either by the presence of the ulcer, or a cicatrix is seen on the mucous membrane of the stomach. The symptoms recognized are generally those of gastric catarrh, with vomiting of blood at irregular intervals. The treatment consists in administering bicarbonate of sodium, argenti nitras or, better, some of the organic compounds of silver, or subnitrate of bismuth is useful, but the use of hydrochloric acid or a stomach-pump is contraindicated.

Cancer of the Stomach : Carcinoma Ventriculi.—Cancer of the stomach is very rare. Symptoms consist of irregular attacks of gastric catarrh with possibly vomiting and gradual loss of flesh, and if the carcinoma is located in the pyloric end of the stomach, we would be apt to find pyloric stenosis and dilatation of the stomach. Eberlin describes a case in which a carcinoma was present in the pylorus and duodenum and accompanied with acute icterus. It is almost impossible to detect with any degree of certainty such a cancer by palpation. Parascandolo performed gastrectomy and removed a cancer from the stomach with complete success.

Parasites of the Stomach.—The spiroptera sanguinolenta is frequently the cause of stenosis of the œsophagus (see Fig. 26 and Plate). In the adult form this parasite is from 3 to 7 cm., the male 3 to 4 and the female 6 to 7 cm., and are blood red in color. They may be solitary, or several may occur in one ulcer. This nodule is frequently the size of a pigeon's egg. The parasite is found in the submucous tissue with a

small opening into the stomach.   In rare instances, this parasite is found
in the bronchial glands, the aortic wall, in the lungs, and in the neighbor-
hood of the kidneys (Railliet).   The general symptom of these parasites
in the stomach is a catarrh of the stomach, gradual emaciation and
sometimes great restlessness.   Hunter describes a dog who was greatly
emaciated and was destroyed as suspected of having rabies.   On post-
mortem, the mucous membrane of the stomach was very much congested,
and he found six nodules the size of a walnut, in which there were
numerous spiroptera sanguinolenta.

Very rare instances are found where the larvæ of the Gastrophilus
equi are found in the mucous membrane of the dog.   The egg may have
been deposited in the hair of the dog, and by being licked off by the
animal, reached the stomach or, from depraved appetite, the animal ate
horse droppings.   This mode of transfer was done experimentally by
Railliet.

DISEASES OF THE INTESTINES.

Intestinal Catarrh.

(Catarrh of the Bowels; Enteritis Catarrhalis.)

Catarrh of the intestines originates frequently from the same causes
as catarrh of the stomach, when the animal has eaten some irritating sub-
stance, and it frequently happens that the two diseases occur together.

Intestinal catarrh is generally caused by the animal eating decayed,
tainted, fermenting, or indigestible food, or from intestinal parasites or
poisons.   It also appears in an infectious form, attacking entire kennels
and animals of all ages.   It is frequently caused by cold or certain in-
fectious diseases and sympathetically in other disturbances of the in-
testinal tract, such as distemper, septicæmia from disturbances of the
circulation and from disorders of the liver, lungs, heart.   Coccidia are
supposed to cause this disease, but the writer never found but one case
in all his observations; in this one case the animal was greatly emaciated.

According to the duration and severity of the disease, we determine
whether we have acute or chronic catarrh of the intestines.   The acute
form of the disease lasts from one to two weeks; the chronic often for
months.

Etiology.—The causes of acute and chronic catarrh in the intestines
are similar; the latter is frequently developed from the acute form and
from frequent return of the disease, the system becomes weakened and
the disease remains in a milder, but chronic form.

The disease may be located either in the small or large intestines, or
in both.   The small intestine is the common seat of the disease, but it is

frequently found also in the large intestines. The various classifications, such as duodenitis, jejunitis, ileitis, typhlitis, colitis and proctitis, are useful only to the anatomist, but not to the observer. Proctitis is frequently seen in the dog in an isolated form. This is given with more detail on page 25.

Pathological Anatomy.—The effects of catarrh of the intestines are practically the same as in all irritations of the mucous membranes. In the acute form, the membranes may be swollen and reddened through the entire intestine, or it may be confined to certain localities, where it is reddened and congested, and the membrane raised and covered over its surface with flaky, slimy epithelium. In very bad cases there is a large number of these epithelial masses, with desquamation of the mucous membrane. These masses of inflamed follicles become grayish-white in color and project from the membrane or finally become ulcerated. In some diseases, where there is severe catarrhal inflammation of the mucous membranes, we find a sympathetic inflammation of the intestine, in some cases even a necrosis from which follows ulceration of the bowel. The writer had one case under his observation, where a young dog died from a necrotic ulceration of the bowels.

In the chronic form, the redness is less intense; the mucous membrane may even be pale or livid, grayish-red or dark red in color. In rare cases it is slate color. The swelling is more regular and covers a larger area, forming a true hyperplasia of the membrane; the inner surface of the bowel becomes irregular and uneven with projections over the entire surface. In some cases the membrane shows true polypous formations, due to circumscribed hyperplasia of the connective tissues. Where there has been cystoid degeneration of the follicles, the intestinal secretions are stopped entirely and the mucous membrane is thin and smooth.

Clinical Symptoms.—The most prominent symptom of intestinal catarrh is diarrhœa, especially if it is confined to the large intestine, although there may be no diarrhœa whatever if the inflammation is confined to the small intestine, as it is well known that the absorption of the fluids and the formation of the fæces are confined to the large intestine, and we often find intense inflammation of the small intestine with profuse diarrhœa without having the large intestine affected whatever. On the other hand, we often find inflammation of the rectum and no diarrhœa at all.

In making a diagnosis it is well not to identify too closely diarrhœa and catarrh of the intestines—that is, consider each case of diarrhœa as being due to catarrh of the bowels—as there are many conditions that increase the peristaltic action and cause diarrhœa that are not directly due to inflammation, such as cold or a sudden chill, to an animal that has been kept warm, to poisonous substances, from the administration of

laxatives or cathartics, or great exertion in an animal, not accustomed to it. It is, however, impossible to draw a distinct line between intestinal catarrh and diarrhœa, but a conclusion can be arrived at by the number, amount, and character of the diarrhœic discharges.

The number of stools varies, to a certain extent, and their consistency, from pulpy to thin, water evacuations. At first the passages are clearer than natural, and yellower, and as the condition goes on they become gray; this color is due to the fact that the passages are so frequent that the liver is not able to furnish sufficient bile to color them, and in a number of cases, there is a certain amount of thick gelatinous mucus mixed in the excremental matter. In some cases the mucus becomes very copious, and sometimes the passages are nothing but mucus, frequently frothy, the stool being filled with small bubbles of gas and an intensely offensive odor, and in rare cases blood and pus are present; for further details see page 27.

In intestinal catarrh the animal is restless, changing its position frequently, groans or cries, arches the back, or may rest the forepart of the body on the ground and have the hind quarters elevated. This is an indication of colicky pains. The examination of the abdomen externally does not furnish much information. Sometimes the abdomen is drawn up; in other cases it is distended. On applying the ear to the region of the abdomen, a great amount of gurgling or rolling is heard in the cavity; this may often be heard quite distinctly some distance from the animal. This is due to the increased peristaltic action. On pressing the posterior part of the abdomen, the animal often evinces pain.

Tenesmus and relaxation of the rectum are generally present in the later stages of this disease. The animal makes prolonged and repeated efforts to pass the excremental matter, and finally passes only small amounts of mucus and blood, after great exertion. In some cases these prolonged exertions cause the lower bowel to be protruded. This, however, is generally seen in young puppies and only in very rare instances in older dogs. If the tenesmus is very great, it indicates that there is great irritation of the lower bowel (as regards the examination of the lower bowel, see page 28).

The other symptoms of catarrh of the intestines are as follows: The color of the urine becomes dark from the tinting of the bile pigment and is lessened in quantity from the drain of fluids from the bowels. Fever is present, but it is generally slight. There is loss of appetite, vomiting, and yellow or icteric coloring of the mucous membranes, great thirst, and the animal becomes weak very quickly and shows great depression. This is specially noticeable when the inflammation is due to eating decayed meat.

Chronic catarrh of the bowels resembles the acute form in many

ways, but it is less severe in its symptoms. The fæces change from soft to firm, like the stools of diarrhœa, and *vice versa*, the animal becoming weak and thin, showing signs of anæmia; but in the chronic cases the appetite is generally very good. In some cases where the disease has been present a long time, when we examine the intestines by palpation, through the abdominal wall, the intestines are found to be firmer and less elastic.

Prognosis.—In strong animals, this disease is generally not very serious, but in young dogs or puppies, it causes great exhaustion and they die from collapse before the diarrhœa can be checked; the chronic form in old animals is generally very hard to control and must be looked upon as a grave condition. Often attacks follow one after the other, completely prostrating the animal and carrying it off finally.

Therapeutics.—In slight cases the only thing to do is to keep the animal in an even warm temperature, regulate the food and, as a rule, lessen it in quantity and make it easier digested. Soup or broth, mixed with bread or biscuit, rice, etc., friction to the stomach and a small quantity of alcohol, in the form of whiskey or sherry, for weak, delicate dogs. It must be borne in mind that in all cases of this disease the treatment will depend entirely on the causes and symptoms that are observed. If the cause has been the ingestion of decayed or putrid substances, or internal parasites, the first thing to do is to clean the intestinal canal out by means of a purgative, such as calomel, Glauber salt, or in weak subjects or puppies, olive oil. If there is any indication that the liver is disturbed, it is best to first administer a dose of calomel and follow up with a saline purgative. Where there are copious and thin discharges and an indication of excessive peristaltic action, laxatives are contra-indicated; it is advisable to use narcotics, and in this instance opium is always indicated, powdered opium, laudanum, morphia or Dover's powders. The attempt to substitute extract of belladonna or hyoscyamus and bromide of sodium in this disease has not proved to be very successful. Beside opium, we should also use the true astringents, such as tannic acid, calumbo root, and cascarilla bark. Certain preparations of bismuth have a tendency to disinfect the intestinal canal and also to soothe the irritated mucous membranes. Xeroform (bismuth tribomphenyticum) or bismuth subgallate or subnitrate. If ulceration of the bowels is indicated by symptoms, the albuminoid or organic preparations of silver or nitrate of silver are to be given, followed up by small doses of naphthalin, salicylic acid or creosote. If we suspect that there is a certain amount of putrid matter in the intestines beside, use saline laxatives to sweep out the decayed material; after doing this administer xeroform or resorcin (see treatment of mycotic gastro-enteritis). It is well to make one or two irrigations of the bowels daily by means of a rubber funnel and a piece of rubber hose with a pipe of hard rubber at the end, which

is inserted in the rectum, as far as possible, and the fluid poured into the funnel and allowed to gravitate slowly into the bowel. The best solutions to use are a 1 to 2 per cent. solution of tannin, alum, or 1/2 to 1 per cent. solution of silver nitrate or one of the various synthetical silver salts (argenol, argyrol, argentamine, picratol), the solution to be about 30 per cent. The amount to use is about 1 to 2 litres. If this amount causes much irritation and straining, it must be discontinued; but it is well to give the animal at least one injection by this method, as it helps to clean out the lower bowel and facilitate the action of the medicinal agent.

The treatment of chronic catarrh of the bowel is practically the same as the acute. Catarrh of the rectum may be caused by an extension of the irritant from the intestines, but this condition is more apt to result from mechanical irritants, very hard fæces, sharp splinters of bone or wood, rectal parasites; in male puppies that are housed with other older animals, particularly stud dogs, the rectum of the younger dog is frequently greatly irritated by attempted copulation on the part of the older male. Proctitis is recognized by difficult and painful defecation and the passage of small quantities of fæces covered with mucus and frequently bloody. When making a diagnosis, the rectum can be examined by means of the fingers previously oiled and introduced into the rectum or by means of a rectal speculum. After removing the cause, hard fæces or a foreign body, inject into the rectum, by means of a clyster apparatus already described, a thin mixture of starch with a small amount of opium in it or alum or organic silver solution. Tincture of nux vomica is very useful as a tonic in one or two-drop doses, before meals, twice daily. The quantity of food requires special attention. Give easily digested food and of a character that will not produce a large amount of fæces; bones, fat, tendinous, fibrous meat must be avoided. In order to counteract the loss of strength, give small quantities of rare or raw meat, finely chopped, milk, egg, rice and also the various peptone preparations. In young puppies the various infant foods so largely used in children practice are used as a substitute for milk. In persistent diarrhœa, give bismuth subgallate subnitrate or salicylate or the organic compounds of silver. In rare cases, where we find constipation present use a saturated solution of Glauber salt, in teaspoonful doses; Hunyadi, Apenta or other laxative waters may also be given. Any complication of the stomach will have to be treated by the method advised under Catarrh of the Stomach.

The toxic and mycotic inflammations of the stomach will be described separately.

Gastro-intestinal Inflammation.—Gastro-enteritis is caused by the absorption of various acids or irritating substances and also by the excessive use of drastic purgatives, such as aloes, calomel, croton oil. If the

drug should be slowly soluble, or in the powder form, or contained intimately mixed with some other substance, it may reach the small intestines or even the large intestines and the rectum.

The intensity of the disease depends on the amount of the drug taken and on the effect it has on the mucous membranes. The only result may be an attack of acute catarrh, with some loss of the epithelium of the mucous membrane, or there may be also a gangrenous destruction of the walls of the stomach. It is seldom that irritating agents get any further than that organ, wasting their strength there and changing the wall of the stomach into a blackened or tinder-like mass, and all the surrounding tissues are swollen and reddened by hyperæmia or hemorrhages.

We may safely conclude that we have a toxic gastro-enteritis to contend with when the symptoms of a serious gastric catarrh appear suddenly, especially after eating, and if the grave symptoms increase rapidly and are accompanied by loss of appetite, salivation, vomiting, great restlessness, severe pains taking the nature of colic, and on pressure on the abdomen, it is painful and greatly distended, the vomited matter and the passages from the intestines being mixed with mucus and blood, tenesmus, great weakness and small frequent pulse.

The treatment consists, first, in giving an emetic, or use a stomach-pump or wash the stomach, see page 21, and after that has had its effect, give a laxative, an oleaginous one (olive oil or linseed oil) is the best, rectal injections of warm water, if there is much pain and irritation, small quantities of opium can be given in the oil, and if the poison can be discovered, use the proper antidotes, which are given in the chapter on Poisoning.

Mycotic Inflammation of the Stomach and Intestines (Gastro-enteritis, Mycotic Decayed Meat Poisoning).—This is a variety of toxic inflammation, of the stomach and intestines. It is due to decayed meat poisoning. This is seen after the animal has eaten decomposed meat, offal or from drinking brine (Leisering), or eating cadavers of dogs or other animals that have died infected with bacteria, *i.e.*, pus, septic metritis, mastitis, enteritis, nephritis; from drinking or licking the juices of decayed meat, putrified cheese, sausage; fish and all such matters that are filled with toxines and tox-albumens, developed from the micro-organisms such materials contain, also from drinking from stagnant ponds and bodies of water containing decayed substances, or cadavers. This condition is seen in all sorts and conditions of animals, in the best fed and semi-starved, in the first from depraved appetite, due to indigestion. Even when they are well fed, they get into the habit, if they are allowed to roam in closely populated towns and villages, to go a regular route from one garbage pail to another and eat all sorts of decayed vegetable or animal matter. The active agent has a toxic principle present in it. The

symptoms of that form of poisoning are as follows: vomiting of an amount of very offensive matter, rotten masses of meat and with it quantities of bad-smelling mucus and sometimes accompanied by violent bloody diarrhœa, intense thirst and high fever, 40 to 42°. The writer has seen, however, instances where the temperature was subnormal, a small rapid pulse, great weakness, often complete paralysis, great depression and indifference to surroundings. Death generally follows with every symptom of collapse in 15 to 24 hours. If the symptoms are less acute, there is muscular or intestinal cramp, great difficulty in swallowing, disturbance of sight, dilatation of the pupils, bloody urine. When an animal makes a recovery, it is very weak for a long time, and it is almost impossible to get the animal to eat.

After death, the process of decomposition begins almost immediately, and if a post-mortem is to be held, it must be made as soon as possible. If this is done, the stomach and intestines will present, an intense hemorrhagic inflammation of their walls, swelling of the follicles and mesenteric glands, as well as severe inflammatory changes in the adjacent organs, liver, spleen, heart, etc.

The treatment has to be symptomatic. In the beginning give an emetic (apomorphia) subcutaneously, washing out the stomach, with warm water, or very weak solution of creolin, and the administration of purgatives, emulsions of castor, olive, or linseed oil, and tepid rectal injections of creolin, and massage the abdomen with alcohol or a priessnitz compress, with tepid water or flaxseed poultice. The bodily strength of the animal should be kept up, with black coffee, wine, whiskey, or brandy, spirits of camphor. When there is great depression, spirits of camphor may be injected subcutaneously. In mild cases we may treat them in certain lines as catarrh of the stomach and intestines. The animal should be fed on light foods, easily digested, and in small quantities, no solid meat the first forty-eight hours.

Constipation. Costiveness.

This condition may result, from the animal eating food that is difficult to digest, *i.e.*, potatoes, bread, beans, peas, dog biscuit, corn flour, bones, particularly calf bones, or where the animal has little or no exercise, animal kept on the chain or penned in a small yard, hunting dogs that have worked hard during the open season and during spring and summer do nothing, old dogs that have weakened digestions, particularly if they have suffered from chronic intestinal catarrh (see under that heading). Costiveness is also seen as a result of fever, rheumatism, peritonitis, catarrhal icterus, and diseases of the spine.

Obstipation.
(*Occlusio Intestini; Obturatio Intestini.*

Constrictions of the intestinal tract may be formed in any region and may vary in degree. They always produce more or less obstructions to the passage of the alimentary matter, and when the constriction becomes complete, the intestinal contents, being unable to pass, usually return toward the stomach again, and are expelled by vomiting. In such cases the animals die quickly. This is noticed in very rare instances, where a hernia has strangulated and completely blocked up the canal. (For further details see chapter on Hernia.)

Constriction may be caused by abnormal conditions of the intestinal contents, from the alteration of the intestinal walls, by changes in the position of the intestines, and, lastly, from external pressure.

The bowel is often blocked up by masses of excrement, as a result of improper food or feeding which is not digested in the stomach or intestine; these collections reach the lower bowel and from the constant accumulations of excrement coming down from the small intestines gradually blocks up the entire tract. We also see obstructions, caused by pieces of wood or splinters of bone, that collect masses of fæces around them and fill up the bowel, forming intestinal stones or calculi (coproliths). These invariably have a nidus or centre consisting of a marble, pieces of cork, sponge, or other foreign bodies, or it may be caused by large pieces of bone, stones, glass or metal balls, nuts, pieces of leather, etc., some of which may be swallowed accidentally in the case of trick dogs, or in play.

The constriction of the intestine, from being enclosed in a hernia and the impaction of the intestinal contents pressing into the part is frequently seen in the dog. The intestine frequently becomes twisted or knotted, or even invaginated. These complications, as a rule, occur in the small intestines. External compression of the intestines is frequently caused from enlarged prostate or sarcomas in the pelvic cavity, helminths or parasites that lie in cyst formations in the mucous membrane of the intestines. Sometimes enormous abscesses form in the abdominal cavity, and in rare instances they are caused by accumulations of fluids in the abdominal cavity, as in the case of ascites. In newly born puppies we sometimes see a congenital obstruction of the rectum (atresia ani). Great masses of fæcal matter may accumulate in the anal pouch; this may be due in some cases to the swelling of the anal glands, or by the accumulation of masses of hair gluing around the rectum and preventing defecation; the same condition is seen in tumors of the anus or rectum. For further details see page 29.

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When a portion of the intestine becomes obstructed, the following changes take place: In front of the obstruction, an enlargement forms, due to the accumulation of gas and excrement matter, while the portion of the intestine beyond the obstruction is empty and constricted. The accumulation of gas and matter causes an intense inflammation of the mucous membranes, which extends to the muscular coat of the intestines and soon to the serous coat, and quickly the entire intestinal tract is involved in the inflammation, the constricted portion becomes mortified, and perforation follows, allowing the contents of the intestines to escape in the abdominal cavity, causing purulent peritonitis.

Clinical Symptoms of Constipation.—The symptoms and course of constipation are due to so many different causes that they will be described separately.

In mild cases of constipation the symptoms are not especially characteristic and resemble chronic catarrh of the stomach. At first the animal is noticed to defecate irregularly, the stools are smaller and passed apparently with more or less difficulty, which is especially noticeable, considering the stools are very much smaller than natural.

When from having little exercise and living on highly spiced foods, (veal or game,) or eating quantities of bone that they are unable to digest, great accumulation of fæcal matter gathers in the colon and rectum. The most marked symptom is the repeated attempts of the animal to defecate without any results or after great efforts only succeeding in passing a small quantity of fæces. These are coated with mucus or blood and are passed with more or less pain. The stools are small and are generally yellowish-brown in color, and in powder-like masses that break up easily, showing no moisture in them. The position of the tail is characteristic. It is carried so as to form a curve at the rectum, the curve being from the base to one-half of the tail. On pressing the fingers into the sides of the abdomen, at the entrance of the pelvis up toward the spinal cord, we find an elongated sausage-like body which is extremely sensitive to the touch. This hard mass is found to extend downward and forward toward the umbilicus. The intestines are greatly swollen on account of the accumulation of gas and vomiting is sometimes present (Fig. 28). On making an examination of the intestines by the hand, we may be able to detect the distention. The colon is found to be dilated, through its entire length, forming an enormous sac, filled with a putty-like mass; and during palpation the animal as a rule evinces pain and resists it. This examination should be carefully made, as it may lead to the discovery of the original cause of the constipation. Slight diarrhœa may sometimes be present in severe constipation; this is due to the mass lying in a sac or pouch in the intestine, the firmer material gradually accumulating and the fluid fæces passing over the collected mass. Long continued consti-

pation (coprostasis) may cause infection of the blood from absorption of the fæcal matter, enteritis, mortification, peritonitis and death.

Symptoms of Obstruction of the Intestines.—In complete occlusion of the intestines, due to foreign bodies, invagination or tortion, the animal is irritable and cross and Trasbot has seen cases where the animal showed symptoms very similar to rabies or where it may present the other extreme, being dull and indifferent to the surroundings, refusing all food, but showing great thirst, with no passage of fæces whatever. The rectal temperature is slightly increased, the lower portion of the abdomen is inflated with gas and very painful, even on the slightest pressure; in some cases we may find decided icterus.
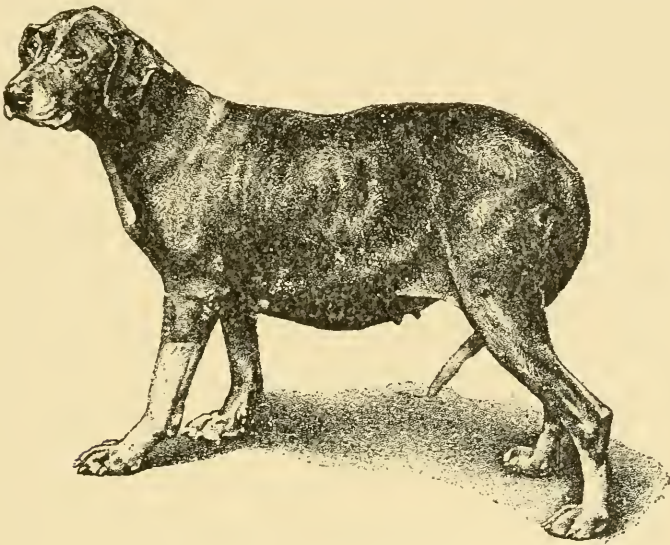
Fig. 28.—Dog with obstruction of the intestines.

The vomiting is constant and very severe, particularly in the later stages of the disease, the animal vomiting whenever it drinks any water. At first the vomited matter is normal, but later on it assumes a greenish color (bile) and finally putrid, containing pieces of fæcal matter.

By examining the abdominal region with the hand we can generally locate the obstruction, which is hard and exceedingly painful on pressure. The swelling can be moved about showing it to be part of the intestine.

In ordinary cases of constriction of the intestines, no definite prognosis can be made with any degree of certainty as to its course and duration. The constriction of the intestine may go on gradually and not cause any serious symptoms for a long time, or it may progress very rapidly and cause a complete constriction in two or three weeks. Where

the condition continues for some time, the animal becomes gradually weaker from day to day, loses flesh rapidly, pulse is smaller and finally imperceptible, the temperature may rise but frequently it remains normal, in a few days the animal may die in a condition of collapse. A favorable termination may result, and foreign bodies, such as pieces of cork, bone or wood may be macerated and passed out finally without any great trouble. It is not difficult, as a rule, to detect the existence of a foreign body in the intestines, but it is very difficult to tell its exact nature. By means of palpation of the abdomen, see page 25, we may be able to detect hard, foreign bodies, or objects, such as hair balls, but invagination or twisting of the intestines is, however, rather difficult to diagnose. Metallic objects, stones, etc., can be diagnosed by means of the Röntgen or X-ray, or by performing laparotomy. Where the intestine is completely obstructed, in front of the obstructed portion of the intestine, is greatly distended, due to the collection of fæces and gas, and the intestine immediately after the obstruction is contracted and empty. At the obstructed point there will be found great inflammation of the mucous membrane, which finally affects the muscular and serous coat and peritonitis, or the portion becomes necrosed and a purulent peritonitis follows and the animal at any of these stages may die of septicæmia.

Therapeutics.—In an ordinary case of constipation give plenty of exercise and a carefully regulated diet. If it is advisable to give the animal very little food for a few days, give plenty of water and small quantities of soup, either beef or vegetable. In old animals, where digestion is more or less weakened, give easily digested food and no bones whatever. Clysters or mechanical laxatives, such as glycerine or soap suppositories, and massage of the abdomen is advised. As a laxative, oleum ricini 15.0 to 30.0 in a capsule or emulsion, Glauber or Epsom salts, 10.0 to 20.0, Hunyadi Janos, or Apenta water, teaspoonful doses.

When a case is very obstinate and does not respond to the previously advised treatment, especially where we find the large colon filled with fæces, and laxatives have no effect, the rectum must be emptied. The finger after being well oiled is introduced into the anus where there will be found hard fæcal masses in front of the sphincter. It is generally impossible to remove them, except by breaking them up, either with the finger or having first injected a small quantity of oil or glycerine into the rectum, or the handle of a spoon can be used to break up the masses, taking care not to injure the mucous membrane. This is to be followed by the injection of the clysters by means of the hose and funnel (see Fig. 29). The lower part of the bowel is filled with a combination of lukewarm water and a small quantity of oil. These clysters should be repeated frequently, at least several times a day, or even several days, until the whole canal is emptied. Or what is better, glycerine suppositories,

and later on administer a sharp purgative, followed by the administration of drop-doses of tincture of nux vomica.

The subcutaneous injection of such drugs as physostigmin, pilocarpine and arecoline are not, as a rule, satisfactory and barium chloride,
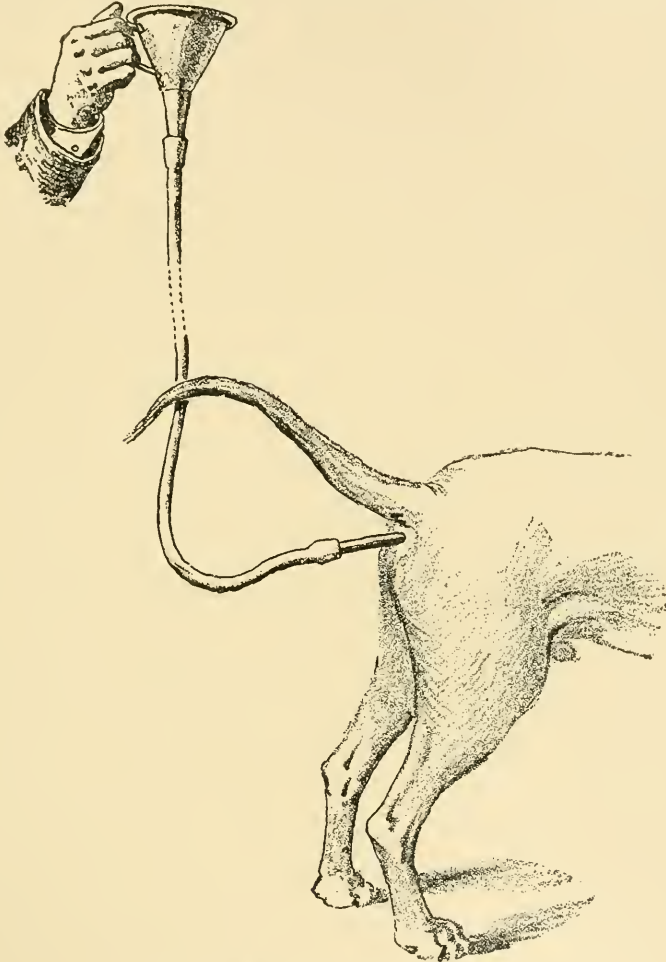
Fig. 29.—Mode of administering a clyster.

ichthlargan, tallianine are not to be advised, as their results are not at all satifactory and at times actually dangerous to the animal. These latter drugs are administered by intravenous injection into the saphena vein. The vein is dilated by means of pressure and when filled, the hypodermic needle is thrust into it, taking care the needle punctures the vein, which will be indicated by a few drops of blood coming from the needle and continuing to drop as long as the pressure is kept on the vein. If it is the

cellular tissue no venous blood escapes. The injection is made and the opening closed with collodion. As in the case in strangulated hernia, or in the case of accumulation of the fæces in the rectum, due to fæcal stagnation, or from the ulceration of abscesses of the rectum, we will have to treat them as described above; but we may add to that the injection of large quantities of soapy water several times daily, which can be given with the apparatus illustrated in Fig. 29, and a dose of calomel followed by castor or olive oil or glycerine injections into the rectum, or suppositories in the form of glycerine, or a solution of glycerine and water 1 to 10.

The stenosis of the bowel that is caused by the impaction of foreign bodies is best treated with laxatives and not with purgatives. Vogel and others advise in the case of sharp or pointed objects, to feed the
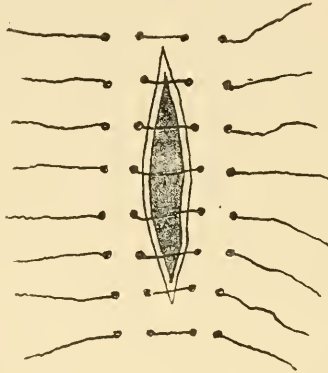
FIG. 30.—Lambert suture.

animal on thin liquid foods, soups of peas and vegetables, but if we do not succeed in getting rid of the foreign body and, if a positive diagnosis has been made, it is best to perform laparo-enterotomy as soon as possible, and not wait until gangrene and peritonitis have set in.

Laparo-enterotomy is performed in the following manner: the animal is anæsthetized and placed on its back, the lower part of the abdominal wall shaved and washed with antiseptics. Make an incision, through the linea alba, posterior to the umbilicus, back to the margin of the pubis about 5 to 8 cm. long. First cut through the skin, then the muscles. Before going into the abdominal cavity, all the hemorrhage must be checked and the blood cleaned off, and then with the thumb and index finger go into the abdominal cavity and, having located the portion of the intestine wanted, pull it through the opening and hold the lips of the wound together; an assistant can hold the edges of the wound together and prevent the rest of the intestines from escaping, and also to prevent possible infection from the escaping fluids, when the incision is made in

the intestine. Make the cut longitudinally, on the intestinal line, on the opposite side from the mesentery, remove the foreign body, taking care all through the operation to prevent the fluids escaping into the abdominal cavity. Wash the inside of the intestines with an antiseptic and unite it by means of Lambert's suture (see Fig. 30) or Czerny's double suture (see Fig. 31). For more exact detail on this subject, the reader is referred to the works on canine surgery by French or Hobday. The operator now takes a fine curved needle, and fine cat-gut suture and puts a number of stitches through the mucous membrane and serous tissues, taking care not to go through the mucous membrane, so that when the thread is tightened the two edges of the cut will be brought so as to face into the intestine; these are tied, and another line of stitches is made over the first, as is illustrated in the accompanying Fig. 31. The intestine is returned to the cavity, and the external wound sewed up with silk and
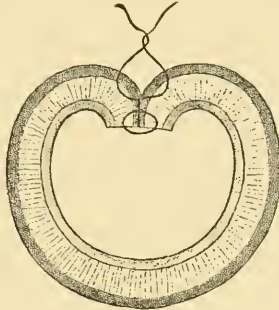
FIG. 31.—Suture of the intestines (*Czerny*).

dressed with an antiseptic dressing. In the male dog see that the dressing is not soiled with urine.

The opening of the abdominal cavity is also to be performed in cases where we can recognize a total constriction of the bowels. In these cases where the anatomical cause of the disease cannot be clearly established, we have no other way to proceed than to treat the symptoms as they present themselves, that is to give purgatives, or, in any case, do not neglect to give plenty of watery clysters. The general treatment must be directed toward keeping up the animal's strength. The first forty-eight hours only water must be given and in small quantities. Subcutaneous injections of the spirits of camphor or ether are better than administering them by the mouth, as they are vomited immediately. Do not give the animal any food until the intestinal obstruction has been removed or at least until there have been free defecation and the passage of the intestinal gas and the general condition is improved. And on the third day the animal may be given food; it must be of the lightest and easiest digested, such as soups, milk, bouillon with egg, meat, peptone, and on the fourth day finely scraped rare or raw beef, or some of the

various foods used as substitutes for milk.   Where the animal is subject to fæcal obstructions, it is well never to let him have bones if it can possibly be avoided.

Intestinal invagination occurs as a result of irregular or extraordinary peristalsis, particularly when the intestinal wall is in a relaxed, debilitated condition, as a result of intestinal catarrh from prolonged administration of laxatives.   Death as a rule occurs from the fifth to tenth day.   The symptoms of invagination are those of occlusion of the intestines, see the above, and more or less blood on the fæces.   We may be able by palpation to detect the invaginated portion by feeling a circumscribed elastic, elongated, sausage-like portion along the intestinal tract.   This is extremely painful on pressure.   If it is detected, perform laparotomy, reduce the invagination by lifting out the loop of intestine and reducing the invagination, but if the irritation is too great, or necrosis has developed, perform enterectomy.   See further on under Enterectomy.

Chronic Constipation.—This is seen occasionally in the dog.   It is due to a weakened or lessened peristaltic action of the bowels.   It is seen in all chronic diseases that are accompanied by emaciation and debility, as in chronic catarrh, fevers, icterus, chronic peritonitis and in many diseases of the nervous system; but it may be observed in many old but healthy dogs, caused by an atrophy of the mucous and muscular membranes of the intestines.   This disease is frequently called chronic obstipation, for it causes a form of constipation which would, as can be readily understood, cause just such a train of symptoms as has been described above.

These animals should be fed on non-stimulating, easily digested food with or without the admixture of vegetable soup, and also plenty of exercise and small doses of tincture of nux vomica.   This treatment is far better than the frequent administration of purgatives, especially Glauber salt, jalap or aloes and cathartic pills.

Enterectomy, Entero anastomosis.—This operation becomes necessary when a portion of the intestine becomes necrosed or where stenosis of a
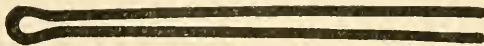
Fig. 32.—Hairpin method of anastomosis, showing the manner in which the pin is bent.

certain portion causes accumulation of fæcal matter anterior to the contraction.   The operation is only possible where there is a small section of the intestine to be removed, as a section of any amount is apt, if the animal makes a recovery, to be followed very quickly by marasmus and terminate fatally in a very short time.

French has devised a very simple mode of operation, the technique of which has proved very efficacious in the writer's hands.   It is as follows:

The animal is put under ether after the familiar antiseptic precautions are used, cut down on the abdominal wall and having exposed the necrosed or the stenosed portion, as the case may be, and very carefully inspect the mesenteric blood supply, as great care has to be taken not to
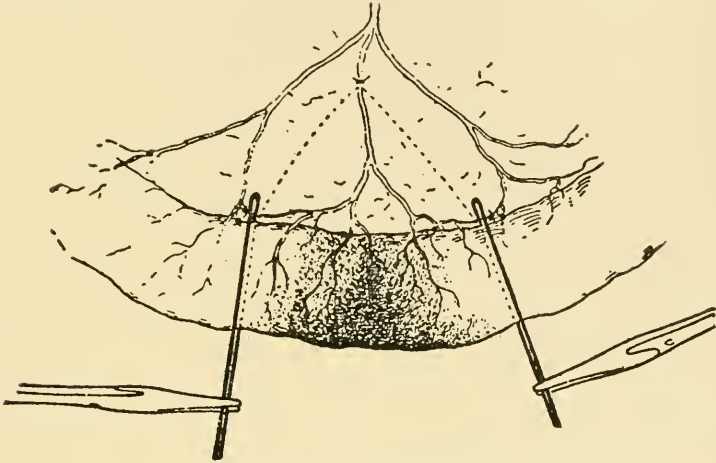
Fig. 33.—Hairpin method of anastomosis, first stage (*French*).

ligate any vessel that would supply any but the portion removed. The vessels are ligated by means of a curved needle being passed around them through the mesentery, the anastomosing loop of the blood vessel being taken up as close to the point of incision as possible. Then an ordinary
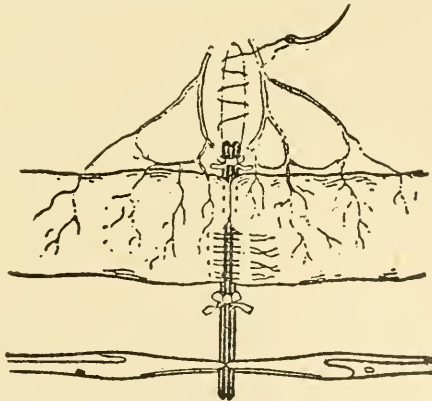
Fig. 34.—Hairpin method of anastomosis, second stage (*French*).

lady's hairpin, bent as in the accompanying cut (Fig. 32), is taken and one prong is passed transversely across the intestine and the free ends of the pin are seized by a pair of hemostatic forceps or tied with sutures and another pin is inserted in a similar manner at the other point of resection;

this point of the operation is illustrated in Fig. 33. The intestine is now cut close to the pins, and the mesentery cut as shown in the dotted line, the severed ends with the pins brought together and the pins tied or held by forceps both top and bottom (Fig. 34), and the suture is commenced at the mesentery, putting in the Lambert stitch on one side, then turn over the intestine and stitch the other side. The stitching is to be done very carefully and evenly, as on this depends the adhesion of the anastomosis. French recommends the ordinary milliner's instead of the surgical needle, as it makes a cylindrical hole that has no ragged edge and the opening adapts itself to the suture, preventing hemorrhage or leakage; the tops of the pins are now cut off by means of a pair of wire-cutters and withdrawn, one at a time, and the two openings left by the pins are sutured; great care is to be taken to keep the margins of the mesentery in apposition; the cut in the mesentery is now closed by means of a continuous suture. The after-treatment consists in keeping the animal on a strict liquid diet, juice of meat, clear soup, or bouillon for at least a week or ten days.

Prolapsus of the Rectum.
(*Prolapsus Recti et Ani.*)

Etiology and Pathological Anatomy.—The lower bowel is kept in place by the peri-proctal connective tissue, the rectal ring, the levator ani and the sphincter ani. By relaxing or distending these supports, we find a prolapsus of the mucous membrane, or even the entire rectum may be protruded (prolapsus recti), or a certain portion of the intestine may become invaginated and only the invaginated portion protrude (prolapsus recti cum invaginatione) or the prolapsed intestine may cause a rectal hernia (hernia recti rectocele). If this prolapsus is not relieved soon, it inflames very quickly and becomes torn and ulcerated, forming a great swelling. It may become strangulated, and in rare cases gangrenous. It generally results from a relaxed condition of the rectal mucous membrane or from excessive straining, from constipation, diarrhœa, or labor pains, from the continued use of hot or irritating clysters, from constitutional weakness of the sphincters and the peri-proctal connective tissues. It frequently occurs in young dogs that have catarrh of the lower bowel or as an accompaniment to distemper.

Symptoms.—If the mucous membrane is slightly protruded, it is only noticed during defecation or urination. It is seen in the form of dark red wrinkles that protrude from the rectum as soon as the abdominal pressure has ceased. If the whole bowel is prolapsed, we find under the tail a cylindrical projection, which protrudes from where the anus was, and hangs downward. The mucous membrane that is exposed is wrinkled

and congested, and at the centre of the dependent portion an indentation is seen; this is the opening of the intestine. Through this we can introduce the finger into the intestine. At the anterior end, the mucous membrane passes directly into the skin and the anal opening. If there is any invagination, the membrane does not terminate at the anus, but seems to go into the rectum, and the protrusion can be lifted up and passed into the rectum between the swelling and the rectum (see Fig. 35).

Therapeutics.—The first thing to do is to remove the cause, whether it be due to diarrhœa or constipation, by putting the animal under
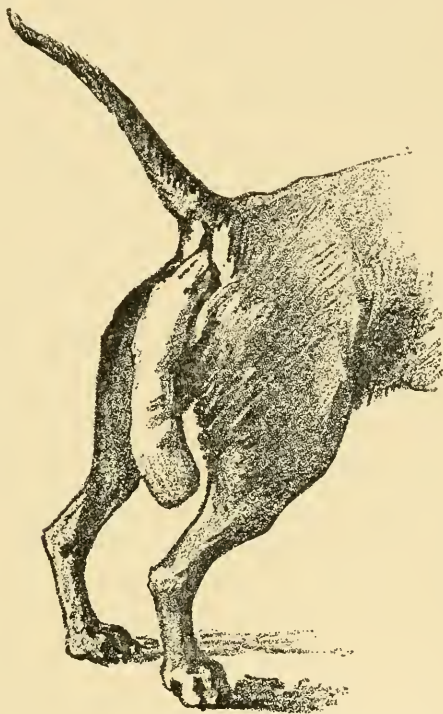
Fig. 35.—Prolapsus of the rectum with invagination.

treatment suitable for such conditions. The most important thing to do is to reduce the prolapsus as soon as possible; place the dog on his front legs and elevate the hind ones, and having cleaned and oiled the inflamed portion, return it to its normal position and fill it with astringent solution, and if it is a long-standing case, opium in suppository or 5 per cent. solution cocaine. If the mucous membrane is very much swollen and inflamed, it is best to scarify it slightly. If the folds of the mucous membrane are blackened and necrosed from prolonged exposure, they must be trimmed off with the scissors. The writer has generally succeeded, even in very bad cases, in reducing the protrusions by bathing

them with cold water or by compressing the protruded intestine on a rubber band, or muslin, commencing at the external end and winding toward the base of the swelling and while it is reduced by the pressure return it to its normal position. It is much more difficult to reduce an invaginated intestine, as the more you press on the protruded portion the more it packs into the end of the rectum. A large bougie or candle is inserted in the end of the protruded portion, and then it is pressed into its natural position; or if this does not succeed, perform laparotomy and draw the invaginated intestine back into position from the abdominal cavity. There is little danger from this operation, if it is performed with ordinary caution. The administration of a hypodermic injection of morphia will insure relaxation and less straining on the part of the animal.

After replacing the intestine, it is generally necessary to place a stitch around the perineum, so as to prevent the recurrence of the protrusion. What is called a tobacco pouch stitch is carried around the anus, and when the strings are drawn it will be seen (as in the cut, Fig. 36) that it prevents a recurrence of the protrusion by drawing the anus together. The sewing of the rectum by this stitch closes up the opening sufficiently to prevent the bowel coming out, but not enough to prevent the escape of liquid fæcal matter. It is not advisable to apply cold irrigations or inject astringents, as the dog is very apt to strain more violently after application of either of these remedies.

At the same time, if the trouble is caused by diarrhœa, give opium, and if caused by constipation, administer saline purgatives. Stockfelt advised that a series of pins should be placed around the rectum and united with threads, and thus produce a greater constriction from the cicatrix when the irritation heals, so as to hold the parts in position.

Grey made an opening on the median line of the abdomen and drew back the intestine and stitched it to the opening with cat-gut sutures, taking care not to put the stitch through into the mucous membrane of the intestine.

When the prolapsus has been of long duration and reduction seems impossible, it is best to take means to remove the protruded portion of the intestines.

Amputation and Sewing by Means of the Double Suture.—Cut off the hair from the region of the anus, then wash the affected parts and region, with an antiseptic, put the animal under ether, the animal is laid on a table, the posterior part of the body is elevated, the prolapsed portion pulled out by means of forceps until normal mucous membrane is seen. Then wash off and apply a rubber band tourniquet as close up to the anus as possible, then a curved needle is passed through both layers,

and brought up to the surface. This is facilitated by inserting an ordinary thermometer into the lumen of the intestine (Hobday) or, better still, a cylinder of carrot (Viborg). Tie this stitch and put another stitch beside this, and continue around the intestine until it is stitched up. Cut off the portion posterior to the stitches, remove portion of carrot and push the stump back through the anus.

Amputation by Means of a Cross Suture.— The method advocated by Miller is performed in the following manner: the animal is etherized and the hair removed, the skin cleaned and two needles with linen or silk suture put crosswise, as in Fig. 37, through the prolapsed portion, the portion posterior to the stitch, is cut off; the stitches are then pulled out from the lumen of the intestine and cut in the centre, thus making two threads. These should be tied, as in the second figure of the cut.

Another method is to place the animal under ether, and having laid it on a table with the posterior extremities elevated, the prolapsed portion is pulled as far as possible out of the rectum. It must then be rubbed in the hands, to remove as

Fig. 36.—Stitching rectum (tobacco-bag stitch); *a,* method of stitching; b, stitch tied.

much blood from it as possible, or a rubber band wound around it, from its extremity to its base, and finally ligated at its base, and then, by means of a bistoury, the protrusion is cut off about one-half of an inch from the ligation.
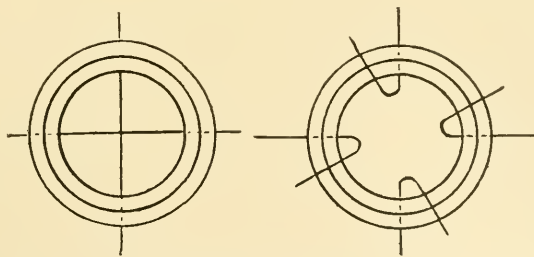
Fig. 37.—Method of suturing in amputation of the lower bowel.

After the blood vessels have been taken up by means of an interrupted stitch (the interrupted stitch is much better, as it makes the union of the lips of the wound much closer), sew up the serous membrane, and afterward sew the muscular and mucous membranes; the rubber band is removed, and the stump is pushed back into the opening.

Malformations of the Rectum and Anus.

Numerous malformations occur in the rectum; projecting polypus formations of the mucous membrane of the lower bowel may project from the rectum constantly, or may only be seen during defecation. We may also find fibroma, adenoma, and other forms of tumors. The writer had a particularly interesting case in a small dog that was quite old. The owner had observed a slight bleeding from the rectum for at least a year; the rectum was examined by means of a speculum and a carcinoma was found. It was located about 5 cm. from anus on the superior portion of the rectum. This tumor had hard raised irregular edges and depressed in the middle. In the peri-proctal connective tissue, we occasionally find adenoma, sarcoma and carcinoma. These growths are apt to cause considerable trouble, as they cause constriction of the mucous membrane and interfere with defecation.

In the anus, we find several types of tumors which we class, in a general way, as anal cancers. They may either be adenomas or carcinomas and, as a rule, present mushroom or fungus-like bodies growing firmly in the skin tissue itself, but having no attachment to the connective tissue. Generally they are firm, or slightly elastic, and when they reach a certain size, they are very slightly attached at their outer edge, and the majority of them can be lifted from their base.

When they reach any size, they are apt to interfere with defecation. These tumors are easily removed, particularly when they have reached a certain size. The only precaution to be observed is to remove the tumor in its entirety and to avoid injuring the sphincter, which would be apt to result either in paralysis of the sphincter or a rectal fistula. Frick advises early removal of tumors from the interior of the rectum. For information of the diseases of the rectum see page 74.

Imperforate Anus, Inflammation of the Anal Pouches, Diverticulum of the Rectum and Hemorrhoids are classed under this Heading.

Imperforate Anus (*Atresia Ani and Atresia Ani et Recti*).—This is a congenital deformity and consists of a defective formation of the rectum and in some cases of the lower bowel. It is seen in newly born puppies, and it is usually confined to the cutaneous covering growing over the anus (atresia ani), or it may be the rectum is only partially developed and it ends in a blind sac some distance from the rectum (atresia ani et recti). In these cases, the fæces are not passed and an artificial opening must be made. The treatment is to cut the skin with a small knife, and the edge of the wound sewed back, so as to prevent it from uniting again;

but if it is found that the lower bowel is entirely occluded, it is better to destroy the puppy. But if treatment is to be tried as in a particularly valuable puppy, we can make a cross incision and by means of the index finger we locate the blind end of the floating colon then, by means of the forceps, draw it to the surface, open it and stitch the edges around the anal opening, as in an ordinary wound.

Inflammation of the Anal Pouches.—These glands are located on both sides of the anus, lying between the anus and the mucous membrane.
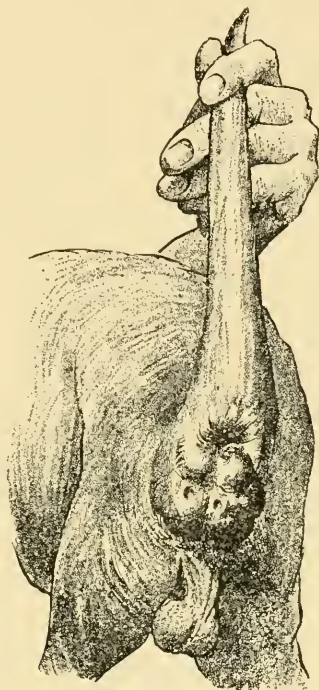
Fig. 38.—Inflammation of the anal glands.

The interior of the pouch is filled with tubular shaped glandular tissue, ending in a short thin canal, see Fig. 38. The secretion of the gland is a yellowish brown fluid, with a very unpleasant odor and an acid reaction. From a variety of causes, such as local irritation, the accumulation of hard fæces, splinters of bone, etc., and from various irritations of the rectum, these glands become inflamed and the anus becomes swollen, on one or both sides, generally the latter. The region is warm, painful to the touch, and there is more or less fluctuation in the swellings. The animal makes repeated attempts at defecation and there is every evidence of tenesmus. The animal is continually licking the anus and pulling and sliding the hind quarters on the ground. On pressing the swellings between the fingers, the contents of the anal pouches are emptied and are expelled

from the anus; this is a thick yellowish-brown liquid, often stained with blood, and it has a very fœtid odor. In some instances the swelling breaks through the skin at the anus, forming an anal fistula.

The treatment consists in pressing the engorged glandular tissue between the fingers, either the two fingers externally, or putting the index finger into the rectum, and pressing on the pouches. If they cannot be emptied in this manner, they must be opened by means of a curved bistoury, and Gutman injects tincture of iodine into the gland. In rare
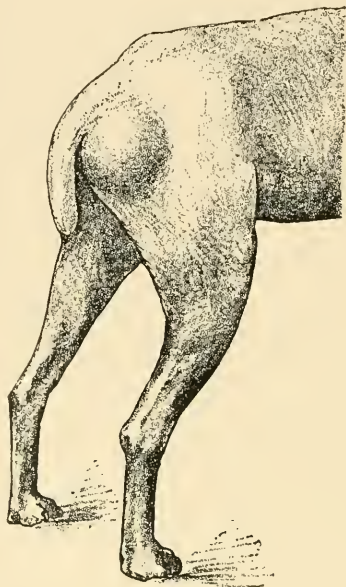
Fig. 39.—Pseudo-perineal hernia.

instances it is necessary to curette the pouches. The general condition may be assisted by laxatives, to assist in easier defecation.

Abscess of the Anal Glands.—The anal glands (acinos gland) which are situated in the sphincter, forming the anus, become inflamed and cause a swelling of the entire neighborhood of the anus, causing great interference with defecation. These generally form pus, fluctuate and break. The treatment consists in opening the abscesses and treating them antiseptically.

Diverticulum of the Rectum, Pseudo-perineal Hernia.—From the frequent accumulation of fæces in the rectum, particularly in old animals, the terminal portion of the floating colon and rectum becomes dilated and forms a sac, and when this diverticulum becomes filled, the neighboring structures are pushed out, and the condition may be mistaken for perineal hernia (Fig. 39.) It can be differentiated from hernia by the fact that

in this case the tumor is hard and putty-like and introducing the finger into the rectum it is found to be filled with hard fæcal matter. The treatment consists in breaking up the fæcal matter and removing it either with the finger, instruments, or by means of clysters, gluten or glycerine suppositories, giving the animal food suitable for this condition. Lienaux operated by cutting the rectum, pulling out all the dilated portion, excising it, and sewing the intestine to the anus as in prolapsus of the rectum. (see Fig, 37).

Hemorrhoids.

These are diffuse or knot-shaped (varicose) distentions of the posterior veins of the lower bowel at the anus. According to their position, we may call them external or internal hemorrhoids.

The former are located outside the sphincter ani and in the subcutaneous connective tissue. The latter are located inside the sphincter and under the mucous membrane. Sometimes these enlarged veins burst and cause considerable hemorrhage. This, however, rarely amounts to anything, as the mucous membrane is generally more or less inflamed all the time, and often the fæces are covered with mucous when they are passed. It is not a rare affection in older dogs.

Clinical Symptoms.—The act of defecation is painful, the fæces covered with mucus and sometimes blood—either pure blood or blood and mucus mixed. On making a digital examination, which is very painful, the mucous membrane is found to be roughened and uneven, or we may see one knotty lump in the orifice of the anus. In rare instances they appear as bluish-red ulcers which encircle the reddened rectum. The animal is nervous, irritable, sliding the posterior part of the body on the floor, especially on the carpet, so as to rub the rectum, and licking the anus frequently.

The causes can generally be ascribed to a stagnation of the veins, from irritation of the membranes, from bile or irritants due to poor or faulty digestion, too much food, and in the majority of instances it will be found that the liver is congested or inactive, from chronic constipation or lack of exercise (Vogel states it follows pregnancy), and carcinoma or stenosis in the posterior portion of the intestinal canal. In some cases it is due to a disturbance of the circulation, from disease of the heart or lungs, and from the irritation of habitual constipation.

Therapeutics.—The best treatment to pursue is first to use saline laxatives, but not in large enough doses to purge, such as sulphate of magnesia or sulphate of sodium, and cold enema and the application of an ointment of lead plaster. Any knots may be removed by ligature, scarification, or by the scissors, and afterward touched by the thermocautery.

6

INTESTINAL PARASITES.

(Helminthiasis.)

Round Worms, Maw Worms (Ascaris Mystax).

Natural History.—The round worm of the dog, **ascaris mystax, ascaris marginata,** is white or yellowish-white, slightly reddish in color and twisted in spirals; there is a difference in the two sexes (see Fig. 40), the males are about 6 cm. and the female about 12 cm. Their thickness varies from 1 to 1.5 mm. The head is slightly flattened and fitted with two wing-shaped borders, which start from the mouth and enlarge slightly as they pass posteriorly. The mouth is a round small opening, and fitted with three to six small lips, which cover a number of proportionately large teeth. The caudal end of the male parasite is
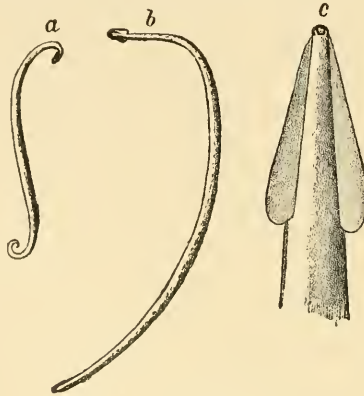
Fig. 40.—Ascaris mystax.

curved and pointed and has numerous small papillæ on each side. The caudal end of the female is pointed and straight. The vulva is about the end of the first fourth of the body from the head. In the genital organs there can generally be seen quantities of round eggs that on examination are found to have a thick, hard shell, which is marked by numerous small grooves. These eggs are found in enormous quantities in the fæces of all dogs affected with the round worm (see Fig. 15). The development of the embryo is not yet thoroughly understood, but from the experiments of Grassi, Penberthy, Albrecht, Frohner, it has been demonstrated that the intestines of puppies that have never taken anything but the mother's milk, contain numerous ascarides, and they have demonstrated that an intermediate host is not necessary, but the worms can be developed directly from the eggs in another animal of the same species.

As a rule, the round worms cause little trouble in the dog. Pemberthy found 250 in a six weeks old puppy that had constant vomiting,

intestinal catarrh, emaciation, anæmia and decreased temperature. But in some instances, large masses of these worms collect and cause considerable catarrhal disturbance of the intestines, or they may even cause symptoms of intestinal stenosis. In rare instances, the parasites produce numerous hemorrhagic furrows or indentations in the mucous membrane. There is no doubt that in some cases round worms cause considerable nervous disturbance, such as cramps or epilepsy, and may even perforate the intestinal wall, causing a secondary peritonitis. The penetration of the parasite into the bile duct has been observed in young animals—puppies under six months. From the observations of Kitt, Gasteiger, Mingazzini, there is no doubt that these parasites cause harm, not only by absorbing nourishment that should go to the host, but by producing and excreting certain toxic substances that cause both inflammatory changes and nervous disturbances. These nervous symptoms generally disappear with the expulsion of the parasite.

Therapeutics.—The principal agent used to remove the round worm is floris cinæ and santonin, the alkaloid of the plant Artemisia santonica. Both can be administered and followed up by a dose of castor oil, or the oil may be given with them. The floris cinæ is given in doses of 2.0 to 10.0 and the santonin in doses of 0.05 to 0.2 for the adult dog and from 0.01 to 0.05 for young or smaller dogs. For the young puppy give 0.025 rubbed up in a little sugar, or in triturate. Decoctions of garlic, thymol, areca nut, are all administered by their various advocates. As a prophylactic measure, pregnant bitches that are about to whelp and are suspected of having ascarides should be put in another place, situated some distance from where they are to whelp and subsequently nurse their puppies and are then given medicine to expel the parasites. This should be followed by a laxative, to wash out the parasites and what eggs may be in the rectum; and after that the region of the anus should be washed to further remove the eggs that may be in that region. Then the bitch is returned to the place where she is to whelp.

 ℞. Flor. cinæ pulv,   10.0
   Ol. ricini,   50.0
  Sig.—To be given on an empty stomach.
 ℞. Santonin,   0.3
   Chloroformum,   5.0
   Ol. ricini,   50.0
   Saccharum,   0.01
  Sig.—One-half in the morning and other in the afternoon.
 ℞. Santonin,   0.2 to 0.3
   Ol. ricini,   45.0 to 60.0
  Shake the bottle before using.
  Sig —Divide into three portions and give one every four hours.

Tape-worm.

Natural History.—The cestodes are flat tape-like worms without mouth or intestines. They grow from one parent or head scolex and adhere together, in a long ribbon-like colony. The head is furnished with sucking cups and hooks, by which means it adheres to the mucous membranes of the intestines. The parasite is narrow at the neck, gradually widening and at its termination it consists of a number of matured segments that separate from the parent parasite, when they are fully developed, and are carried out among the fæces. Each segment is complete in itself, having both male and female genital organs. This order are hermaphrodites and are peculiar from the fact that they produce the germs of the new nursing mothers, of the shape of eggs, while the nurse remains sexless. The ripe segments (proglottides) are soon detached and pass either into manure, or in water, plants or grass. The proglottides break up and the eggs scatter in all directions. The eggs are covered with a hard, tough shell, inside of which is a six-hooked embryo. If the egg is taken into the stomach, the acid gastric juice dissolves the shell; the embryo is liberated, and immediately fastens the hooks into the mucous membrane of the intestine and from there penetrates into the connective tissue of some of the adjacent organs, where it forms a sac-like cyst. These cysts contain fluid, and are termed bladder worms, when empty and cysticercus or cysticercoids when they contain fluid. In each of these bladders we find the individual tænia head furnished with hooks and the sucking caps. In some forms of the tænia these bladders divide and subdivide into numerous daughter-cysts or breeding buds, all of which produce the little heads of the tænia. This is frequently seen in the echinococcus, where enormous masses are found. If any animal, or proper secondary host, gets one of these ripe bladder worms into the stomach the gastric juice dissolves its covering and it finds its way to the duodenum, where it fastens itself by means of its hooks and sucking apparatus and instantly becomes a breeding parasite.

The anatomical structure of the cestodes is very simple. The body parenchyma is divided into two layers, an external and an inner covering. In the latter, we find the sexual organs. The external layer is chiefly muscular, and contains also a mass of calcareous nodules that replace the defective bony structure of the cestodes. The surface of the head is covered with a skin or cuticle, from which the hooks originate. A digestive system and blood vessels are absent, but in the inner layer we find a system of very much branched water vascular system, which is connected with two elongated canals, united at each joint by a cross system of similar canals, which is said to serve as an excretory apparatus.

The branches running into these canals end in a common orifice. Each link or segment has an independent male and female sexual apparatus. The male apparatus consists of numerous pear-shaped testicular bladders with a canal of exit. The end can be turned up into the female opening. In the female portion we find ovaries, uterus and vagina. The uterus is remarkably well defined in each segment (see Fig. 41).

The following varieties are seen in the dog:

Tænia Serrata (Fig. 42).—This variety is from 0.5 to 6 m. in length and about 0.6 cm. in width when fully developed. The head is large, proportionately, bullet-shaped, often four-sided, and is fitted with about 40 hooks in two rows and also sucking disks, which are oval in shape. The first sections after the head are very narrow, and the middle sections are almost four-sided. The anterior bor-
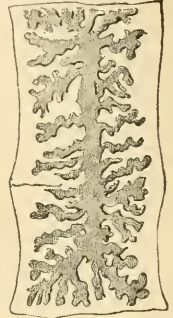
Fig. 41.—Uterus of the Tænia cœnurus (enlarged).
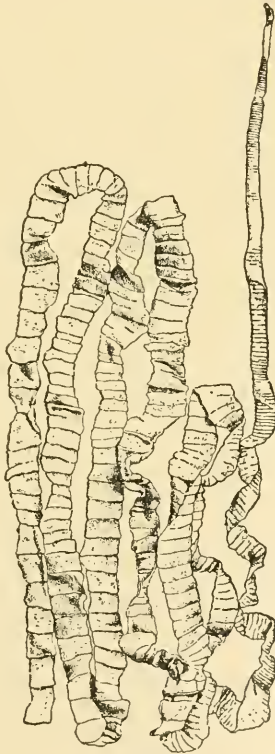
Fig. 42.—Tænia serrata.

der of the segments is much narrower than the posterior. The edges are serrated or saw-like, hence the name. The genital orifice is situated

on the border, alternating one on the right and next on the left. The
full-grown segments are nearly square or may be broader than long.
The uterus has a long central body, with eight branches on the side.
These send out numerous subdivisions from each individual branch.
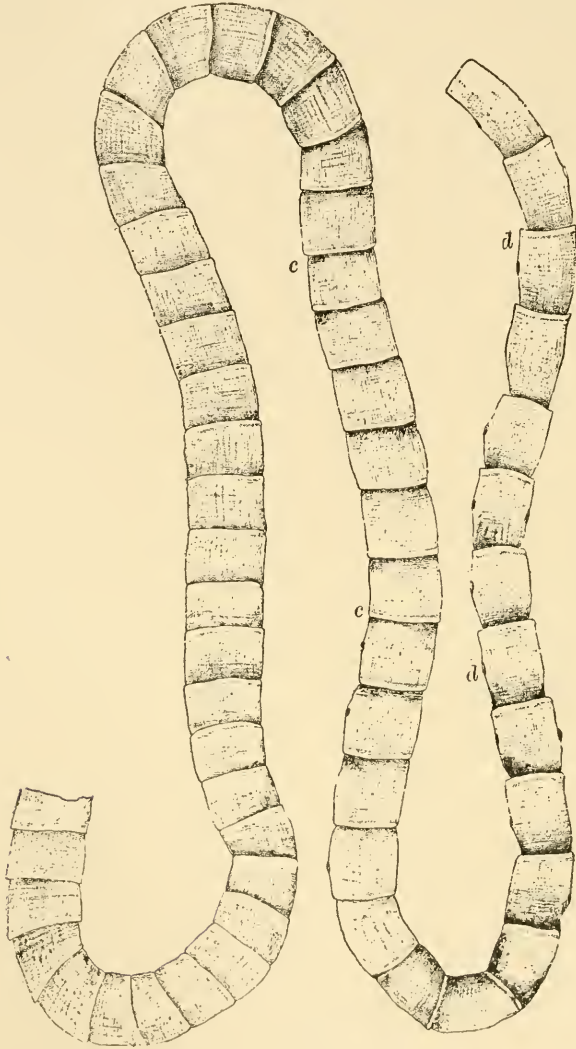
Fig. 43.—Tænia marginata, posterior end of worm.

The eggs are indented on the sides and have a hard tough shell, 36 to
40 mm. long 31 to 36 mm. wide. The bladder worm is found in the
liver of the wild and domestic hare, called the cysticerus pisiformis.
This grape-shaped cyst has been found to grow as large as a hazel nut, has

been found by Lesbre in the brain of a dog affected by tænia serrata. This was probably caused by self-infection. This animal exhibited symptoms resembling rabies, and was incessantly grinding the teeth and snapping the jaws.

Tænia Marginata (Fig. 43).—This is the longest and widest tænia of the dog, being from 1.5 to 3 m. in length. In rare instances it has been found to be 5 m. and the width of the developed segments is about 0.5 cm. Its head is nearly rounded with four small sucking disks and a double crown of 36 hooks. The segments are nearly square. In the middle of the colony they may even be broader than long, with irregular edges and partially overlap the following section. The sexual orifice which is situated on the margin may be alternately on the right
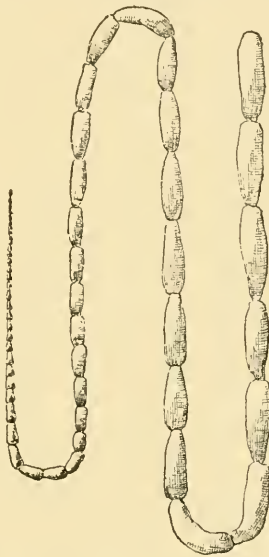
Fig. 44.—Tænia cucumerina, Dipylidium caninum.

or left side, the right sections are longer than their width, which are 14 to 16 mm. and 5 to 7 mm. wide. The uterus has a short central body and has five branches on either side, which are intertwined. The eggs are irregularly round and enveloped in a tough thick shell. The bladder worm of the tænia marginata is the cysticercus tenuicollis, and is found in the serous tissues of the sheep, cow, goat, pig, squirrel, and monkey in captivity, and occasionally in man (Dewitz). Frequently we find the cysticercus on the peritoneum and liver of the sheep and pig, varying in size from a pea to the size of a man's fist.

Tænia Cucumerina (Dipylidium Caninum) (Fig. 44).—This is a small tænia 10 to 40 cm. long and 3 mm. wide. It has a small elongated head, with sixty hooks with a retracted mouth or proboscis; the seg-

ments are rounded at the corners and are the shape of a cucumber, hence the name, and have a small sexual orifice at each end. The individual sections are about 8 to 10 mm. long and 3 mm. wide. These segments are easily detachable, and are reddish-pink in color. This coloration is due
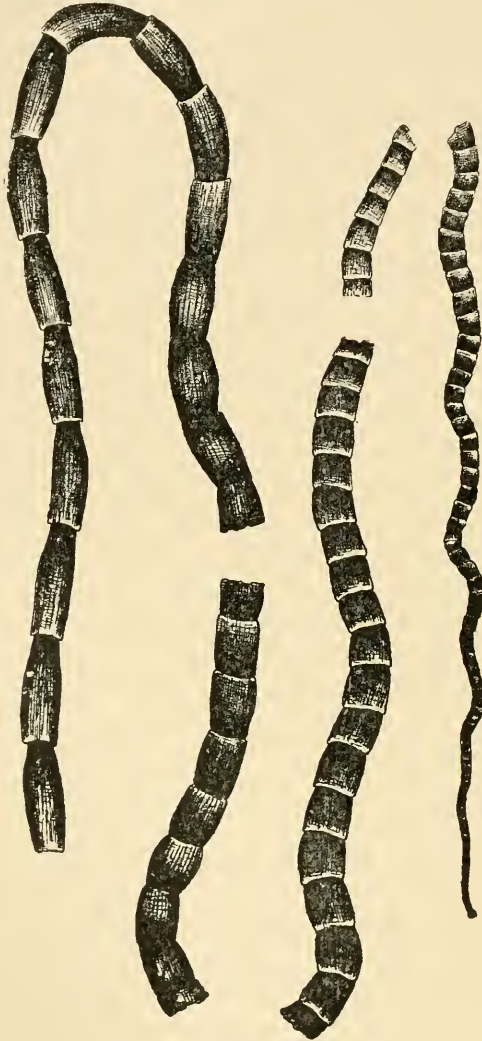
Fig. 45.—Tænia cœnurus.

to the color of the shell of the egg. The uterus is irregular, with double-shelled, rounded eggs, six to fifteen massed together in elongated cocoons. The primary stage of this tænia which is very common in the dog, is in the abdominal cavity of the dog-louse (trichodectes canis) (Metchnikoff)

and also in the common dog-flea (certopsyllus canis) and in the flea of man (pulex irritans).

Tænia Cœnurus (Fig. 45).—This tænia is generally about 40 cm. long, although in rare instances it may be 1 m. It has a small pear-shaped head, with twenty-four to thirty hooks and four sucking disks. The anterior links of the colony are always very short, and those at the extreme end are elongated and narrow, 7 to 13 mm. long and 3 to 3.5 wide, white and shaped like a cucumber seed. The uterus has a long central body, with eighteen to twenty-six side branches. The eggs have a hard shell, elliptical and 30 to 36 mm. diameter with an indurated border. The larval state of this tænia, which is the cœnurus cerebralis (bladder worm), varies in size from a small seed to a large egg, and has a number of nursing or daughter-cysts or bladders on its inner wall. It is generally located in the brain, and in rare instances in the spinal cord. It is seen in all ruminants, especially sheep.

Tænia Echinococcus (Fig. 46).—This is the smallest tænia of the dog, most dangerous to man. Its greatest length is 4.4 mm., and it has three and in rare instances four segments. The last segment is the largest and the only one to possess sexual organs. The uterus is large and irregular, without any central border. The head is round and has four sucking bodies and twenty-four to forty-eight small imperfectly developed hooks, arranged in two rows. The eggs are round and slightly elongated, the shell being formed in several layers. The bladder worm is the echinococcus polymorphus; the bladder is filled with a nonalbuminous fluid and generally has daughter-cysts on the sides. These cysts may assume enormous proportions, ranging in size from a pea to a

FIG. 46.—Tænia echinococcus: *a*, tapeworm, enlarged twelve times; *b*, cyst containing head; *c*, immature head.

man's head or even larger and on the walls we find numerous ammen heads. There are two varieties of the echinococcus, the distinguishing characters being the length of the hooks and the arrangement of the eggs. It is found in the pig, cattle and sheep and very rarely in solipeds and carnivora. In man it is generally found in or attached to the liver or peritoneum, but it has also been found in the lungs, kidneys, spleen, muscular system, pleura, bones and the brain.

The following parasites are occasionally found in the dog:

Tænia Serialis.—This parasite, about 35 to 75 mm. long, resembles the Tænia cœnurus. The intermediate host of this parasite is found in the rabbit.

Tænia Litterata, pseudo-cucumerina, Tænia lineata. This parasite resembles the Tænia cucumerina, is found in the fox, but rarely in the dog.

When animals live on the sea-shore we frequently find them affected with bothriocephalus latus. This parasite is found in its immature state in certain fish.

Tape-worms are very common in dogs; some observers claim as high as 54 per cent. of all animals. In Europe all varieties of the parasites seem to occur according to different speaking countries. The record given by Schones is as follows: Hunting dogs 52.94 per cent. were affected mostly with Tænia serrata; butchers' dogs 66.66 per cent., mostly Tænia marginata; watch dogs confined to the yards and grounds around buildings 40.44, mostly Tænia cucumerina; work dogs used to pull, 72.22, mostly Tænia marginata; sheep dogs, 57.14 were affected not only with Tænia cœnurus to the extent of 7.14, but were also infected with Tænia marginata, Tænia serrata, Tænia cucumerina; pet dogs 70.37, of which 36 had Tænia marginata, Tænia cucumerina and 15.74 Tænia serrata.
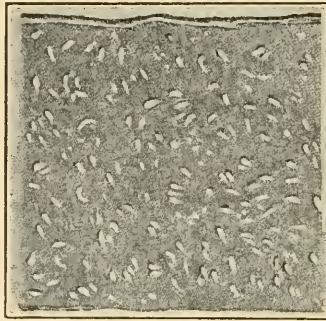
Fig. 47.—Tænia echinococcus; mucous membrane of a portion of the intestine covered with the parasites.

The writer finds in the United States by far the most prevalent is the Tænia cucumerina, occurring in eighty-two of these cases, Tænia serrata ten, and marginata only in two instances, and Tænia echinococcus never observed.

There is no question that one individual is attacked to a greater extent than others, and the parasite finds more favorable conditions in the mucous membrane of the intestine of certain animals. The parasites may be found in enormous numbers, particularly the Echinococcus when they cover the mucous membrane and give it a velvety appearance (Fig. 47).

Clinical Symptoms.—When tape-worms are present they generally cause more or less disturbance in the host. Very decided symptoms, such as chronic intestinal catarrh, can sometimes be attributed directly to the presence of the parasites. Infected animals, as a rule, are restless, great eaters, and in spite of the amount of food they eat they remain thin. Often they produce the same symptoms as ascarides,

but, as a rule, the tape-worm causes much more trouble than the round worms. Schieferdecker found that in the duodenum, where the Tænia cucumerina are generally found, the mucous membrane had numerous small tunnels through which the tænia passed in and out, and caused a peculiar hypertrophy of the papillæ; in some cases they were four or five times their own length. In some cases Lieberkuhn's glands were sunken and collapsed and in several cases had completely disappeared. The Tænia echinococcus, when they are present in large numbers, cause great irritation of the intestines, with hemorrhagic infarction of the tissues. In nervous animals they cause epileptic spasms or even symptoms of rabies, such as a change of voice, paralysis of the lower jaw, dulness and indifference to surroundings; Friedberger and Frohner have also observed similar symptoms in dogs that have been affected with a Tænia cucumerina. In rare instances the tænia have been known to perforate the intestines. According to the observations of Cadeac, the perforation was made by two of the Tænia serrata. In a great number of instances it is impossible to say positively that the animal has tape-worm unless the segments are observed in the fæces, and the most dangerous to man (Tænia echinococcus) is extremely hard to find, on account of the small size of the segments. The other tape-worms are comparatively easy to find, as the segments are readily seen on the outside of the stools or catch in the anus and hang on the hair, the dog frequently drawing attention to them by licking the anus or drawing the hind extremity along the floor by means of the front legs. In doubtful cases it is well to give a small dose of some tæniafuge, and the animal will generally pass a few segments.

Therapeutics.—The most important of the numerous tæniafuges recommended are as follows:

1. **Extract of Male Fern (extractum filix mas).**—According to the experience of the author, it is the best agent to use. It is to be given on an empty stomach (in the morning being the best time). In small dogs in doses from 0.5 to 1.0 and in large animals 2.0 to 5.0, in pill form or in capsule. As this drug has no purgative properties, it must be followed up in one or two hours by a dose of castor oil (30 to 50 grammes). Male fern is very liable to deteriorate if kept any length of time. Therefore it is wise to procure it from a drug house that can guarantee it is fresh. It must be borne in mind that male fern in large doses is a poison, and the maximum (4.0) must not be exceeded in a large dog. Gesimer advises filmaron in 0.2 to 1.0 capsules or a 10 per cent. solution of filmaron. This should be given in the morning on an empty stomach and followed by a dose of castor oil.

2. **Kamala.**—This is to be given in doses of 2 to 8 gm., and in large animals up to 15.0. The powder may be rubbed in with a little ether

and given in capsule but when the powder is bulky, as in large doses, it may be mixed with honey or syrup. It must be repeated in one hour after the first dose. As it is a purgative, it is not necessary to follow it up with any other drug, which is an advantage, but to completely empty the intestines of the parasite, it is sometimes wise to follow it with a laxative.

3. **Kusso** (**Flores koso**).—This is to be given in doses from 2.0 to 6.0 grammes, diluted with milk, repeated three or four times at intervals of three-quarters to an hour. Only a good result can be expected when the drug is fresh. This should be mixed with, or followed by, a small quantity of castor oil.

4. **Areca Nut.**—The pulverized areca nut is administered in from 1.0 to 4.0 in capsule mixed with honey or butter, followed by a laxative. Schiel advises a combination of areca nut and kamala. Areca nut is frequently vomited and must be given with raspberry syrup or some other sweet syrup, which generally prevents it being vomited.

5. **Chloroform.**—1.0 to 4.0 should be shaken up with castor oil and given at once; the chief objection is, it is very apt to be vomited.

Pomegranate (**Cortex granate**).—In the shape of the macerated decoctions, 25 to 60 seeds (pumpkin seeds crushed and macerated in hot water). Oxide of copper in doses of 0.01 to 0.05 daily for several days. Turpentine 2.0 to 4.0 beaten up in the yolk of an egg, daily for three days. Benzine pelletierum tannicum, strontium lacuticum, creolin, naphthol are tæniafuges, but are only used to a slight extent, as they are much less efficient than the first preparations mentioned.

After the animal has passed the parasites they ought to be picked up on a shovel or other object and put in the fire to destroy the segments, especially if you have reason to suspect that the Tænia echinococcus is present, on account of the danger to man.

R.   Ol. resin. felix mas,   0.75   to 1.0
       Areca semina pulv.,   1.0 . to 2.0
     F. M. Capsule No. 1.

     Sig.—Give on an empty stomach followed by castor oil.

R.   Ol. resin. felix mas,   1.0   to 4.0
     F. M. Capsule No. 1.

     Sig —Give on an empty stomach.

R.   Kamala,   1.0   to 2.0
       Anæsthesin,   0.15   to 0.2
     F. M. Capsule No. 1.

     Sig.—Give on an empty stomach

R. Ol. res. felix mas,   0 75
    Kamala,   1.0
    Ol. olivæ, 1 drop.
    F. M. Capsule No 1.

R. Chloroform,   2.0 [to 4.0
    Ol. ricini,   30.0 to 40.0
    Sig.—Give in two doses one week apart.

R. Areca semina pulv.,   1.0 [to 3.0
    Sig.—In capsule, honey or milk.

R. Kousso,   4.0 to 6.0
    Mel.
    G. S. teaspoonful.
    F. M. Electuray.
    Sig.—To be given in two doses, one week apart.

Oxyuris Vermicularis.—By this name (Fig. 48) we mean a small, white, thread-like round worm. The female is from 9 to 13 mm. in length and the male from 3 to 4 mm. in length. This parasite is rarely found in the dog. They are generally located in the rectum and the lower large intestines. They cause great itching of the anus, and the animal is observed to lick that part constantly and also to frequently pull the hind-quarters on the floor.

These harmless parasites are removed by clysters composed of solutions of salt water, quassia bark, vinegar or a weak solution (1–2000) of corrosive sublimate.

Dochmius.—Dochmius (Anchylostomum uncinaria) (Fig. 49) is a small, thread-like parasite which belongs to the family of strongylides (palisade worm). The end of its head is like a bell-shaped capsule, having two small, curved teeth on its dorsal border and four teeth on its ventral border. By means of the bell-shaped disk and the teeth on the inner part of its mouth it sucks and buries its head into the mucous membrane of the intestine and sucks blood. Three forms of this parasite are found in the small intestine of the dog and are described as follows: the Dochmius duodenalis, the male 10 mm. long, the female 12 to 18 mm. long; the Dochmius trigonocephalus, the male is 9 to 12 mm. wide, the female 15 to 20 mm. wide, and the Dochmius stenocephalus, the male is 6 to 8 mm. long and the
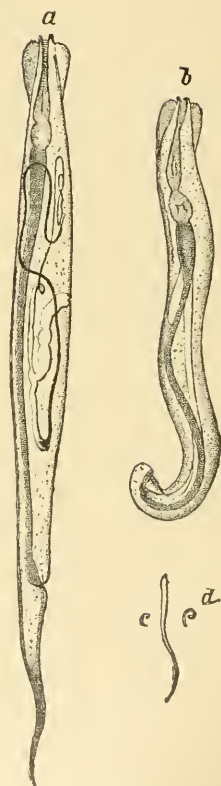
FIG. 48.—Oxyuris vermicularis: *a*, m a g n i f i e d diagram of the female; *b*, the male, magnified; *c*, natural size of the female; *d*, natural size of the male (*Vierordt*).

female is 8 to 10 mm. long.   The Dochmius duodenalis is the parasite
that observers have named as causing the disease known as Egyptian
chlorosis.   This disease is indicated in man by general anæmia.   The
eggs, which are oval, are passed in enormous numbers in the fæces of
affected persons, and lie on the leaves of aquatic plants or the moist
ground, and are taken up in the drinking water, food or eating of
grass by dogs, reach the intestines of the animal and the parasite soon
matures.   One branch of the Dochmius, seen in Austria, Italy and Japan,
Dochmius uncincoriasis, causes great disturbance, particularly in hunt-
ing dogs.

Animals affected with this parasite become anæmic, weak and
thin, develop hemorrhagic enteritis and catarrhal pneumonia and have
a peculiar discharge from the nose, of a thin, bloody mucus (Megnin,
Raillet).   Peregand found these cases generally had piroplasma with
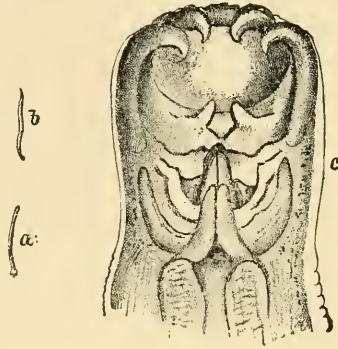
Fig. 49.— *a*, Male; *b*, female (natural size); *c*, magnified head (*Jaksch*).

the other symptoms.   There are also œdematous swellings, ulcerations
or gangrenous swellings of the skin, with intense cachexia.

Therapeutics.—The treatment consists in the administration of
tæniafuges, felix mas, kamala, cadeot combined with calomel.   Megnin
uses calomel and arsenic, the latter in 0.005 to 0.01 doses.   Besides this,
give easily digested and nutritious food, milk, and eggs.   The fæces of
all affected animals should be burned and the stools and benches where
the dogs sleep should be cleaned.   Drinking water to be from a spring,
or else filtered or boiled.

The presence of this parasite is recognized in the same way as one
would locate the tænia, that is, by the presence of the parasite or eggs
in the fæces.   They are easily recognized, the eggs being similar to the
ascarides.

Besides the already mentioned parasites, we also find the Distoma
echinatum (Generali and Ratz) and the Distoma heterophytes, found by
Jansen in Japan and by Loofs in Egypt, in the intestines.   The Tri-

chocephalus depressiusculus is found in the cæcum (Fig. 50). This parasite, according to a number of authors, may produce a catarrh or hemorrhagic condition of the intestines and invagination of the cæcum. Animals af-
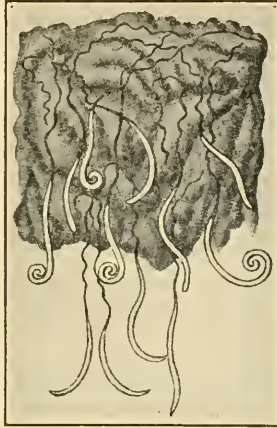
FIG. 50.—Wall of the cæcum with numerous Trichocephalus depressiusculus.

fected with these parasites suffer from dochmiasis or anæmia. This distomum heterophytes was found in an animal presenting symptoms of rabies.

DISEASES OF THE PERITONEUM.

Inflammation of the Peritoneum—Peritonitis.

Etiology.—Peritonitis is comparatively rare in dogs and is generally seen as a secondary disease; due originally to some irritation or injury of some of the other organs of the abdomen, the stomach, intestines, spleen, liver, kidneys, bladder, prostate, or the uterus. From toxic gastro-enteritis, ulceration of the stomach or intestines, accumulations of fæcal matter in the intestines; from metritis or parametritis after labor; from inflammation or abscess of the liver; from purulent inflammation of the kidneys, or from purulent pleuritis; from rupture of the abdominal viscera and the escape of food, fæces, gas, bile, pus, parasites perforating the intestinal mucous membrane, and in rare instances from the presence of parasites (Plerocerooides barletti) in the abdominal cavity. It may also occur from a general inflammation of all the serous membranes of the body, as is sometimes observed in infectious diseases; to pyæmia or metastatic peritonitis; from the breaking down of tubercular masses that have collected on the peritoneum, or from cancer. Primary peritonitis is always caused by some injury to the ab-

dominal wall, shocks, blows, or by penetration of the abdominal walls, or after some operations and from cold (rheumatic peritonitis).

Pathological Anatomy.—According to the extent of the disease we call it either partial (circumscribed) or general peritonitis (diffused); according to its course, acute or chronic; and according to its character, we call the exudate serous, fibrinous, purulent, putrid, or hemorrhagic. The purulent form of the disease is the most common and on account of the extensive irritation that any inflammation causes in the peritoneum, it is apt to take the diffuse form of the disease; and while it may start originally as circumscribed, the disease generally becomes

Fig. 51.—Section through the abdomen of the dog showing the distribution of the peritoneum: *a*, kidney; *b*, aorta; *c*, vena cava; *d*, intestine; *d'*, duodenum; *e*, pancreatic gland; *f*, spleen; *g*, liver; *h*, subperitoneal fat.

diffuse in a short time. The peritoneum is first injected and ecchymosed, becoming dull red and velvety, due to the removal of the endothelium and partially to the exudate, which contains more or less fibrinous substances. This collects as a thick layer over the peritoneum and the exudate unites the intestines to each other or to the different organs in the abdominal cavity, or even to the sides of the abdominal wall. In recent cases these adhesions are easily pulled apart, but later on they become firmly united and are very hard to separate (adhesive peritonitis). There is also a quantity of fibrinous exudate thrown out, which is accompanied by more or less liquid. This varies from a small quantity to several litres. There is always some œdema of the serous wall of the intestines, which becomes soft and friable (Fig. 51).

The chronic form may start out as such at the onset, but generally it follows an acute attack, the peritoneum becomes very much thickened

and adhesions form, with the intestines and the adjacent organs, at times contracting the intestinal walls and causing a lessening of the diameter of the intestinal canal. In the chronic form the exudate is not purulent, as a rule, but is composed of a thick, hemorrhagic serum. In the dog, we sometimes observe a form of ascites (see under that head) in which we have a chronic thickening of the peritoneum and a collection of a turbid, fibrinous exudate (inflammatory ascites).

Circumscribed Peritonitis may be caused by any irritation of the viscera, such as inflammatory and suppurative processes of the stomach, intestines or uterus, classed as perigastritis, perienteritis and perimetritis and the irritation extend to the serous coat. We often find small circumscribed deposits on the liver, occasionally on the spleen and other abdominal organs, that have originated from slight peritonitis. In cases where there is a small amount of purulent peritonitis, the inflammation remains in one locality and becomes encysted. As a rule, with the exception of circumscribed peritonitis, death generally occurs in the first stages of the disease, and it is only in the mild cases, where the exudation is very slight, that there is any chance of recovery. The exudate breaks down and is re-absorbed but, as a rule, there is such an extensive alteration and adhesion formed that it is only in rare cases that the animal ever is restored to perfect health.

Clinical Symptoms and Course of the Disease.—(1) Acute diffuse peritonitis. When the disease is caused by some traumatism, by perforation, either from the intestines or externally, the symptoms appear very rapidly. At first there is colic, great restlessness, and a stiff, unnatural gait. The posterior extremities are carried out from the body and are not flexed. The animal groans and cries. The pain is continual, the abdomen is very sensitive on manipulation, the slightest touch produces intense pain. There are some cases in this disease, however, where the animal shows very little pain, but this is only seen where there is great debility. The abdomen becomes distended in the early stages of the disease, due to inflation of the intestinal tract from gas and later on by the collection of the exudate. When the abdomen is distended, if gas is present, on percussion, the sound is hollow, and when exudate is present, the sound is dull. The exudate, of course, lies on the floor of the abdominal cavity; but where the exudate forms very rapidly, the whole abdomen is filled up, pressing on the diaphragm, compressing the lungs and causing great dyspnœa.

In the early stages the abdomen is tucked up, the walls tense, firm and painful to the touch, and it is generally some time before the abdomen begins to enlarge from the collection of the exudate. As a rule, the bowels are constipated except where there has been some diarrhœa, or diarrhœa alternated with constipation, present before the disease started,

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which is seen in those cases where there is ulceration and perforation of the mucous membranes. Vomiting is always present, the vomited matter being greenish-yellow mucus, and in the latter stages we frequently find fæcal matter in the vomited material; the urine is lessened in amount and contains a large amount of indican. There is total loss of appetite. The temperature rises to 40° C. or above. If the disease is not so severe as to cause death in a day or two the temperature fluctuates, being high at one part of the day and then it becomes subnormal, its character being remittent. The pulse is fast, thin and wiry, and finally imperceptible.

The majority of cases are fatal, the animals dying in from one day to a week, according to the intensity of the disease. They usually die in a condition of collapse; in rare cases from heart-failure or suffocation from the rapid collection of the exudate. The most rapidly fatal cases are those due to the perforation with septic infection.

Circumscribed or Chronic Peritonitis produces less marked symptoms and is harder to recognize, the symptoms of diffuse chronic peritonitis being those of ascites, and, as a rule, not diagnosed except on post-mortem. The best way to confirm a diagnosis is to puncture the abdomen with a small trocar and see the character of the fluid.

Therapeutics.—Remove the cause if possible; if this cannot be accomplished by surgical interference, acute diffuse peritonitis should be treated with constant applications of cold water compresses to the abdomen, and, if the irritation is very intense, the application of a counter-irritant such as frictions of camphor oil, mustard poultices or mustard oil; the latter is the best. Take 30 to 50 grammes, of a mixture composed of mustard oil, 10 parts and olive oil 100, rubbing it well into the abdomen; applications of hot water to the abdomen by means of the priessnitz compress are also useful. Opium is to be given internally in doses of 0.1 to 0.5 grammes; laudanum 1.0 to 5.0, and where there is collapse give whiskey and spirits of camphor. If there is any obstruction of the bowels, give injections of warm water or subcutaneous injections of physiological salt solution. The exudate should be removed by puncture of the abdomen, but this is not to be done until the acute symptoms have subsided. It must always be borne in mind (and this holds good in inflammation of other serous membranes) that the production of a serous exudate is a process that tends to lessen the acuteness of the existing conditions, because the liquid helps to keep the intensely inflamed parts separate and prevents frictions and its complicating inflammation, hence it should not be removed too early but when the exudate is suspected to be purulent and by means of an explorative puncture has been proven to be so, a laparotomy must be performed, and the whole abdominal cavity washed out with a weak solution of salicylic or boric acid. When the

animal shows signs of recovery, the diet must be carefully regulated, at first milk, or thin soup, as the animal is very apt to vomit. Then the lightest diet, soup, milk, juice of beef, a small quantity of lemon juice can be administered, a teaspoonful at a time, or a teaspoonful of essence of pepsin.

Abdominal Dropsy.

(Hydrops Ascites; Ascites; Hydrops Abdominis; Hydrops Peritonei.)

By this is meant a collection of serous liquid in the abdominal cavity that originates without inflammatory symptoms, being due to transudation. The amount of liquid collected varies very much. In some cases there are only a few spoonfuls, in others 15 to 20 litres of liquid.

The color of the liquid is sometimes as clear as water, but generally it is reddish-yellow. It may also be filled with flakes of fibrin,
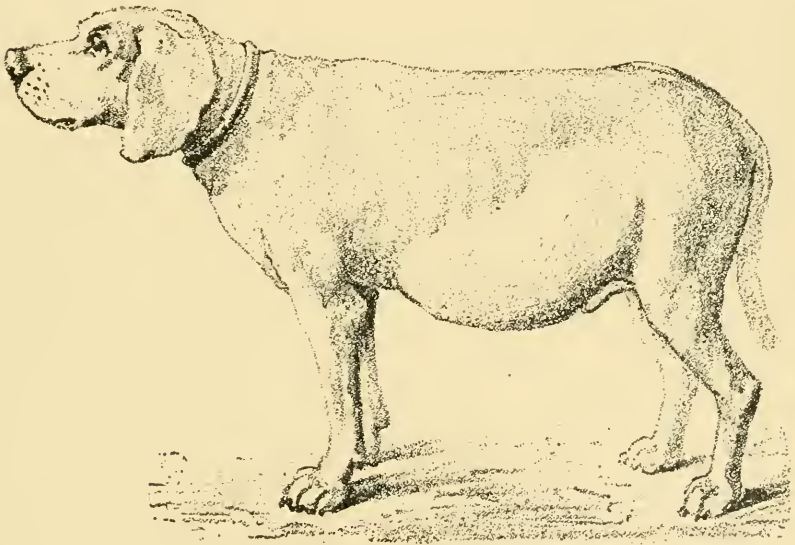
Fig. 52.—Dog with ascites.

which indicate chronic peritonitis, or turbid as milk (chylous ascites). When exposed to the atmosphere it usually remains fluid and only in rare instances it becomes firm and jelly-like. It is thin and watery and slightly sticky when pressed between the fingers and about the specific gravity of blood serum. At first the peritoneum is normal, but, if this condition lasts some time, the peritoneum becomes macerated, is pale or dull white, and finally a general degeneration sets in. When the animal

has been repeatedly punctured, inflammatory processes may take place, and are followed by adhesions. The abdominal organs become anæmic and frequently dropsical (Fig. 52).

Etiology.—Ascites never appears as an independent disease, but must be regarded as a symptom of another disease. As the peritoneal veins belong to the mesenteric system, any obstruction of the portal veins cause these serous collections, for instance, in cirrhosis of the liver, or tumors of that organ, or from compression of the mesenteric veins by tumors, abscesses, etc. Ascites is also seen as a symptom of general dropsy of the kidneys or lungs, and from defective action of the heart. It may also be caused by local diseases of the peritoneum, such as tuberculosis, carcinoma, or from chronic inflammation between transudate and inflammatory exudates. In young animals ascites may develop without any other complications or cause and may make a complete recovery (Hutyra and Marek).

Clinical Symptoms.—The chief clinical symptom of this disease is the accumulation of fluid in the abdominal cavity. Small amounts very frequently are not noticed and in fact, cannot be determined by any means except by tapping. When there is a considerable collection of serous fluid, the abdominal wall is distended, and, from being in the lower portion of the abdomen, the cross-section outlines of the trunk resemble those of a pear. There is a peculiar sunken appearance of the flanks (see Fig. 52). When the tips of the fingers are struck against the distended abdomen, there is a fluctuating movement; and when there is a large quantity of fluid present, the splashing sound of the fluid can sometimes be heard when the side of the abdomen is struck sharply with the flat of the hand. By percussion, we can tell, to a certain extent, the amount of the fluid present. The animal should be made to stand, so that all the fluid lies in the base of the abdomen. By percussing, beginning at the lower part of the abdomen and moving upward on the wall where there is fluid present, we will get a dull sound ; and when the line of fluid is passed, we get the intestinal or tympanic sound. It is very important that the animal should be in a standing position, as it can be readily understood that when the animal is lying on its side, the fluid gravitating to the lower side, we would get a clear tympanic sound all over the abdominal wall on the upper side and still have a large quantity of fluid in the cavity.

The higher the fluid collects, the greater is the pressure on the abdominal organs, and the consequent pressure on the diaphragm, causing interference with normal respiration. The urine is generally normal, but reduced in quantity, and the quantity of the accumulated fluid pressing on the bladder may sometimes cause involuntary emptying of the bladder. In the later stages œdematous swellings appear

in the extremities, or we may find a general dropsy, the digestion is impaired, and the bowels disturbed. In the majority of cases diarrhœa is present, with occasionally vomiting. While it seems very easy to make a diagnosis when the above symptoms are present, still the following diseases may present several or all of the symptoms above described.

1. **Acute or Chronic Peritonitis.**—When one reads the symptoms of acute peritonitis the diseases can be readily separated, but in the latter part of the disease, when the effusion has collected, or where the chronic stage of peritonitis is present, it is a little difficult to separate them, the only positive means being to puncture the walls with a small trocar (hypodermatic) and obtain a small quantity of the fluid, and it is rather common to see ascites associated with chronic peritonitis.

2. **Fatty Deposits in the Abdomen.**—This disease is quite frequently present in old dogs; but a differential diagnosis can be made from the fact, that, where there are enormous collections of fat present, the abdomen is round in appearance, but does not become pendulous, whether the dog is standing or recumbent. It is well not to puncture in these cases, as it gives no information, and may cause internal hemorrhage.

3. **Abnormal Collections of Urine in the Bladder.**—In these cases we feel a ball-shaped body in the posterior portion of the abdomen; this swelling does not follow the changes in the position of the body, and is not indicated by percussion. A good way to make a differential diagnosis is to lift up the animal by the posterior extremities, and if it is ascites the liquid will settle on the diaphragm and interfere with respiration; if the bladder is filled, we do not have the dull percussion sound.

To further confirm the diagnosis pass the catheter.

4. **Distention of the Bowels with Gas** (Meteorismus).—In this instance, there is an absence of the fluctuation and the clear tympanic sound all over the abdomen.

5. **Collections of Urine in the Abdomen after Rupture of the Bladder.**—On the passage of the trocar, the clear urine is passed which can easily be recognized by the color and odor, with absence of urine on catheterization, and uræmic fever, or convulsions.

6. **In Advanced Gestation.**—By careful manipulation the fœtuses can be easily distinguished in the abdomen.

Besides the above conditions, we may also have to distinguish between ascites and tumors of the abdominal cavity (hydrometra, pyometra). All these affections can be recognized by carefully considering the history of the case and the accompanying symptoms.

It is always well to carefully study the exciting cause of the disease, as the course of treatment depends on it. This, however, is rather hard to do, for, as a rule, the collection of fluid is caused by the dam-

ming or interference in the mesenteric system, by cirrhosis of the liver, or some interference in the portal system. These are likely to improve with tapping and symptomatic treatment. But in anasarca, hydrothorax, general dropsy due to a weak heart, or valvular affections of that organ, disorders of the lungs or kidneys, hydræmia or marasmus; it depends to a large extent on whether we can either restore the affected organ to a normal condition, for if they are permanently affected, the condition is generally chronic. Quite often we find affections of the liver and spleen that are never recognized during life. To make an examination of these organs it is well to do it just after the animal has been tapped and the fluid has been removed; the walls of the abdomen are collapsed, and the organs can be manipulated with greater ease at that time. If tumors are present, they are readily recognized.

Notwithstanding all the etiological conditions described, there are often cases where the cause can only be guessed at.

Prognosis and Therapeutics.—As a rule, the prognosis is unfavorable as we are unable to remove the exciting cause. The cases that recover are generally in young dogs and the dropsy is the only existing condition. In the majority of cases, the ascites disappears spontaneously. Our first effort is to remove the exciting cause, if it is recognized; and then to remove the dropsical effusion, either medicinally or surgically. At the same time the animal should be well fed on highly nitrogenous, easily digested food and tonics (see anæmia). This can be done in the following ways:

1. **By Laxatives.**—This method is to be followed where there is constipation associated with the disease. Saline purgatives are the best, glauber salts, epsom or rochelle salts, such laxatives as jalap, podophyllum, castor oil, are contraindicated, as they irritate the stomach and destroy the appetite and weaken the animal. The salines are indicated, only in sufficient doses, to cause a slight laxative action, so as not to interfere with the appetite.

2. **Diuretics.**—This form of treatment has always been popular to be given and is still much used. These are only used where there is positive evidence that there is no previous irritation of the kidneys. The best are the vegetable diuretics, such as digitalis, strophanthus, caffeine, salicylate of soda, oil of juniper, liq. potassii acetas; among the more recent diuretics are theocin, theobromin, soda salicylate 4.0 to 6.0 in sol., diuretin 4.0 to 6.0; the best saline drugs are acetate of potassium and sodium.

℞. Tinc. digitalis fol.,   1.0
     Liq. potassium acetate,   30.0

Sig.—One teaspoonful three times daily.

R. Agurin, 0.1 to .04
    Caffeine-sodium-salicylas, 2.0 to 5.0
    Sacharrum alba. 5.0
  M. F. et divid charter No X.

  Sig.—One powder three times daily.

R. Agurin, 2 to 6.0
    Aqua menth. pip, 150.0

  Sig.—Tablespoonful three times daily.

3. **Hydrochlorate of Pilocarpine.**—We may sometimes obtain very good results with this drug. The injection of the solution subcutaneously is made once daily (0.005 to 0.01 of water). Zahn gave three drops of the 1 per cent. solution on the tongue, three times daily. The administration of this drug causes the amount of saliva to be greatly increased, and the amount of fluid exudates to be very much decreased. Frohner recommends Arecolin.

4. **Tapping or Puncture of the Abdomen.**—This is indicated where there is a large collection of fluid, that is pressing on the diaphragm, and also used as a diagnostic procedure. Whether it is best to remove the fluid in all cases is a question that has not yet been decided; yet the writer is of the opinion that the fluid should be removed, provided the animal is robust and not too old, especially as the operation is comparatively harmless, and has the advantage over purgatives and diuretics in that the accumulation is removed quickly. In a great number of cases the fluid has not accumulated after one or more punctures. Friedberger and Frohner have seen old dogs that have died during, or shortly after, the operation. The method of puncturing or tapping is to take the ordinary trocar, a narrow caliber one is best, even if it takes a long time to drain out. We also avoid unconsciousness, which sometimes occurs where a large quantity is drained out too suddenly. During the operation the pulse, respiration, and general appearance of the animal must be watched carefully, in case the animal might collapse from the shock. In such an event, the trocar must be removed instantly and a subcutaneous injection of spirits of camphor must be given. The trocar should always be boiled, immediately before using.

The method of operating is very simple. The place to insert the catheter is generally about the umbilical region, on or to one side of the linea alba. The animal should be placed in a standing position. Should the canula become plugged either by the omentum or intestines coming against the opening of the canula, it should be pulled downward, or moved to one side or introduce an elastic catheter and push them to one side. After the fluid has ceased to flow, remove the catheter and paint the opening with collodion.

The other changes in the peritoneum have no special value. Tubercular masses, sarcomas, and carcinomas have been already mentioned; also parasites. Plerocercoides barleti are found free or partially encysted, also the pentastomum denticulatum was found by Rochefontaine in great numbers in the subperitoneal cyst of the liver and mesentery, and here also have been found the bladder cysts of the tænia echinococcus.

DISEASES OF THE LIVER.

Catarrhal Jaundice.

(Icterus Catarrhalis; Icterus Gastro-duodenalis.)

Etiology.—In catarrh of the stomach we often find symptoms of jaundice with that disease, especially where the inflammation of the mucous membrane extends to the duodenum, and the ductus choledochus becomes closed by the swelling of its mucous membranes and prevents the exit of the bile. As soon as such an obstruction occurs, the bile can no longer flow into the intestines; it becomes stagnant and dams back, causing a pressure on the bile-ducts, and being unable to escape, it finally enters the lymphatic vessels of the liver, from them into the blood through the thoracic duct. After this there follows a series of symptoms that have been named jaundice (icterus). In the early stages of the disease we have to deal with an icterus that is produced by stagnation of the bile. It has been found by observers that the pathological or artificial stoppage of the flow of the bile, and, consequently, damming back of the bile, will produce jaundice in forty-eight hours. This has a number of names—stagnating icterus, icterus of reabsorption, or hepatogenous icterus. While the swelling of the mucous membrane is generally the cause of this disease, still there are a number of other causes that may also produce it, such as foreign bodies in the ducts (parasites, gallstones, etc.), from ulceration of the mucous membrane, by the cicatricial contraction of tumors, or abscesses in or near the liver, from intestinal parasites invading the bile-duct, from the bile being very dense and flowing slowly, by disturbance of the liver cells and the bile driven in an opposite direction (Minkowski), and diffuse icterus (icterus per paranedesen), in disturbance of the blood circulation due to thrombus in the portal arteries, the presence of bacteria, from the eating of decayed meat and from certain infectious diseases, in cases of poisoning from phosphorus. The stopping of the flow of bile sets up an inflammation of the tissues and sometimes forms abscess of the liver, but as the great majority of cases are caused by the catarrhal form, we will describe that. Any cause that will produce catarrh of the stomach will finally produce icterus, such as

improper food, especially when it is frozen; cold drinks after over-heating; salt meat, or salt fish. That form of icterus that is so often seen during distemper is very likely to be catarrhal.

Pathological Anatomy.—The symptoms of catarrh of the duodenum are always present; the vessels are more or less injected, and the mucous membrane swollen. As a rule, the mouth of the duct is closed, and it is only by very strong pressure on the gall bladder that we are able to open it and force the bile out of the duct. In some cases a white clot of mucus is forced out and when the duct has been plugged up some time the bile is converted into a syrupy or semi-solid mass, but in the majority of cases it is due to swelling of the intestines and not to catarrh of the mucous membrane of the duct.

In some post mortems, we may not find any swelling in the region of the duct, but very frequently the post-mortem changes are so quick as to be hardly recognizable at the autopsy. Another fact to be taken into consideration, is that the canal is so very narrow in the dog that it takes a very small amount of swelling to obstruct it.

The body of the liver may be changed; it is generally enlarged and anæmic, and varies in color from a yellow to a yellowish-brown. The color is irregular and it is mottled like a nutmeg. The cells of the liver are infiltrated and filled with globules of fat, colored with brownish pigment, in the shape of granulated clots. The cadaver is generally anæmic; the blood is clotted in the heart and large blood vessels or we find large lumps of hard reddish-yellow coagulate, or the blood may be stained yellow and contain white blood corpuscles in increased quantities. The red blood corpuscles are not much changed, but vary in size. All the tissues of the body, except the white substance of the brain, the spinal cord, the peripheral nerves and the corneal tissue, are stained more or less by the bile-pigment. The heart muscle undergoes a certain amount of fatty degeneration. The kidneys are anæmic; in the pale portion of the kidney we see extensive whitish stripes running in the direction of the urinary canals; this is caused by an irregular fatty degeneration and pigmentary infiltration of the canals (Siedamgrotsky).

Clinical Symptoms and Course of the Disease.—As this disease is generally associated with catarrh of the stomach, the first symptoms in jaundice will be of that disease—loss of appetite, increased thirst, vomiting, coated tongue; in some rare instances, however, these may be absent, the first symptom being that of jaundice (yellowishness of the mucous membranes).

When the bile and bile acids enter the blood the following symptoms are observed:

1. By the entrance of the coloring matter of the bile into the tissues, they become more or less yellow, first yellowishness of the conjunctiva

and sclerotic coat; later the whole cutaneous covering becomes tinted. The yellowishness may be very plainly seen on the abdomen, on the inner fascia of the thighs, and the mucous membrane of the mouth and throat; the color may range from a light yellow to a dirty orange-yellow; the latter color generally spreads over the entire body in the later stages of the disease.

2. On account of the coloring matter being present in the urine, it is changed from the normal to a yellowish-green or to a dark greenish color; when put in a vessel and agitated it foams very quickly and if a piece of paper or linen is placed in it, it becomes tinted the color of the bile. It is also easy to detect the presence of bile color of the urine by chemical examination. (For further details, see the chapter on the Examination of the Urinary Apparatus.) Besides the bile acids, the urine almost always contains albumen, short hyaline casts, pigment granulations, and epithelium of the kidney.

3. On account of the stoppage of the flow of bile into the intestines, the fæces become gray or clay-colored and contain much undigested fat, and hydrobilirubin is present. The fat substances not being digested, the fæces become very fœtid; this change is due to the loss of the antiseptic effect of the bile, and as the food is passed along the intestine the tonic effect of the bile is absent.

4. The bile acids present in the blood produce a certain amount of depression of the nerve-centres, and for this reason we find that the pulse and respiration are subnormal in action, and the temperature is reduced. Other symptoms of the narcotic effect of the bile are seen in some cases where there is depression, great muscular debility, indifference to surroundings, somnolence and finally deep coma; we also find hemorrhagic conditions of the skin or mucous membrane.

The local examination of the liver gives very little satisfaction. The writer has never been able, except in one case, to find any perceptible enlargement of the liver. Manipulation of the liver does not seem to give the animals pain in the later stages of the disease. The prognosis in the dog is generally unfavorable. The yellow coloration gradually becomes deeper, the temperature falls to subnormal in the majority of cases, the pulse becomes weak and irregular, and finally death occurs with general paralysis. If the cases progress favorably, the first sign is a lessening of the coloration of the urine and a darker hue to the fæces; the pulse becomes fuller and more regular, the temperature increases, the animal shows more animation, and the color in the mucous membrane and the skin becomes lighter, until it finally disappears. If there is a relapse, it is generally by improper feeding.

Therapeutics.—We must first aim to reduce the irritation of the duodenum, also the bile-ducts. This is first effected by regulating the

diet; small quantities of lean meat, milk, purees, gruel, and besides this giving saline laxatives and alkaline in the form of carbonates and carbonic acid, if the constipation is persistent. Strong purgatives have been recommended, such as calomel, castor oil, and infusions of rhubarb; but they are of no particular value; in fact, in the majority of cases, they do more harm than good, as they have a tendency to swell the mucous membrane. Enemas of warm water, two or three times daily are very useful. We can also try to empty the gall bladder mechanically, by pressing the abdomen between the fingers in the region of the kidneys; also by faradization—a strong current is to be applied in the region of the liver on both sides of the abdomen; this must be kept up for ten minutes at a time, twice daily. Or we may use emetics, it being claimed that the compression of the liver during emesis, the violent contraction of the abdomen, will often empty the gall bladder. We can also try to carry the bile out of the system by the kidneys. The best drugs to use are diuretics, such as acetate of sodium or potassium. Where there is great debility or depression we can use spirits of camphor or ether. Boldine, the alkaloid of the Pennus boldos, has recently been spoken of as producing good results in jaundice; it is given in doses of 0.08 gramme daily with calomel. Great weakness or persistent sleepiness can be treated with camphor, ether, and caffeine.

R. Sal. Carolin fact. 10.0
   Aqua, 150.0
   M. F. Sig.—One tablespoonful three times daily.

R. Sodii salicylatis, 4 to 10.0
   Syrupi Rhei, 200.0
   M. F. Sig.—One tablespoonful morning and night.

R. Ac. Tartaric, 15.0
   Aqua distilata, 200.0
   M. F. Sig.—One teaspoonful three times daily.

Other Affections of the Liver.

The other affections of the liver are of slight importance and are rarely met with during life, consequently they will be only mentioned briefly.

Hyperæmia of the Liver.—This may be caused either by an increased or obstructed flow of the bile, and therefore it is important to be able to distinguish between the two.

Congestive hyperæmia of the liver is a normal condition during digestion; it may be abnormally increased by eating large quantities of food, especially if it is rich and irritating, and from want of exercise; decayed or tainted food may also cause this condition.

Stagnating hyperæmia of the liver may be caused by defective valvular action of the heart or a weakened condition of that organ; in the later stages of acute diseases, such as the lungs; in cases where large numbers of the lung capillaries become atrophied and useless; in great pleuritic exudations; in extensive induration of the lungs, with emphysema; and also in dropsy of the pericardium.

Pathological Anatomy.—The liver is greatly enlarged and very hard; when a section is cut in it, the blood seems to run out of it in large quantities. This blood generally is dark colored, especially if the stagnation has been prolonged. The liver tissue may be spotted, the spots corresponding with the central veins which are located in the centre of the lobules; or we may notice peripheric zones (nutmeg liver) alternating with lighter colored spaces. The liver gradually becomes smaller and its surface dull, and later on the parenchyma finely granular.

Clinical Symptoms.—It is not possible to make a positive diagnosis of this disease, we can only suspect it by great tenderness on pressure in the region of the liver, and perhaps slight icterus, ascites may accompany hyperæmia of the liver; but as these symptoms may all be caused by catarrh of the bowels, it is well to be very cautious before making a positive diagnosis.

Therapeutics.—Remove the cause if possible, regulate the diet and administer saline laxatives.

Inflammation of the Liver (Hepatitis).—This disease appears in three forms—parenchymatous, interstitial and purulent.

1. Parenchymatous hepatitis accompanies various infectious diseases, probably in the same way that we see congestion of the liver. It is seen as a symptom of acute phosphorus-poisoning, also as an accompaniment of certain infectious diseases.

The pathological-anatomical alterations are as follows: Enlargement, softening, and a friable condition of the tissue, which breaks easily to the touch. At first it is dark red, but later on it becomes a yellowish clay color, due to the enlarged acini; the capsule is dull and thickened, due to a certain amount of perihepatitis. If the disease lasts any time, the volume of the liver is greatly lessened.

The clinical symptoms are, evidences of catarrh of the stomach, pain on pressure in the region of the liver, icterus, and the liver is found on palpation to be enlarged.

2. **Interstitial Hepatitis (Cirrhosis of the Liver) (Hardening of the Liver).**—This disease originates from causes that are at present unknown. There is no doubt that certain chemical or bacterial poisons which originate in the intestines have some part in causing this disease. Friedberger and Frohner surmise that it is caused by valvular disease of the heart.

Pathological Anatomy.—There are two stages in this disease. In the first stage the liver is very much enlarged and hard, the edges of the lobes are blunt on the surface, there are a number of uneven depressions. On making a transverse section, we find a net-work of reddish-gray tissues that surround the lobules; later on this involves the lobules themselves. In the second stage we find a cicatricial contraction of newly formed tissue, and at the same time the disappearance of the true tissue of the liver. The liver then becomes gradually smaller and has a very irregular surface; the capsule is thickened and in some places depressed; the tissue is hard and tough when cut with a knife.

Clinical Symptoms.—The disease generally starts without any visible symptoms, although it is a common disease in old dogs that have lived well. When the disease has become pretty well advanced we find evidences of an interference in the portal circulation by the appearance of ascites and chronic catarrh of the stomach. With these symptoms we also find a tendency to constipation with occasional changes to diarrhœa. In rare instances a certain amount of icterus is present. This is due either to the interference with the passage of the bile from the gall bladder by catarrh of the duodenum or to a contracted condition of the small bile-ducts. There is no pain on pressure in the region of the liver, even in the advanced stages of the disease. After removing the fluid, the outline of the liver can be felt by palpation.

The disease is generally very slow, but ends fatally; when there is ascites and some œdema of the extremities present, the end is not far off.

Therapeutics.—This consists in treating the case as if it were one of catarrh of the stomach, by means of saline purgatives and, if ascites is present, by puncture. The disease should be regarded as incurable.

3. **Purulent Inflammation of the Liver (Abscess of the Liver).**— This may be caused by injuries, such as blows or kicks, externally, or from foreign bodies or perforating abscesses coming from the stomach, from metastasis from phlebitis and thrombus undergoing purulent destruction, and from pyæmia in abscess of the stomach, and in the bile-ducts from the presence of gall-stones or parasites.

Pathological Anatomy.—Abscesses of the liver appear singly but may be present in large numbers; the traumatic abscess is generally solitary and the metastatic, multiple. The pus is cream-like and in some instances fœtid and reddish-green in color. Small abscesses may heal by absorption, but the large ones open into the abdominal cavity and cause fatal peritonitis.

Icterus symptoms, with frequent chills, point to abscess of the liver. Treatment is useless.

Fatty Liver (Hepar Adiposum).—This is an abnormal diffuse fatty

infiltration of the cells of the liver. It is hard and seems anæmic when the section is made through the organ. The cells are found to be infiltrated with fatty globules and the nuclei pushed to one side.

This condition is seen in old dogs that have been well fed and had little exercise, and is naturally a fatty infiltration. It must, however, be distinguished from the fatty degeneration that is found to follow several poisons, and in the later stages of consumption. In fatty infiltration the blood of the portal vein carries abnormal quantities of fat into the liver, which is deposited in the cells. In fatty degeneration the fat originates in the cells themselves; this is due to the albumin separating into two substances. One contains nitrogen, while in the other it is absent. This latter part undergoes fatty degeneration.

The treatment of fatty liver is the same as for any adipose condition.

Neoformations of the Liver and Gall-stones.—The neoformations found in the liver of the dog are sarcomas, carcinoma, adenoma, and lipoma. These cause irregular enlargements on the body of the liver, and produce symptoms similar to those of cirrhosis of the liver. Sometimes large tumors can be felt through the abdominal wall.

Gall-stones are very rare in the dog. Frohner describes one case where the animal died with an icterus gravel. Immediately after death he found in the ductus choledochus a large bluish-black friable gall stone, the size of a pea. On section, this was brownish-yellow in the centre. Parascendolo described one case where the ductus choledochus was impacted with a mass of stones. The only way that they might be recognized would be the appearance of icterus, from retention, preceded by intense colic.

Treatment is the same as retention icterus; small gall stones may be present in the gall bladder without causing any peculiar symptoms, other than slight disturbance of the digestion.

Parasites.—The following parasites have been found in the liver: distoma truncatum, distoma campanulatum, and distoma conjunctum (Ercolani). In the bile-ducts, ascarides have been found, Ercolani and Lissizin found a fully developed male eustrongylus gigas and coccidia (Rivolta), also the bladder cyst of the echinococcus.

Amyloid and Lardaceous Liver.—Amyloid liver, as a rule, is a symptom of a general amyloid condition, developed from a cachectic state, from prolonged suppurating wounds or from chronic inflammation of the pectoral membranes.

The liver is very much enlarged and blunt on the edges of the lobes. On section, the cut surface is speckled and grayish-brown in color. On microscopical examination the walls of the capillaries will be found to have undergone amyloid degeneration; when stained with Lugol's iodine solution, the degenerated portions become mahogany-brown in color.

Lardaceous liver is developed when we have a disease that has a tendency to produce amyloid degeneration. The liver becomes very large. With it we generally find amyloid kidney with albumin in the urine and we also are apt to find an amyloid spleen.

POISONS.

A short abstract on poisons with their symptoms and treatment is here given; it is not at all complete, and the student is referred to works on toxicology.

Poisoning by Caustic Alkalies.—Caustic lime, soda or potassium, lye, sal. ammoniac, etc. These in their concentrated form may be administered accidentally, or may have been used in some external preparation and licked off by the animal. Caustic soda or potassium may be swallowed by animals that are very thirsty. The writer observed a dog that was poisoned eating meat that had caustic lime sprinkled on it.

The lips, mouth, tongue, throat, and œsophagus are more or less cauterized, with salivation and vomiting of strongly alkaline materials, which is sometimes bloody. There is bloody diarrhœa. The potassium preparations cause paralysis of the heart.

The treatment consists in the administration of vinegar or acetic acid, gruels of flour, oat meal, starch, emulsions of oil (olive, linseed, or cotton-seed). The giving of emetics or the use of the stomach pump is contra-indicated, as they are apt to cause perforation of the stomach.

Poisoning by Caustic Acids.—This is of rare occurrence and is generally caused by the insufficient dilution of medicinal preparations, or the vicious administration of acids.

The mucous membrane of the mouth, throat, and œsophagus, is eroded or burnt brown. There is salivation and vomiting of a brownish-black material, with a strong acid reaction, which contains more or less blood, violent pain, small thready pulse, and finally collapse.

Therapeutics.—Emetics and the stomach pump are contra-indicated, as there is danger of perforation. Limewater, dilute ammonia or soda solutions, emulsions of olive, linseed, or cotton-seed oils, small quantities of opium, and in case of collapse the subcutaneous injection of ether or camphor.

Poisoning by Arsenic.—This is sometimes given intentionally on pieces of meat, or caused by eating some of the various rat poisons, the overdosing of Fowler's solution, or licking external preparations that contain arsenic.

There is violent inflammation of the stomach and intestines, great restlessness, bloody diarrhœa, vomiting and dyspnœa, great weakness, and finally collapse and death in a few hours.

Therapeutics.—Emetics and iron preparations, the hydrated sesquioxide of iron every quarter of an hour, carbonate of magnesia, a teaspoonful every twenty minutes, followed by alcoholic stimulants. The stomach pump can be used, if there is not prompt emesis.

Poisoning by Hydrocyanic Acid; Prussic Acid.—This is generally given intentionally, in the form of cyanide of potassium, rarely the pure acid. There is an odor of bitter almonds on the breath. The symptoms are vomiting, yelping cries, dyspnœa, convulsions of the legs, and death in a short time. If the dose should be small, there is restlessness, fear, dyspnœa, dilated pupils, convulsions of the extremities, fall in temperature until it is subnormal, marked slowness of the respirations and pulse, cyanosis and unconsciousness.

Therapeutics.—Emetics, artificial respiration (rhythmic pressure of the lower abdominal walls, bathing in cold water, stimulants, chlorine water, and subcutaneous injections of atropia.

Poisoning by Carbolic Acid.—This is quite frequently observed and is caused by the animal licking external preparations which contain the drug; this is frequently seen as a result of the use of some of the various preparations sold under the name of creolin, which are nothing more than crude carbolic acid, or some coal tar by-product, and the animal is bathed frequently in a strong solution of it. It may also be caused by the animal licking a wound or the wound absorbing carbolic acid, tar or creosote which has been applied as a dressing. It may also be absorbed following the injection of strong solutions of carbolic acid into the uterus. The urine is dark in color, frequently a dark olive green, there is slight colic, pain on pressure of the abdomen, vomiting, diarrhœa, great inflammation and redness of the mouth, marked weakness, decrease in the temperature, twitching of the muscles, paralysis, convulsions and collapse.

Treatment.—White of egg, glauber salts, and stimulants.

Poisoning by Iodoform.—This may be caused by licking wounds dressed with the drug and also from the injections into cysts of too strong solutions. In very large doses we find great gastric disturbance, small, frequent pulse, decrease in the internal temperature, suppression of urine, albuminuria, dulness, and convulsions, alternated with great excitement and finally collapse. In smaller doses we find catarrh of the mucous membranes, emaciation, and skin eruptions.

Therapeutics.—In the acute form give emetics followed by carbonate of potash, large quantities of starch, subcutaneous injections of atropia. In the milder forms saline laxatives, tonics and, of course, immediately remove the cause.

Poisoning by Phosphorus.—This may be caused by the animal eating some of the various roach or bug poisons that have been spread on bread

and placed in a cellar or building. There is constant vomiting, the odor of the ejected matter is that of phosphorus, and if taken into a dark room it is luminous.

There is great restlessness, howling, whining, fever, and indications of intense irritation of the mouth and throat; and the saliva is thick and copious. After these symptoms have been present for some time, the animal becomes quiet, the mucous membranes become dirty yellow, great pain on pressure on the liver, stomach, and intestines. The fæces are tinged with blood and there is albuminuria; and according to some authors, if there is any icterus in a suspected case, it is a clear indication of phosphorus poisoning; finally, there is paralysis and collapse.

Therapeutics.—Use sulphate of copper as an emetic, and turpentine in emulsion as an antidote, and treat other symptoms as they appear. Permanganate of potash, nitrate of cobalt, heavy magnesia, are antidotes.

℞. Cupri Sulphatis, 1.0
Aquae distillatæ, 50.0
Sig.—Give a teaspoonful every ten minutes until emesis occurs.

℞ Ol. Terebinthinæ, 20.0
Sol. Acacia, 50.0
Aqua. Distil., 200.0
Sig.—A tablespoonful every fifteen minutes.

Poisoning by Mercury.—1. Acute poisoning by corrosive sublimate is very rare. The symptoms are intense inflammation of the entire intestinal tract, vomiting of blood and bloody diarrhœa, with intense local irritation followed by symptoms of paralysis and death.

2. **Mercurial Poisoning** takes a slower course when caused by calomel or mercurial dressings, particularly when mercurial (blue) ointment is applied for skin eruptions. We find salivation, catarrh of the stomach, profuse diarrhœa, emaciation, with marked muscular debility.

Therapeutics.—In the acute form give gruels, milk, magnesia, water, sulphur, iodide of potassium, stimulants. In the slower form of poisoning give iodide of potassium, or sulphur.

Poisoning by Strychnia.—This is frequently administered intentionally, although it is often caused by the administration of too large doses of nux vomica, dogs being particularly susceptible to the action of strychnia. There are violent tetanic spasms, trismus, and opisthotonus. The convulsions are clonic, having intermissions between them, and the longer the intermission the milder the attack and the more chance of a recovery.

Therapeutics.—Give narcotics, chloral hydrate in clysters, 2.5 grammes to 40.0 of water; morphia, tannin, and tincture of iodine.

Poisoning by Chloroform.—This is caused either by the careless ad-

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ministration of chloroform during anæsthesia, or when animals are old or have weak hearts or lungs. It destroys sensibility, reflex action, irregular, weak pulse, dilated pupil, the blood becomes very dark and there is congestion and cyanosis of the visible mucous membranes, arrest of respiration and pulsation.

Therapeutics.—Cease the inhalation immediately, put the animal in the fresh air, open the mouth, draw out the tongue by means of a pair of forceps, and perform artificial respiration. Dash cold water on the head, active friction of the skin, and the subcutaneous injection of atropia, skopolamin, or strychnia.

R.   Atropia sulph,   0.05
      Aqua distil.,   5.0
      Sig.—Inject a gramme of the solution subcutaneously.

Poisoning with Gas (Coal, Carbondioxide, or Illuminating).—Great lassitude, insensibility, labored respiration, mydriasis, paralysis, and convulsions.

Therapeutics.—Fresh air, artificial respiration, dash cold water on the head, active friction of the skin, smelling salts, bleeding, and the intravenous injection of the physiological solution of chloride of sodium.

Poisoning by Iodine.—This may result from the licking or the absorption of iodine, particularly when it is used in the injection of cysts in the form of iodine or Lugol's solution.

The symptoms and course are very similar to iodoform. After a toxic dose there is stomatitis and pharyngitis, brown patches on the tongue and the vomiting of brown material, and if starch should be present in the stomach in any quantity, the material is turned bluish in color. The free administration of starch solution, and sulphate of soda and sulphurette of soda in solution 1 to 20 of water, must be given freely in teaspoonful doses.

DISEASES OF THE RESPIRATORY ORGANS.

PHYSICAL EXAMINATION OF THE RESPIRATORY APPARATUS.

In making an examination of the respiratory apparatus the following points are to be considered:

Examination of the Nose.

It is a rather hard thing to make an examination of the nose, on account of the anatomical conformation of that part, and we are practically restricted to the aid a nasal mirror can give us and the character of the nasal secretions. The external portion of the nose is moist and cold in health, colder than any other part of the body, and dry and warm when a dog has any fever or elevation of temperature, in the first stages of nasal catarrh, and in fevers or acute disease. This should not be taken as a positive evidence, as frequently cases are seen where this is no guide, the nose being cold when there is great fever or the animal in a state of collapse.

Swelling, redness, and excoriation at the entrance of the nasal chambers indicate an inflammatory and purulent condition of the nasal mucous membrane.

Any discharge from the nose, beyond a natural moistness, indicates some diseased condition. In cases of acute nasal catarrh it is clear and thin, nearly pure serum in the beginning, but later on it becomes mucous and finally muco-purulent. In chronic catarrh it is firmer, sticky, and finally very tenacious, and sticks to the external opening of the nose, often entirely closing it up and eroding the skin, where it comes in contact with it. In distemper it is yellowish to yellowish-green in color; sometimes it is streaked with blood or pus, and in rare cases it has a fœtid odor.

When the discharge is copious, especially when the head is jerked downward with a sneezing cough, it is generally a sign of some irritation of the frontal sinuses. A nasal discharge following coughing generally comes from some trouble in the deep sections of the air-passages, larynx, windpipe, bronchi, or the lungs; a rusty yellow discharge indicates croupous pneumonia; this is, however, very rare. Frequent sneezing, with a copious, purulent, bad-smelling discharge mixed with blood points to the presence of pentastoma tænioides in the frontal or nasal cavities. In cases of acute catarrh of the throat, foreign bodies, paralysis of the larynx, or

large tumors in the throat, the discharge from the nose may be mixed with some of the contents of the stomach. These affections are extremely rare in the dog compared with other animals. True cases of bleeding of the nose are seen in hemorrhagic catarrh of that organ, in suppurating conditions of the nasal cavities from the pentastome, and also in distemper. Hemorrhage of the lungs is indicated when there are large masses of frothy blood discharged from the nose and mouth. Wheezy respiration is generally due to some contraction of the nasal cavities, for instance, as a consequence of violent nasal catarrh, tumors, fractures of the nasal bones, narrowing of the nasal passages, pressure from some of the neighboring organs, or solid collections of matter. In some breeds of dogs, such as pugs and bulldogs, the passage is so narrow that a slight contraction may cause them to breathe through the mouth. A simple method of detecting whether the nostril is entirely obstructed is to hold a lighted candle in
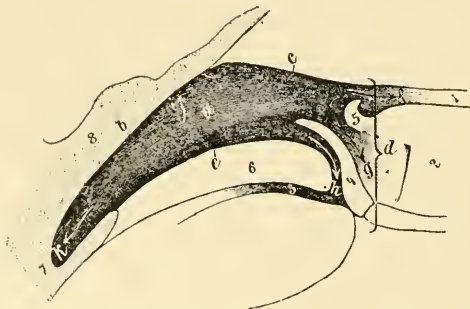
Fig. 53.—Diagrammatic section of the pharynx: *a*, pharynx; *b*, palate; *c*, soft palate; *d*, epiglottic wall; *e*, frænum; *f*, entrance to œsophagus; *h*, entrance to the mouth *i*, entrance to the Eustachian tube; *k*, entrance to the nasal passages; 1, epiglottis; 2, larynx; 3, cavity of the mouth; 4, epiglottis; 5, arytenoid cartilage; 6, palate; 7, vomer; 8, base of skull.

front of the nostril suspected and see if the flame is blown. If the nostril is clear the flame moves violently or may be blown out, but if the obstruction is complete or partial the flame moves slightly or not at all. The nasal sound is like a snore when copious accumulations of mucus have collected on the mucous membrane, as in distemper, or the later stages of simple catarrh of the nose. In all the affections named, many animals seem to have an intense itching, which they indicate by rubbing the nose against solid objects, or wiping it with the paws. We must recollect, however, that the same symptoms may be observed in an animal infected with intestinal worms.

The naso-pharyngeal region can be examined by means of the laryngeal mirror; when the presence of foreign bodies or pathological process, tumors, etc., is suspected, the mouth is held open by means of a speculum and the mirror introduced into the mouth; this method of examination should be made as quickly as possible as the instrument chokes the ani-

mal; the observer must act quickly and have a thorough understanding of the region and any pathological symptoms noted.

Percussion of the nose and frontal sinuse is made with some light metal hammer such as the handle end of a key, percussing first one nasal bone and over the frontal sinuses, then the other, to note the difference in sound. A dull sound may indicate a catarrhal condition of the nostril, or
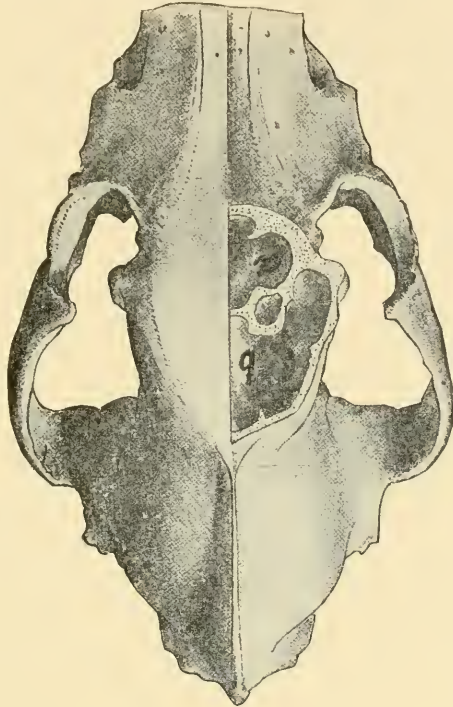
Fig. 54.—Position of the frontal sinuses *a*, inferior; *b*, superior.

frontal sinuses, the presence of a tumor, or some pathological alterations; on the other hand, the presence of a clear percussing sound should not be taken as indicating that these changes are not present. Large tumors by pressure cause changes or elevations on the nasal bones of the frontal sinuses; such alterations may also be seen in the hard palate see (Fig. 54).

Physical Diagnosis of the Larynx and Windpipe.

The symptoms include the bark, cough, and respiration, as well as the local symptoms. The bark is always rough, hoarse, or shrill in all affections of the internal larynx, and is always of great importance in rabies (barking howl), or total loss of voice; this is particularly seen during or after dog shows. The cough is an accompaniment of all affections of the

larynx; and in the later stages of catarrh, where there is much mucus, it is loose, moist, and rattling, and may be produced by slight pressure on either side of the larynx, by cold, pressure, or after drinking; in any chronic irritation of the larynx, any excitement, such as the pleasure of meeting a person they know, will start a severe coughing spell. The respiration is always dyspnœic and accompanied by a stenotic bruit when from the results of some diseased condition there is a contraction of the larynx. Auscultation of the larynx is performed by placing the ear directly on the larynx. Normally the sound is a slightly wheezy respiration. Rubbing, creaking, or rattling sounds indicate more or less liquid accumulations (mucus, pus, or blood); wheezy, gasping, snoring sounds indicate severe swelling of the mucous membrane or tough mucus (chronic catarrh); it may also indicate the presence of tumors, membranous accumulations, and paralysis of the muscles of the larynx.

A local external and internal examination of the larynx can be made. Externally the larynx can be examined to see whether it is swollen, as in acute laryngitis; for fracture or dislocation of the cartilages, for œdematous, phlegmonous, or emphysematous swellings of the part or its surroundings, and sensitiveness to pressure, always indicates some irritation of the larynx.

The internal examination of the larynx is very easy and simple except in cases where the animal is very vicious; the method of keeping the mouth open is fully described on page 12, and then by means of a spatula, or the handle of a spoon, the tongue can be depressed or pulled out of the mouth with a pair of blunt forceps; the examination should be made near a window or by means of a lamp or electric torch; the light can then be thrown into the posterior portion of the throat. Vicious animals may be put under ether or stupefied by morphine. When the mouth is opened and the tongue depressed, we can easily see the entire pharynx and the upper wall of the larynx and epiglottis, and in some cases a part of the windpipe, and swellings, discolorations, hemorrhages, ulcerations, new formations, foreign bodies, paralysis of the vocal chords can be readily diagnosed; a good knowledge of anatomy and a quick eye is necessary, however. In acute catarrh the mucous membrane of the larnyx is injected and red and covered with slimy white or yellowish mucus. In chronic catarrh it is not so red, but the mucous membrane has a number of bluish-red vessels running through it and covered with tough, glassy, or purulent mucus; the membranes are sometimes granular; we may also find at the entrance of the œsophagus foreign bodies, tumors, or abscesses. The trachea is examined externally by palpation to see if there is any change or dislocation of the rings, œdematous or phlegmonous swellings of the surrounding structures and enlargement of the thyroid gland.

Physical Diagnosis of the Lungs.

The lungs of the dog consist of a number of layer-like portions which are united by the bronchi and connective tissue; the anatomical positions of the lungs are shown in Figs. 55 and 56. The left lung is divided into two portions or lobes, an anterior and a posterior; the former is again subdivided in two; this division is not very distinct in some cases. The section that divides the large lobes begins opposite the fourth and fifth vertebræ and runs downward and backward as far as the sixth rib; the anterior lobe extends as far as the first rib, and anteriorly and posteriorly to the sixth rib; the large posterior lobe extends back as far as the eleventh or twelfth vertebra, where it extends upward and lies between the vertebræ and the diaphragm. The left lung has a small incision near the heart, called the heart incision. The right lung is somewhat larger than the left, and extends as far back as the twelfth or thirteenth vertebra; it is divided into four lobes, the posterior lobe being considerably larger than the corresponding lobe of the left lung. The cardiac lobe lies upon the heart, almost surrounding that organ; the other lobes hold the same relation as they do in the left lung. The middle lobe of the lungs is a club-shaped portion that lies in a special groove in the mediastinum, extending anteriorly as far as the heart and posteriorly to the diaphragm.

In making an examination of the lungs we must take into consideration the shape of the cavity of the chest, sensitiveness to pressure, the number and character of the respiratory movements, the character of the cough, and the information derived from auscultation and percussion.

Shape of the Cavity of the Chest.—In healthy animals the two sides of the chest should be symmetrical. A depression on one side means pain in that portion of the chest, dry pleuritis, recent fractures of the ribs, one-sided contraction of the lung after a rapid absorption of the exudate of pleurisy. In a case where there is a fractured rib there may be a protrusion in one place, an inflammatory condition of the ribs, and tumors of the wall of the chest; when the whole chest seems swollen, it indicates double pleuritis, with a great amount of exudate present; when only the posterior half of the thorax seems distended and we find the abdomen enlarged, it indicates ascites, tumors, or collections in the abdominal cavity.

Sensitiveness to Pressure.—This is produced by a number of inflammatory conditions of the skin and subcutis, the ribs, or the intercostal muscles as in cases of muscular rheumatism, or in fracture of the ribs, and quite frequently in pleuritis; in this case there is pain on pressure between the intercostal spaces, and there may be great pain shown when there is no exudate; this is a very common symptom. For further information see page 149.

Number and Character of the Respiratory Movements.—Normal breathing is performed in the dog, as in other animals, through muscular ac-
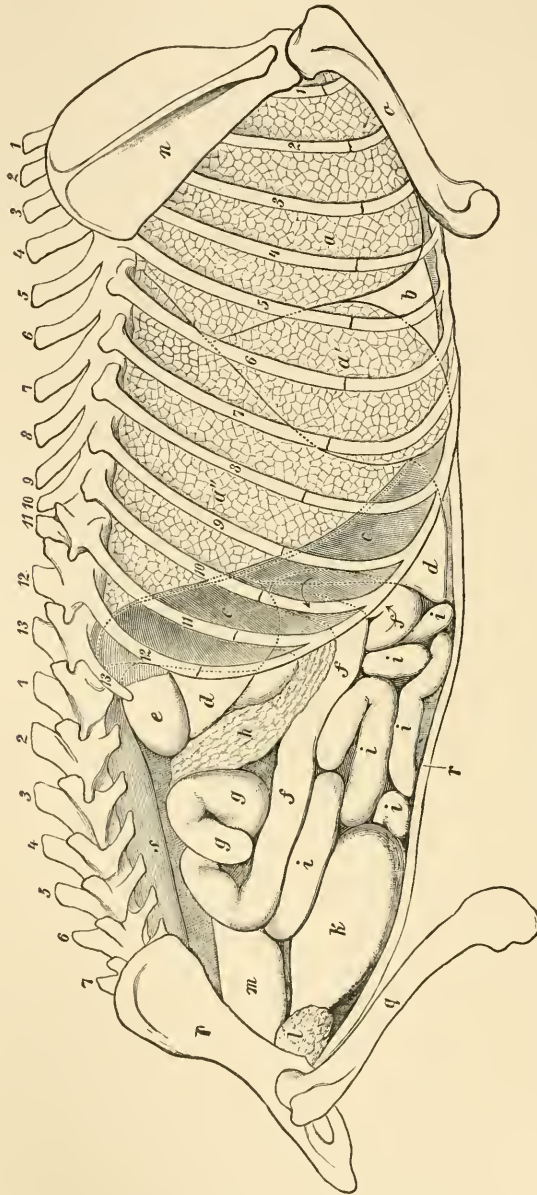
FIG. 55.—Right side of the thorax and abdomen: *a*, anterior lobe of the thorax and abdomen: *a*, anterior lobe of the right lung; *a'*, heart-lobe; *a"*, right diaphragmatic lobe; *b*, heart; *c*, diaphragm; *d*, liver; *e*, right kidney; *f, g, i, m*, intestines; *h*, pancreas; *k*, bladder; *l*, prostate.

tion in inspiring, and the elasticity of the tissue of the lungs and the walls of the chest in expiration; this is also aided by the pressure of the intestines

on the diaphragm. It is only when the respiration is obstructed that the assistance of the muscles of respiration is required in expiration. The works on physiology give more minute details on this subject. The normal respirations are from twelve to twenty-eight per minute, the size and
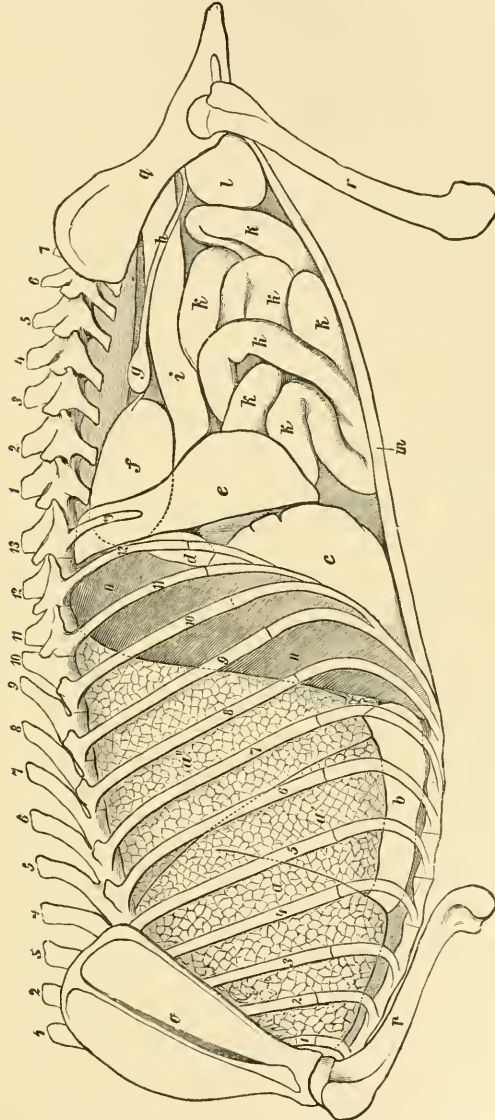
FIG. 56.—Left side of thorax and abdomen: a, left anterior lobe; a', left heart-lobe; a'', left diaphragmatic lobe; b, heart; c, liver; d, stomach; e, spleen; f, left kidney; g, left ovary; h, left horn of the uterus; i.k, intestines; l, bladder; n, diaphragm.

age of the animal making a slight difference, in the smaller dog, of course, being more frequent. Various conditions tend to alter the above number, such as running, physical excitement, atmospheric temperature, the presence of a stranger, particularly if they handle the animal, overloading of

the stomach, and advanced pregnancy. While the respirations in the dog are regular, yet they are disturbed more quickly by physical excitement than in any other animal, and after any unusual exercise, the dog will open the mouth.

A pathological lessening of the number of the respirations, may be seen in all serious affections of the brain and its membranes, in acute infectious diseases, such as septicæmia and distemper and in cases of contraction of the air-passages.

A slight increase in the respirations may follow any increase of temperature; they are also increased, when any pain is present, in circumscribed pleuritis, in the commencement of peritonitis, in fractures of the ribs, and in rheumatism of the intercostals. Laborious respiration (difficulty in breathing, dyspnœa) is seen where there is any contraction of the pharynx, larynx, or windpipe; for instance, from the swelling and inflammation of the mucous membrane in those organs, foreign bodies, tumors, etc. We see laborious breathing, with great increase of the number of respirations, in any irritation of the bronchial tubes, where they become contracted or filled with mucus, and in all diseases of the true lung-tissue, in all exudates into the pleural cavity, or in diseases of the abdomen, where there are collections of solids or fluids in the abdominal cavity that press on the diaphragm in cramp or spasm of the muscles of respiration, as in strychnia poisoning, tetanus, or eclampsia in nursing bitches, in diseases of the heart where there is stagnation of the thoracic circulation. In all cases of dyspnœa in the dog the animal rarely lies down, but prefers to assume a sitting position with the front legs spread wide apart.

Cough.—The nature and form of cough are very important symptoms in all diseases of the respiratory organs. Cough is produced by reflex action from all parts of the mucous membranes of the pharynx, windpipe, bronchi, and also by an inflamed pleura. The pulmonary tissue never produces cough by reflex irritation. The so-called "stomach cough" is only imaginary; no such thing can truly be said to exist. Cough is generally absent in diseases of the brain or in certain cases of extreme weakness, and just before death from poisoning, as well as in cases where the glottis and the muscles of respiration are acutely inflamed. Where the sensitive ends of the vagus and particularly the supra-laryngeal nerves become paralyzed it is impossible to produce coughing by manipulation of the throat. Dogs do not cough intentionally, and if it is very painful they can suppress it.

An animal may be made to cough by pressing the sides of the pharynx between the fingers; if the throat is pressed hard an animal will cough and make motions very similar to those of vomiting.

Occasionally an animal is found that the most severe pressure of the

larynx will not produce any signs of coughing, although it may make a swallowing movement.

Several spells of coughing, after a slight pressure of the pharynx, point to a diseased condition of that organ; if the same pressure is made on the windpipe, and the animal coughs violently, it also indicates a diseased condition of those parts. In bronchitis and catarrhal pneumonia, coughing can be produced by tapping on the wall of the chest, indicating diseased conditions of the deeper air-passages, particularly bronchitis, bronchopneumonia or catarrhal pneumonia. Spells of coughing may be produced as a result of unusual exercise, running, jumping, excitement, or from going out into cold air.

In the beginning of acute bronchitis and in pleurisy the cough is dull, weak, usually frequent, dry, and husky. In chronic emphysema, bronchitis, catarrhal or croupous pneumonia the cough is soft and frequent. The cough in emphysema and œdema is very much the same, but not very frequent, and in tuberculosis it is hollow and dull. There are many exceptions to this rule; for instance, in cases where foreign bodies enter the lung through the mouth or following vomiting, the cough is convulsive and violent, resembling whooping-cough (chronic pharyngeal catarrh) in its intensity. As a rule dogs cough more frequently at night than during the day.

The expectorations cannot be examined in the dog as in man, as the animal generally swallows all the secretions; in rare instances there may be a small portion of the mucus thrown out of the mouth or nose in coughing. We can often see the animal chewing or swallowing after a fit of coughing, which indicates that the animal has brought up a piece of mucus into the mouth or pharynx; this is seen when the cough becomes loose, moist, or rattling, and is what is termed "looseness" of the cough, being seen generally in pharyngeal, tracheal, and bronchial catarrh. The

Fig. 57.—Pleximeter.

largest amount of excretion is seen in bronchial and tubercular diseases, while in catarrhal and croupous pneumonia, and also in certain forms of bronchitis, we find the excretion is thick and firm and accompanied by dry, laborious coughing spells, and at the end of the cough there is a swallowing movement. In hemorrhage of the lungs the cough is accompanied by more or less foamy blood from the nostrils and mouth and in some cases symptoms of choking; a slight hemorrhage may escape our observation, as generally all the blood is swallowed.

Percussion of the Thorax.—Percussion (tapping) is performed by means of a percussion hammer and an ivory or metal plate (pleximeter)

(Fig. 57). Lay the plate close to the wall of the chest, and, with the hammer in the other hand, strike the plate a number of light, quick taps; the fingers can also be used, and are preferred by some. Place the index or middle finger of the left hand firmly on the chest wall, and with the index finger of the right hand tap on the finger of the left hand.

The limits of percussion are given in Fig. 58, but it must be taken into consideration that on expiration the posterior limit of the lungs is carried forward of the dotted line and not extending to the last rib and also that when the stomach or intestines are very much filled with gas, and crowd the diaphragm forward, the extent of the lungs is lessened. The percussion area lies in a triangular space between the lower side of the mus-
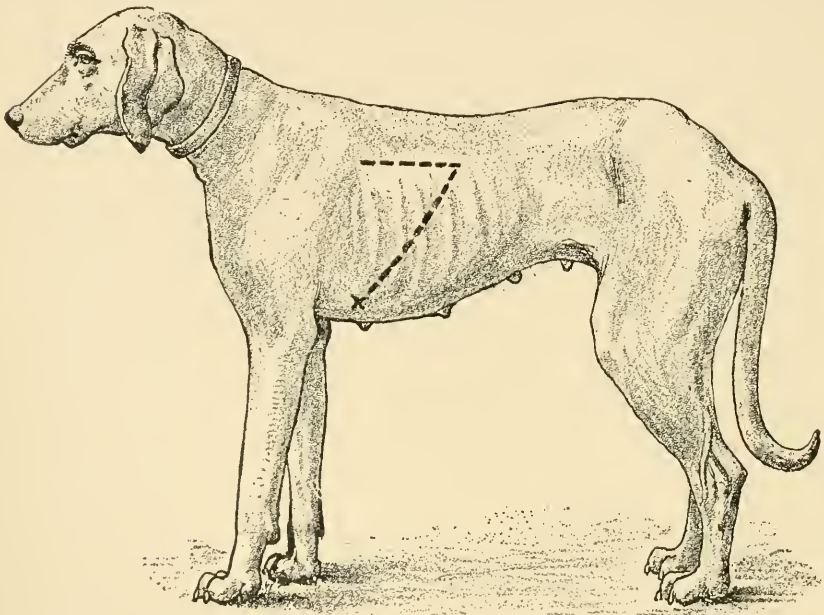
Fig. 58.—Field of percussion; x, location of heart beat.

cles of the back, the posterior portion of the muscles of the forearm, and the ends of the ribs, and by pulling the forelegs forward, the extent of the chest wall can be increased for examination. In percussion we make the distinction between a clear, loud, normal lung sound and a tympanitic, dull, or solid sound of a diseased lung. The clear normal sound of the healthy lung is heard all over the thorax, the volume of sound depending on the thickness of the lung at the particular part being examined. The muscular layers of the chest have a certain effect on the sound, very thick walls lessening the sound to a certain extent; the sound is more or less dull over the shoulder-blade, sterum, and back; the posterior borders of the lungs often have no perceptible sound, as they are so thin.

A dull, muffled sound, which has been mentioned in the above classification, is heard in the following conditions: In the tissues of the lung, where the air cannot reach, as in hepatization; in croupous pneumonia; in tuberculosis, provided that the diseased centre is not entirely surrounded with tissue containing air; in tumors of the lungs; in hemorrhagic infarction; in sections of the lungs that are compressed by pleuritic or pericardial effusions. Œdema of the lung is only accompanied with dulness when it is well advanced.

The dull sound is present, when an abnormal medium is between the lungs and the pleximeter, as in the various pleural diseases; tumors of the pleura; pleuritic or dropsical effusions; and also in certain pathological alterations of the chest, as in œdema, or tumors. The more the tissues fill up near the walls of the chest and the greater the density of the medium between the pleximeter and the lungs, the more indistinct and muffled the sound becomes.

The tympanitic sound is heard where there is any cavity or hollow in the lungs, as in pneumothorax. In the alteration of the tension of the parenchyma of the lungs, we find the sound above pleuritic exudates and in the neighborhood of large tumors of the lungs, or in compression of the lungs from the pushing forward of the diaphragm due to tumors, or ascites. It is also heard in moistening of the alveoli by fluids and reduction of the contained air, as in the loose moist stage of croupous pneumonia; and where there are many small tubercular centres, in the tissue of the lungs, which are hollow in the centre and contain air, and it is sometimes heard in œdema of the lungs. Cutaneous emphysema of the walls of the chest gives a clear tympanitic sound. There are several modifica-

Fig. 59.—
Stethoscope.

tions of this sound, such as the cracked-pot or metallic, tinkling percussion sound, but these are not of much diagnostic value, as they appear only when there may be large cavernous spaces in the walls of the chest.

Auscultation of the Lungs.—This is performed, either by putting the ear directly against the walls of the chest, over the affected region (direct auscultation), or by using a stethoscope (Fig. 59) (indirect auscultation). (A form of stethoscope called the "membranate stethoscope," a modification of the phonograph, has lately been introduced and used in the larger animals with considerable success, but the person using it must be thoroughly familiar with the chest sounds and also with the instrument to get the best results, but the writer finds that on account of its size it is not of much practical use in the dog.) The first method is the best, especially with restless animals.

The ear distinguishes the true respiratory and accessory sounds. In

the former we hear a vesicular respiratory bruit, which has a lapping char-
acter, and the bronchial respiratory bruit, which is a blowing murmur,
and, lastly, an indistinct respiratory bruit, which is a slight soft murmur.

The vesicular respiratory bruit is heard when any portion of the lung
that is filled with air lies against the wall of the chest.   In normal inspira-
tion the sound is a smooth, regular murmur, the air going directly into the
alveoli without any resistance.   This sound can be increased very much
even during health by active movements or during excitement; it is also
much clearer and louder in emaciated animals where the walls of the chest
are thin.   The vesicular murmur is always much louder in young animals,
and especially in puppies; the murmur is also noted in expiration in
animals under nine months.   According to the amount of irritation, the
vesicular murmur is lessened in bronchial catarrh where there is much
swelling of the mucous membrane and secretions collected, in stenosis of
the upper air-passages, in emphysema of the lungs, in certain stages of
catarrhal pneumonia, in pleuritic or dropsical exudations, in thickening
of the pleura from the deposit of lymph-masses, tumors or œdema.

It disappears entirely in croupous pleuritic effusions, in pneu-
mothorax, and in closure of one of the large bronchial tubes.

The vesicular murmur is increased in dyspnœa in portions of the
lungs that are healthy when other parts are diseased, the healthy portions
doing all of the work; this is especially seen in bronchitis, where the
smaller bronchi are plugged up with secretions.   We occasionally find
an irregular vesicular murmur in healthy dogs, but it is also heard in
cases of bronchitis; this murmur is heard only on inspiration.

The murmur of expiration is very slight; in normal cases it can hardly
be heard; it is quite plain when the breathing is strong after excitement,
action, etc., especially in young dogs and those animals that have a thin
chest wall.   According to the diseased condition, the sound is strength-
ened, varied in tone, and prolonged.

The bronchial respiratory bruit (bronchial breathing, wheezing
sound) may be heard in the normal respiration of the pharynx, wind-
pipe, and the anterior part of the chest in diseased conditions; it appears
where any part of the lung is deprived of air, and the disease has plugged
up the smaller bronchi and extended to the larger-sized bronchi.   This is
the case in the various pulmonary affections, where we find large sections
of the lungs are obstructed, or in compression of the lung by a pleuritic
exudate or by tumors, and in rare cases by the pressure of the diaphragm
where it is pushed forward from the collections of fluids in the abdomen.
It is also heard when a quantity of mucus is coming up the bronchial
tubes; this sound disappears when the mucus is coughed up.   Lastly,
we find it in cases where the lung has large cavernous spaces in it.

Indistinct respiratory bruits are heard in lobular pneumonia, where

the diseased lobules are located among clear tissue that the air is passing into, and where the true character of the respiratory bruit is not heard on account of the loud rattling of the air going through the contracted bronchial tubes. Indistinct respiratory sounds are also heard where there is more or less mucus in the bronchial tubes, and after the animal has had a coughing spell the true bronchial sound is heard.

Irregular bronchial sounds (rattling bruits) are caused by the movement of the mucus or fluids that are in the air-passages, being carried to and fro by the passage of air. They are dry (snoring, wheezing) where a small quantity of sticky mucus collects in the bronchial tubes, as is seen in some catarrhal affections and in cases where the mucous membrane is considerably swollen. The snoring sound is generally heard in the large bronchial tubes. The wheezing sounds occur in the smaller bronchial tubes. A spell of coughing produces considerable change in the character of the slight, rattling sounds of the chest. The rattling sounds are moist when the secretions are liquid; the thicker they are the duller the bruits become. We hear moist, rattling sounds when the secretions are collected in the large bronchi; this sound is also heard when there are cavernous portions in the lungs. We find much less when this is the case in the middle bronchi, and a very low bronchial bruit when the small bronchi are involved. By this means we can distinguish in what position the irritation lies in the bronchi; this is rather important in diagnosing a case of bronchitis. When the fine bronchioles are involved it has a crackling or crepitant sound and sibilant bruits; these are only heard during inspiration. This sound may sometimes be heard in the alveolar passages and in the alveoli themselves, when they are filled with mucus or closed up, and where the air can reach them only by strong inspiration. This is seen in the first and third stages of croupous pneumonia, in œdema of the lungs, and in capillary bronchitis; in the last, the crepitation is mixed with an irregular rattling sound. We find also the friction sound of the pleura; this is not heard in the normal condition, but in disease; it is either crepitating, scraping, or scratching. It is heard in pleurisy; as a rule it is louder on inspiration than expiration. This sound is produced by collections of fibrinous accumulations on the pleura. These sounds are not heard when the pleura is separated by an exudate. The sound is plainest at the commencement of the disease, and when the exudate is being absorbed. This sound is not altered by coughing, and in this way can be distinguished from rattling sounds which are heard when it is a case of pleuro-pneumonia. The rubbing sound caused by the broken ends of a fractured rib is indicated by the crepitation on movement of the ends of the rib.

DISEASES OF THE NASAL CAVITIES.

Catarrh of the Nose.
(Cold in the Head; Coryza; Rhinitis; Nasal Catarrh.)

Etiology.—Catarrh of the nose (catarrhal inflammation of the nasal mucous membranes) occurs very frequently and originates from local causes (dust, smoke, pentastomum tænioides, foreign bodies) or by cold. Coryza is also a symptom of distemper, and may appear secondarily in any inflammation of the other mucous membranes of the head. Where a large number of dogs are kept together, it may occur as an epizootic or may result from being bathed in cold weather and not being properly dried, clipping or shaving the hair, or from ulceration of the nasal passages.

Clinical Symptoms and Course.—These are sneezing, wiping the nose with the paws, or rubbing it against some object. Later a nasal discharge, which is watery and liquid at first and later becomes turbid, thicker, and more tenacious; and it may become purulent, according to the complications that may appear later on. If the cavities in the upper chamber of the nose are affected, the discharge is very profuse and there is more or less disturbance of the general system. When the catarrh is confined to the anterior chambers the nasal cavities are often very much contracted and we hear a snuffling nasal bruit; and if the chamber is very much contracted we may see dyspnœa, and the animal is then compelled to breathe through the mouth. This is apt to occur more in those dogs that have narrow, twisted, or curved nasal chambers, as in the case of the pug and bull dog. True bleeding of the nose (epistaxis), or mucus streaked with blood, is very seldom seen. The duration of a case of nasal catarrh is usually short; although we may occasionally see a case where there is a tendency to a chronic condition; in such a case, the secretion becomes purulent and has a tendency to dry around the nose, forming a dirty crust around the nostrils and the upper lip (see later under Pentastomum tænioides); in such cases the mucous membrane is dry, corrugated and frequently gray in color, the breath may remain fœtid, resisting all palliative treatment, and may continue as a chronic condition and affect the animal all through life. In very bad cases the secretion is purulent, with a very bad odor, and in rare instances streaked with blood. This is specially the case where the pentastomum tænioides is the cause of the diseased condition of the mucous membrane.

Therapeutics.—Nasal catarrh will generally disappear without any special treatment. To protect the neighboring tissue from the excoriation of the tissues caused by the discharge it is well to keep it clean with tepid water and a little borax, or to coat the part with vaseline or

oxide of zinc ointment. In all mucous, purulent, or chronic catarrhs spray the nose with a 2 per cent. solution of creolin, or coat around the nostril with vaseline or oil. In acute catarrh it is best to spray the nostril with an atomizer, using either of the following solutions: creolin, 2 per cent.; carbolic acid, 2 per cent.; boric acid, 3 per cent.; the inhalation can be given in the form of warm solutions, allowing the animal to inhale the steam from them by the method described in the treatment of chronic catarrh of the larynx on page 136, or with an atomizer; infusion of chamomile, carbolated water, tar water, and oil of turpentine have been used with good results. Fœtid discharges from the nasal cavity may be treated by injections or local applications but, as a rule, animals resist treatment, and the excitement and irritation to the animal does much more harm than good. The vapor apparatus described on page 136, is much simpler and produces good results. Painting the nasal cavity with a 1 to 5 per cent. solution of cocaine will anæsthetize the mucous membrane and lessen the irritation of the animal; an atomizer may be used or powder applied by means of an insufflator is useful to make local applications to the nose; in making such local applications care must be taken to have the patient's head dependent and use very little force in the application, so the injection may traverse only the nasal cavity and not be driven into the larynx and into the lungs. The mild albuminous solutions of silver may also be used.

Other Diseases of the Nasal Cavities.
Bleeding at the Nose (Epistaxis).

This is a result of traumatic or mechanical causes, such as blows, bites, lacerations, or the entrance of foreign bodies into the nasal cavities; it also results from acute or chronic catarrh, pathological growths, parasites in the nasal cavity, congestion or rush of blood to the nasal region, infectious diseases, parasites (pentastomes), or hemorrhage from the lungs.

Violent bleeding at the nose can be controlled by injections of cold water or a 3 per cent. solution of chloride of iron into the nostril. It is very difficult to place a tampon in the dog's nose that will be efficient, on account of the anatomical peculiarities.

When the pentastomum is present, the only efficient way to get at it is to trephine the frontal bones, so that agents can be injected directly into the location of the parasites. For this operation refer to the text-books on surgery.

Treatment.—No treatment is generally required, as the majority of attacks of epistaxis stop spontaneously if the animal is kept quiet. In persistent cases make applications of cold water to the head or solutions of equal parts of vinegar and alum are injected into the nose, or in-

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jections of vinegar and water, equal parts, 3 to 5 per cent. solution of alum, tannin, chloride of iron or antipyrin. Tampons are rather difficult to apply, but if the bleeding is persistent they can be used. Use small pledgets of cotton steeped in chloride of iron, taking care the plug is not pushed in entirely, so that it can be removed later by means of forceps. The best means of applying the tampon is to use the rapid tampon. The so-called internal styptics are useless. The injection of gelatine solution, once so much in vogue, is not now used, as it is dangerous. Anæmia from exposure and persistent epistaxis is considered in the chapter on that subject.

Fig. 60.—Dog with chronic catarrh and pus in the frontal sinuses.

Tumors of the Nasal Cavities.

These may be indicated by a swelling or alteration of the nostril or the adjacent structures; frequently osteo-sarcomas involve the nasal septum, palate or superior maxilla, the new growth absorbing or disturbing the normal anatomy of these structures and carcinomas converting the bones into soft cellular structures. Polyps are sometimes present and are removed either by tortion or by removing the nasal bone and getting into the nasal cavity.

Catarrh and Pus in the Frontal Sinuses.

This may result from traumatisms or from pentastomes (see later) or new formations in the frontal sinuses, as a result of nasal catarrh, indicated by swelling and dulness on percussion of the frontal sinuses (see Fig. 60). Acute catarrh of the frontal sinus may result as a sequel of influenza; as a rule, however, it is spontaneously absorbed. If it is

chronic, the pus may be liberated by trephining, and the cavities washed out with astringent solutions, peroxide of hydrogen, zinc, lead, or alum.

Pentastoma and Pentastoma Influenza (Linguatula Tænioides).—This tænia-like parasite, which belongs to the class of archnides, and order of Linguatulæ, has a flat, tongue-like body, which is indented at its borders and composed of 90 to 100 segments, making the body have a saw-like appearance, and is whitish-yellow in color (see Fig. 61). The female is 80 to 95 mm. and the male 18 to 20 mm. long, both sexes about 1 to 2 mm. wide.

These parasites are found in the sinuses of the forehead and the upper nasal chambers (Fig. 62); they may also find their way into the pharynx, where they are developed sexually. The eggs are yellowish-brown, as many as 500,000 being found in one female; these eggs are attached to some vegetable substance eaten with the vegetable food by a herbivorous animal or man. In the stomach it becomes free when the shell is dissolved and reaches the liver in various ways. It is found in the spleen, kidneys, peritoneum, and in rare instances in the

Fig. 61.—Pentastoma tænioides.

lungs, where it becomes encysted; this is the sexless larval form, pentastomum denticulatum (*Linguatula denticulata*) (Fig. 63). It resembles the sexed parasite in general shape, except that it is much
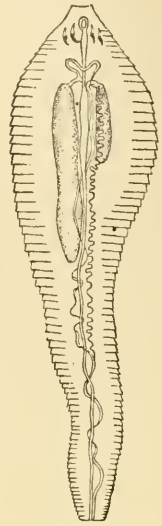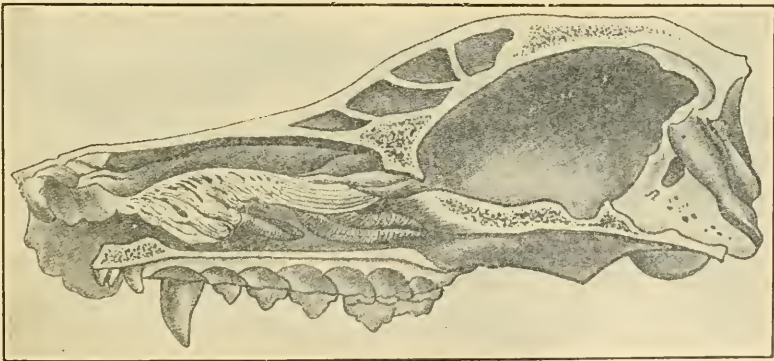
Fig. 62.—Cross-section of the head of a dog with pentastoma in the nasal cavity.

smaller, from 4 to 5 mm. long, and in its anterior part about 1.5 mm. wide. It lies in a detached cyst which is about 5 mm. long. In six months it becomes sufficiently developed to break through the cyst-wall, and by direct migration finds its way to the bronchial tubes; it is coughed up from the lungs of the host and finds

its way into the nasal cavities of the dog through the food or is carried into the nose in respiration and crawls up into the nasal cavities. While the disease is rarely observed, numerous cases seem to occur in certain districts.

The majority of observers consider the disease rather difficult to diagnose and generally it is only when it involves a number of animals, such as a pack of hounds or carriers, or in one of the districts where it is prevalent, that it is noticed. The larger breeds of dogs are most frequently affected and show the symptoms of chronic nasal catarrh.
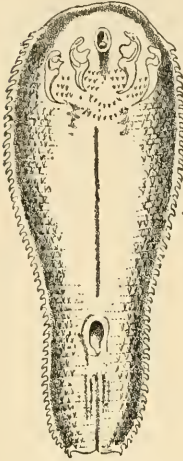
Fig. 63. — Pentasto-mum denticulatum.

Pentastomum catarrh differs from ordinary nasal catarrh, from the fact that in pentastomum catarrh there is a more or less bloody nasal discharge which is very purulent and putrid, and that the animal is greatly depressed. There is marked interference with respiration, the animal appearing at times to almost suffocate; the sense of smell is generally lost or is very slight; it becomes emaciated and sneezes a great deal oftener than in ordinary catarrh. An instance is recorded where the parasite penetrated the hard palate, causing a great flow of saliva. In some cases the inflammation has extended from the nasal cavities to the cranial cavity and produced meningitis with severe cerebral symptoms, great excitement, restlessness, and a tendency to biting or snapping, and also paralysis of the lower jaw and several symptoms very similar to those of rabies.

Friedberger and Frohner advise that in all cases where there are symptoms of rabies, that the frontal sinuses be examined, as there are often cases where the pentastomum is present and it may produce cerebral symptoms, and even death, without any marked alteration in the mucous membranes of the nasal passages. At the same time it is possible in rare instances to find a pentastomum in a dog that has died from true rabies. The writer may mention that he has also found cerebral symptoms in an animal that has been suffering from purulent (non-parasitic) nasal catarrh.

Fig. 64. — Egg of the pentastomum tænoides magnified 200 times.

Treatment of pentastoma consists in the injection into the nose of solutions (either by means of a syringe or by an atomizer) of boracic acid, creolin, chloroform, benzine, carbolic acid, or by the application of the vapors of chloroform, formaldehyde, etc. All these preparations are

rather difficult to apply, on account of the narrowness of the nasal passage in the dog. In very acute cases, the best method of procedure is to trephine the upper part of the nasal passage and going directly into that cavity inject it with solutions of turpentine, chloroform, corrosive sublimate solution and wash out the parasite. This can be accomplished by using a good sized syringe filled with the solution (creolin 1, water 15, or emulsion of turpentine in linseed oil 1 to 10) and putting a small section of rubber hose on the end of the syringe; insert it into the opening and inject slowly, taking care to see that the animal's nose is depressed and so allow the flow to go over the location of the parasites.

DISEASES OF THE LARYNX.

Acute Laryngeal Catarrh.
(*Acute Laryngitis*).

This is generally observed in the spring and autumn, and at times seems to be epidemic; it may be caused by lying in a draught, being bathed in cold weather, cutting the coat too early, or sudden changes of temperature. It is found more frequently in delicate or pampered dogs, these animals catching cold much more easily than hardier animals.

Etiology.—The most common cause of catarrh of the larynx is cold; laryngitis rarely originates from direct irritation by agents that affect the mucous membrane of the larynx, such as inhalation of smoke, dust, irritating gases, foreign bodies, etc. It may result from constant barking, as when an animal is exhibited at a show and barks constantly, or through lying near a fire and getting very warm and then going and lying at the door, where the draught will come on the head and throat. Laryngitis appears as a secondary symptom of acute inflammation of the nose, trachea, and bronchi, and it is generally one of the precursory symptoms of distemper.

Pathological Anatomy.—The mucous membrane of the larynx is partially or entirely reddened, inflamed, and swollen, and covered with mucus over its entire surface; this mucus is rarely purulent; in serious cases, the membrane is eroded or ecchymosed in spots.

Clinical Symptoms.—The first noticeable symptom is a cough; this may be very loud, according to the condition; it is always coarse, hard, and dry in the beginning; later it becomes softer and more moist as it is accompanied with the secretions of mucus, and the animal may retch and act as if going to vomit.

By a slight pressure on the glottis we can make the animal cough, and the larynx seems to be painful on manipulation; running, excitement, drinking cold water, or the administration of medicine all produce coughing. Difficulty in respiration is seen in certain forms of laryngitis

where there is intense inflammation and great swelling of the mucous membrane; it is accompanied by more or less wheezy or rattling sounds, which can be heard by placing the ear on the larynx.   There is not much constitutional disturbance in the milder forms of this disease; in more acute cases, the animal is depressed and eats slowly; this is probably caused by a certain amount of irritation extending to the muscles of deglutition, and to swelling of the mucous membrane, or from some form of pharyngitis, which may be present at the same time; if so, it is generally accompanied by a slight rise of temperature and loss of appetite.   This condition in young dogs should always be watched very carefully, as it may be one of the premonitory symptoms of an attack of distemper.

The disease generally lasts only a few days, but if a case is neglected and does not receive care and proper treatment, it is apt to remain irritable and become chronic.

Therapeutics.—The first thing to do is to remove the animal from cold draughts and apply friction, with some mild liniment over the larynx, also the application of a moist warm compress over the larynx with the inhalation of medicated vapors, a pinch of belladonna leaves or a teaspoonful of tincture of benzoin in boiling water, and internally the administration of some expectorant or narcotic.   These medicines should only be administered when the cough is persistent and the violence of it tends to aggravate the irritated condition of the mucous membrane; morphine is the best, as it lessens the cough and irritation; it can be administered with potassium cyanide and syrup of wild cherry.   The following prescription is very useful where the animal is a small pet dog, that is, one kept in the room; it tends to prevent the cough, which is always worse at night:

$\mathR{R}$.   Morphiæ sulph.,   0.1
         Aq. amygdalæ amaræ,   24.0
         Sig.—Half a teaspoonful three times daily.

$\mathR{R}$.   Morphiæ sulph.,   0.12
         Potassii cyanidi,   0.15
         Syr. pruni virginianæ,   96.00
         Sig.—One teaspoonful four times-daily.

$\mathR{R}$.   Ext. hyoscyami,   1.0
         Liq. ammon. acetatis,   20.0
         Sig.—Twenty drops every half hour.

$\mathR{R}$.   Heroin hydrochloratis,   0.1
         Aquæ,   150.0
         S.—One to two teaspoonfuls every six hours.

Occasionally we may find a foreign body in the larynx presenting the following symptoms: Dyspnœa accompanied by loud coughing or

whistling sounds mingled with the coughing, great anxiety shown on the animal's face; cyanosis of the mucous membranes. If the animal is actually choking, perform tracheotomy immediately, then endeavor to dislodge the foreign body and if this is not successful laryngotomy is indicated.

Chronic Catarrh of the Larynx.
(Chronic Laryngitis; Convulsive Cough; Chronic Irritable Cough.)

Etiology.—Chronic laryngitis generally results from one or repeated acute attacks of laryngitis, or from chronic catarrh of some of the other organs of the air-passages; the pharynx, trachea, or bronchi, etc. It may also follow swelling or ulceration of the pharynx, or from the formation of a tumor in that organ.

Pathological Anatomy.—The mucous membrane is thickened, but not so red as in acute laryngitis; it is marked with fissures and elevations due to thickening, caused by the chronic inflammatory processes; and here and there may be noticed a dirty bluish-red coloration. The surface is granular, on account of the swelling of the inflamed mucous glands; in rare cases, we may see small papilliform elevations or small eroded or ulcerated places which mark a breaking-down of some of the mucous glands; the secretion which covers the affected parts is thick, slimy, and tenacious.

Clinical Symptoms.—The symptoms are similar to acute laryngitis except that they are not so severe; the larynx is slightly sensitive to pressure, showing that some irritation is present; the animal will cough after manipulation, but not to such a marked degree, and he does not try to get away from the pressure, as would be the case in the acute form, and there is no disturbance of the general system. The cough sounds dry, hoarse, and rough, sometimes moist, and is frequent, quite loud, and accompanied by a wheezy inspiratory sound, with, in rare instances, retching or even emesis, night being the time it is mostly heard, or when the animal runs about and plays and he is going to be taken out for a run. In some cases the cough resembles the whooping cough of children (tussis convulsiva). As a rule the respiration is not increased, but in chronic cases where one attack follows another the respiration is greatly increased with the slightest exertion. Some animals make a wheezy noise as though there was a decided contraction of the larynx. This latter condition may continue for years, and the cough in particular is constantly present.

Therapeutics.—As a rule, the treatment of this disease is unsatisfactory; this, of course, depends to a large extent on the animal. Being removed from the conditions that have originally caused the disease, the first thing to do is to keep the animal indoors, perfectly quiet and pro-

tected from cold, with rest, and avoiding excitement or prolonged howl-
ing.   Among the agents used in general treatment the following are best:
Inhalations of hot medicated solutions, carbolic acid, tar, oil of turpentine
or powdered salt, chlorate of potassium, alum, or tannic acid.   Inhala-
tions with these agents by means of an atomizer, or by vapor bath should
be made twice daily for ten or fifteen minutes.

It is readily understood that inhalations are rather hard to admin-
ister in the dog, as the animal cannot be kept still while the medication is
being made, and also because the dog breathes through the nose, and if
prevented from doing so the vapor is carried into the throat and again
into the mouth.   The only practical way to get an animal to inhale a
vapor is to put him in a close box and through an opening introduce
steam that fills up the apartment; then the animal has to inhale it.   This,
however, can be practised only in a hospital.   But where the animal is
at home, the best method of procedure is to place him on a cane-seated
chair, and having placed the medicated agent, steaming hot, under the
chair, cover the animal with a sheet and hold him for ten or fifteen min-
utes; or we may also hold the steaming vessel under his nose and cover the
head.   It is only with the greatest difficulty that the laryngeal mucous
membranes can be painted with any medicinal agent.   This is to be re-
gretted, as it is the only direct way that the membrane can be treated with
any certainty.   In making local applications to the larynx an assistant
holds open the mouth by means of tapes, the tongue is pressed down-
ward by means of a spatula or the handle of a spoon, and the throat is
sprayed by means of an atomizer or a brush or a quill.   The intratracheal
method of administration of medicinal agents is rather difficult to follow
out, particularly in animals that are fat or have short necks; insert the
needle beneath the larynx or through the crico-thyroid ligament, the solu-
tions to be used are 1 per cent. solution of morphine or codeine.   These
injections should be made daily or every other day.

Frequently in chronic catarrh we use narcotics to stop the severe
cough produced by irritation of the membrane—morphine, codeine,
heroin, and in rare cases bromide of potassium or chloral hydrate.
Expectorants are not of much use in the dog.

As to other affections of the larynx, with the exception of tuberculosis
of the larynx and certain tumors described by Cadiot (both conditions
which are extremely rare), the only one of practical importance is

Hemiplegia Laryngis.

This is occasionally observed.   In this affection the animal has a pe-
culiarly shrill bark, which is varied in tone, becoming harder and harsher
and spasmodic, accompanied by great difficulty in respiration, marked
dyspnœa and roaring sounds during respiration.   The condition may be

W. McDougall, del.
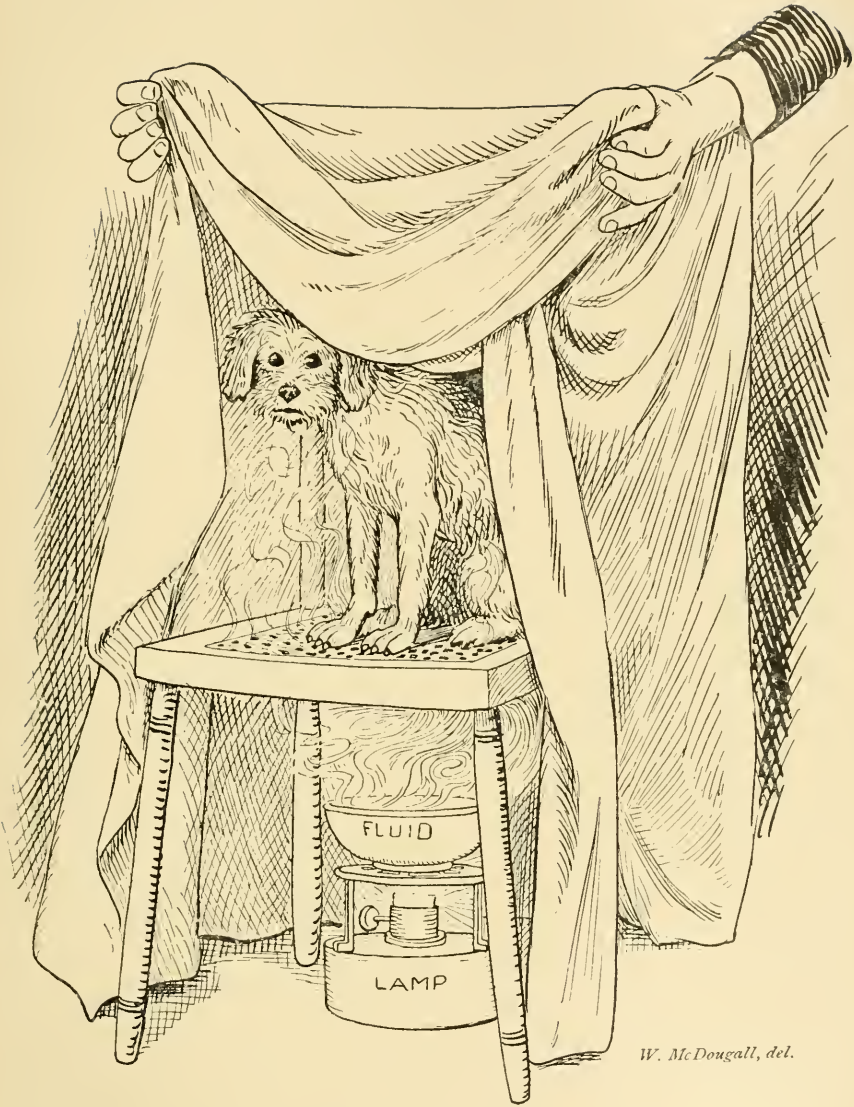
MODE OF ADMINISTERING MEDICINAL VAPORS.

produced by dragging on a collar, follow traumatisms, as in one case observed, that is, fracture of the first rib on the left side, and it is also seen following the pulmonary form of distemper. The treatment consists of the application of a galvanic battery over the region of the recurrent nerve, the administration of nux vomica internally, or of strychnia, subcutaneously.

DISEASES OF THE AIR-PASSAGES AND BRONCHIAL TUBES.

Catarrh of the Windpipe and Bronchia; Bronchitis.
(*Trachitis and Bronchitis Catarrhalis.*)

Etiology.—Catarrh of the air-passages and of the bronchia occurs very frequently in young, weakly, or debilitated dogs. It sometimes originates primarily, but, as a rule, it occurs as a secondary disease. It is caused by cold, especially by breathing cold air when the animal is warm; and in pet dogs we see it quite often where the animals will lie near the register or an open fire until they are very warm and then go to the outside door and lie on the floor where the draught can strike on them and so cool off very rapidly, and repeat this a number of times. It is also caused by mechanical or chemical irritants, such as smoke, dust, parasites, strong gases, or, secondarily, from the extension of inflammations from neighboring organs, as the larynx or lungs, or from defective blood circulation of the lungs, produced by weakened heart action. Catarrh of the trachea and bronchia is very often seen as a complication of distemper, as well as many serious internal diseases, especially in affections of the brain. The latter condition is generally traced to the fact that there is an accumulation of particles of food and secretions, which collect in the mouth and throat, decompose, and are respired into the trachea and produce an irritation.

There is no doubt that infectious influences play a certain rôle in the cause of this disease.

Pathological Anatomy.—In describing any catarrh of the trachea it should be classed under the head of bronchitis, as it is impossible to draw the line of distinction between the two. In bronchitis the mucous membrane is diffusely inflamed, swollen, and tears easily when touched. In the ealier stages of the disease, there is little mucus found on it, but as the disease goes on to the later stages the secretion becomes more copious and turbid, purulent, and filled with pus corpuscles; later on it becomes more or less colored with blood corpuscles.

Chronic Catarrh.—In this condition, the color of the mucous membrane is brownish-grey, and the membrane is frequently uneven and thickened; in circumscribed spots or covering the entire membrane the

secretion is clammy, slimy, or shining, in some cases it is bad-smelling or even putrid, similar to atelekase.

In old cases of chronic bronchitis, there may be some stenosis of the tubes, and also, from the constant irritation of the bronchia, emphysema of the lungs. In regard to this the reader is referred to works on pathological anatomy.

Stenosis (contraction) of the bronchia may be caused either by swelling of the bronchial mucous membrane or by the collection of masses of thickened secretion in the tube. In some cases, the two causes acting together exclude the air from the alveoli of that part of the lungs to which the affected bronchia carry the air, causing the lung-tissue to collapse. This condition, which originates in the manner described, does not change its structure, but soon becomes solidly filled with blood.

In all chronic conditions, we also find the opposite of stenosis, that is, bronchiectasis (widening of the bronchial tubes); this is caused by a relaxed condition of the bronchial walls, due to the chronic irritation and also to the pressure of collections of the secretions. This dilatation of the tubes may be either cylindrical or spindle-shaped.

Emphysema of the Lungs.—This is found near the atelectatic centres and on the borders of the lungs; this condition is supposed to be caused by violent coughing spells and also by bronchitis. The affected parts do not collapse, but appear soft, clear and bloodless; they will, however, collapse quickly on incision.

Clinical Symptoms and Course.—These vary, according to the amount and location of the irritation, whether it is in the trachea, large, medium, or small bronchia, and whether it is acute or chronic.

1. **Acute Catarrh of the Large Bronchia.**—This commences with slight and frequent chills, accompanied by fatigue, indfference, depression, loss of appetite, and sometimes with a stiff and strained gait and slight rise of temperature, which may rise to 40° C. Soon afterward the animal commences to cough; this is one of the principal symptoms of the disease. In the beginning it is short, painful and dry, later it becomes moist and more frequent. It can easily be started by slight pressure on the trachea and also by tapping on the chest close behind the shoulder.

Percussion, as a rule, does not reveal the full extent of the disease. On auscultation, in mild cases, we hear an increased vesicular respiration in the trachea and large bronchia, and when the medium-sized bronchia are affected there is an accumulation of mucus in the tubes and the vesicular murmur is increased. This is due to the fact that while the bronchitis is in the dry stage the sounds are roaring or snorting in character, and when the fluid mucus has accumulated the sounds become rattling, as if the air was passing through a thick mucus (mucous râles.)

**2. Acute Catarrh of the Smaller Bronchia ; Bronchitis Capillaris ; Bron-
chiolitis.**—When the small bronchia are affected, these sounds are much
more decided, and in this condition there is high fever and general disturb-
ance of all the functions, and also a marked difficulty in respiration, and
the disease takes a much more serious course, particularly in young dogs
affected with distemper. One prominent symptom in the dog is the in-
flation of the cheeks with each expiration. Any pressure on the walls of
the chest will immediately produce a fit of coughing. The cough is first
dull and weak, and as the disease increases it becomes looser and easier,
the vesicular sounds being very wheezy. Capillary bronchitis in young
animals is very apt to terminate in catarrhal pneumonia, but even if this
grave complication does not occur, it is still a very dangerous disease and
is apt to prove fatal. The course of the disease is never less than two
weeks, and may often last several weeks before the animal makes a
recovery.

This disease, or the results of it, is what is generally termed **asthma,**
so often seen in old, well-cared-for dogs. The disease is characterized by a
certain amount of difficulty in respiration, which is increased by running
or by any excitement, and is generally accompanied by a severe attack of
coughing, which in severe cases ends with every evidence of choking or
even vomiting. The cough is generally moist, and may be accompanied
by a certain amount of rattling. In the majority of cases, where the
disease is not far advanced, the animals enjoy good health and rarely ex-
hibit any fever. In old cases, the expired air may be bad-smelling or fœtid.

Percussion gives no definite results. Auscultation gives sounds that
depend on the number and size of the diseased bronchia and the character
of the mucus accumulated in them. We may find either moist or rat-
tling sounds, which vary in character, and a heightened vesicular respi-
ration or else an indistinct mucous sound.

Therapeutics of Tracheal and Bronchial Catarrh.—Keep the animal in
a moderately warm but well ventilated place, where it is dry and free from
draughts. In the early stages of the disease give a mild expectorant,
such as syrup of tolu or wild cherry. Local inhalation of vaporized drugs
is not of much use, as very little of the drug is carried into the bronchial
tubes, especially the small ones. We may administer medicinal vapors by
putting a teaspoonful of tincture of benzoin, if the expressed air is fœtid,
or a weak solution of creolin, lysol, or carbolic acid in a quart of boiling
water, and hold it so that the animal will inhale the steam, or a Priessnitz
compress may be put around the thorax; this should be taken off and
adjusted every three or four hours.

In the chronic cases, we generally get good results from the adminis-
tration of expectorants, such as apomorphia, ipecacuanha, and spirits
of mindererus; and where there is a violent cough, add narcotics, such

as morphia, extract of hyoscyamus, or dilute hydrocyanic acid or cyanide of potassium. When there is fever present, a few doses of antipyrine (0.5 to 1.0 gramme, twice daily) will generally suffice.

Tartar emetic, chloride of ammonium, and sulphuretted antimony are of little use; in fact, do more harm than good, as they often destroy the appetite and cause great depression. In the early stages of the disease the cough does not amount to much, but in the later stages, it is constant and very disagreeable, especially at night, and it is in such cases that expectorants are useful to remove the accumulations of mucus. The addition of morphia to the apomorphia solution has the tendency to counteract the emetic effects of the latter drug.

One important factor in this disease is to keep up the general system by giving easily digested food of a mixed character and in concentrated form, and administer wine or brandy in small quantities. If the heart should give evidences of weakness, use stimulants, brandy, spirits of camphor, or digitalis.

In chronic bronchial catarrh where a permanent cure is not to be expected, we can alleviate the sufferings of the animal by inhalations of tincture of benzoin or balsam of Peru, one teaspoonful to a cup of boiling water, or by means of the vaporizer; inhalations of medicated vapors are very useful, and especially the vapors of turpentine, where there is a great accumulation of mucus and a fœtid breath. Inhalations of the vapors of tar and creosote are also useful. The action of tar is a little irregular and occasionally destroys the appetite. Ichthyol and thiol are given in doses of 0.2 to 0.5 gramme several times daily. Narcotics should be administered only when the cough is very severe.

℞	Morphiæ sulphatis,	0.09
	Potassii cyanidi,	0.13
	Syr. pruni virginianæ,	88.0
	Sig.—One teaspoonful four times daily.	

℞	Tinc. aconiti,	0.05
	Tinc. belladonnæ,	0.03
	Tinc. bryoniæ,	0.02
	M. F. Triturat No. 1.	
	Sig.—One tablet three times daily.	

Parasitic Bronchitis.

The following parasites produce bronchitis; parasitic bronchitis, however, is very rare.

Strongylus Bronchialis Canis (Osler); **Filaria Tracheo-bronchialis** (Blumberg Rabe).—These parasites are very small and lodge in the mucous membrane of the trachea forming greyish-red globular protuberances

ranging in size from that of a small pea to a coffee bean (Tracheitis veru), Cosa verminosa (Rabe). These parasites cause severe coughing, dyspnœa great weakness, fever, vomiting, and colicky pains.

Strongylus Vasorum (Baillet).—These are long thread-like worms which lodge in the right side of the heart and the pulmonary artery. The eggs are carried by the blood into the lungs, and lie in the minute branches of the bronchi (bronchioles) forming fine nodules resembling those of tuberculosis; the embryo is liberated, gets into the bronchi, causing irritation and coughing, and the young parasite is expelled with the mucus coughed up, or some of the parasites find their way into the alimentary tract, then into the veins, and are carried back to the heart. Animals affected present the following symptoms: dyspnœa, ascites, and emaciation.

The Spiroptera sanguinolenta (see page 51) also find their way into the air-passages, causing chronic bronchitis.

DISEASES OF THE LUNGS.

Catarrhal Inflammation of the Lungs; Pneumonia.
(*Catarrhal Pneumonia; Lobular Pneumonia; Broncho-pneumonia.*)

Etiology.—Catarrhal inflammation of the lungs generally originates as a secondary disease following bronchitis, by an extension of the inflammation of the small bronchia into the alveoli, or from the obstruction of the bronchial tubes; it may originate primarily as pneumonia or in the pulmonary form of distemper. Certain animals, such as very old dogs, or young animals, undeveloped and underfed, as well as animals that have gone through some acute illness, are predisposed to the development of lobular pneumonia. Lobular pneumonia is caused by accumulations of mucus in the trachea which may be only imperfectly coughed up, or in very weak cases, lying in the tubes, become decomposed and putrid, and so act as an irritant. These particles of mucus are carried into the deep portions of the lungs, directly on the alveoli, and form a capillary bronchitis; it may become converted into a catarrhal pneumonia. In some cases particles of food, medicines, especially thick mixtures, get into the larynx when the animal is unconscious or where there is partial paralysis of the throat. These substances penetrate into the lungs and are very difficult to dislodge from the bronchia. This form of the disease is generally termed traumatic or aspiration pneumonia.

Roberts has described catarrhal pneumonia in an epidemic form attacking all ages, developing a high temperature, and loss of 30 per cent. Savarese has described a specific pneumococcus, but in all probability both observers have described a condition similar in nature.

Pathological Anatomy.—In a lung affected with catarrhal pneumonia, we always find all the characteristics of bronchitis, and as the disease advances, the group of alveoli that belong to the affected bronchia are rapidly filled with the catarrhal deposit, preventing the air from penetrating into them. Soon we see an intense hyperæmia of the walls of the alveoli and the exudation of a thin, non-coagulating fluid, and numerous white blood corpuscles, which soon become pus corpuscles, and the commencement of a fatty degeneration and detachment of the alveolar cells. The alveoli and the small bronchia become entirely filled with pus corpuscles and a certain number of blood corpuscles and broken-down epithelial cells, and the inflamed portion of the lung can easily be distinguished from its healthy surroundings, forming firm, tough, roundish or lobulated lumps, which vary in size and number, projecting slightly above the surface of the lung, and on making a cross-section of the diseased portions, in the earlier stages of the disease, they are seen to be dark bluish-red and later on become gray, while the surrounding tissue that is not diseased is normal or, what is more frequent, is slightly congested with blood. The detached centres, which show plainly in the early part of the disease, soon become confluent, so that finally we find large sections of the lung involved. In rare cases we find fibrinous (croupous) centres in connection with the catarrhal pneumonic centres and extended vesicular emphysema in the neighborhood of the affected centres, and at the borders of the lungs it is often seen. We may also have subpleural and interstitial emphysema and sero-fibrinous or pussy pleuritis about the broncho-pneumonic centres.

Clinical Symptoms.—It is very difficult to make a sharp distinction between capillary bronchitis and lobular pneumonia on account of the close relation between these two diseases. If the disease has affected the alveoli, there is a marked acceleration of the respirations, in some cases as high as 60 per minute, and also inflation of the cheeks with each expiration; the cough is short, frequent, and apparently very painful, the pulse running from 150 to 170, temperature rises quickly and remains high. On making a physical examination by percussion, there are a number of dull centres though the lungs; in some instances the whole of the lung gives dull sounds on auscultation. According to the stage of the disease, we hear râles of various characters, strong vesicular breathing, snoring, fine or loud bruits, and where there is extended infiltration, we hear bronchial respiration and certain spots where there is no respiratory murmur at all.

The temperature often goes up to 40° or 41°; this high temperature usually commences early in the disease or it often makes a rise when the disease has become converted into catarrhal pneumonia. If this complication does not occur, the temperature will not make any marked change, but will follow a regular course, which is to rise quickly at the onset

and gradually fall as the disease decreases and the animal goes on to convalescence.

Course and Prognosis.—The course of catarrhal inflammation of the lungs is rarely less than three weeks, and is often prolonged over three months, with varying degrees of intensity. Traumatic pneumonia is the only form of the disease that runs its course quickly.

The evidences of termination of the disease are: Recovery by resolution, in which the inflammatory products, which fill the smallest bronchia and the alveoli, are changed into a form of emulsion and are either reabsorbed or coughed up, or develop into a secondary disease, for instance, chronic interstitial inflammation of the lung or, in rare cases, the formation of purulent gangrenous centres. Third, death, which may occur at any stage of the disease; in the early stages, as a consequence of great extension of lobular pneumonia or at any time as a result of **œdema of the lungs,** this is observed in very young animals that are very weak, particularly in the pulmonary form of distemper, but it may also occur in very old debilitated animals. Traumatic pneumonia, if it is acute, generally results fatally and little or nothing can be done to produce a favorable result.

Chronic Interstitial Pneumonia.

(Chronic Induration of the Lungs; Cirrhosis of the Lungs; Phthisis.)

When the disease terminates in this pathological condition we find an inflammatory deposit in the interlobular and interstitial connective tissue. This deposit compresses the alveoli and small bronchia, and they lose their functions and are finally absorbed, and on section of the affected portion of the lung it is found to be coarse, rough, and irregular on its surface, the tissue varying from yellow to yellowish-red in color and the lobules surrounded by connective tissue. The bronchia surrounding the affected portion are distended and pocket-shaped, and there are also a certain number of spots of localized emphysema.

The clinical course of the disease shows very little fever, but the animal is never entirely restored to health; the respirations are short, labored, and with a quick, weak cough. The affected animal becomes emaciated, the condition is complicated with dropsical effusions, and it finally dies from exhaustion.

In some cases of lobular inflammation of the lungs the inflamed portions form abscesses, or we may find portions of the lung that are gangrenous. These terminations depend on the nature of the irritant, and generally occur after traumatic pneumonia (foreign bodies). When suppuration commences in the alveoli, an abscess is formed and a pear-shaped body is found in the centre of the infiltrated lobule, and sur-

rounding it is a thin, delicate layer of yellowish tissue and over that a tough layer of red inflamed fibrous tissue; large abscesses may be formed by the fusion of all the infiltrated pulmonary tissue.

When gangrene has developed, the inflamed catarrhal centre becomes dirty greenish-brown in color, or in severe cases, almost black. In the early stages the diseased portion is hard and fibrous, but it soon becomes soft and pulpy and filled with a turbid, fœtid, greenish serum. When the disease is slow and chronic, the gangrenous spots are limited in size, but generally when the disease assumes the gangrenous form, it becomes diffuse and the animal dies rapidly from exhaustion.

We recognize the gangrenous form when the breath becomes putrid, for in the dog it is almost impossible to get any of the discharge that is coughed up, the animal generally swallowing the mucus. Auscultation of the lungs may detect tympanic or metallic sounds, mucous râles and increased bronchial sounds. When gangrene (necrotic pneumonia) has developed, the animal has a putrid breath and a series of alarming symptoms accompanying it—septic fever, chills, and a high temperature, with weak, irregular pulse. If the sputa were examined, we would probably find numerous micrococci, bacteria, and portions of broken-down lung-tissue.

Œdema of the Lungs.—This is apt to follow not only pneumonia, but all debilitating diseases that weaken the left side of the heart, and that organ is unable to force the venous blood through the lungs. There is a regurgitation of the blood, and the alveoli and bronchia become filled by a serous fluid which exudes from the blood vessels. The œdematous lung is distended and much larger than normal; on pressure with the finger the indentation remains some time. On section of the lung, a large quantity of reddish foamy fluid exudes from the tissues and the bronchial tubes.

When œdema of the lungs follows catarrhal pneumonia it generally begins with great difficulty in respiration, labored or stertorous in character, a short, faint cough, and in rare instances a quantity of thin reddish fluid comes from the nose or mouth. On making a physical examination, percussion gives no results but those found in catarrhal pneumonia. On auscultation, we hear rattling bruits all over the chest, especially in the anterior part, and also in the trachea; the blowing sounds may be very loud in some cases, and can be heard some distance from the animal. Death occurs in a short time. Some time before the actual symptoms of œdema appear, the exhausted condition of the heart is indicated by the pulse being irregular, that is, weaker at inspiration than at expiration.

Therapeutics.—In treating lobular pneumonia we follow the same general course as we do in bronchitis. The writer obtained the best

results with Priessnitz's compress and from the remedies recommended under the treatment for bronchitis. The good effects of moist, warm compresses can be much increased by sharp friction with a small quantity of mustard oil to the sides but it must be applied only in young, strong, healthy animals. The best method of application is to make a liniment of 3 parts of oleum sinapis æthereum in 45 parts of olive oil and divide it into 2 parts and apply one-half to each side of the chest then wind a dry bandage around the chest walls and ten to twelve hours later apply Priessnitz's compress. Narcotics are to be given when the cough is constant and distressing. Where there is much debility stimulants such as wine or ether are indicated and the animal should be given small, often-repeated quantities of chopped meat, juice of meat pressed from raw beef, broth, milk, and the peptone preparations.

Some good is to be derived from inhalations in this disease. When the breath is offensive we advise inhalations of benzoin, 4.0 to cup of boiling water. Inhalations of creosote are recommended, but on account of the danger of absorption and irritation of the kidneys by that drug they are to be used with extreme caution. In septic fever, after the appearance of gangrene of the lungs, give subcutaneous injections of ether or camphor.

When œdema of the lung is recognized, it must be regarded as a grave symptom for it is generally fatal. We must, therefore, take very energetic measures—active stimulants, such as mustard oil to the sides, and also injections of ether or camphor subcutaneously. Bleeding and the use of cardiac stimulants, such as digitalis or caffeine, are useless.

Other Diseases of the Lungs.

Catarrhal pneumonia is the only important disease of the lungs in the dog; the others which are here described are of small importance and rarely seen.

Congestion of the Lungs, Acute Hyperæmia of the Lungs.—This disease is comparatively rare, generally being observed in the summer, as a result of very severe exercise; for example, in hunting dogs, in warm weather, or animals running after cars, wagons, or bicycles until exhausted, or as a result of infiltration of the lung in ascites, or from cold air, gas, great heat or smoke if the animal has been in a burning house or kennel, etc.

The early acute symptoms are greatly accelerated respiration, mouth open, tongue deep blue to purple and hanging out, animal restless and excited, heart full, bounding, and easily felt through the chest wall, hard full pulse, cyanosed mucous membranes, and if the acute condition continues for any length of time, apoplectic œdema, apoplexy, or

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acute pulmonary hemorrhage follows and death occurs in a very short time.

Therapeutics.—Keep the animal in the air or a well ventilated room and let the animal rest, with no disturbing influences. In grave cases use venesection, cold baths and clysters, or massage of skin. If œdema threathens, treat accordingly.

Croupous Inflammation of the Lungs; Fibrinous Pneumonia.—This is a firm, hemorrhagic exudation in the alveoli of the lungs and small bronchia. Is very rarely seen in the dog. The writer has never seen a case of true lobular pneumonia, but has seen a few cases of croupal lobular pneumonia, the course of which is very similar to that of catarrhal pneumonia in all its symptoms, the difference being detected only on post-mortem. Roll makes the statement that croupous inflammation of the lungs is common in the dog, but he probably meant croupal lobular pneumonia.

The clinical difference between croupal and catarrhal pneumonia is the rapid course in the onset of the former, the bronchial murmur is lost early, due to the filling up of the bronchial tubes, the frequent complication of pleurisy and the quick formation of a pleuritic exudate.

Anthracosis pulmonum (blackening of the lungs), due to the inhalation of coal dust or coloring matter found in animals living in cities or kept as watch dogs in factories where dust is constantly in the atmosphere, is quite common in the dog, but it has no pathological significance.

Emphysema of the lungs is not such an important disease in the dog as it is in man and the horse. That form of emphysema which appears in bronchitis and pneumonia, characterized by an extreme distention of the alveoli, has been mentioned under these diseases. If the irritation is constant, the disease becomes chronic and a progressive atrophy of the alveolar walls takes place until they are entirely closed up, the neighboring alveoli become absorbed or altered, and finally large cavities are formed, and the blood vessels become atrophied. On section of the lung the edges of the cavities are pale, soft, and the blood vessels are stained with pigment. Sometimes, as a result of severe exertion, such as vomiting, pregnancy, or laceration of the alveolar walls, air is allowed to penetrate into the interlobular, interstitial, or subpleural connective tissue; this is generally caused as a result of severe and continual coughing spells and where animals have died from some form of suffocation. Siedamgrotzky describes a case where an old emphysematous dog had a severe fit of coughing and the lung was lacerated, causing pneumothorax.

Bronchial Asthma; Asthma.—Under the general term of asthma we understand dyspnœas, accompanied with continued cough and labored spasmodic breathing. The true spasmodic asthma, as described in man, in which there are acute attacks of spasmodic respiration, can hardly be

said to occur in the dog. Temporary dyspnœa occurs in heart disease, nephritis, and some other affections. In a general sense, asthma or bronchial asthma, as we designate the disease in man, is characterized by attacks of acute dyspnœa at irregular intervals, caused by temporary spasmodic contraction of the bronchi. While it was once generally thought that asthma was a pure neurosis (bronchiale neurosum), the inclination of the present day is to believe that in the majority of cases reflex action from the nasal mucous membrane is one of the chief causes. The attack generally begins by constant sneezing and drawing inhalation with great effort as if the nose was entirely filled; care must be taken not to confuse this condition with congestion of the turbinated bones or nasal polypus.

Neo-formations of the Lung.—With the exception of tubercular alterations, changes in the lungs are exceeding rare. Carcinomas may occur, generally associated with carcinoma of the thyroid or the mammary glands; these appear in varying sized nodules in the lung tissue; those attached to cartilaginous layers of the bronchi grow to quite a large size. The clinical symptoms in the early stages of these formations are not very pronounced and rarely observed, but may present symptoms similar to chronic affections of the lungs, such as chronic bronchitis or interstitial pneumonia. There may be difficulty in respiration, œdema of the head and neck, due to pressure on the jugular. Frohner found one case of carcinoma of the lungs where the animal had frequent hemorrhage. Treatment is useless. Parascandolo, keeping up artificial respiration, removed a carcinoma through the chest wall from a large dog.

DISEASES OF THE PLEURA.

Inflammation of the Pleura; Pleurisy.
(*Pleuritis.*)

Etiology.—The disease is divided into two forms—primary and secondary pleuritis. The **primary** form may be caused by cold; it may also occur as a metastasis, or from the presence of certain bacteria in the blood, which find a favorable nidus in the pleura, lodge there and set up pleuritis. The **secondary** form results from traumatic causes, such as animal being kicked, stepped on, or receiving a violent blow on the thorax, from the extension of inflammations from the surrounding organs, as gangrenous pneumonia, pericarditis, or from peritonitis extending through the diaphragm, fractured ribs, injuries to the walls of the thorax, or perforation of the throat by foreign bodies. We also see it in all forms of pyæmia and tuberculosis. Cadeac thinks that in nine out of ten cases of septicæmia following serous or fibrous pleuritis in the dog, it is of tuber-

cular origin. Tumors of the pleura, chronic nephritis, and acute articular rheumatism may also develop pleurisy. Piana found bacilli and Hutyra and Marek found it caused by streptothrix (actinomyces) canis.

Pathological Anatomy.—The exudation which collects rapidly crowds the lung of the affected side and finally presses it against the spinal column and mediastinum, pressing the lung into an inert mass (lung atelectasis). The opposite lung is the seat of considerable collateral hyperæmia, which may lead to œdema, according to the severity of the condition. When compression of a lung is continued for any length of time, the alveoli lose their functional activity, their walls collapse and become adherent even if the fluid exuded finally becomes absorbed. After this has occurred, it can readily be recognized by the depressed appearance of the ribs. In cases of primary pleuritis which have been seen by the writer, the inflammatory process was always restricted to one side, and that, as a rule, was the left side. The cases of secondary pleuritis were generally double-sided, but the inflammatory conditions are never of equal intensity on both sides, one side being always a little worse than the other. Besides having the results of pressure shown on the lungs, we also find the heart is pushed toward the healthy side of the mediastinum or the diaphragm.

The conclusion of pleuritic inflammation depends on the intensity and duration of the disease and the character of the exudate. In favorable cases the latter is reabsorbed and good results follow. In serious cases, only part of the liquid portion of the exudate is absorbed, while a fibrinous exudate covers the pleura; this becomes converted into a granular tissue containing numerous vessels and later into a stringy cicatricial tissue, called a pleuritic sward, with more or less adhesions of the pleura between the lungs and inner wall of the thorax and between the lungs and diaphragm. Although the sward formations may be very extensive, it is possible for the lung to regain its normal extension, but this takes a long time. Thin adhesions sometimes tear; and extended adhesions offer a constant hindrance to the unrestricted use of the affected part of the lung. Purulent exudates are sometimes reabsorbed; but, as a rule, if the pus is not removed at the proper time by surgical interference it breaks out, either through the pleura into the lungs and then through the bronchia, or it forms an abscess somewhere in the cavity of the chest, generally in the region of the sternum, by undermining the pleura and muscles of the chest.

Clinical Symptoms.—In the primary form of pleuritis, when its origin is from cold, etc., it is ushered in with a rapid rise in temperature, the pulse increases in frequency, and at the onset the animal generally has a chill; the temperature remains high, and the pulse is small, weak, and thready. Primary pleuritis with purulent or putrid effusions is rare,

and when it does occur it is always accompanied by a high remittent fever.

The general health is very much disturbed. The animal is stiff and sore on moving about; has little or no appetite, but intense thirst. The visible mucous membranes are reddened and congested, and in cases where there is much exudation, the membranes are dark bluish-red. The fæces are dry and hard. The urine presents some symptoms that are diagnostic; for instance, while the exudate is forming and collecting, the urine is scanty and thick and albuminous in reaction. When the exudate is commencing to be reabsorbed the urine increases very much in quantity and is very clear or whitish-yellow (see chapter on Examination of the Urine).

There is also marked dyspnœa. In dry pleuritis the respiration is superficial and rapid, and where there is great exudation the respirations are short and painful and the animal has all the symptoms of smothering. A characteristic symptom is the way the animal endeavors to assist respiration by assuming a sitting position with the front legs spread out as far apart as possible and using the abdominal muscles, with show of pain on pressure of the abdominal muscles of the affected side. The animal has a soft, dry, weak cough; this may, however, be absent.

The physical symptoms are characteristic. On percussion at the onset of the disease there is little change of sound, but when the exudate has reached a certain height, the lower parts of the chest give a dull sound which seems to be limited in a straight line, according to the position of the animal. Above the exudation the sound is tympanitic on account of the retraction of the lung. Auscultation gives a friction bruit in the onset, and when the fluid begins to be reabsorbed and the pressure of the exudate against the lungs is lessened, the respiratory bruit is altered. In the earliest stages of the disease the sounds are vesicular, but as the exudate collects the sounds become indistinct or blowing and finally only bronchial, and when the bronchial tubes are affected the sound is lost entirely. In the healthier parts of the lungs we find increased vesicular breathing.

Course and Prognosis.—Primary pleuritis is generally slow in its course; the time taken by the exudate to become reabsorbed is very long, except in very young animals, unless it is removed in an operative way. When the exudate commences to be reabsorbed the percussion sound becomes less dull and the respiration bruit more distinct, and if the exudate becomes quickly reabsorbed, the diseased side is lessened in circumference, or it can be better described as being flatter.

Death may occur during the critical period of the disease by collateral hyperæmia and œdema of the non-affected sections of the lungs, by carbon-dioxide poisoning, from defective function of the lungs, by

total stagnation of the circulation of the blood, from pressure of the exudate on the large blood vessels and the heart, or later on by exhaustion and by secondary diseases. To this class belong dropsy caused by stagnation of the blood circulation, from weakness of the heart, and amyloid degeneration of the kidneys, liver, or spleen. Death may also occur from complicating diseases, such as bronchitis and lobular pneumonia.

The prognosis is generally favorable; as a rule, very severe cases of primary pleuritis make good recoveries, depending largely on the animal and character of the exudate and the reabsorption of the lymph, and there may at times be adhesion of the whole or part of the pleuritic surfaces. In secondary pleuritis the prognosis depends on the original disease.

Therapeutics.—The treatment of secondary pleuritis is the same as the primary, but in the former we must take into consideration the treatment of the original disease. In the early stages of the disease, when the exudate is collecting, we must apply counter-irritants, such as liniments or plasters of mustard. When a copious exudate has been formed we try to induce its reabsorption by stimulating the kidneys by means of acetate of potassium, acetate of sodium, with the Priessnitz compress. When the heart is weak we use digitalis and squills. Small doses of calomel are also useful.

R̵. Hydrarg. chlor. mitis,   0.03
    Digitalis pulv.,   0.05
    Saccharum lactis,   0.5
M. et fiat pulv. No. vi.
Sig.—One powder three times daily.

Diuretics and cardiac stimulants have only an indirect influence on the accumulations, and when the exudate is gradually absorbed one can hardly credit these drugs with accomplishing the results, as the exudate is usually reabsorbed, when the acute inflammatory stage of the disease has passed. The best method of treatment is the removal of the secretion by surgical means, that is, by puncturing the chest wall. This operation is not at all dangerous in the dog, and is generally successful, unless the adhesions are too thick.

The operation must be performed where there is a very large exudate and the dull sound can be heard over the entire lung, that is, where there is œdema of the lung and intense dyspnœa caused by the pressure of the exudate; or where there is deficient reabsorption as is seen where the fever has entirely disappeared and the fluid does not show any signs of becoming reabsorbed.

Puncture of the Cavity of the Chest.—This must be on the side where the exudate is highest; this can be detected by auscultation.

The trocar used in this operation is an ordinary sized trocar, seen in Fig. 65, or, if we wish to make first an exploring puncture, we use the

needle of the ordinary hypodermatic syringe. The needle, after having been disinfected, is introduced into the lower third of the wall of the chest, in any of the interspaces between the fifth and ninth ribs, the patient being in a standing position or laid on a table and held by means of an assistant. The entrance of air into the thoracic cavity must be avoided, and to prevent this we must use a trocar that has a faucet, or else where we use the ordinary trocar and canula when the flow of the fluid becomes stopped at any time from some obstruction at the end of the trocar, it is well to put the finger over the end of the opening to prevent the air from being sucked into the cavity. When the animal coughs violently the trocar must be withdrawn or the finger kept on the opening of the trocar or when the fluid becomes bloody or the point of the trocar is felt resting on the pleura. It is well to empty the cavity slowly and never entirely, as the two faces of affected pleuræ coming in contact with each other and rubbing often causes acute hemorrhage. After withdrawing the trocar it is well to paint the opening with some iodoform collodion.
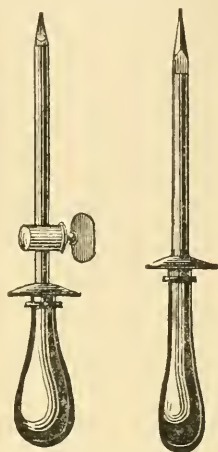
FIG. 65.—Trocars for puncture of the thorax.

When the fluid obtained is purulent, it generally requires several punctures to empty the cavity. The animal should have a nutritive but easily digested diet—soup, beef tea, or lean meat, and when the fever is high, antipyrine in doses of 0.5 to 2.0, according to the size of the dog.

Dropsy of the Chest.
(*Hydrothorax.*)

Any accumulation of serous fluid that is not dependent on an inflammation of the pleura (that is, of a transudate) in the cavity of the thorax, is called hydrothorax. This is often a symptom of general dropsy or it may arise from chronic disease of any of the organs (see ascites). In such cases the effusion first shows itself in the chest when dropsy of the skin (anasarca) exists, or as a result of disturbance of the venous system, particularly of the portal.

Pathological Anatomy.—Hydrothorax, as a rule, affects both sides of the chest. Frohner records a case where one side only was affected. We find in the cavity of the chest, a clear yellow fluid, sometimes stained with blood and distinguished from a pleuritic exudate by the absence of fibrin, very little cellular elements, little albumen, and by a low specific gravity. The pleura is œdematous and swollen, and in long-continued cases it has a flaccid or macerated look. The lungs do not

present any change except the signs of partial compression.   The other organs of the body are anæmic.

Clinical Symptoms.—The physical examination of this disease presents symptoms very similar to pleuritic exudates, but the change takes place quickly, and fever and cough are absent, but in dropsical transudates both sides of the thoracic cavity are filled, and on changing the position of the animal the fluid moves about much more quickly than a pleuritic exudate would, and the sensitiveness of the animal to pressure on the walls of the chest and the rubbing or crepitating bruit of pleuritis is absent.

Therapeutics.—The treatment, as a rule, is of a palliative character, as it is only in very rare instances that we succeed in removing the original disease; but we may use the same agents as in ascites.   The operation of tapping the chest wall (see puncture of the cavity of the chest, page 150) is only to be resorted to when the fluid has collected in large quantities and the animal is threatened with suffocation; but this only affords temporary relief.

Other Diseases of the Pleura.

Pneumothorax.—*Etiology.*—The cause of pneumothorax, that is to say, the accumulation of air in the thorax, is produced in several ways; by perforating wounds of the chest, by the breaking into the pleural cavity of a collection of pus from the lung, by tearing of the lung tissue from great exertion, and from perforation of the œsophagus or pharynx. Careless puncture of the chest wall, fracture of ribs, perforation of the bronchi by a foreign body, which finds its way into that part, or it may also be caused by degeneration of the pleuritic effusion, causing the formation of gas.

Pathological Anatomy.—On making an opening into the chest with trocar and canula, the air escapes with a hissing sound; if the collection of air is great, the lungs are pushed out of position, interfering greatly with respiration.   If this condition exists for any length of time, a purulent, and, in rare cases, a sero-purulent, pleuritis is developed, caused by the presence of some irritant agents that have gained admittance into the cavity besides air.

Clinical Symptoms and Course.—There is great difficulty in respiration, and the affected side of the chest wall is visibly distended, and during respiration it remains almost stationary.   When the heart is pushed out of position there is a peculiar tympanitic sound, the pulsations have a metallic echo, and the respiratory bruit is absent.   In some rare cases we hear a metallic bruit; this is caused by the entrance of air directly into the pleural cavity with each inspiration.

Animals in this condition generally die rapidly, although we may find rare cases where recovery takes place by an absorption of the air, or is followed by the accumulation of a fluid (pneumohydrothorax) which itself in turn becomes rapidly absorbed. The treatment consists in the administration of camphor or alcoholic stimulants and in tapping the chest wall.

Hematothorax.—In consequence of the destruction of some large vessel or vessels in the lungs or the pleural cavity or from the presence of growths we find extensive hemorrhage into the thoracic cavity. The physical symptoms are similar to those of other pleural exudates, but this condition comes on very rapidly and in this condition the mucous membranes become very pale. When the symptoms are not pronounced the operation of puncture will determine the condition positively. Normal hemorrhages are easily and quickly absorbed, but often where there is great dyspnœa, puncture of the chest wall is always advisable.

Other Pathological Conditions of the Pleura.

Besides tubercular deposits we find endothelial papillomas which are seen in the form of velvety or grape-like formations on both sides of the mediastinal coats of the pleura and on the pleuritic coat of the diaphragm. These formations frequently cause a low form of chronic pleuritis (Kitt). The writer has observed an intrathoracic chondroma of great size, which was attached to the ribs, filling up the left thoracic side and pushing the left lung and heart to the right side. There was severe dyspnœa and anasarca.

DISEASES OF THE CIRCULATORY APPARATUS.

EXAMINATION OF THE CIRCULATORY APPARATUS.

Examination of the Heart.

Anatomy of the Heart.—The normal position of the heart may be seen in Fig. 66. It lies on the left side, but not so far as is seen in other domestic animals. The direction of its axis is not vertical, but extends slightly in a posterior direction, with a slight curve toward the left side. The base of the heart extends from the third to the seventh rib; the apex extends backward toward the diaphragm. Superiorly the heart lies close to the large vessels—the trachea and the œsophagus—and close on all sides to the lobes of the lungs. In its inferior portion it lies close to the chest-wall, extending from the third to the seventh rib. In the heart-sections we find the following arrangement: the right section lies in a right anterior direction from its axis and the left lies in a left posterior direction.
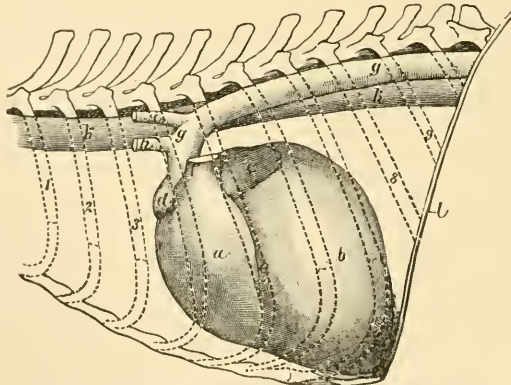
Fig. 66.—The heart in position: *a*, Right ventricle; *b*, left ventricle; *c*, left auricle; *d*, right auricle; *f*, pulmonary artery; *g*, aorta; *k*, œsophagus; *l*, diaphragm.

The size of the heart varies greatly in different animals, even when in a normal condition, and it is, therefore, impossible to lay down any relative rule as to its size or dimensions. According to Colan, the weight of the heart compared with that of the body is 1 to 90; and according to

Rabe, it varies from 1 to 40 to 100, and taking relatively all the breeds of dogs, and also of sex and age, the relative size is 0.6 and 2.2 to 100.

It is difficult to make an examination of the heart on account of its position, lying as it does hidden between the lobes of the lungs, with only a small portion of its surface exposed where it can be heard, and from the fact that it varies in size not only in the various breeds, but also in individuals. We find that in animals affected with the various heart affections and also in perfect health the pulmonary bruit may be so increased that it is impossible to detect when there are weak heart sounds, as the largest portion of the heart is covered by portions of the lungs, and as these parts also make sounds the ears cannot detect the sound. The restlessness of the animal during examination and the movements of the cutaneous muscles and the coat of the animal are all factors that assist in preventing a proper examination of the heart.

The following details must, therefore, be looked upon to a certain extent as theoretical in character.

In making an examination of the heart we must consider the position and size of that organ, its palpitation sounds, and character of the pulsations.

Position and Size of the Heart.

Both are to be detected by percussion, but for the reasons above explained it rarely answers our expectations. In percussion over the position of the heart we find in normal conditions a dull sound which lessens in deep respiration. The position, either standing or recumbent, may make a decided difference.

In animals having a small heart, the sound is often entirely absent. The sound of that section of the lung that lies between the heart and the chest wall is also a factor that makes the sound dull, and it is only by strong percussion that any sound can be detected at all, so that it may hardly be said to be of much diagnostic value.

There may be an abnormal dulness in the heart's action in hypertrophy, in dilatation, in exudates and transudates around the heart, and in retraction or contraction of the lobules of the lung surrounding the heart; but we may often be deceived by abnormal processes that surround that organ, such as thickening of the lung sections or swards on the pleura.

The dull sound is absent in enlargement of the lungs by emphysema, when air has entered the pericardium, after injuries, in one-sided pleuritis, and in pneumothorax. The sound is anteriorly situated in the chest when there is intense meteorization of the stomach or intestines, and in ascites.

Character of the Heart Pulsations.

The pulsations of the heart can be distinguished by putting the hand on the inferior portion of the chest near the sternum, about the fifth rib (on the right side the pulsation is situated a little more anteriorly). The pulsation makes a distinct vibration of all the adjacent parts, and in emaciated animals there can be noticed with each pulsation a distinct swelling or motion of the lower portions of the ribs; this vibration may be greatly lessened by the presence of layers of fat on the sides of the chest. After great exertion or excitement the strength of the pulsation against the chest-wall is greatly increased.

The pulsations of the heart are increased by disease in the following conditions: After considerable loss of blood, in any case of fever, in palpitation of the heart, in some forms of heart disease, in hypertrophy of the heart, or by the influence of some poisons, such as digitalis or aconite. It is almost imperceptible in degeneration of the muscle of the heart, in the later stages of acute diseases, in cases of poisoning, in fatty degeneration of the heart, and when the heart has become compressed by the effects of hydrothorax, pneumopericarditis, or emphysema of the lungs. It is distinguished only on the healthy side in lateral pleuritis.

Character of the Heart Sounds and Bruits.

In order to distinguish the heart sounds we must put the ear close to the side directly over the heart where the beats are loudest; it is better to cover the place with a handkerchief or cloth, or we may use a stethoscope. We should hear two sounds in each heart beat—a systolic, which corresponds to the ventricular contraction, and a diastolic, which corresponds with the beginning of the diastole. Both these sounds follow each other with short intervals between. The pause between the first and second sound is short, but between the second and the next first the sound is much greater. The first sound is a mixed muscular and valvular sound of the mitrals and tricuspids, and the second is a semilunar valvular sound.

Unfortunately these sounds are indistinct and incomplete in the dog, even in perfect health. In very fat dogs we may not hear any heart sound, or we may only hear the first one. In well-fed dogs it is not rare to hear the first sound, which is a great deal louder than the second, only on the left side. In thin animals we can hear the sound distinctly on both sides. With the respiratory bruit we lose to a certain extent the full strength of the sounds, and often only the first sound is heard. After great activity the heart's action is increased so much, and the sounds

follow each other so rapidly, that it is impossible to distinguish one from another.

In pathological conditions the heart sounds may be increased by a number of causes, as in the beginning of certain fevers; but generally it is an indication of hypertrophy. A lessened heart sound is found in any heart weakness, as in degeneration of the heart muscle, in accumulations of exudates around the heart in the pericardium, or in emphysema of the lung sections, etc. In such cases, as a rule, the heart sound is imperceptible.

As can be readily seen, it is by no means easy to hear the heart beat in its normal condition, and the condition becomes more complicated when we have to distinguish pathological sounds—"heart bruits." We distinguish between endocardial heart bruits, which originate in the heart direct, and pericardial heart bruits, which come from the arterial part of the heart and its envelope. The former are divided into organic and inorganic bruits. The organic heart bruits are produced by stenosis (contraction) of the ring and by insufficient or imperfect closing of the valves, which may occur either in systole or diastole, making the heart sound indistinct, or it may be entirely absent, and the bruit takes the place of the heart sound. The systolic bruit is buzzing or blowing in character, and indicates an imperfect closing of an arterio-ventricular valve (in most cases of disease of the mitrals). The diastolic bruit is rushing or wheezing in character, and indicates a stenosis of the arterio-ventricular ostia, or the imperfect closure of an arterial valve. The inorganic heart bruit is seen in all forms of anæmia, and occasionally in fevers. Pericardial bruits are very similar to pleuritic friction sounds, that is, a scratching or scraping sound. They are located in a sharply defined locality and do not occur in direct rhythm with the heart sounds, but seem to occur between them. They are noticed in pericarditis as soon as there are any fibrinous deposits present and there is not sufficient pericardial fluid present to keep the folds free from contact with the heart. A change in the position of the animal makes quite a difference in the character of the bruit, and it may easily be distinguished from endocardial sounds. The pericardial friction sound is distinguished from the pleural friction sounds by the fact that it is entirely independent of the movements of respiration.

Character of the Pulse.

The pulse is best examined in the femoral artery, inside of the thigh, and it may be felt also, in the radial artery, inside of the forearm. In the examination of the pulse we must take into consideration its frequency, its cadence, and its quality.

The normal pulse varies greatly, according to the breed, age, and size of the animal, and is rapidly increased from such causes as physical efforts, fear, fright, pleasure, etc. The general pulse is from 70 to 120, in large animals being less and in very small animals having a correspondingly frequent pulse rate. The rhythm (cadence) should be regular in a healthy animal, and physical causes make it irregular; but an irregular pulse in perfect health is very common in the dog; in fact, perfect rhythm is rare, as can be easily demonstrated by taking the pulsations frequently, the irregularity being well marked in very young or old animals. In normal conditions the pulse must be similar in both thighs.

We find a lessening in the pulse in some forms of poisoning, following hemorrhages, in affections of the muscle of the heart, in starvation, diseases of the brain, meningitis, in hepatogenous icterus, also in collapse and in diseases characterized by a continued high temperature.

An increase of the pulse is found in all fevers, in cases of valvular defects, in heart weakness and paralysis or collapse of that organ from continued high fever. When the temperature increases the pulse rises. The pulse is irregular (arhythmic) in some diseases of the heart (incompensated valvular defects, myocarditis) after large doses of digitalis, and in heart weakness. It is only intermittent (as a forerunner of entire irregularity) in slight cases of valvular defects, in some diseases of the brain, and in gastricism. The pulse is full and bounding under great physical exertion, small and collapsed after severe hemorrhage and in enteritis. In intense heart weakness and collapse it becomes thread-like and imperceptible.

The venous pulse—that is, the apparent increase in the amount of blood in the jugular at its entrance into the chest—is often seen in the dog. It is generally a symptom of some chronic heart affection, such as imperfect closing of the tricuspid valves, and of heart weakness.

DISEASES OF THE HEART.

Acute Endocarditis. Endocarditis Verucosa; Endocarditis Ulcerosa.

Etiology.—This disease is comparatively rare. Jensen reports that out of a clinic of 3,240 dogs, he found 13 with ulcerative endocarditis. This condition may be caused by a sympathetic irritation of myocarditis or mediastinitis, but this is extremely rare, it being caused by the presence in the blood of certain microorganisms which lodge on the endocardium, particularly in the valves and the deeper portions between the trabeculæ, causing inflammation of the tissues. Endocarditis can be produced experimentally by the introduction into the blood of various forms of bacteria (staphylococcus, streptococcus, etc.) particularly

if the valves have been previously affected with inflammatory processes. Consequently it is very apt to appear in such diseases as distemper, septicæmia, pyemia, articular rheumatism, and in rare instances in tuberculosis; it may also follow wound abscesses, chronic ulcerated inflammations of the skin (dermatitis), and as a consequence of some unknown bacterial invasion. Frohner and Jensen have observed an infectious malignant endocarditis.

Pathological Anatomy.—While we differentiate between endocarditis verucosa and endocarditis ulcerosa (endocarditis diphtherica, endocarditis maligna), one may follow the other. The former (the milder form) commences with the formation of various sized wart-like protuberances on the free edges of the valves and their attachments, and also on the trabeculæ and papillary muscles; when the latter are attacked, it may cause necrosis and tumefaction of the endocardium. This condition may cause the formation of emboli which get into the circulation, are liberated, and produce grave conditions in various organs of the body. The aortic and the bicuspid valves are more frequently affected; the pulmonary and tricuspid valves, very rarely.

Clinical Symptoms and Course.—There may be little or no fever in the onset of the disease, but if there is fever present it is generally high. The general condition is greatly disturbed, increased irregular heart action, pulse weak and irregular; on ausculation the pulsation is heard and little change is noticed in the early stages before any material alteration has been made in the valves. Later, when the deposits become organized, the heart beat is muffled and the two sounds of the heart become one, or an early systole and diastolic murmurs. The respirations are more or less accelerated and labored, there is cyanosis of the visible mucous membranes and with these symptoms there may be certain metastatic changes in other organs.

The course of the disease varies; in some cases death occurs in a very short time, in the majority of cases, however, the disease progresses slowly, the symptoms may increase in severity; they may decrease in severity and the animal be comparatively well for weeks, and then the acute symptoms may recur and the disease become chronic. In mild cases animals may take complete recoveries, but this is comparatively rare.

Therapeutics.—Rest, avoid any excitement, cold compresses, such as an ice-bag over the region of the heart; where there is a small irregular pulse we should administer digitalis, strophanthus, or caffeine. When dangerous symptoms appear, subcutaneous injections of camphor, ether, or atropin. For the fever we should use salicylate of soda, aspirin, cinchona, antipyrin or antifebrin.

Valvular Diseases of the Heart; Chronic Endocarditis; Valvular Defects.

General Notes on Valvular Defects.—By valvular defects we understand such anatomical alterations in the valves and openings as lead to an irregularity in the circulation of the blood, becoming apparent by visible symptoms in the pulse or general condition; but those slight valvular defects so often seen in post-mortems and never noticed during life are not to be considered.

Valvular defects appear in two forms: first, when the valves close imperfectly; second, when the openings become contracted, causing stenosis. Imperfect closure of one valve causes a certain amount of blood to flow back into the portion of the heart from which it has just come; for instance, when there is imperfect action of the mitrals or of the tricuspids in systole, part of the contents of the ventricles rushes back
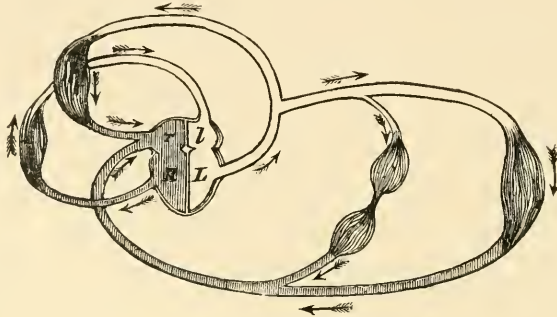
FIG. 67.—Diagram of the blood circulation.

into the auricles, and when there is insufficient action of the semilunar valve in the diastole, a part of the blood that has been thrown into the artery returns into the chamber again.

Stenosis of one opening retards the passage of blood, when we have a contraction of an arterio-ventricular opening. At the time of diastole the blood is kept back at the entrance of the affected ventricle, and it is imperfectly filled, while in the aortic opening in pulmonic stenosis the exit of the blood out of the ventricles (Fig. 67) in the systole is retarded. In any of these conditions there is imperfect heart action; every defect of an arterial opening interferes with perfect ventricular action and every defect in a venous opening causes a corresponding lessening of power in the auricle.

An abnormal pumping of the blood in this manner is sure to cause more or less disturbance of the entire organism, but there are certain compensatory processes in the heart itself that tend to overcome this. As a consequence of the impaired flow, the heart muscle is worked much harder and becomes hypertrophied (compensating heart hypertrophy).

We often see cases where defects of the aorta become equalized by a hypertrophy of the left ventricle. In valvular defects of the mitrals the stagnation of the blood occurs in the veins, capillaries, and arteries of the lungs, and as far back as the right ventricle, which becomes dilated and hypertrophied while trying to take up the extra work thrown on it. In course of time we also see hypertrophy and dilatation of the left ventricle; during diastole the stagnated blood runs in great quantities into it out of the dilated auricle.

These compensating processes of the heart are apt to prevent for a long time any great functional disturbance provided the heart receives its proportional nutrition. If this is not the case, for instance, in anæmic and cachectic feverish animals, the compensating heart hypertrophy is not present or is only developed to a slight degree, and also in cases of insufficient nutrition, due to some alteration in the coronary artery, the heart is no longer able to satisfy the demands claimed from it and tires out, and all the effects of blood-stagnation rapidly show themselves.

Etiology of Deficient Valvular Action of the Heart.—The most common causes of valvular defects are endocarditic processes, which are developed on the valves and take an acute course, according to the amount of the irritation, and cause a fibrinous, rigid thickening of the valves. Sooner or later we find an imperfect closure of the valvular openings through cicatricial contractions and adhesions to the lobula of the valves or in their neighborhood. This condition is quite common in old dogs, and may appear as a result of great nervous excitement, cold, articular rheumatism, distemper, and other infectious diseases. Cardiac valvular changes are frequently seen as a result of chronic nephritis. The mitral valves are most frequently affected. Cadiot and Ries found out of thirteen cases, five of the mitral, four of mitral and tricuspid, two of the tricuspid alone, and one of the valve of the aorta and one mitral and aorta. We may also see deposits of lime salts and a contraction of the opening belonging to the affected valve. In rare cases there is heart weakness and imperfect valvular action, which may be caused by a dilatation of the opening, and, thus becoming abnormally distended, the valves cannot meet and make a complete closure. Atheromatous processes may also produce this condition. .

General Symptoms of Deficient Valvular Action of the Heart.—The symptoms which appear at a certain time in all valvular troubles are as follows: Increase of heart and pulse action (after slight exertion it is abnormally increased); palpitation of the heart; difficulty in respiration; vertigo after any exertion; cyanosis of the visible mucous membranes, especially of the head; venous pulse; dropsical effusions, such as œdema of the legs, abdomen, or testicles; hydrothorax; hydropericardium; ascites; albuminuria, with lessening of the amount of urine; complications of the

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digestive organs of various kinds, and, finally, general nutritive disturbances, such as anæmia, emaciation, etc.

Symptoms of Valvular Deficiency in one Opening. Insufficiency of the Mitrals.—The imperfect closing of two of the valves occurs very frequently in the dog. Besides the alterations of the valves we find hypertrophy and dilatation of the left auricle of the heart, and in the later stages also of the right ventricle.

The clinical symptoms are: Increase of the pulse and distention of the artery, systolic bruit heard on the left wall of the chest, increase of the second (pulmonic) sound, weak, frequent pulse, shortness of breath, and later dropsy, etc.

Stenosis of the Left Venous Opening.—This is generally accompanied by mitral insufficiency. It leads also to dilatation and hypertrophy of the left auricle and the right ventricle, and in such cases the left ventricle is generally small, narrow, and contains little blood.

The clinical symptoms are: Slight increase in the pulse, diastolic bruit (this is absent in some cases); considerable increase of the second (pulmonic) bruit, very small, irregular pulse; great difficulty in respiration, and dropsy makes its appearance early in the disease.

Disease of the Aortic Valves.—This condition of the semilunar valves, causes a dilatation and hypertrophy of the left ventricle and flattening of the papillary muscles.

The clinical symptoms are as follows: A very strong heart beat; increase of the heart dulness on the left side, and a full, bounding pulse, is very frequently noticed. This character of the pulse is also noticed in small arteries that in normal conditions have no distinct pulse. We also find shortness of breath, œdema, and dropsy of the dependent parts.

Stenosis of the Aortic Opening.—Rare in the dog. The clinical symptoms are a systolic bruit, a very slight sound of the aorta, small, weak pulse, general anæmia, etc.

Imperfect action and disease of the tricuspid valves cause distention of the right auricle and also a systolic murmur on the right side and a strong, venous pulse. Stenosis of the right venous opening and defects of the pulmonary valves are extremely rare.

We very frequently have a combination of a contraction of an opening and also a deposit on, or retraction of, the valve at that opening, and also a single valvular defect; these two make a combination of symptoms that are rather hard to separate.

Prognosis and Therapeutics of Valvular Defects of the Heart.—A diseased valve must be considered incurable, but it may exist for a long time without causing any decided disturbance of the general circulation. It is impossible to predict how long a "compensating" state will continue. Mitral defects seem to last the longest. This conclusion is arrived at

from the fact that it is quite common to find serious heart defects in post-mortems on dogs that have been apparently healthy during life.

Compensating heart defects do not require any treatment. We try to aid the heart in its efforts by giving nutritive diet and removing all exciting causes, such as great or prolonged exertion.

As soon as the heart begins to weaken and the difficulty in respiration increases, accompanied by œdema, palpitation, etc., we must use heart tonics, such as digitalis, strophanthus, caffeine, etc.

℞. Tinc. strophanthus, 15.0
    Sig.—Ten to twenty drops morning and evening.
℞. Caffeine nitricum, 0.5
    M. F. charta No. x.
    Sig.—One powder morning and evening.
℞. Caffeine citrate, 3.0
    Tinct. digitalis, 4.0
    Aquæ, 64.0
    Sig.—One teaspoonful twice daily.

If by medicinal treatment we succeed in reestablishing a compensating action, the œdema gradually disappears; if, however, we do not get the desired result and there should be any œdema remaining, we must treat it symptomatically, using those diuretics mentioned under the treatment of pleurisy, particularly theobromin (rather than calomel). Where there is decided palpitation, we must use cold compresses in the region of the heart, or subcutaneous injections of morphia. In milder cases use the salts of bromine. Great weakness of the pulse must be treated with alcohol, ether, or camphor, etc. Tinc. nux vomica may be given in doses of one drop three times daily when the appetite is poor.

The symptoms above described are sometimes found in dogs that do not present any marked alterations in the valves or openings, either during life or on post-mortem; these are due either to simple idiopathic hypertrophy and dilatation or to alteration of the heart muscle.

Diseases of the Heart Muscle.

Idiopathic Hypertrophy and Dilatation of the Heart.—We find on post-mortem, as a rule, a hypertrophy of the left ventricle, but occasionally it is of both ventricles. At the same time we do not find any alteration of the lungs or kidneys which might produce secondary hypertrophy of the heart muscle. The causes are extreme and constant exertion, cold, abnormal excitability of the heart (in closely bred lap dogs), overfeeding, and too much rich blood (as in pet animals).

Chronic Myocarditis, Indurative Degeneration of the Heart, Inflammatory Myocarditis.—This condition may follow an attack of acute distemper and is often mistaken for valvular defects. In this condition the heart is greatly enlarged and dilated, and the walls are hypertrophied. The body of the heart muscle is filled with a number of whitish hard bodies which on examination are found to be cicatricial connective tissue.

The cause of the existence of these bodies has not been fully determined, but they are due either to myocarditis or to defective nutrition of the heart muscle, as a consequence of contraction or atrophy of the coronary artery.

The clinical symptoms presented are as follows: Weak heart, palpitation, dizziness, vertigo, increase in the number of pulse, and dropsical effusions.

Auscultation gives nothing but pure heart sounds, and with the above symptoms there may be a callous degeneration of the heart or a pure idiopathic hypertrophy, as during life it is impossible to determine which, and treatment in both cases is the same. Treatment is of no practical value; it consists of protection against excitement or great bodily exertion; give nutritive, easily digested food, and, if the heart is irregular, heart tonics.

Other Diseases of the Heart.

Nervous Palpitation, Palpitation of the Heart.—In this condition the physical examination reveals no anatomical alteration of the heart. The heart beats with great force, so that it can be noticed distinctly on the external thoracic walls; the beat is clear and in cases where the palpitation is great, the heart makes only one sound; the respirations are accelerated and shallow, the animal is anxious and restless, but, as a rule, if kept quiet, the attack soon passes off. If continued apply cold compresses in the region of the heart and give a hypodermic solution of morphine or administer sodium bromide, chloral hydrate, etc.

Tumors of the Heart.—These mentioned by a number of authors are either of sarcomatous or fibrous nature, are usually never diagnosed during life, but may be seen on the post-mortem of an animal dying suddenly.

Parasites in the Heart Muscles.—Cysticercus or bladder worms are found in the heart. Lindmere found in the external strata of the tissue in the heart of a dog a number of cysts about the size of a hazelnut which were filled with a clear fluid, which seemed to be the cysticercus cellulosæ. There was nothing to indicate that these parasites caused the heart the slightest irritation.

DISEASES OF THE PERICARDIUM.

Pericarditis.

(Inflammation of the Heart Envelope.)

Etiology.—Inflammation of the pericardium may originate in a primary way by traumatisms or cold, or, secondarily, in connection with infectious or inflammatory diseases of the neighboring organs, especially pleuritis, or disease of the endocardium and myocardium. It is a question whether this condition can originate from perforation of lung abscesses or from foreign bodies coming from the œsophagus. Tuberculosis seems to be the most frequent exciting cause of this disorder. Traumatisms such as gunshot wounds, fracture of ribs, may cause pericarditis. Cold or rheumatism is said to be a predisposing cause of pericarditis, but this theory is very doubtful.

Pathological Anatomy.—Pericarditis occurs either in the acute or chronic form. The anatomical alterations that it produces on both surfaces of the pericardium correspond to those on the pleura caused by pleuritis and occur in the following forms, fibrous, hemorrhagic, purulent or icteric. The most common form is serofibrinous pericarditis, with copious liquid exudates in the pericardium and masses of fibrinous lymph attached to the surface of the pericardium; in very rare instances, the folds are attached to each other. When this condition has been present some time, the pericardium becomes dilated and relaxed and the heart-muscle shows more or less atrophy.

Clinical Symptoms.—Slight pericarditis rarely shows itself to any marked degree, but in severe cases there is decided palpitation, the pulse becoming weak and indistinct, with marked irregularity in the rhythm. On auscultation there is great dulness all over the region of the heart; finally the heart sound is entirely lost or simply a pericardial rubbing bruit is heard. When the pericardial folds are attached or when they are separated by effusions this sound disappears.

There may be an increase of temperature, loss of appetite, and the slightest exertions cause marked increase in the respiration with cyanosis of the visible mucous membranes. As soon as the disease becomes advanced, the same symptoms that are seen in any case of defective heart action are noticed; the lessened arterial pressure causes irregularity in the action of the urinary apparatus, and from venous stagnation dropsy shows itself in different parts of the body, especially in the extremities. As a result of acute infectious diseases, pleuritis and pleuro-pneumonia, we may have acute inflammation of the pericardium and death as a

result. Chronic pericarditis may also produce death; its action, however, is slower.

Therapeutics.—Keep the animal as quiet as possible; give nutritive, easily digested food (meat diet or milk) and such agents as will lessen the fever and tone up the heart. The Priessnitz compress and cold-water compresses might produce better effects, but they excite the animal and thus do more harm than good. Laxatives, such as sulphate of magnesium or sodium, Epsom salts, calomel. As heart tonics give strophanthus or digitalis, etc. When the exudate accumulates to an alarming extent, we must resort to surgical means and empty the pericardium by means of the trocar, as in pleuritic effusions, and must be careful to use as long and as thin a trocar as possible. (An aspirating syringe needle is the best.) Select a space over the dullest part of the heart and insert the trocar low down in the left chest wall, taking care not to put the point in too deep and thus injure the heart itself.

The treatment of pericarditis is generally symptomatic. If great weakness of the pulse is observed administer wine, alcohol, ether, or camphor; the latter seems to be best to use for this particular affection.

Dropsy of the pericardium (hydropericardium) is a collection of fluid in the pericardium without any direct inflammation of the serous pericardium.

In health the pericardium always contains a small amount of fluid, and it is only when we recognize, by physical means, a very much increased amount of fluid in the sac that it can be called hydropericarditis. Dropsy of the pericardium may appear as a symptom of various diseases (defects of the valves, inflammation of the heart muscle, diseased conditions of the coronary arteries or of the kidneys, and acute anæmia) as well as in connection with inflammation of the pericardium and is generally accompanied with all the symptoms of general dropsy.

The clinical symptoms are those of pericarditis; the friction bruit and the increase of temperature are absent; however, the treatment consists in removing the original causes and, if this cannot be done, to puncture. Diuretics (digitalis) are to be administered, but these, as a rule, only produce temporary effect.

Hemorrhage of the Pericardium (Hæmopericardium).—This is rarely seen. It may be caused by gunshot wounds, by a bursting aneurysm, or by laceration of one of the coronary arteries (see also spiroptera sanguinolenta), rupture of heart, or the formation of tumors, etc., of the myocardium. Death by compression of the heart generally occurs in a short time. Where results are not fatal in a short time—that is, where the blood oozes out slowly and fills the sac gradually—it is impossible to make a certain diagnosis unless the diagnosis is based on the appearance of acute anæmia. This is also the case when air (pneumopericarditis)

or blood penetrates into the cavity from the lungs in cases of some traumatism of those organs.

FILARIA IN THE BLOOD.

Four kinds of parasites have been found in the blood of the dog, namely Filaria immitis, Hæmatozoon lewisi, Strongylus vasorum, and Spiroptera sanguinolenta.

Filaria Immitis, Filaria Hæmatica.—(Males 16 cm. and females 35 cm. long; both 1.5 mm. thick.) They lie inside of the heart; very rarely in the left, generally on the right, where they multiply in great numbers, often hundreds massed in a ball (Megnin); they are rarely found in any other part of the vascular system; on the other hand, the embryos
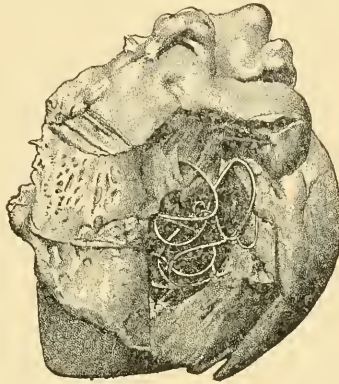
Fig. 68.—Heart, with Filaria immitis in the ventricle (*photograph*).

measure 0.25 mm. long and 5 mm. thick, are found in the circulation in hundreds of thousands and can be readily seen under the microscope in a sample of blood of the affected animal (Delafond, Nocard, Gruby, Renther, Johne, Rieck, Deffe, and others). The mature filariæ living in the heart (Fig. 68), cause disturbances of the circulatory system, dilatation and hypertrophy of the heart, endocarditis, formation of thrombi with all its results, and even rupture of the heart. The embryo may plug up the small arteries particularly of the lungs, brain, and spleen. The embryos seem to be excreted through the kidneys. This parasite is generally found in Indian, Chinese, and American dogs, especially in the southern states. Wheeler rarely made a post-mortem that he did not find it, often without presenting any observable symptoms during life. It is rarely found in Europe. The clinical symptoms are not at all characteristic—emaciation, epileptiform convulsions, disturbance of the heart action, intestinal hemorrhage, and excitement—but frequently the filaria may

exist in great numbers and none of these symptoms be present—unconsciousness, dyspnœa, and rabiform symptoms.   How the parasites find their way into the blood is rather interesting.   The embryo is passed in the urine and carried by air or water into rice fields or swampy places, and the parasite finds its way into the system through the dog drinking the water.   Some authors contend that the larvæ get into the blood as the larvæ of the Filaria sanguinis of man by being first absorbed by the mosquito and then developed and passed again to the dog.

Frohner tried to reinoculate a dog intravenously with blood containing the embryo, but with negative results.

As to prophylactic or therapeutic measures, nothing has as yet been found to answer the purpose.   In regions where the parasites exist, the administration of boiled or filtered water could be carried out only in the case of household pets; diuretics tend to wash the parasites from the kidneys.   Frohner says that in Japan, where the parasite is prevalent, arsenic is used with advantage.

Hæmatozoon Lewisi.—These parasites are very small, resembling Filaria immitis found in India, China, Italy, and France.   Grassi thinks the larvæ develop in the fleas and lice that infest the dog.

Strongylus Vasorum (Hæmatozoon Subulatum).—These exist in France and in certain parts of Italy.   Leisering found them in the blood, lungs, prostate, and the spongy portion of the penis.   He considers Hæmatozoon subulatum to be identical with Strongylus vasorum or one simply to have taken a different form.   These parasites produce anæmia, gradual emaciation, irregularity of the heart's action, and cough.

Spiroptera Sanguinolenta (Filaria Sanguinolenta).—This parasite has already been described on page 51.   In its larval form it is found forming aneurysms which burst and form hemorrhages into the pericardium, or entering the pulmonary circulation incomplete are carried into the lungs.

DISEASES OF THF URINARY AND SEXUAL APPARATUS.

EXAMINATION OF THE URINARY APPARATUS.

This comprises the examination of the prepuce, urethra, prostate, bladder, kidneys, the vulva in the female, and especially of the urine.

Examination of the Prepuce, Vulva and Urethra.

If a glossy or purulent discharge comes from the prepuce, it indicates a catarrhal condition of the part (catarrh of the foreskin or gonorrhœa of the prepuce). If the discharge is purulent, bloody, and has a fœtid odor, we will find wounds, ulceration, swellings, or new formations, on the prepuce or the glans. To make an examination of the penis, we must lay the animal on its side, take hold of the base with one hand and with the other retract the foreskin, so as to expose the penis as far back as the glans, and in this way it is comparatively easy to make an examination. If it is found impossible to expose the free portion of the penis, it indicates phimosis or an abnormally narrow opening of the prepuce, while paraphimosis is a condition in which the greatly distended glans is outside of the opening of the retracted prepuce. Catarrhal affections, (urethral or gonorrhœal) of the urethra are very rare in the dog. They are recognized by a discharge of purulent mucus from the urethra, by difficulty in urination, and the animal, on catheterization, may pass purulent mucus from the urethra. In cases where there is great difficulty in passing urine, or where it is retained entirely, it becomes necessary to pass the catheter or sound. When this retention of urine occurs, it is generally due to the presence of a stone in the bladder, a collection of stones in the urethra, or swelling of the prostate, but it may also indicate cicatricial strictures of the urethra, irritants, acute cystitis, distention of the bladder by prolonged retention of urine, stone of the bladder, or neoformations in the bladder.

Fig. 69.—
Male catheter.

Passing the catheter in the dog: It is best to use an ordinary rubber catheter in the male dog (about 2 to 5 mm. in diameter and the ordinary

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length), Fig. 69.   The subject is laid on the left side or back and held in that position by an assistant.   The prepuce is pushed back behind the swelling of the glans and held firmly with the left hand (see Fig. 70). Now grasp the catheter with the right, of course, first seeing that it has been well lubricated with some oil or cosmoline and that it contains the wire-stylet, and introduce it into the urethra; if it is pushed forward up the canal and meets with an obstruction at the posterior end of the bone of the penis, it is due to a flexure of the canal and also to the fact that the diameter of the urethra is less and the part at that portion has slight contractile properties.   By a gradual pressure the stricture is overcome and the catheter passed upward to the arch of the perineum; here the wire-stylet must be withdrawn from the catheter at least one-third, so as to allow the catheter to round the curve of the ischial arch; a
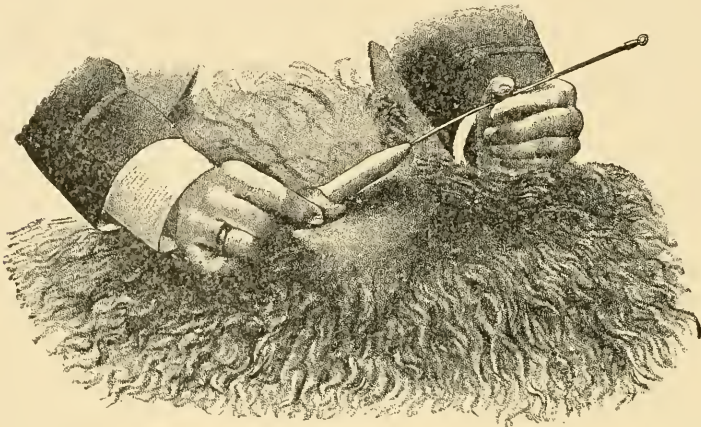
FIG. 70.—Passing the catheter.

gradual pressure soon brings it into the bladder, when the wire can be removed entirely.

In the bitch catheterization is very difficult at times, for while the instrument should be introduced along the middle line of the vestibule, frequently it is almost impossible to find the narrow opening of the urethra, and a vaginal speculum is sometimes necessary to locate the position of the opening; we generally use a metallic catheter, either silver or German silver (Fig. 71).   The instrument is passed up on the floor of the vagina until it comes in contact with the urethral opening (see Fig. 72); this is closed with a slight sphincter (the so-called urethral valve); this is soon overcome and the catheter passed into the bladder without difficulty, except in cases where the urethral opening is extremely small.

In the bitch it is rare that an examination of the urethra is necessary, but certain discharges from the vulva are of diagnostic value. During the period of "heat" (menstruation), which occurs normally twice a year, in June or July, and in December or January (this, however, is not a hard and fast rule, as it may occur in April or May and November or October), we have a copious bloody discharge, and during the preparatory stages of labor we see a thick, clammy discharge, and the lochia com-

FIG. 71.—
Female catheter.
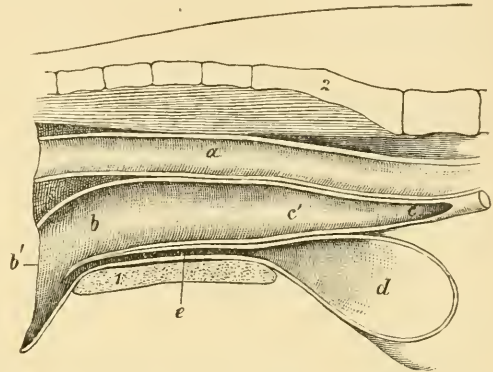
FIG. 72.—Median section through the pelvic cavity; *a*, rectum; *b*, vagina; *b'*, vulva; *d*, bladder; *e* urethr;a *l*, pubic symphysis.

mences with a non-fœtid, serous, slimy discharge, which soon changes to a thick, yellowish fluid. Purulent, putrid, and bad-smelling discharges are generally found in inflammatory or ulcerative discharges from the vagina or uterus. It may also be observed when a carcinoma is present. In such cases it is best to introduce a mirror-speculum into the vagina and make a specular examination. The instrument to use is the so-called two-valved rectal mirror (Fig. 73). Digital examination of the vagina is often productive of more certain diagnosis.

Examination of the Prostate.

This body varies in size, but in the dog it is large in comparison to the relative size in other animals, varying from the size of a hazelnut to that of a walnut. It is a round, ball-like body cut into two portions, lying on the neck of the bladder where the urethra commences (Fig. 74). It lies about the anterior portion of the pubic bone, and being free to a certain extent, it can be pushed into the abdominal cavity with the finger. In hypertrophy of the prostate, we find a painless hard body varying from the size of a walnut to that of a small orange. Acute prostitis is extremely painful and we find increased local temperature, prostatic

abscess indicated by fever and fluctuation of the prostate. The prostate may be covered by a number of irregular knob-like bodies, invariably painless to the touch. A remarkable diminution of an enlarged prostate invariably follows castration in the male.

Examination of the Bladder.

The bladder is almost entirely covered by peritoneum and lies just anterior to the brim of the pelvis, or in some cases it lies entirely in the abdominal cavity. When the bladder is very much distended, it extends as far as the umbilicus and fills up the lower portion of the abdomen.
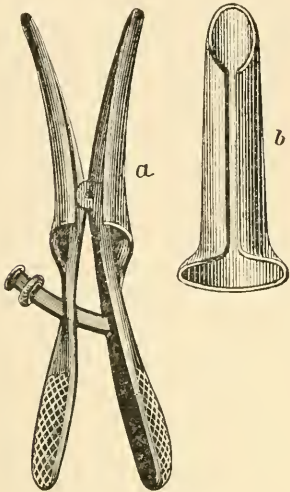
FIG. 73.—Speculums.
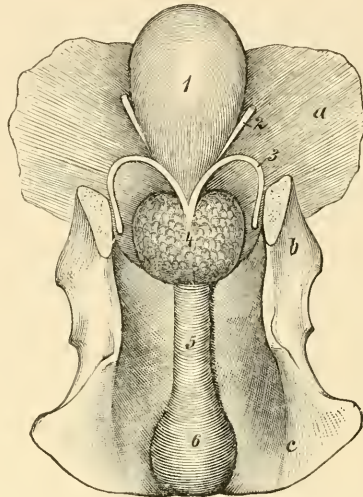
FIG. 74.—Section through the pelvis of the male: 1, Bladder; 2, opening of the ureters into the bladder; 3, spermatic ducts; 4, prostate gland; 5, urethra, showing Wilson's muscle; 6, arch of the urethra; *c*, pelvis.

It can be distinguished by manipulation. It is a round, distended, tumor-like body, giving a dull sound on percussion. On examination of the rectum we not only feel the neck of the bladder and the prostate, but the bladder itself can be easily distinguished. Percussion in the region of the bladder when it contains a very little urine or is empty gives a hollow sound. Tumor or stones in the bladder can be felt by pressing down toward the wall of the abdomen, provided the bladder is empty or only partially filled; pain on pressure in the region of the bladder indicates an inflammatory condition of the bladder (catarrh of the bladder), and in this condition the animal evinces more or less pain even when the bladder is normally distended and any pressure put on it.

Examination of the Kidneys.

The kidneys are bean-shaped and are almost entirely covered by peritoneum; they lie in the lumbar region, the left kidney about the thirteenth rib, the right kidney about the twelfth rib; posteriorly the kidneys extend over the second, third, and fourth lumbar vertebræ; in rare instances the left kidney may be still further back, both kidneys lying directly opposite each other. Frequently they are readily distinguished by manipulation through the abdominal walls, and especially one or the other kidney may lie free from its attachments or be abnormally enlarged during life. The left kidney is always much easier to palpate than the right. The best position is to have the animal standing, holding the thumb on the vertebra and with the other fingers manipulating the abdominal walls until the outlines of the kidneys are recognized. Pain on pressure may indicate nephritis, pyelonephritis, or paranephritis; enlargement of the kidney would indicate tumors, abscesses, pyelonephritis, hydronephrosis or purulent nephritis; abnormally small kidneys may indicate a chronic interstitial nephritis. Change of the position or remarkable mobility would indicate floating or migrating kidney.

Examination of the Urine.

The urine has to be examined as to its amount, color, transparency, reaction, weight, odor, and the presence of certain foreign or chemical substances.

Amount of Urine.—The amount of urine passed in one day depends largely, of course, on the size of the animal, the quantity of fluids it drinks, and the temperature of the atmosphere. It is difficult to estimate the exact amount of urine an animal will pass under normal circumstances, as one animal may remain indoors, is house-broken and retains his urine until he is allowed to go outside, and other animals that are free urinate small quantities at every street corner. Friedberger and Frohner found dogs confined in cages urinated two or three times in twenty-four hours, but the amount even in individuals varies, exercise having great influence on the amount excreted. The average amount of urine passed by the larger kinds of dog is from 0.5 to 1.5 kilogrammes daily; in smaller breeds, one-half that amount. An increase in the frequency of the act of urination may indicate some irritation of the bladder. A decrease in the amount of urine passed indicates that the water of the body is being taken up through some other channel, as in violent diarrhœa, great salivation, during the formation of pleuritic or perito-

neal exudates, or in dropsy, in fevers, in decrease of the pressure of the heart, as in valvular defects, myocarditis, etc. An entire stoppage of the urine may occur in acute or subacute inflammation of the kidneys, in obstruction of the urethra, paralysis or rupture of the bladder, from calculi in the bladder or urethra, from stricture of the urethra, or from swelling and pressure of the prostate, or from certain poisons.

An increase of the amount of urine (polyuria) may be due to the presence of a large amount of water in the blood (anæmia, hydræmia), in atrophy of the kidney, where there is great reabsorption of exudates, or in diabetes mellitus (a condition that corresponds to diabetes insipidus in man). This, however, is extremely rare in dogs. We may see it after the administration of the different diuretics. It is frequently seen in convalescence from acute diseases.

Constant dribbling of urine indicates paralysis or weakness of the bladder.

The Color of the Urine.—This varies in the healthy dog from pale yellow, when it has few chemical constituents, to dark reddish-yellow when it is concentrated and has a high specific gravity. Food also has a certain influence on the color. After eating fat it is reddish-yellow, and after meat it is light yellow; after eating sugar or bread it is dark yellow, and when the animal is starved it is deep yellow. Disease has also a great effect on the color. It is a deep yellow in fevers and pale or colorless in diabetes mellitus or insipidus and in chronic interstitial nephritis. After the administration of diuretics it is light in color, and in disease of the liver the coloring matter of the bile may change the color of the urine to all shades of yellow, varying from lemon-yellow to deep or even brown-yellow (see icterus). A red color is produced by the coloring matter of the blood, general anæmia, or atrophy of the kidneys; a green or light brown, by diseases of the liver and catarrh of the duodenum. Constant dribbling or slow voiding of the urine without any apparent pain (incontinentia urinæ) indicates weakness or paralysis of the sphincter or the bladder itself; it may occur from certain affections of the spine, in acute cystitis, or from tumors of the bladder. Difficult or painful urination (dysuria, retentio urinæ) or even total retention of urine indicates urethral calculus or certain poisons. Hæmoglobinuria is found in piroplasmosis and following the administration of certain of the febrifuges such as chlorate of potassium, pyrogallol, chrysarobin, naphthol, analine, kairin, thallin, acids, etc. Also from intense burns, occasionally in septicæmia and in infectious hæmorrhagic gastro-enteritis, in acute cases of distemper, and from sudden chills. Rhubarb and senna turn the urine yellow, while the addition of an alkali turns it red. Cascara sagrada turns the urine greenish-yellow, santonin and cina produces a red-yellow. Analine also produces a blood red. Naphthalin a brownish-red; carbolic

acid, or cresote, salol, resorcin and the various coal-tar products produce a greenish-black urine, which on exposure to atmosphere becomes dark oilve-green. Thallin produces a bluish-green urine and a blue-red is produced by pyoctanin. The appearance of blood in the urine indicates. grave conditions. In hæmaturia we may see the urine like blood, the color corresponding to the number of blood corpuscles present, and in hæmoglobinuria the coloring matter is granular or dissolved blood-coloring matter, actual blood corpuscles rarely being present, the urine then being dirty reddish-brown in color. Both the above conditions may exist simultaneously in some cases.

Transparency and Reaction of the Urine.—When the urine has been passed recently it is clear and transparent, and has an acid reaction. After feeding with bread for some time it is turbid and alkaline. After feeding with fat it is alkaline. In pathological conditions when the urine has been passed recently it is turbid and filled with mucus and epithelium, pus cells, bacteria or triple phosphates. An alkaline reaction generally indicates catarrh of the bladder, or we may see this condition in hæmaturia, in reabsorption of exudates, transudates, or in hemorrhage into the abdomen or thorax.

Odor of the Urine.—There is a slight penetrating odor in normal urine; sometimes it is slightly garlicky. Sulphonal produces a fruity odor. In cases of catarrh of the bladder the urine has a strong ammoniacal odor, and when any amount of turpentine has been absorbed the urine has a faint smell of violets. If much ammonia is present when a glass rod is dipped in muriatic acid and held over the urine, a white cloud-like vapor arises from the urine.

Fig. 75.— Areapikometer.

Specific Gravity of the Urine.—This varies in the dog between 1016 and 1060. It can be tested by means of the urinometer or if we have only a small quantity we can test it readily by the areapikometer. This instrument the writer has found to be very useful. It is shown in Fig. 75. Place the urine to be tested into the receptacle *C*. Fill it full, taking care that there are no air bubbles in it. Close it and then sink it in water at 15° R. The specific weight of the urine will then be marked on the scale.

As a rule it will be found that dark urine has a high and light-colored urine a low specific gravity. But there are exceptions to this, for in diabetes mellitus the urine is clear and high in specific gravity, while in nephritis it is dark in color and has a low specific gravity. Dark urine seen during starvation has a low specific gravity.

Foreign Substances in the Urine.—The following substances appear
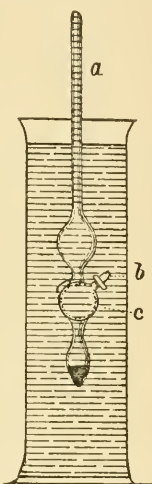
in the urine under pathological circumstances. Mucus, blood, particularly red blood corpuscles, white and pus corpuscles, fat, epithelium, and tissues, urinary cylinders, animal and vegetable parasites, crystals, albumen, sugar, or coloring matter of bile and indican.

a. Mucus is found in the bladder under all conditions, either in health or disease of the urinary passages, and is found in particularly large quantities in catarrh of the bladder.

b. **Blood.**—If the blood is mixed in the urine evenly and the corpuscles are reduced in size and cylinders are present, it indicates hemorrhage from the kidneys. If blood is present it is called hæmaturia and when the urine is stained with blood or blood-coloring matter it is called hæmoglobinuria or methæmoglobinuria. Heller's test or the spectroscope can be used to test urine for blood or blood coloring matter.

Heller's Test.—Add to the sample of urine a solution of caustic sodium or potassium, rendering it strongly alkaline; the solution is then
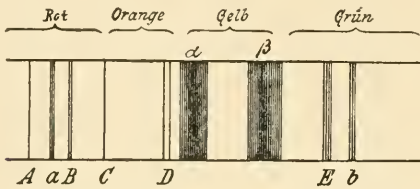
FIG. 76.—Spectrum of urine in hæmoglobinuria.

FIG. 77 —Hæmatin crystals.

brought to a boiling point, and a flocculent reddish-brown deposit is thrown down.

Spectroscope.—The spectroscope examination is made by means of an ordinary pocket spectroscope; it may be necessary to dilute the urine slightly with water if too concentrated.

Microscopical examination will positively determine the presence of blood cells.

Hæmaturia is indicated by the presence of red blood corpuscles in the urine, and if the urine has been allowed to stand some time contracted or broken down blood corpuscles may be found and the red coloring matter disappears. This condition is present in all diseases of the kidneys.

Hæmaturia is found in all diseases of the kidneys, acute nephritis, acute renal stasis, hemorrhagic infarction, traumatisms, tumors of the kidneys, diseases of the urinary passages, particularly the pelvis of the kidney, pyelitis, nephrolithitis, eustrongylus gigas, and in diseases of the bladder, such as cystitis, neoformations, calculus, inflammation of the prostate and urethra.

The location of the hemorrhage may be indicated in the following

manner. If from the kidney, by the presence of large quantities of epithelium and cylinder casts, while the absence of casts and the presence of epithelium peculiar to the bladder, would indicate it came from that organ. If the urine is bloody at irregular intervals, it indicates hemorrhage from the pelvis of the kidney. When the blood is not mixed with the urine, but comes down in a mass, the diseased condition must be in the bladder. This indication is not always certain, as we may see the blood evenly mixed with the urine in diseased conditions of the bladder, such as cystitis. When the blood is passed just before the urine or follows after the last of the urine has passed, or is passed involuntarily, it indicates hemorrhage from the prostate or urethra. Hæmaturia may result from certain infections or constitutional diseases, or as a result of the presence of certain filaria in the blood.

c. **White Blood Corpuscles, Pus.**—White blood corpuscles are found in the urine and are found associated with red blood cells; they are also found in the majority of diseases of the kidneys and urinary organs. When a considerable quantity of pus is passed, it indicates the opening of an abscess in the prostate. When a smaller quantity is present it indicates the presence of some inflammation of the mucous membranes of the kidneys. We can obtain definite information as to this condition by making a microscopical examination of the epithelium to see whether any cylinders are present or not.

d. **Fat** may be seen in drops on the surface of the urine or shortly after it has been passed. In very fat animals this may be seen as a normal condition, and where animals have had large quantities of fat given to them. It also indicates the fatty degeneration of epithelium of the kidneys. Friedberger and Frohner have seen a pathological lipuria associated with croupous pneumonia in animals with certain anemic and cachectic conditions. It is also present in the various diseases of the kidneys. Do not be misled, when you have passed a well-lubricated catheter and see oil floating on the urine, into thinking that it is a pathological condition.

e. **Epithelium and Broken-down Tissue.**—In health a few epithelial cells are always passed, but when they are present in large quantities it indicates some active inflammation going on in some part of the urinary tract, and a microscopical examination of the cells to ascertain their size and shape will indicate the section of the urinary system they come from. Large quantities of squamous epithelium indicate an irritable condition of the bladder, but it may also come from the uterus or pelvis of the kidney. Renal epithelium in any quantity indicates disease of the kidney; large quantities of glandular cells, mixed with pus corpuscles and dumb-bell bacteria, indicate disease of the prostate. Broken-down tissues in the urine indicate renal tumors, suppurative or septic

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nephritis, severe inflammatory processes, or carcinoma of the bladder or prostate (Fig. 78).

f. **Renal Cylinders.**—Where we find hyaline cylinders, granular cylinders, epithelial cylinders, or blood casts, then we can feel assured that there is some disease of the kidneys. Blood cylinders indicate hemorrhage of the kidneys. Epithelial cells in large numbers indicate great desquamation of the epithelium, as in acute parenchymatous neph-
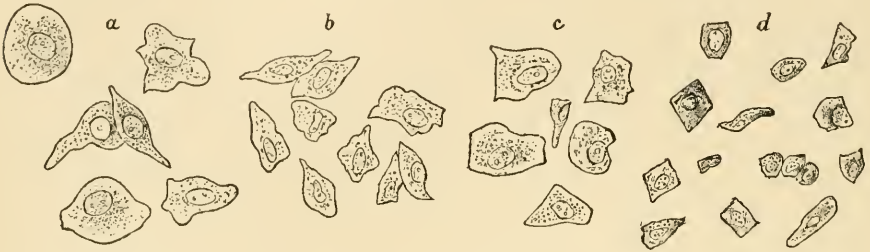
Fig. 78.—Epithelium found in the urine: *a*, From the bladder; *b*, from the ureters; *c*, from the pelvis of the kidney.

ritis. Hyaline or epithelial cells when mixed with pus cells indicate suppurative nephritis. Hyaline and granular cells are present in all diseases of the kidneys and always in albuminuria and fevers (Fig. 79).

g. **Vegetable and Animal Parasites.**—Vegetable parasites may be found in recently voided urine in the form of the split fungus, side by side with triple phosphates (Fig. 80). Siedamgrotzky found numerous ball bacteria and pus corpuscles in suppuration of the prostate. Animal
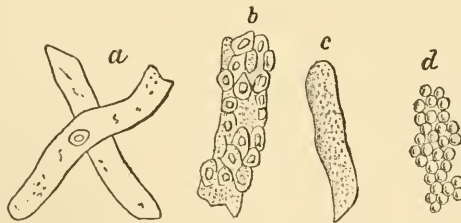
Fig. 79.—Uric cylinders: *a*, Hyaline cylinders; *b*, epithelial cylinders; *d*, granular cylinders; *c*, blood cylinders.

parasites may be found, either the eggs of the eustrongylus gigas or the embryonic forms of the filaria immitis.

h. **Crystals.**—We find collections of precipitates in the urine and indications of alkaline fermentation, the urine being alkaline in reaction and containing crystals of triple phosphate, phosphoric acid and ammoniacal magnesia; these crystals develop in ammoniacal urine and are coffin-shaped, they are soluble in acetic acid, thus being distinguished

from calcium oxalate, and occur in large quantities in chronic cystitis. There are a number of abnormal substances found in the urine. The principal ones are albumin, sugar, and the coloring substances of the bile.

i. **Albumin.**—The presence of albumin in the urine is always an indication of disease. The two most important forms of albumin are serum-albumin and serum-globulin; the two are generally in combination, and both give the same reaction.
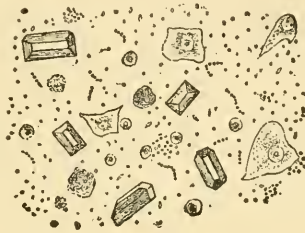
Fig. 80.—Urine of a dog with cystitis, triple phosphate crystals, red and white blood corpuscles, and cystic epithelium. Bacteria.

Koch's Test.—The urine to be examined must be carefully filtered before proceeding with the test. The urine is boiled in a test-tube, having been previously rendered acid in reaction by the addition of a small quantity of acetic acid. The urine may become opaque from two causes; from the presence of albumin or from phosphates; to this we add nitric acid drop by drop until the phosphate is all dissolved and the albumin remains opaque.

Heller's Test.—The urine is rendered acid; then pour a small quantity of nitromuriatic acid down the side of the tube, and if there is any albumin present there will be a pronounced opaque ring or line where the acid meets the urine.

Test with Acetic Acid and Ferrocyanide of Potassium.—The urine is rendered acid with acetic acid and drop by drop a 5 to 10 per cent. solution of ferrocyanide of potassium is added; if albumin is present, a white turbidity indicates the presence of albumin. If the solution immediately becomes turbid on the addition of a very small quantity of the solution it is due to the presence of mucin and must be filtered immediately before proceeding. Very concentrated urine must be diluted with a certain quantity of water. The quantitative test for albumin must be made by means of an albuminometer; if this is required the methods described in text-books on analytical chemistry should be consulted; as a rule the simple proof of the presence of albumin is sufficient for diagnostic purposes.

Albumin occurs in the urine from two causes: in false or accidental albuminuria, and in true or renal albuminuria.

The first occurs when there is free albumin in the urine from accidental causes, as where the albumin is added to the urine in its passage from hemorrhage, inflammatory conditions in the passages, or from purulent inflammations. In such cases the microscope will easily make the differential diagnosis. The quantity is always small.

True albuminuria is of much greater importance, as this condition is always a symptom of pathological alterations in the epithelium covering the walls of the gland. Healthy epithelium will always retain the albumin in the blood.

We see true albuminuria in all forms of acute and chronic inflammation of the kidneys, in fatty degeneration of the kidneys, in amyloid kidneys, and in any altered condition of the renal circulation, such as stagnating hyperæmias as a consequence of heart disease, and in chronic inflammatory conditions of the lungs, pleuritis, hydrothorax. The horizontal position of the dog does not, however, cause such a great disturbance in the posterior extremities when the smaller blood vessels are congested as it does in man,

Albumin will sometimes be found in the blood from anæmia, leukæmia, in acute poisoning, and from high fevers, acute infectious diseases, or violent muscular exertion. In acute nephritis a large amount of albumin is found to be present, in smaller quantity in chronic nephritis, while in acute atrophy of the kidney very little albumin may be found, but in the latter condition we generally find that there is present more or less nephritis or a slight parenchymatous degeneration of the kidneys. And it is well to examine the urine under the microscope to see if cylinders are present.

Sugar.—The grape-sugar test is generally made when an animal has a good appetite and polyuria and yet becomes generally emaciated, and when the urine is pale but of a high specific gravity.

The tests are Trommer's, the bismuth, and the fermentation test.

Trommer's Test for Sugar.—Put a few c.c. of urine in a reagent glass, taking care to first see that there is no albumin in it, and if so coagulate it and filter it out. Take the urine and dilute it with an equal bulk of water, and render it alkaline with a small quantity of sodium hydrate; then add drop by drop a 4 per cent. solution of cupri sulphas until the liquid is clear and the sediment dissolved, then heat it until it boils, and if sugar is present we see a reddish-yellow vapor appear at the surface of the fluid.

Bismuth Test.—Ten parts of urine from which all albumin is removed has the following solution added to it: bismuth subnitrate 2 parts, Rochelle salt 4 parts, and a hundred parts of 10 per cent. solution of

caustic soda; this mixture is boiled five minutes, and if sugar is present the mixture becomes black.

Fermentation Test.—This test is always to be preferred in dubious cases; it is also useful to determine the quantity of sugar present. In this test the saccharometer is used. The method consists in adding a small quantity of yeast to a certain proportion of urine; for further details the reader is referred to works on the chemical analysis of urine.

In diabetes mellitus a large quantity of sugar is generally found in the urine. This disease, however, is extremely rare in the dog. It is also found when the animal has been fed on a pure sugar diet. A considerable amount of sugar has been found in the urine of bitches that were nursing, especially when the pups were prevented from nursing for some time. The writer cannot say whether it is found in the dog in certain cases of poisoning, or from some neurotic causes.

Coloring Substance of the Bile.—The coloring substances of the bile are found quite frequently in the urine of the dog. The presence of these indicates an obstruction in the excretion of bile. It may often be seen in catarrh of the intestines and in the gastric form of distemper. Icterus is the most common cause of this condition. (For further information, see icterus.) Frohner found this also in neurosis and bronchial forms of distemper, in some diseases of the kidneys, in pleuritis, and in great heart weakness. Voigt also found it in animals that were starved. Bile acids in the urine are of no diagnostic value in the dog, and will not be taken up in this work.

DISEASES OF THE KIDNEYS.

Inflammation of the Kidneys; Nephritis.

It is impossible to accurately separate the different inflammatory conditions of the kidneys, and as a rule it is only on post-mortem that the condition can be properly diagnosed. Consequently, the practitioner has to be satisfied if he can recognize with certainty that the animal has some affection of the kidneys, and whether it is acute or chronic. In the dog it is only in chronic nephritis that we find a general atrophy of the kidney.

Acute inflammation of the kidney may be traced to severe cold, to traumatisms, or to sympathetic irritation from adjacent organs, or to acute catarrh of an infectious or toxic character.

The diseases of the kidneys in the dog do not possess that importance that they do in man.

Acute Inflammation of the Kidneys.

(Acute Nephritis; Nephritis Acuta.)

Etiology.—The most common causes of this condition are infectious diseases and poisons. By this is meant the effect produced by the absorption of infectious noxious agents, such as the various septic diseases, or certain irritants that have originated in the body and are passed into the kidneys and cause great irritation while they are passing through these organs, and also certain micro-organisms that reach the blood and become located in the capillaries of the kidneys. Certain chemical substances, such as phosphorus, arsenic, lead, mercury, copper, cantharides, turpentine, colchicum, male fern extract, strong spices, carbolic and tar acids, naphthol, and chrysarobin, that are absorbed or taken into the stomach pass through the kidneys and cause great irritation. Some of these chemical substances are absorbed by the skin from various ointments that are applied in mange, such as carbolic acid, mercury, cantharides, balsam of peru, storax, etc.

Acute nephritis may also originate from an extension of inflammation from neighboring organs, and also from traumatic influences, such as blows, shocks, etc., in the regions of the kidneys. There is a condition called rheumatic inflammation of the kidneys that is supposed to originate from cold. This occurs generally in young dogs during severely cold weather.

Pathological Anatomy.—The alterations in the structure of the kidney depend on the intensity of the irritation, and the alterations are more or less distinctly marked. In slight cases the epithelium seems to be the only part affected, the connective tissue and the blood vessels show no pathological alteration other than a reddish-gray coloration of the covering, or sometimes a yellowish coloration (parenchymatous degeneration). When the irritation is great, there is true parenchymatous inflammation of the kidneys. The epithelium and the intermediate tissue become affected, as do the blood vessels, and all the exudation processes which accompany acute nephritis follow. The anatomical alterations that are found are as follows: The epithelium has undergone extensive desquamation, as in parenchymatous degeneration, but more acute in its type. The capsules of the glomeruli and the small urinary canals are altered, and the connective tissue is filled with a liquid infiltration forming numerous coagulated masses containing large numbers of leukocytes rich in hydrogen and the urinary canaliculi are filled with hyaline and epithelial cylinders. The vessels are enlarged (hyperæmic) and partially compressed by the surrounding

exudates. In the interstitial tissue and in Muller's capsule we find small circumscribed hemorrhages. There are a number of circular-shaped inflammatory centres surrounded by liquid exudates.

The inflamed kidney may present a variety of different appearances. It may be enlarged or normal in size, soft or hard, reddened or very pale or yellowish-white, and on the surface of the kidney there may be found a number of hemorrhage spots that are slightly elevated from the surface of the gland. The capsule can easily be stripped from the body of the kidney. There are certain forms of acute nephritis and glomerulo-nephritis that present so little visible changes that they may escape the eye of the non-experienced practitioner. Concerning more accurate details refer to the various text-books on pathological anatomy, particularly Kitt, who has made a special study of the pathological anatomy of domestic animals.

Clinical Symptoms and Course.—Slight inflammatory conditions of the kidneys are rarely recognized in the dog, as the only diagnostic points are to be found on examination of the urine. This contains a small amount of albumin, some hyaline cylinders, and a few epithelial cells and leukocytes.

In acute inflammatory conditions the animal has a peculiar stiff gait in walking, and in some cases staggering, with the hind legs carried straight, and tenderness on pressure in the regions of the loins; there may be pain on pressure in the region of the kidneys, and an exact knowledge of the anatomy will aid to discover whether these organs are enlarged; a quick full pulse, with loss of appetite, and persistent vomiting in the early stages of the disease; great lessening in the amount of urine secreted, and what is passed is dark in color and contains small portions of coagulated blood, but the animal may make frequent attempts to urinate, and the faeces are dry and hard. The amount of urine passed in such conditions is small and contains a large amount of albumin. The urine is turbid, reddish-brown to dark red in color; if allowed to stand there is a thick mucus-like sediment of a red-brown or, in rare cases, opaque red color, and the specific gravity is greatly increased; examined microscopically, it is found to contain numerous tube-cylinders, epithelium, and white blood corpuscles, also red blood corpuscles, which give the urine a variable color, according to the number of corpuscles present; chemically tested, large quantities of albumin are found to be present. There is generally more or less pain on urination; this is probably due to the acrid condition of the urine. There are also present more or less symptoms of uræmia, with great weakness, fatigue, and temperature generally subnormal, the pulse weak and thready, vomiting, diarrhœa, œdema of the limbs, convulsions, coma, and death. The result in an acute case is not often favorable if the disease lasts from 8 to 14 days.

When the symptoms are milder and the animal recovers, this is indicated by an increase in the amount of urine secreted and its becoming clearer; but this condition may be followed by chronic nephritis.

Therapeutics.—Medicine, as a rule, has little or no effect on these cases. Tannin, 0.1 gm. several times daily; tinct. fol. uvaursi, 1.0., or fuchsin, and iron preparations may all be used.

The dietetic treatment is the most successful and consists principally of rest and food that is non-irritating to the kidneys, such as milk, mutton broth, rice and gelatine soups, are especially useful. Meat may be given, in the acute stages, but only lean meat and in spare quantities, avoiding anything that is spiced or salted. The symptomatic treatment is to try to lessen the strain thrown on the kidneys by trying to carry the fluids out of the body by some channel other than the kidneys, and we try to do this through the skin or the intestines. This can be accomplished to a certain extent by giving the animal hot baths or using warm bandages (the Priessnitz compress) around the body, particularly around the kidneys, and also by active purgatives which have no action on the kidneys, such as cascara sagrada, also jalap and calomel. Where there is great pain in the region of the kidney and the animal moves about with the back arched, the application of a warm linseed poultice in the region of the kidneys is particularly useful.

To relieve the kidney we can also try pilocarpine, which produces great salivary secretion in the dog. This, however, must be used with great care in dogs that have any affections of the heart or lungs. Diuretics must not be used in nephritis, as they increase the secretion of salts, especially the alkalies. General debility should be treated by alcoholic stimulants, such as brandy, whiskey, or sherry, in the case of very small animals. Use inhalations of chloroform, clysters of chloral hydrate, or salts of bromine to counteract convulsions. Where acute nephritis occurs as a result of some infectious or toxic disease, the symptoms must be treated in connection with the exciting cause

Chronic Inflammation of the Kidneys.

(Chronic Nephritis; Nephritis Chronica.)

Etiology.—Chronic nephritis originates, as a rule, from acute nephritis or starts in a mild form and gradually becomes chronic; this is seen particularly when it originates from toxic or infectious causes, and in animals that are subjected to repeated colds or lie in damp kennels, so that it is very difficult to tell at times just how a chronic case may originate.

Pathological Anatomy.—There are two forms of chronic inflammation of the kidneys; first the large white kidney (chronic parenchymatous

nephritis), and the atrophic or hard kidney (chronic interstitial nephritis). The first condition is generally the forerunner of the second, but, as the hard kidney is most frequently found in post-mortem, it is possible that it may develop as a primary condition. The white kidney is enlarged from the normal size, and has a smooth yellow or irregular yellow-colored surface. The cortical portion is yellowish in color, while the pyramids are red. In some cases we find the kidney large and red, or alternated red and yellow, or covered with hæmorrhagic spots. The atrophic kidney (shrunken or contracted kidney) results from an increase of the interstitial substance and atrophy of the parenchymatous substance. It is hard and tough on its surface, and has small, wart-like irregularities and granulations. The capsule is thickened and it is hard to strip from the body of the kidney; here and there we find small cysts of various sizes. The cortical substance is lessened in diameter and striated with layers of dark colored tissue. The pyramids are smaller and deep red in color.

Clinical Symptoms and Course. —As a rule, very little that can be recognized in the dog during life. The quantity of urine passed is greatly increased and at much shorter intervals; this increase of the amount of urine passed is one of the first symptoms to attract the attention of the owner. The urine is very light in color, almost like water, the specific gravity being much lessened. Microscopically examined, we may find isolated hyaline cylinders, and a few blood corpuscles; albumin is never present in any great amount, frequently for a certain period small quantities of albumin may be present and then it entirely disappears. Palpation of the kidney may find it hard, and uneven on the surface. In such cases there is generally hypertrophy of the left ventricle, which can be recognized by palpitation of the heart (loud pulsations and a hard, full pulse). It is presumed that this high arterial pressure tends to keep up the action on the impaired kidney and prevent any serious disturbance in the secretion of the kidney. As the disease advances we soon recognize a change: the heart becomes weaker in its action, the pulse is small and frequent, the urine is scant, dark and very albuminous. This is followed by chronic inflammatory processes in various organs, especially the bronchia, and in the intestinal canal; and finally we have symptoms of uræmia. In the majority of cases the parenchymatous form can be recognized by the urine. This is very similar to acute nephritis. It contains much albumin, and the urine is scant in quantity, and there are certain dropsical symptoms in the dependent regions; death may occur as a result of general dropsy or uræmia, or such complications as pneumonia, pleurisy, or pericarditis. There is also loss of appetite, great fatigue on taking any exercise, hypertrophy of the heart, which finally becomes weak, and then symptoms of uræmia follow as stated above. In rare cases the condition may change and the active symptoms cease; the urine gradually becomes

clean and of a lighter specific gravity, it increases in quantity and the dropsical regions return to their normal condition.

Therapeutics.—The treatment of chronic nephritis is the same as in acute. As the course of the disease generally covers a long period and the affected animal suffers great loss of strength, the animal must be fed frequently on milk, rice, or meat, being careful to use no salt or spices. But the dropsical conditions can be treated by diuretics and aromatics; pilocarpin is also sometimes used, and when there is great anæmia give iron salts to assist absorption of the pathological neoformation resulting from the inflammatory processes. Iodine, iodide of potassium, or sodium may be administered.

Other Diseases of the Kidneys.

There are in the dog a number of pathological conditions of the kidneys which are of very little importance; the most important of these will here be described briefly.

Renal Hyperæmia.—This follows as a result of arterial hyperæmia and may be produced by the same causes as produced acute nephritis; frequently certain diseases of the circulatory or respiratory organs, interfering with the venous circulation, produce passive hyperæmia of the kidneys (renal stasis). Thrombus in the renal circulation or tumors pressing on the vessels may also cause it. In renal congestion there is a large amount of urine secreted, which is light in color and of a low specific gravity, whereas in renal stasis the urine is of high specific gravity, dark in color and contains a certain amount of albumin, hyaline, cylinders and blood corpuscles in small amount. The urine after standing some time forms a thick red precipitate of urates, which are readily redissolved by heat.

The treatment consists in endeavoring to remove the active cause of the hyperæmia by treating the primary affection.

Amyloid Kidney.

Amyloid kidney generally occurs in connection with amyloid degeneration of some other organs of the body. The kidney is slightly increased in volume, firm, smooth, with yellowish-white coloration of the cortex, and in the parenchymatous form the condition can usually be recognized by the character of the urine. This generally presents the same symptoms as those of acute nephritis. The urine is loaded with albumin and much lessened in quantity.

The amyloid condition is seen not only in the kidneys, but also in the liver, pancreas, and intestines.

Pathological Anatomy.—A kidney thoroughly affected with amyloid disease is slightly enlarged, hard, smooth, and shows at the intersections a deep yellowish-white coloration, easily distinguished on section. The glomeruli are easily distinguished with the naked eye as small glossy spots. On staining with Lugol's solution the affected parts are colored a mahogany-brown and with methyl are colored purple-red. For further details see works on pathological anatomy.

Clinical Symptoms.—The extremities are dropsical, with complete loss of appetite, coma, uræmia, and then death. In a case where the animal was unsteady and weak, with paleness of the mucous membrane, Zimmerman found an amyloid kidney associated with hypertrophy of the left side of the cord.

Therapeutics.—The treatment consists in following what is prescribed in nephritis.

Abscess of the Kidneys.

(Suppurative Nephritis; Pyelonephritis.)

Etiology.—The direct cause of the formation of abscess of the kidney is direct injury of the kidneys or in the region of them, causing the formation of purulent abscess in the urinary passages, the bladder, the urethra, or the pelvis of the kidney. In certain cases this condition is associated with ulcerous endocarditis, from the results of an embolus which may be liberated and get into the circulation.

Pathological Anatomy.—Purulent nephritis occurs in various forms, according to its origin. When this condition is caused by an embolus it is seen in the shape of small abscesses which are easily distinguished by the naked eye. When a section is made through the kidney, these abscesses extending along the canaliculi present a peculiar appearance and are grayish-yellow in color, round or oblong in shape, and are generally surrounded by a red circle. When the spot is examined under the microscope there are swarms of micrococci in the centre of the mass, and it is reasonable to believe that these are the causes of the abscesses. Only in rare cases do the abscesses become confluent, and when they do they form large pus centres that, as a rule, cause death. When the abscess forms in the pelvis of the kidney the pus extends into the straight urinary canals, in some cases as far as the surface of the kidney, and is indicated by a protrusion or elevation of the external surface, which is yellowish in the centre and surrounded by a circle of yellowish points. When large abscesses are formed from these and become confluent, the whole kidney may become altered into one large abscess. The covering capsule of the kidney then becomes thickened and holds the abscess with its contents (pyo-

nephrosis). In the early stages, where the micrococci have just collected in the urinary canals and have started to form abscess centres, a very interesting study is afforded.

Clinical Symptoms.—The symptoms of abscess of the kidneys may not differ to any great extent from chronic nephritis, the diagnosis being based on local manifestations, by means of palpation of the abdomen in the region of the affected kidney; this may be greatly enlarged or even fluctuating if the abscess has formed pus. An examination of the urine may show it to contain numerous pus corpuscles, a large quantity of micro-organisms, and an excess of albumin and pus, blood cylinders, renal epithelium and, in rare cases, we may even find portions of broken-down renal tissue. It is possible, however, to find an acute case in which none of these symptoms are presented and where the urine is practically clear; this is particularly noticeable when the irritation is due to an embolus. The whole appearance of the animal presents all the symptoms of an acute wasting disease; the fever is irregular or intermittent and there is generally rapid emaciation.

Perinephritic abscesses may become so large that they form a tumor-like body in the lumbar region, and the pus can be detected under the skin, in some cases so large that the enlargement fluctuates. When such is the case, and we have confirmed our diagnosis by means of an exploring needle, the sac should be emptied by an aspirator or by making a fairly large opening and emptying the abscess of its contents. It should then be washed out daily with an antiseptic solution. If the kidney itself is not directly affected by the abscess, we may expect a quick recovery under good antiseptic conditions (see treatment of wounds).

Treatment.—If the disease is confined to one kidney, the treatment should be surgical and the abnormal kidney removed, care being taken, however, to be sure the remaining kidney is normal and able to perform the duties of both.

Inflammation of the Pelvis of the Kidney.

(*Pyelitis.*)

Etiology.—This is caused by the irritation or extension of certain inflammations from the body of the kidney, from poisonous irritants passed from the blood through the kidneys, from foreign bodies that lie in the pelvis, from nephritic stones, or strongylus gigas, and this condition is also seen in infectious diseases that are acute in character, as well as in the extension of inflammation from neighboring organs (nephritis, cystitis) and from any of the various conditions that result in interference with the flow of urine, stricture of the ureters, from the presence of calculi,

tumors, or abscesses of the prostate, paralysis of the bladder, as in spinal paralysis, or in hydronephrosis.

Pyelitis occurs in a number of forms varying according to the intensity of the irritation and is generally part of other morbid processes. This disease is recognized by means of the microscope, particularly when we discover epithelium of the pelvis of the kidney in the urine, or by manual examination of the kidneys through the abdominal wall, when enlargement of the pelvis may be detected (see also parasites of the kidney), or there may also be present some symptoms of inflammation of the kidney or catarrh of the bladder. The treatment consists in the attempt to remove the original irritant.

Hydronephrosis; Dilatation of the Pelvis of the Kidney.

Etiology and Pathological Anatomy.—Whenever there is a stenosis or stricture of the urinary passages and consequent obstruction, the urine is dammed back and presses on all the canals behind the point of obstruction, and as a consequence the canals are distended and finally become enlarged. If the obstruction is in the urinary tube, the bladder, ureters, and the pelvis of the kidney become enlarged; but if one ureter only is affected, the corresponding kidney becomes enlarged; and where the pelvis is much distended and after the condition has lasted some time, the body of the kidney becomes absorbed. The whole kidney becomes converted into a pouch-like mass of connective tissue, filled with liquid. This fluid at first is urine, but soon becomes converted into mucous secretion. In one case described by Siedamgrotsky, he observed, instead of a kidney, a large bladder or cyst, with walls formed of connective tissue, filled with a syrupy brownish fluid containing numerous cholesterin crystals. This condition is produced gradually, for any sudden interference or stoppage of the flow of urine would produce uræmia or rupture of the urethra and uræmia and death in a short time, but in hydronephrosis the condition comes on slowly and may result from periodic irritation and stricture of the urethra, from tumors of the prostate, the presence of calculi in the canals, or by inflammation of the mucous membrane of the bladder.

Clinical Symptoms and Therapeutics.—The cystic kidney in slight cases is rarely recognized; in more acute cases it is indicated by a fluctuating painless tumor in the region of the kidney; in certain cases there is a decided enlargement in the size of the abdomen; by puncture and use of an exploring trocar we find the fluid described by Siedamgrotszky. When there is double hydronephrosis the urine is suppressed and symptoms of uræmia are shown very quickly. The disease can only be treated successfully when it is caused by obstruction of the urethra; for instance, where the obstruction is due to a calculus in the urethra and it is removed by surgical means.

Nephritic Stones.

(*Nephrolithiasis; Renal Calculi.*)

Nephritic stones are formed in the pelvis of the kidney and range from the size of a mustard-seed to that of a pea.   (Megnin found two stones each weighing six and seven grammes in the pelvis of a dog.)   They are irregular, warty, or sharply irregular, and consist of phosphate and carbonate of calcium; in rare instances the so-called cystic calculi are found; these, when first removed, are soft waxy bodies with a dull surface, composed of triple phosphate and uric acid.

The formation of these collections is not thoroughly understood, but they are probably formed by some foreign body, such as mucus, blood, fibrin, epithelium, urinary cylinders, shreds of tissue, or collections of bacteria; and the salts are deposited on this medium in successive layers, so that finally a large mass is formed.

Nephritic stones may produce pyelitis, pyelonephritis, or hemorrhage from the pelvis of the kidney.   If the stone lies at the entrance of the ureter or even passes into that canal and becomes lodged, it will retard the flow of urine and even cause rupture of the ureter or pelvis of the kidney and death from peritonitis.   Frequently the calculus is forced along the ureter, causing great agony, and finds its way into the bladder.   These stones are not, as a rule, diagnosed with any degree of certainty during life.   Symptoms of pyelitis with the continual passage of small stones from the urethra are about the only indications that will guide the observer.

Tumors of the Kidneys.

These neoformations can be determined only by a manual examination of the kidney through the abdominal wall; they frequently cause an enormous increase in the size of the kidney, particularly so in carcinoma, the soft form of cancer being most frequently seen.   In the pelvis of the kidney and the ureters we find irregular papilla-like formations (carcinoma papillomata, papilloma destruans (Kitt); these may obstruct the normal flow of urine and cause a distention and enlargement of the pelvis of the kidney and the renal ducts and an atrophy of the kidney itself.   The only possible relief to such a condition is the surgical removal of the kidney.

Animal Parasites of the Kidney.

Of the various parasites of the kidney the strongylus gigas has a special interest.   This parasite is not unlike the common earth-worm and

about the thickness of a lead pencil. It is generally blood-red in color, and invariably found solitary. It is usually found in the pelvis of the kidney, causing great irritation of its mucous membrane, the pelvis of the kidney and even the kidney itself being converted into an enormous cyst in the middle of which lies the parasite, twisted in a round spiral mass.

During life there are no symptoms which could be called characteristic and recognized with any ease. The animal may show evidences at times of great pain, quick respirations, moving from one place to another, uttering occasionally short cries of pain, scratching or digging with the paws in an aimless way, great depression, staggering gait, the back is arched or bent laterally; in rare instances there are severe cramps of the posterior extremities. The urine is generally turbid and contains pus; under favorable circumstances we may find the eggs of the parasite, these are brown in color, oval in shape, and their external surface is granular or pitted; they are about 70μ long and 40μ wide. The presence of the eggs of the parasite is of course positive evidence of its presence. The parasite may find its way into the bladder, producing a cystitis, or into the urethra, obstruct that canal, or it may be passed out entirely. As a rule the parasite causes so much irritation locally as to cause the death of the host. Lacosta, however, had a case where the animal passed the parasite and made a complete recovery. The treatment consists in the administration of oil of turpentine in repeated small doses.

DISEASES OF THE BLADDER.

Catarrh of the Bladder; Inflammation of the Bladder.

(*Cystitis*.)

Etiology.—Catarrh of the bladder is generally caused by microbes such as coli bacilli and their kindred bacteria, and also by the pyogenic cocci, staphylococci, streptococci, etc., which find their way into it, as a result of certain infectious diseases and are eliminated by the kidneys or by certain chemical irritants, such as oil of turpentine, cantharides, carbolic acid, or creosote, and also calculi. Septic instruments, such as catheters, when introduced into the bladder, may set up an irritation of the mucous membrane. Cystitis is caused by the extension of an irritation from the urinary ducts. In septic or mycotic inflammations of the intestines, and thus the kidney carrrying off waste materials, from irritation of the pelvis of the kidney, from the uterus, and from retention of the urine, caused by stones in the urethra in bitches. From hypertrophy of the prostate, or in case of well "house-broken" dogs that retain the urine, being unable to get oustide, and as a consequence of retention produce

a paralysis of the bladder, in bitches having a difficult or protracted delivery, from traumatisms, such as penetrating wounds, or contusions as a result of being run over by a wagon or automobile. Where the urine becomes very alkaline from the excess of ammonia, it produces an irritating effect on the bladder, as also does continual retention of urine, especially when it is heavily charged with salts. It has been said that cold will produce cystitis. Cystitis may also be produced by the extension of inflammation from neighboring regions, or in grave infectious diseases an irritation can be caused by the toxins of broken-down micrococci being carried away

Pathological Anatomy.—There are quite a number of varieties of cystitis—mucous, muscular, serous, croupal, ulcerous, diphtheritic, and gangrenous—but, as a rule, it is very seldom that we can differentiate between the various forms, and it is best from a practical standpoint to distinguish the disease as acute and chronic catarrh of the bladder. In the acute form the mucous membrane of the bladder is colored in an irregular way by dark red spots. It is also more or less swollen and covered with mucus and detached epithelium. In the later stages of the disease, the mucous membrane may be covered with detached epithelium and covered with small hemorrhagic spots. In very severe cases we find a croupous membrane covering the bladder, and it may be so acute as to cause gangrene, and mucous membrane is sloughed off and extensive abscesses are formed. In such cases the muscular and serous coats of the bladder are also greatly inflamed; and if the irritation is extensive enough, we may also find evidences of peritonitis.

In the chronic form the mucous membrane becomes very much thickened and covered with enlarged mucous glands. The surface presents a peculiar greenish or slate-gray color. This is due to the hemorrhages that occur in the tissues from time to time. On the surface we often find raised papilla-like formations, and the submucous tissues and muscles are hypertrophied.

Clinical Symptoms and Course.—The first symptom noticed in this disease is the passage of an increased amount of urine, the animal emptying the bladder frequently, but passing only a small quantity of urine each time, at the same time showing evidences of pain. In rare cases there may be a retention of urine due to cramp of the neck of the bladder from irritation. On making an examniation of the bladder through the abdominal wall, the animal shows pain on pressure of that region. An examination of the urine by the microscope will assist us in making a positive diagnosis. If there should be some disease of the kidneys present, while the specific gravity of the urine is not much changed, in the early stages of the disease, it is somewhat darker than usual, and there is an increase in salts and it contains only a normal amount of mucus, albumin, a few pus

and perhaps a few blood corpuscles, and masses of bacteria and epithelium of the bladder. This condition may continue for a long time. The reaction of the urine depends on the nature of the bacteria present, and it is generally alkaline but may be acid, as in cystitis produced by the coli bacilli. Mild cases of cystitis are not diagnosed, but as the disease continues the urine becomes thicker and turbid, and on making a microscopical examination of the urine we find numerous pus cells and epithelium of the bladder; the urine rapidly loses its acid reaction and soon becomes neutral or alkaline, and has a strong ammoniacal odor. Urine from an animal in this condition ferments very rapidly and contains numerous crystals of triple phosphate, ammoniacal phosphate of magnesia, and, in rare instances, uric acid crystals and numerous bacteria. (Fig. 81.)

Fever as a rule is present in this disease, but is never intense, but is of rather an intermittent character. There is also severe depression and loss of appetite. The course of the disease, generally, is rapid, and in
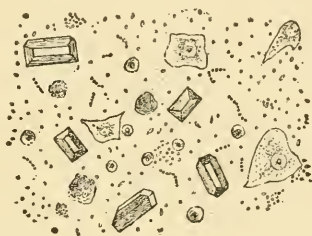
Fig. 81.—Urine of a dog with cystitis, triple phosphate crystals, red and white blood corpuscles, and cystic epithelium. Bacteria.

slight cases the animal recovers in a few days; but in acute cases, the acute symptoms may last for weeks, and then the animal is liable to have relapses from time to time, and if the primary causes such as stone, urethral stricture, paralysis of the bladder continue, the cystitis becomes chronic. The chief danger in cystitis lies in the possibility of a complication of pyelitis, pyelonephritis, suppuration, paracystitis, etc., and death may finally be caused by perforation of the necrosed bladder and the animal dies of peritonitis, gangrene, or uræmia. The most frequent termination of the acute form is into the mild chronic form.

In the chronic form the symptoms are much milder, and for a long time the urine is the only guide to a diagnosis, as it is only in advanced cases that the animal will show any pain on pressure of the abdomen; the change in the urine characteristic in this condition is that it becomes strongly ammoniacal. The contractile power of the bladder is gradually lost, and the animal may present symptoms of incontinence of urine, passing small quantities of urine without any effort; or this is seen in well-trained house

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animals that pass small quantities of urine although making every effort to retain it until they are outside; or it may pass away drop by drop when they are moving about or asleep.

Therapeutics.—The treatment of cystitis may be dietetic, medicinal, or local, according to the symptoms presented. In slight cases it is only necessary to administer non-irritating agents, such as tartaric acid, dilute muriatic acid, liquor potassii acetatis, or infusions of juniper; and a liquid diet, such as milk or soups. This assists in increasing the amount of urine and also in lessening its specific gravity, and by that means cleans out the bladder. In the more acute conditions, we try to correct the con-
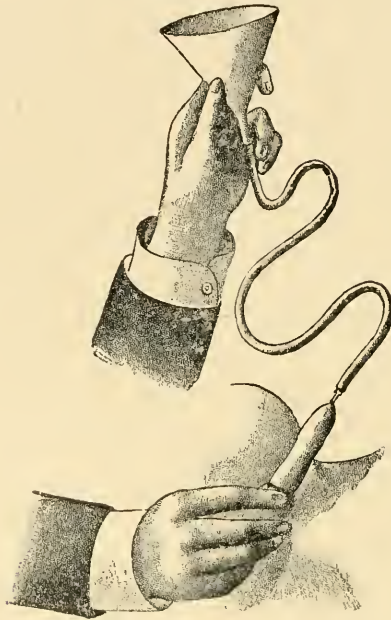
Fig. 82.—Apparatus and method of irrigating the bladder in the dog.

dition of the urine by means of disinfectants, such as salicylic acid, salol, boric acid, naphthalin, chloride of potassium, or urotropin several times daily in 0.5 doses, helmitol 1.0 three times daily, hetralin 2.0 three times daily, or a decoction of fol. uva ursi. The writer has always obtained good results from the administration of the last two agents.

In the treatment of this chronic form, besides the various alkaline salts, we should use the resinous diuretics, such as oil of turpentine, balsam of copaiba, or oil of sandalwood.

The local treatment of the bladder is very effectual. This is done when the urine is found to contain large quantities of bacteria and pus corpuscles, and when ammoniacal decomposition appears very quickly.

This consists in introducing the medicinal agents directly into the bladder by means of the catheter. The catheter is introduced into the bladder and the bladder emptied, and by means of a small hose the catheter is connected with a small funnel (see Fig. 82), and a medicinal douche allowed to flow into the bladder, and then the hose is placed in a dependent position and the liquid allowed to trickle out. This can be repeated several times without removing the catheter. When the animal is very small and a very fine catheter is used, the fluid may not flow freely; in such a case a syringe is adjusted to the end of the catheter and the fluid forced into the bladder and again drawn out by means of the syringe, or an aspirator bottle may be used.

The writer first cleans out the bladder with clean water, then washes with a solution of boric acid, 2 per cent., or of tannin 2 per cent.; sulphate of zinc 1 per cent., resorcin 1 per cent., nitrate of silver 1 to 2 per cent. Ginsiner recommends hydrargyrum oxycyanatum 1 to 100. Jahn had very good results with adrenalin (suprarenin in 1 to 10,000) in hemorrhagic cystitis. Pressnitz compresses or warm poultices to the hypogastric region, and morphine or bromide of soda in cases where there is involuntary or constant urination, also warm clysters to keep the intestines clear. Where there is extensive hemorrhage, give an injection of 2 per cent. solution of tannic acid. Creolin, 1 per cent., is also used, but is not as satisfactory as the former. The liquids must be tepid. In the dog, of course, this treatment is a little harder to perform than in the bitch, but with a little practice it is very easily accomplished and produces very satisfactory results. With the bitch a short metallic catheter can be used. It must be remembered that house dogs must be allowed to go out frequently as the retention of urine is a frequent cause of this condition.

Debilitated or Paralytic Conditions of the Bladder.

Paralysis and Paresis. Vesical Uremia.

Etiology, Clinical Symptoms, and Prognosis.—Weak bladders, due to paralysis or paresis, are generally seen in old dogs, and are produced by a number of causes. One frequent cause of this condition is that house dogs that cannot get outside or are carried long distance on the trains, or are benched at a show, retain the urine for a long time, producing extreme distention of the bladder. Obstructions of various kinds which prevent the passage of the urine, such as the presence of a calculus at the neck of the bladder or in the urethra, as hypertrophy of the prostate, strictures of the urethra, by weakness of the muscular coat of the bladder, caused by chronic catarrh of that organ, and certain diseases of the nervous system also produce this condition.

This condition may also be the result of fracture of the vertebræ, extensive hemorrhage of the spine, myelitis, spinal meningitis, tumors, poison and general debility.

Clinical Symptoms.—There are two forms of this disease: Paralysis of the detrusor and paralysis of the sphincter vesicæ. It is quite common to find both conditions present in one animal. In the first condition (ischuria, retentio urinæ) the bladder becomes so distended that its elasticity is lost, and the muscular coat loses its power of contraction, and, finally, when the bladder is so distended that the connective tissue alone holds it and presses on the sphincter vesicæ and overcomes it, the urine trickles out in small quantities, the animal is uneasy, makes frequent attemps to urinate and may or may not succeed in passing any urine; on palpation of the abdomen the bladder is found greatly distended, and mere manual pressure on the abdominal walls in the region of the distended bladder may cause evacuation of that organ; the urine passed is found to be highly concentrated and has a very unpleasant odor.   The paralysis of the spincter vesicæ is termed overflowing of the bladder (urination by incontinence).   When the sphincter is paralyzed the urine flows constantly or at very short intervals, the slightest contraction of the depressor being sufficient to expel it; this is painless to the animal.   In this condition the bladder is nearly always empty.   In making an examination of the bladder through the abdomen, when paralysis of the detrusor is present, the bladder will be found distended, even when the animal has passed some urine only a short time before, whereas in paralysis of the spincter the bladder will be found to be empty.   As a rule there is no great change in the animal's condition, except in these cases where the original cause is some disorder of the spine; then the appetite is scanty and the animal shows great disinclination to exercise.

When cystitis accompanies this condition the animal shows more or less pain when it urinates.   This, however, is seen only in rare instances. In the majority of cases the prognosis is unfavorable; the only cases in which a favorable termination is to be expected are those of simple distention of the bladder, as in house dogs, when from overdistention of the bladder when the animal cannot get out, or when a calculus is in the bladder or urethra and the cause is removed surgically.

Therapeutics.—The treatment best adapted to relieve this condition is to regulate the passage of urine, as in catarrh of the bladder, by pressing the bladder through the abdominal wall and emptying it, or catheterization and by injections into the bladder of claret wine, solutions of tannin 1 to 2 per cent. internally, or tinc. nux vomicæ 5 to 10 drops once or twice daily, strychnia muriate 0.001 to 0.003 subcutaneously, or fluid ext. ergotæ 0.50.   We can also try faradization of the vertebræ over the lumbar region or massage of the abdomen in the region of the bladder.

Stone in the Bladder.

(*Lithiasis.*)

Etiology and Pathological Anatomy.—The various lithic formations found to originate in the pelvis of the kidney and the bladder are found either in the form of fine sand-like or gritty substances, or formed calculus; these may be subdivided into urates, oxalates, phosphates, and cystates.

Urates.—These consist of uric acid or uric acid salts, or both in combination. They are small, hard, yellowish or reddish-brown bodies, having a smooth surface; on cutting through the centre they are found to be formed in concentric layers or strata.

Oxalates are composed chiefly of oxalic acid and lime salts, and are more or less mixed with uric and phosphoric acids. They are hard, brown in color, and have an irregular mulberry-like surface.

Phosphates.—These are composed of phosphoric acid, lime, and triple phosphates. They are gray-white in color and, as a rule, are soft and friable.

Cystic Stones.—These are soft, wax-like bodies, having a shiny crystalline, irregular surface.

All these lithic deposits contain besides their inorganic elements, numerous organic elements, such as epithelium, blood cells, mucus, etc.

Klemmer found on careful examination of 3301 dogs that 12 or about 0.38 per cent. were affected with stone. The size to which these calculi may grow is considerable. In Dresden there is a calculus taken from a German boar-hound that is 11 cm. long and 7.5 cm. wide, 6 cm. thick, which weighed 490 grammes when fresh. They are generally started in their formation in the pelvis of the kidney, and, generally, from some foreign body, such as a blood clot, a piece of mucus, epithelium, etc., around which the sediment in the urine forms and gradually the crystalline elements accumulate. This deposit is formed very quickly in cases of cystitis, where the urine is undergoing alkaline fermentation and produces a copious sediment in the urine.

Paul Bert and Studensky found by experiments that the food and fluids that the animal takes may have a certain influence on the formation of stone in the bladder. The former mentions two cases in which one was fed exclusively on meat and the other on vegetables. On post-mortem of the animal fed on meat there was found a phosphatic calculus, but no trace of inflammation of the urinary organs.

Studensky placed foreign bodies in the bladder and found that when the animal was allowed to drink only water that was thoroughly impregnated with lime salts that there was soon formed over the body a thick,

heavy deposit of lime salts, and that results differed greatly in animals fed in the usual way, with pure water and meat. In the latter case the concretion was much smaller and deposited much more slowly.

The irritation produced by stone in the pelvis of the kidney has been already pointed out (see page 190.) Stones in the bladder, as will be spoken of later, cause not only interference with the flow of urine, but by their weight and position may cause a hypertrophy of the walls of the bladder.

Clinical Symptoms and Course.—When the uric calculus lies in the bladder and has not attained any size, it may stay there a long time and not produce any marked symptoms, with the exception of a slight catarrh, and that is only noticed when the animal has had a long run, the urine then being voided with great difficulty, perhaps mixed with blood or mucus, and has a penetrating odor. Palpation through the abdominal wall, even when the bladder is partially filled, may discover the stone as a hard body lying in the bladder; in the bitch, the urethra being very short, it is easily detected by means of a catheter. When the stone gets into the neck of the bladder or passes into the urethra and lodges at the posterior end of the bone of the penis very severe symptoms are noticed. Retention of urine is indicated by an entire suppression (ischuria), or urine is passed in a thin stream or only by a drop at a time, the animal showing great pain. A partial obstruction of urine is soon followed by a complete obstruction.

The symptoms presented in the dog are very striking. The animals are very restless, looking frequently towards the region of the kidney and whining. They place themselves in the position to urinate and strain violently without any result, or perhaps a few drops are passed and these may be mixed with blood. The appetite is lost and the pulse is rapid and thready; they stand with an arched back or walk with a staggering gait and extended legs. The abdomen becomes distended and we can finally feel the bladder through the abdominal walls like a hard, distended body which is very painful on examination. When the catheter is passed it goes in easily enough until the neck of the bladder is reached, when it stops and cannot be passed any further, and no urine escapes from the catheter.

Uric calculi lie on the floor of the bladder and can be felt through the abdominal walls by manipulation, that is, of course, when they have reached a good size; the small ones escape detection, but they may be suspected when the urine has a gravel or sand-like sediment.

The urine, when it is retained in the bladder, gradually accumulates, and if it is not drawn off in three days the bladder is ruptured; it may even burst in two days. When this occurs it causes death in a few hours, with the following symptoms: the animal becomes dull or comatose, with

shaking or trembling of the muscles, and the restlessness and pain seem to have disappeared. Pressing on the abdomen may produce great evidence of pain, but in the majority of cases this is absent. After the first two hours the abdominal wall is covered with a cold sweat, and the bladder cannot be felt on manipulation. Soon a deep coma from which the animal cannot be roused sets in and dies in a short time. In rare instances the animal may have convulsions, which occur with short intervals between them. Death may also occur before the bladder is ruptured, as a consequence of extensive gangrenous cystitis with pyelitis.

Therapeutics.—While the first procedure in treatment of stone is essentially surgical, however in cases where the animal passes very small calculi or sand-like particles and shows every evidence of the presence of cystic calculi or where an animal passes small stones which lodge at the end of the penal bone and has to be operated on frequently, he should be given large quantities of liquids or waters that are supposed to have litholytic action—for instance, acids for dissolving phosphatic calculi, alkalines for breaking up uric calculi, or lithia mineral waters, such as Vichy, Kissingen, Carlsbad. Or the bladder may be washed out with various solutions (see cystitis). In oxalate and cystic stone the animal should be given all the water it will take. When the stone is present and is causing retention of urine, there is nothing left then but to remove the stone by means of an operation called *urethrotomy* if the stone is lodged in the urethra at the posterior end of the bones of the penis, or *cystotomy* if the stone is located in the bladder; this operation is performed by opening the urethra at the ischial arch, and by means of a small pair of forceps introduced into the bladder, through the urethra, the stone is grasped and crushed and afterward washed out of the bladder. In the bitch an incision is made into the short urethra and the stone is seized and crushed in a like manner.

When ischuria or stoppage of urine is present, the treatment depends to a large extent on the location of the calculus—that is, whether it is in the neck of the bladder or whether it has gone into the urethra some distance and lodged there. In the first instance we can sometimes introduce the catheter and by a gradual pressure we can push the stone into the bladder; or if it is further in the urethra, we can push a well-lubricated catheter past the stone and allow the escape of urine and prepare for the operation, for if the stone is in the urethra this must be performed immediately.

Urethrotomy.—This is usually performed from the posterior end of the bone of the penis, as the great majority of uric calculi pass down the urethra and lodge at the posterior end of the bone of the penis and can be detected by the catheter; when this is passed and comes against the stone there is a certain rough sound felt that resembles crepitation. Lay the animal on the side or back, and after having injected cocaine into the skin

(or administered ether if the animal be very hard to handle, although this procedure is rarely necessary) insert a well-oiled catheter, make an incision about 3 cm. in length, cutting down on the median line on the skin making a free opening, then cut a second longitudinal incision on the urethra on the stone or on the end of the catheter (Fig. 83); calculus can then be pushed back toward the opening in the majority of cases, and by means of a pair of small forceps the stone is grasped and pulled out.   In some cases it is necessary to enlarge the opening in the urethra; as a rule, however, do not make the opening any larger than is absolutely necessary.   Occasionally when the stone lies in the canal just under the bone of the penis, it is extremely hard to remove, and after making the incision it has to be forcibly
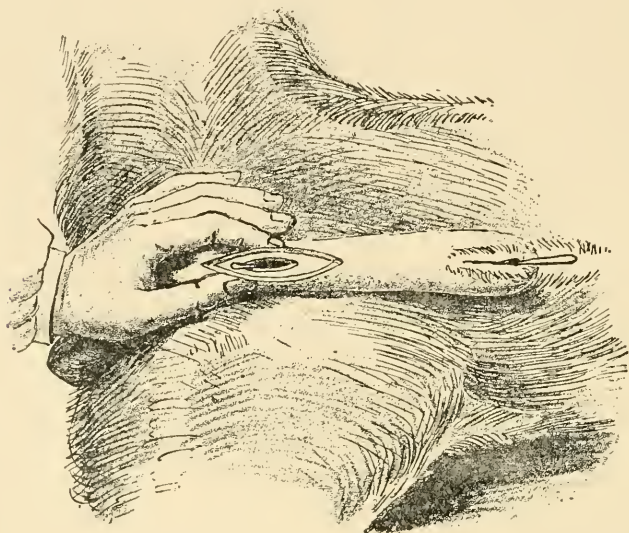
Fig. 83.—Urethrotomy.   Catheter introduced and end seen at the incision.

dislodged by means of the catheter.   It is well to leave the wound open unless it is a very large animal or the stone should be exceptionally large; in that instance do not put more than one stitch in it.   For two days the urine escapes out of the external opening, but soon closes up, and in about eight to ten days it has closed up completely and the urine is passed in the natural way.

The wound of the operation is apt to leave a stricture in the course of the urethra, and in an animal that is predisposed to the formation of calculi examine the urethra occasionally with the catheter and if a stricture is present dilate it with a bougie.

In cases where the stone is situated up in the urethra at the ischial arch it is much more difficult to operate on account of the well-developed

bulbus cavernosum. The incision must be made down on the catheter, which has been previously inserted as far up as possible. The higher operation must never be attempted unless this latter precaution is taken, as it is almost impossible to find the urethra unless the sound is in it.

Another mode of operation is to introduce a catheter into the penis until it reaches the obstruction, and by means of a tape looped around the free end of the penis it is drawn away from the prepuce, which is held back by an assistant, and then cut down on the end of the catheter; the catheter is pulled back a short distance, but not entirely, and the penis bent over, and by means of a small pair of blunt forceps the stone can be removed; when this is accomplished pass the catheter into the bladder and wash out any calculi that may still remain in the bladder or urethra; by means of a small hose attach the catheter to a syringe and inject the bladder full of tepid water.

In the bitch the operation is much more simple. The urethra is opened by means of a thin tenotome introduced on a grooved director and the opening enlarged, and then the forceps passed into the opening, the stone crushed, and the bladder washed out. It is generally necessary to introduce one finger into the rectum to guide the stone into the forceps before it can be grasped. Great care must be taken in such an operation to avoid crushing the tissues. In the bitch there is no after-treatment necessary.

Cystotomy.—Laprocystotomy, or cutting through the abdominal wall is the only mode permissible on the dog, lithotripsy being prohibited on account of the size and anatomy of the urethra of the dog.

Laprocystotomy, cystotomy suprapubica: Preparatory to the operation the urine is removed from the bladder and the bladder washed out with a 2 per cent. solution of boracic acid, the tissues in the neighborhood of the incision thoroughly cleansed and disinfected, the animal is put under ether and an incision is made in front of the pubis parallel with the prepuce and directly on the median line (in the bitch cut directly on the linea alba); make an incision about 5 to 8 cm. long, take up the hemorrhage by means of absorbent cotton, then draw out the bladder, surround it with cotton compresses and an incision about 1 to 3 cm. is made in the bladder and by means of a pair of forceps the stone removed, if the stone is incysted it should be scraped out; the bladder is then washed out with boracic acid solution, the wound stitched with carbolized catgut, the muscular and serous coats are sewed with the edges turned inward, the stitches must be put very close together as distention with urine causes the very elastic bladder to open and allow the escape of urine into the peritoneal cavity; return the bladder after having first cleansed it with boracic acid solution, and the abdominal wall closed and the wound covered by a bandage. As

blood clots are apt to form in the course of the urethra, French advises that the animal be catheterized at least twice daily until normal urina-ation is established.

When the bladder is so distended that it is deemed dangerous to operate before emptying the bladder of its contents, we may empty the bladder by means of a fine trocar and canula. In the bitch the trocar should be introduced on the median line, at the brim of the pelvis, and in the dog, either on the right or left side of the flank, low down and as near as possible to the brim of the pelvis.

Sometimes ruptures of the bladder are caused by accidents, such as being run over by wagons when the bladder is full. The animal dies, as a rule, in forty-eight hours, from collapse, before peritonitis has devel-oped. On post-mortem, the bladder is found to be infiltrated with blood and very much swollen at the lacerated region only. In injuries to the lumbar region, where the animal is dull or even comatose, it is always well to consider the prognosis doubtful, and Siedamgrotzky deems it advisable to consider the prognosis doubtful in injuries to that region, even where there are no acute symptoms presented.

Stricture of the Urethra.—Indications of painful retention of urine are often presented when there is a stricture of the urethra caused by injuries to the urethra from calculi or by cicatricial contraction following the operator's knife, from intense nephritis, or by torsion following co-itus. An examination by means of the catheter generally gives some information as to the character of the stricture; the practitioner must, however, remember that there is always more or less normal stricture at the posterior end of the bone of the penis. The sound must be passed each day and allowed to remain about twenty minutes if the stricture will admit of it. The size of the catheters must be gradually increased; great care being taken to thoroughly disinfect the catheters after each insertion. This method has been used with success in a number of cases of stricture, but it must be continued for several weeks.

Hoffman cured a case of stricture of the posterior end of the bone of the penis by opening the urethra at the spot of stricture and ampu-tating about 2 cm. of the bone of the penis with a pair of bone forceps.

Other diseases of the bladder.

The following are comparatively rare and unimportant diseases of the bladder.

Cramp of the Bladder, Cystospasmus.—This is seen following severe cystitis, calculi, diseases of the prostate, etc. This condition is also ob-served as a symptom from the effects of certain poisons, decayed food, from disease of the spine and from unknown causes. It is indicated by

persistant cramp of the sphincter and retention of the urine (retentio urinæ). The treatment consists in friction in the region of the bladder, luke-warm clysters to which chloral hydrate may be added, subcutaneous injection of morphia and the administration of boldine.

Neoformations of the Bladder.—The tumors of the bladder worth special mention are papilloma villosum and the carcinoma papillomatodes. The early symptoms are profuse hemorrhage which occurs from time to time, producing acute anæmia and often causing death. These tumors are generally associated with chronic cystitis. In the region of the bladder we are sometimes able to detect these neoformations in the form of a soft tumor-like mass and in rare instances we may find some portions of the broken-down tissue in the urine. In some instances instead of a solitary tumor we may find a diffuse mass spreading over the wall of the bladder which on palpation feels like a hard irregular body. Other pathological growths may be sarcoma, carcinoma or myoma. It may be possible under very favorable circumstances, to remove these tumors by means of cystotomy, but it is very rarely done, for generally when we make the diagnosis the tumors have reached considerable size and involve the entire bladder.

Retroflection of the Bladder.—This condition may be found as a result of constipation or disease of the prostate, and from constant straining and tension, a distended bladder may be retroverted and lie between the rectum and the prostate and may cause the development of a perineal hernia. If pressure is made on the soft fluctuating hernial tumor, the animals are apt to place themselves in a position to urinate. The treatment consists in attempting to remove the original cause by means of laxatives, warm baths, rectal enemas (see Diseases of the Prostate). If these methods do not succeed and the distention of the bladder becomes very pronounced, first try to empty the bladder by means of the catheter and if that cannot be accomplished, on account of the twist in the urethra, then empty the bladder by means of a trocar; the puncture is to be made in the upper part of the tumor. Generally when the bladder is emptied it falls back into position, but the condition may return if the exciting causes return. To obtain a permanent fixture of the bladder, we must perform cystopexia (after Hendrix). This consists in making an incision into the abdominal wall on one side of the penis as near the median line as possible; insert the finger into the cavity and return the bladder to its normal position and suture it to the abdominal wall, so that the centre of the posterior wall of the bladder will lie on the anterior margin of the pubis.

Inflammation of the Urethra—Urethritis.—This is very rarely observed, being invariably caused by some traumatism, calculus or other foreign bodies, improper catheterization, injuries during coitus (see

gonorrhoea of the prepuce). The symptoms consist in the constant flow of a muco-purulent fluid from the urethra, redness and tumefaction of the external orifice, the animal places himself in a position to urinate and if he does succeed in urinating he shows great pain. On making any pressure on the urethra, a few drops of a muco-purulent discharge comes from the external opening. The treatment consists in the injections of astringents, claret wine, sulphate of zinc, and 1 to 2 per cent. solutions of nitrate of silver.

DISEASES OF THE MALE SEXUAL ORGANS.

DISEASES OF THE PROSTATE.

INFLAMMATION OF THE PROSTATE.

(Prostatitis.)

A number of causes lead to inflammatory processes in the prostate which produce hypertrophy or neoformations of that organ; the enlargement may be temporary or permanent, but as a rule it invariably produces more or less interference with the evacuation of the fæces, and obstruction of the free passage of urine.

Inflammation of the Prostate.—This may result as a complication of cystitis, urethritis, urinary calculi, from careless or ignorant catheterization and from the pressure of hard masses of fæces lying in the rectum in persistent constipation, proctitis, etc. Prostitis is also observed in stud dogs that have served a large number of bitches within a comparatively short space of time or have been in the stud for a number of years, and it also results from pyæmia.

Symptoms and Course.—The disease may occur in the acute or chronic form; the latter is discussed under hypertrophy of the prostate.

The acute form is rare and causes the animal to walk with back arched and a stiff, stilted gait, and show evidence of great pain when either urine or fæces are passed. In cases where there is great enlargement of the prostate the animal may hold the fæces and cause constipation by not putting any pressure on the abdominal muscles or may also retain the urine. On making an examination of the gland, by introducing the finger, well lubricated, into the rectum, we find it very much enlarged, hot and painful to the touch, and the animal shows great depression, loss of appetite and fever. The animal exhibits great pain during catheterization when the instrument passes the prostate.

The terminations of this acute condition are as follows:

The prostate may break down and suppurate, forming a fluctuating

tumor in the pelvic cavity; accompanied by great difficulty in urination, or it may assume the chronic form and develop cysts; this latter condition, however, is rarely diagnosed during life. Sometimes these cysts are seen on post-mortem, and the animal previous to that was without any fever or acute symptoms, or the inflamed prostate may ultimately form abscesses which break through into the urethra, or the rectum, and in very rare cases into the connective tissue of the pelvis. In the latter termination we find a gradual tumefaction and formation of an abscess in the perineal region, which suppurates and breaks, or there may be the formation of small abscesses which become encapsulated in the prostate.

Therapeutics.—This consists in giving the animal small quantities of non-irritating food, cold clysters and cold or luke-warm applications to the perineum; also the frequent passage of the catheter to prevent overretention of urine in the bladder; and also the administration of saline purgatives, such as sulphate of magnesium, Carlsbad salt, etc. When pus has formed, which can be determined by digital examination per rectum, introduce a speculum into the rectum and cut down on the fluctuation by means of a sharp-pointed bistoury. The hemorrhage which follows is very slight, and no attention should be paid to it. Hendrix introduces the finger into the rectum and puts considerable pressure on the fluctuating prostate and breaks the abscess into the urethra. Where the swelling extends to the perineum and distends it, it is best to apply warm applications until the pus has formed, and then cut down and evacuate the sac.

Chronic Prostitis (Hypertrophy) of the Prostate.—This is the form of the disease most frequently seen, and develops from the acute form, but in the majority of cases the disease starts in at the onset, as the chronic form. It is a common disease in old dogs, and is indicated by a hypertrophy of the whole organ; as a rule, the swelling is symmetrical, but sometimes one side of the gland is larger than the other. It varies in consistency; in some cases very hard, in others, soft; in the former case it is due to a hyperplasia of the fibro-muscular tissue; in the latter it is due to an infiltration of the gland with a purulent fluid as a consequence of chronic purulent inflammation.

The symptoms of a hypertrophy of the prostate are irregular; in some cases there is difficulty in urination (dysuria, strangury), and also more or less cystitis and pyelitis, etc., or constipation due to the animal making no effort to evacuate fæces. The surest means of diagnosis is to make a digital examination of the prostate per rectum. It is distinguished from the acute form by the absence of heat and sensitiveness, but is very much larger than the normal gland. Rossi contends that hypertrophy of the prostate does not affect the urinary canal to any great

extent; the tissues of the prostate only are affected and situated as it is on the floor of the pelvis, it has plenty of room to expand. Lienaux observed one case where there were intermittent hemorrhages, and finally interference in urination and evacuation.

Therapeutics are not productive of much good results. For the constipation give saline laxatives; if the urine is retained, catheterize the bladder and administer internally ergot or iodide of potassium. The remedy that has given the best results has been the hypodermic injection into the gland of a solution of iodine (iodide of potassium, 2 parts; tincture of iodine, 2 parts; and water, 60 parts) at intervals of fourteen days. The solution is injected through the rectum directly into the gland by means of a small hypodermic syringe.

Castration has been repeatedly tried; in a number of cases it has produced very good results and the animal was greatly relieved from active symptoms, the prostate being reduced to its normal size, but in certain cases the animal steadily failed, lost flesh, and in three or four weeks became a skeleton and died apparently from inanition.

Tumor of the Prostate.—Tumor of the prostate is generally carcinomatous in character, causing an irregular enlargement of the gland, differing from the symmetrical enlargement seen in hypertrophy of the gland; this aids materially in reaching a diagnosis. It is rather difficult at times to make a diagnosis where only the general indications of hypertrophy of the prostate are seen, that is difficulty in defecation and urination, and conclusions can only be based on the general health of the animal, which shows a gradual want of nutrition. Lienaux recommends extirpation of the prostate (prostotomy) even in simple hypertrophy. Other anomalies, such as prostatic calculi, tuberculosis of the prostate, have no particular interest and need not be taken up here.

DISEASES OF THE PENIS AND PREPUCE.

Phimosis and Paraphimosis.—By **phimosis** we mean a contraction of the prepuce over the free end of the penis. It is often of congenital origin, and is occasionally caused by injuries and consequent cicatricial contraction; but as in the dog, the foreskin is rarely withdrawn, it is of little importance; if, however, the contraction is so complete as to cause retention of a certain amount of urine; the retained urine decomposes, and acts as an irritant, causing inflammation and tumefaction of the prepuce. Phimosis prevents copulation, and as soon as the penis is erected, causes paraphimosis. Treatment consists in making a longitudinal incision on the median line of the prepuce and removing a certain amount of the tissue and sewing back the mucous membrane. **Paraphimosis is the**

condition where the penis passes through the narrow opening of the prepuce the glans becomes swollen, and the prepuce becomes tightened behind the glans penis, the narrow ring of the prepuce causes venous engorgement, becomes œdematous, causing a great swelling and purple coloration of the glans, and if this is allowed to remain some time, causes partial gangrene. The above phenomenon is seen during coitus or from erection in attempting copulation, from traumatic causes, from neoformation, or paralysis of the penis.

The therapeutics of paraphimosis consists in reducing the glans as soon as possible with friction and careful manipulation; this is accomplished by careful lubrication of the parts with some bland oil and putting a steady pressure on the glans, at the same time pressing forward the prepuce over the enlarged part; with a little patience it is reduced. If this is not successful, bathe the glans with cold water or alum applications, lead water, sulphate of zinc, or wrap the protruding portion of the penis in a cold bandage, beginning at the outer end and quickly wrapping it around the distended penis, thus forcing the blood out of the engorged glans, then as the bandage is removed the penis is returned, drawing the prepuce over it. If we do not reduce it by this means, then cut the ring with a curved probe-pointed bistoury or a pair of scissors. It can then be returned immediately; scarification of the penis is rarely necessary. In extensive necrosis of the glans, paralysis, tumors, etc., it may be necessary to remove the penis; this is removed by a circular sweep of the knife. If the penal bone is to be cut through it may be done by means of a pair of bone forceps or sawed through. To overcome stenosis of the urethra from cicatricial contraction of the wound the urethra is opened about 0.5 cm. and sewed back of the wall of the penis. It is well, however, not to resort to this until you have tried every other method.

Gonorrhœa of the Prepuce. Preputial Catarrh.—By this term we mean catarrhal or purulent inflammation of the mucous membrane of the prepuce; it is rather common in dogs that are well fed; it is harmless but unsightly from the discharge of yellow mucus constantly dripping from the end of the prepuce, and some cases are extremely obstinate to treat. It may be caused by retention of urine, phimosis, calculi of the bladder, prolonged coitus, dirt, uncleanliness, or masturbation. It is frequently observed in old dogs, due in their case to stagnation of the veins of the prostate. The symptoms consist in slight redness, and swelling of the prepuce and glans, and the secretion of a thin, purulent mucus, which is generally licked off by the animal. On pushing back the prepuce, the lymph-follicles are generally found to be swollen, and can be felt on manipulation with the finger as small bodies about size of a seed or pea. In rare cases the inner wall of the prepuce and the bulbous portion of the glans are covered with papillary excrescences.

Rarely or ever in this condition is there any pain on pressure of the affected parts. The treatment consists in the injection of acetate of lead water or 1 per cent. solution of zinci sulphas or argenti nitras, 1 per cent., or claret wine. Before making the medicinal injection it is well to thoroughly clean out the prepuce, with repeated sluicings of luke-warm water.

The disease has no correlation with the *specific gonorrhœa of man*, but in rare cases we may find an animal affected with gonorrhœa which has extended from the foreskin into the urethra and an enlargement of the inguinal lymphatics, forming a bubo. In one of the cases observed by Siedamgrotzky, the gonorrhœa was accompanied by intense inflammation of the eyes.

Neoformations of the Glans and Prepuce.—Neoformations are sometimes found on the dog and are either papilloma, carcinoma, or sarcoma. These appear in a variety of forms—warty or corrugated, sometimes pedunculated but generally with broad bases, hard or soft and bleeding easily to the touch, situated on the penis or prepuce, visible only when the prepuce is retracted except in rare cases when they are situated on the external opening of the prepuce and protrude beyond the opening. There may be a more or less abundant discharge of purulent mucus, stained occasionally with blood. (For infectious genital tumors, see under that head.) The papilloma can be removed by the scissors or a small pair of forceps, and the blood stopped by compression or a solution of alum, or, what is much better, the thermo-cautery. Albrecht recommends that the tumor be touched daily with a solution of chromic acid 1 to 30. Carcinoma and sarcoma generally require the removal of a portion of the glans. (See chapter on Neoformations.)

DISEASES OF THE TESTICLE AND ITS COVERINGS.

Inflammation of the Scrotum.—We frequently see inflammatory conditions of the scrotal covering as a result of contusions; they may, however, be caused by eczema, which sometimes causes great swelling and sensitiveness, the animal walking with a peculiar stradling gait; this condition may involve the entire scrotal sac, and on account of the irritation of the tissues from the animal constantly licking and biting affected part, it is very slow in healing, and frequently covers over a long period of time before making a complete recovery. Occasionally partial necrosis occurs, followed by sloughing of a portion of the scrotum. (See Diseases of the Skin, under Eczema.) Moller has also seen serpentine varicosis of the scrotum with ulceration and accompanied with profuse hemorrhage. Treatment: Keep the animal in a dry kennel or let it lie on a cushion and

prevent the rubbing on any rough object and apply oxide of zinc, talcum powder, bismuth preparations, or boracic acid, and the animal must be restrained from licking or irritating the affected portions, either by means of a muzzle or the scrotum covered by a Priessnitz bandage. If necrosis develops as a result of the condition just described or from traumatisms or freezing, etc., and the sloughed portion is very extensive it may be necessary to castrate the animal as well as remove the necrosed portion.

Inflammation of the Testicle—Orchitis.—Orchitis without any other injury is very rarely seen in the dog; it may be caused by a kick, or a blow, or from crushing or by metastasis from acute inflammatory conditions of the adjacent urinary organs. The testicle is hot, swollen and smooth on its surface and very sensitive to the touch; the animal walks with its hind legs wide apart, and sometimes there is fever and loss of appetite. In the majority of cases, the irritation subsides quickly, and the animal is well in a few days; in rare instances, the irritation is followed by suppuration and the formation of more or less pus, the abscess points, breaks through the scrotum and discharges. In acute cases, on the subsidence of the acute symptoms it is followed by induration of the testicle and that body becomes firm and irregular on its surface. In one case that the writer observed the epididymis was also greatly swollen (epididymitis). The therapeutics consists of warm applications and rest, paint with tincture of iodine and apply a well-padded suspensory bandage over the scrotum. When the effects of the iodine have passed off apply salicylic acid ointment. If suppuration has commenced, it should be encouraged as much as possible with warm applications and poultices and opened as soon as the abscess has pointed, cleaned out with corrosive sublimate solution, and treated as an open wound. There is no treatment that will have any permanent effect in chronic orchitis.

Injuries to the Testicles and Scrotum.

As a rule, the wounds of these parts are caused by fighting with other dogs, and are either lacerations or perforated wounds. In the majority of cases, try to get drainage and keep the wound clean by means of antiseptics; this is best accomplished by putting a piece of absorbent cotton saturated with the solution on the scrotum, and by means of a long-tailed bandage tied around the body the cotton can be kept in place. Where the testicle is badly injured, the gland had better be removed by castration, as it is only in favorable cases that the animal makes a good recovery and the seminal power is retained.

(For further details on the subject consult the chapter on Hernia of the Testicles and Castration.)

Neoformations of the Testicles.—Omitting tuberculous deposits, we
14

find fibroma, sarcoma and carcinoma; the former can easily be felt on the surface of the testicle as distinct circumscribed elevations; the latter two on the other hand are indicated by a hypertrophy of the testicles and the spermatic cord may be involved, and in rare cases both testicles are affected. The testicle may be greatly enlarged, the surface smooth or it may be uneven and irregular. Rarely do these neoformations involve the scrotum; when they do, they form adhesions and if they make an external opening in the scrotum Kitt has observed that it is extremely difficult to distinguish by microscopical examination the true pathological character of these hypertrophied testicles and place them in their proper class (Orchidarm, Orchidoblastom). Fig. 84 represents one of these tumors.
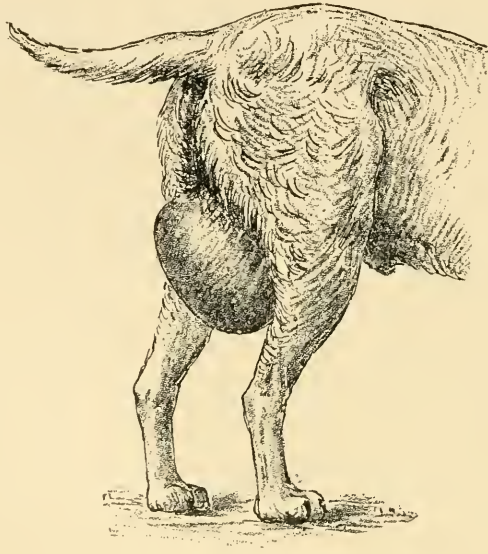

Fig. 84.—Enlargement of scrotum.—Orchitis.

Castration is the only radical method to remove these malignant tumors and it should be done early before the entire region becomes involved.

Castration of the Male.—The animal is prepared by washing the region of operation with an antiseptic solution, put the animal under ether or inject the region with 4 per cent. cocaine, turn him on his back, an incision is made in a longitudinal direction through the skin of the scrotum and vaginal tunic, and the posterior portions of the cord are cut through and the anterior or vascular portion is ligated with silk and cut through just below the ligature and the other testicle treated in the same manner (Fig. 92); in young animals the cord is simply scraped through or twisted off by means of tortion, and the opening in the scrotum closed by

means of a stitch, and covered with a disinfectant dusting powder, and a truss bandage applied. The wound is dressed daily, it heals up rapidly. It is well not to allow the bandage to remain on too long, as it is apt to irritate the animal. Another mode of procedure is to make an incision on the median line of the scrotum, but before doing so tie a string around the scrotum just above the testicles, so that when the incision is made the testicle will not be drawn beyond reach; having made the incision on the median line, cut through the tunica, draw out both testicles, twist them round several times, making a spiral of the cords, then cut the cords as high up as possible with the ecraseur or a pair of emasculating scissors. The hemorrhage is slight and much better than the complication of the ligature hanging in the wound.

Cuterebro Emasculator.

(*Emasculating Bot Fly.*)

This parasite which is frequently observed in squirrels and occasionally in rabbits has been observed in two cases in the dog where the grub of the parasite was found imbedded in the scrotum. These were in English setters and the dogs had been in the Southern states for some time.

The scrotum swells slowly, beginning at the dependent portion, until a round, firm mass, resembling in size and shape of the ordinary "warble" seen in cattle's backs, but not quite so large; it apparently gives the animal no discomfort unless the parasite should act as an irritant and form an abscess; when this occurs it is followed by great irritation of the parts, and subsequently sloughing of a portion of the scrotum and destruction of the testicle. The treatment consists in finding the opening or vent of the parasite in the skin and carefully enlarging it, taking care not to penetrate the larva, when it can be pushed out and the wound cleaned with a solution of peroxide of hydrogen. If the grub is punctured and it collapses, the remaining portion of the parasite must be carefully removed, as it causes great irritation if allowed to remain. Dress daily with a 1 to 3000 solution of corrosive sublimate.

DISEASES OF THE FEMALE SEXUAL ORGANS.

DISEASES OF THE VAGINA AND THE UTERUS.

INFLAMMATION OF THE VULVA AND VAGINA.

(*Vulvitis and Vaginitis.*)

Inflammation of the vulva and vagina results, as a rule, from difficult labor or unskilled assistance during delivery, and in rare cases as a result of improper copulation, or when young bitches or very delicate animals

are having their first litters. In the acute form the labia pudendi are tumefied and painful to the touch. The condition is indicated by a whitish, purulent discharge, in some cases being fœtid, which is generally licked off by the animal. The examination in the larger animals can be made by means of a speculum (Fig. 85). On examination of the vagina we find it intensely red and inflamed and covered with a grayish, mucous discharge; the mucus is also grayish in color, and has in some cases striated lines or petechial patches. In chronic cases there is a constant discharge from the vulva of a whitish-yellow muco-purulent fluid which agglutinates the hair in that region, and the animal is constantly licking the discharge; the mucus is sometimes grayish in color, and carcinoma is often present. (See chapter on Tumors for further details.)

Fig. 85.
Vaginal
speculum.

The therapeutic treatment consists of daily injections and irrigations of astringent or disinfectant washes of sulphate of zinc (1 per cent.), or permanganate of potassium solution, boric acid, or creolin, lysol, bacillol, etc., or a solution of acacia (mucilage) is useful. In chronic cases use nitrate of silver, 1 per cent. solution, or sulphate of zinc, 2 to 100 solution.

Prolapse of the Vagina and Uterus.

(Prolapsus Vaginæ; Prolapsus Uteri.)

Prolapse of the vagina is more common than prolapse of the uterus; it is seen especially in young bitches, frequently at the termination of heat and occasionally at the latter period of pregnancy; it rarely occurs as a result of parturition. In some instances it is accompanied by serious alterations of the vagina, especially hypertrophic alterations, and also in rare cases we find polypus formations. As a rule there is more or less protrusion of the vagina through the vulva, appearing in the form of pear- or flap-shaped, red, inflamed tissue covered with mucus (Fig. 86). In very rare instances the prolapse is so great that the os of the vagina can be seen through the external opening. When the vagina has been partially prolapsed for some time, the exposed portion becomes so infiltrated and hypertrophied that it becomes impossible to reduce it. Care must be taken to differentiate between a pedunculated fibroma and the prolapsed vagina, and instances are not rare where the vagina is prolapsed and a tumor whose existence is never suspected also accompanies it.

The prolapse of the uterus in the dog is practically impossible, for the reason that the uterus itself is merely a body in name, and really the uterus

consists in the horns, the true body of the uterus being a small body from which the horns bifurcate almost at the os (Fig. 87).

The therapeutics of prolapse of the vagina is practically that used in prolapse of the anus and rectum. In slight cases after copulation, the animal should be kept quiet, and it will then soon disappear; the application of vaseline or boracic acid ointment, however, may be used. The retention of the vagina is much more difficult than returning it to its normal position; the protruded portion is carefully washed with warm water and an antiseptic solution of boracic acid or creolin solution and the
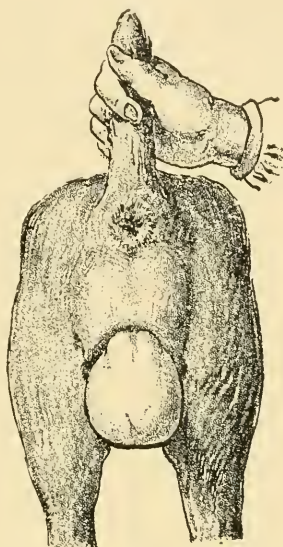

Fig. 86.—Prolapse of the vagina.

animal placed so that the hind quarters are elevated for at least an hour. If there is great tumefaction, the protruded portion must be massaged for some time to lessen the volume of the enlargement before attempting to reduce it. If that is not sufficient, and the protrusion recurs in a short time, it is well to introduce a tampon into the vagina or pack the vagina with antiseptic gauze or cotton and stitch the lips of the pudenda in such a manner as not to interfere with the normal passage of urine, and assist defecation and prevent straining by the administration of laxatives or using glycerine suppositories. The writer generally uses the following method: After returning the vagina to the normal position, he puts two stitches in the pudenda and leaves them there for three days, when they are removed.

In one case where there was great thickening of the walls of the vagina

and reduction of the prolapse was impossible, and another where the
vagina prolapsed immediately after the stitches were removed after being
there for several days, the writer performed a partial amputation, taking
out an elongated piece of mucous membrane and sewing it up by a continu-
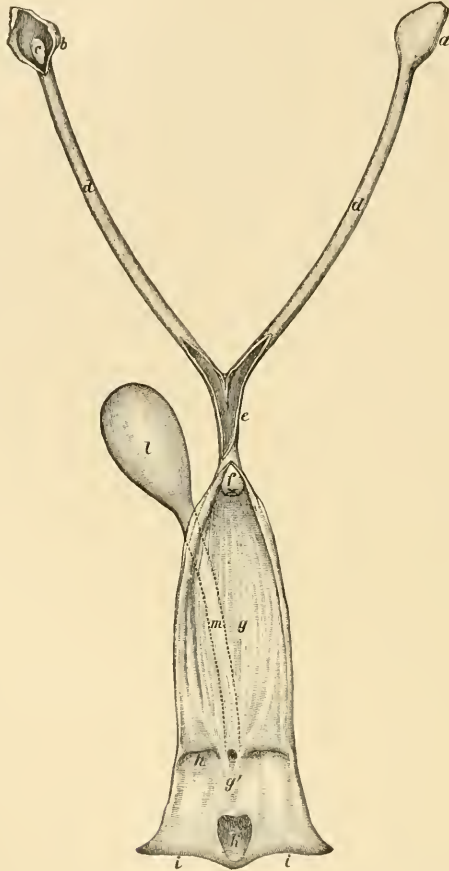ous stitch of cat-gut, which was followed by good results.

Fig. 87.—The genito-urinary organs of the bitch: *a*, ovary covered with capsule; *b*, capsule of ovary;
c, ovary; *d*, horns of the uterus; *e*, body of the uterus; *f*, os uteri; *g*, vagina; *g*, opening of the urethra;
h, clitoris; *i, i*, vulva; *l*, bladder; *m*, urethra.

Reduction of the uterus is much more difficult, and in the majority of
cases it is impossible except by laparotomy. The prolapsed portion
should be lubricated and gradually worked back, and after the fingers can-
not reach any further, a tallow-candle must be inserted and the horn pushed
back as far as possible. If this method is not successful, laparotomy
should be performed in the manner spoken of in hernia. An incision is

made into the abdominal wall and the finger inserted until the Fallopian tube is felt, and then the animal is held up by the posterior extremities, and by gradual tension the horn of the uterus is pulled back into position and the opening in the abdomen is closed. The rules named for retaining the vagina are then to be followed. The uterus can be retained in position by making an opening in the median line of the abdomen and pulling the horn into position and then stitching the horn to the upper part of the abdominal wall. It is needless to say that the stitch must be of cat-gut.

Neoformations of the Vagina.—The tumors found in the uterus are fibroma, papilloma, and carcinoma. The fibrous are frequently observed; they may appear either singly or multiple, varying from the size of a pea to as large as an egg; they are hard, smooth on the surface and usually pedunculated, occasionally protruding from the vaginal opening, and are not at all sensitive.

The papilloma are rarer, found generally at the interior of the vagina and in the form of warty, irregular elevations resembling a raspberry, or, if larger, a cauliflower; the tumors closely resemble true carcinoma, so rare in the dog. Of true cancer the writer has observed only one case in a St. Bernard; this neoplasm occupied the inferior lateral floor of the vestibule of the vulva; it was soft and spongy, irregular in form, bleeding easily to the touch, foetid in odor, the cancer had a broad base, was hard and indurated, and extended some distance into the tissues. True cancer is very rare and is indicated by a foetid ichorous discharge from the vagina. The vagina can either be examined by the introduction of the index finger, or using a speculum. Frohner advises digital examination. The cancers occur in single or multiple groups, soft excrescences attached to the mucous membrane of the vagina which are not painful to the touch but bleed easily on manipulation. These cancers vary in form; some are rough with irregular elevations like a cauliflower; they may be polypus in shape, or they may occur as a diffuse mass of irregular infiltrations spread over the mucous membrane of the vagina. Where it can be done these tumors should be removed as early as possible.

DISEASES OF THE UTERUS.

Inflammation of the Uterus (Metritis).—It is a common occurrence to have inflammation of the uterus after protracted labor. The disease can be subdivided into the following varieties, catarrhal and septic, according to the exciting causes:

(1) **Catarrhal Metritis. Superficial Metritis, Catarrh of the Uterus.**—In this condition the disease is limited to the mucous membrane and presents the same symptoms as are seen in all catarrhal inflammations of mucous

membranes; the course may be acute or become chronic; the causes are mechanical injuries which the uterus may be subjected to during labor or immediately after; cold may be said to be a predisposing cause.

The **clinical symptoms** are as follows: The vulva is slightly reddened and swollen, and there is a copious discharge from the vulva; this is purulent, sometimes bloody or slightly putrid, and is much increased in quantity after the passage of fæces or urine; but the animal licks it off so soon that the observer must look immediately after each evacuation or it may escape his notice.   Some bitches carry their tails in a curved position when suffering from this condition, are uneasy and occasionally strain; some animals have complete loss of appetite, and in some cases slight fever is present.   As a rule, the discharge lessens and disappears in a few weeks or it may become chronic, and there is an abundant discharge of white or whitish-yellow purulent creamy fluid (leukorrhœa, fluor albus); the animal becomes emaciated, loses flesh and has a stairy, rough coat.   In some cases there is a gradual swelling and obstruction of the os uteri, the purulent material is held in the uterus (pyometra), pyemia develops, and death occurs in a short time. External manipulation through the abdominal wall may find the uterus greatly increased in volume, and on digital examination per rectum the vagina is found to be drawn into the abdominal cavity.

Fig. 88.
Double catheter for washing out the uterus.

The therapeutics consist in tepid injections of nonpoisonous antiseptic fluids, such as permanganate of potassium (1 per cent. solution), boric-acid (2 per cent.), and creolin (1 per cent.), tannic acid (2 per cent.), solution of corrosive sublimate (1 to 2000.)   In using these solutions it is best to use the irrigator with the two catheters (Fig. 88); in one opening the fluid is forced through into the uterus and allowed to circulate and flow out of the other opening.   The uterus must first be thoroughly rinsed out with luke-warm water before the medicinal irrigations are applied.   If the os uteri is contracted, it can be dilated by means of a bougie.   In the chronic form (dysmenorrhœa) we should use injections of ergot or sabine oil.   In chronic cases, with persistent fœtid discharge, the uterus should be removed.

(2) **Septic Metritis.   Gangrenous, Ichorous Inflammation of the Uterus** (*Puerperal Fever*).—Septic inflammation of the uterus should be considered a disease of wound infection in which we find intense irritation of the uterus and vagina, accompanied by violent constitutional disturbances. During and after labor septic materials find their way into the uterus and, owing to the condition of the uterus at that time, when it is practi-

cally in the same condition as an open wound, the septic materials are taken up very quickly and every condition is favorable for their propagation. Collections of blood, decidual tissue, etc., exposed to the air decay very quickly, and where there is any erosion of the mucous membrane of the vagina or the cervix, or even the uterus at the points of placental attachment, the poison is taken up and enters the tissues and is carried into the circulation. The eroded portion of the uterus that has taken up any of the septic material soon presents an ulcerated surface which is covered by a necrotic or diphtheritic coating, and in some cases the vagina becomes intensely swollen, is dark brown or reddish-brown in color, and covered with spots of diphtheritic ulcerations.

The inflammatory process extends rapidly from the mucous membrane into the deeper tissues, affecting the muscular and the pelvic cellular tissues, and also the lips of the pudenda, and from the internal surface of the uterus it extends to the uterine muscles and the broad ligament, and in acute cases to the serous covering of the uterus and the peritoneum. When the acute symptoms are present (perimetritis and parametritis) ptomaines and septic material enter the circulation and cause acute septic fever. The prognosis is generally unfavorable.

Clinical Symptoms.—The vulva and the mucous membrane of the vagina are swollen and livid red, and discharge copious masses of discolored, fœtid pus. In the earlier stages the animal shows great pain on pressure to the abdomen; the pulse is very fast, thready and finally becomes imperceptible. The respirations increase in number. The temperature in the early stages is increased, but soon falls, becoming subnormal toward the end. The mucous membranes of the mouth and conjunctiva are livid, an offensive diarrhœa commences, and the expired air from the lungs smells of decayed tissue.

When the animal presents the acute symptoms early and does not eat or drink from the onset, it soon becomes comatose and dies in from twelve to twenty-four hours.

Therapeutics.—In such cases to get any favorable results treatment must be prompt and energetic. The uterus and the vagina must be thoroughly irrigated with antiseptic fluids, and also the general treatment indicated in septicæmia. For antiseptic irrigating fluids we use creolin, 2 per cent. solution; lysol, 1 to 100; actol (1 to 1000); formalin (2 to 50); corrosive sublimate, 1 to 2000 solution. First irrigate the uterus with warm water using the double catheter shown in Fig. 88, and clean it thoroughly until there is no discoloration in the escaping fluids; then inject the medicated solution into the uterus several times; repeat this several times daily. As a stimulant, use whiskey, brandy, camphor, either internally, or subcutaneously; the latter is best, as you are apt to get quicker results, and you also avoid the danger of the animal vomiting it, which it is very apt to

do.   Ergot or caffein are used with some success where there is great weakness of the heart.

R.   Camphor pulv.,   0.2
      Gummi acacia,   0.6
  F. chart. No. xii.,
  S.—One powder every two hours.

Prolapse of the Uterus. Prolapsus Uteri.—This condition is extremely rare and occurs only during or immediately after delivery. From very severe traction during labor or awkward assistance, particularly of the last fœtus, the horn of the uterus everts, passes beyond the os uteri and vagina (invertio uteri without prolapse, incomplete prolapse of the uterus) or passes entirely beyond the vulva and generally carries also a portion of the uterus with it. It protrudes out of the vulva in the form of a tumor-like mass, the mucous membrane being tumefied and livid in color. The membrane may be excoriated in places and in extreme cases gangrenous.

Treatment.—This is practically the same as prolapse of the vulva or rectum. The protruded portion is carefully bathed with mild antiseptic solutions such as boracic acid and endeavor to return it to its normal position by even pressure of the fingers; if this succeeds, place the animal so that the hind quarters will be slightly elevated, inject a solution of boracic acid into the uterus, and followed by a hypodermic injection of morphia which tends to overcome straining on the part of the animal. If the prolapse recurs it may be reduced and a sponge or oakum tampon inserted into the vagina and the orifice closed with sutures (see page. 213). If the uterus persists in resisting the above mentioned treatment, the animal should be etherized, the abdomen opened on the median line, and the uterus or Fallopian tube drawn down to the opening and tied to the abdominal opening by means of sutures, taking care not to include the mucous coat of the intestines in the stitch. If gangrene has set in, the exposed uterus must be amputated. The exposed portion of the uterus is drawn out, ligatured with strong silk thread, and the dependent portion cut off just below the suture; care must be taken not to include the bladder or the urethra, and the stump pushed back into the pelvic cavity; some operators advise an elastic ligature. Cutting off the prolapsed portion by means of an ecraseur is not to be advised.

Neoformations of the Uterus.—Fibromas are found most frequently in the uterus and sometimes reach to a considerable size. Cyst sarcoma and carcinoma are also seen; the latter are generally found in the form of soft, loosely organized masses, filling up the entire lumen of the uterus, occasionally involving the adjacent organs (the intestines and bladder). The only radical means of treatment is to extirpate the entire uterus. The sub-

cutaneous injection of ergotin had been found to check the growth of myofibroma and in some cases to remove it.

Obstetrics.

As a rule, the bitch has her pups without any difficulty. The period of pregnancy varies from fifty-eight to sixty-two days (Dun kept a record of 189 bitches and found the average period was 63.28 days, the maximum being seventy-one days and the minimum being fifty-three days) when she generally seeks a quiet place and drops from one to eight (sometimes more) blind pups, which open their eyes in from ten to twelve days, the period of whelping being from one to six hours (quite frequently lasts ten to twelve hours), in rare cases eighteen to twenty-four hours. The labor pains generally appear from three to ten hours before birth, and are indicated by the bitch being very restless, going into dark corners, or scratching as if to make a bed, she whimpers, moans, groans, assumes the position as if urinating or defecating, and frequently passes small amounts of urine, and on putting the hand on the abdominal walls, the fœtuses are found to be showing considerable movement. The retention of the whole or a portion of the placenta is very rare in the bitch, and when it does occur it is indicated by the following symptoms:—great depression; no milk in the mammæ; the bitch pays no attention to the pups; frequent contraction of the uterus similar to labor pains; entire loss of appetite; pain on pressure of the abdomen. The temperature was normal at first, but gradually increased; the pulse was quick and hard, and a fœtid discharge from the vulva.

The short but strong umbilical cord is torn during labor or bitten off by the bitch immediately after birth, and the entire mass of placenta and amnion is eaten by the mother. After the birth of the pups there is slight lochial discharge, bloody in the onset and finally purulent; this discharge lasts for several days.

The normal course of birth may be changed by the following conditions: 1. The labor pains may not be strong enough. 2. There may be a narrow, contracted pelvis. 3. The vagina may be lessened in diameter by cicatricial contractions, tumors, etc. 4. The fœtus may be very large, a monstrosity. 5. Fœtus may be presented in an irregular position. 6. Torsion of the horn; this is extremely rare. As a rule, the bitch does not require the assistance of the veterinarian, although very small animals and the higher bred animals may need some assistance, but it is best to leave the bitch as quiet as possible and not to interfere with her in any way. Small bitches sometimes have very large pups, the size of the male has also an effect on a litter. When the labor pains are weak or entirely absent, an examination of the uterus is made by

introducing the index finger, well oiled, into the vagina, the other hand putting pressure on the abdominal wall; and if we find the fœtus is in position, the head is felt in the dilated os (the breech presentation is also seen, but is rare) and the pelvic cavity normal, artificial assistance is contraindicated, at least for an hour or two; if at the end of that time the head has not advanced, ergot must be given internally or, subcutaneously, massage of the uterus through the abdominal wall, and applications of warm cloths to the abdomen.

One writer speaks very highly of glycerine in 1 to 10 solution with warm water as an agent to encourage the contraction of the uterus in cases of difficult parturition; it is injected directly into the uterus. If the animal is depressed and weak, administer stimulants—whiskey, wine, or alcohol or spirits of camphor internally or subcutaneously—and if these fail to produce the birth of the fœtus it may have to be removed by forceps, of which there are a variety, the simplest of which are the most useful, hooks—(Fig. 89).—or the fœtus may be noosed by means of a copper wire or cotton cord held in a tube (see Fig. 90).

Fluid extract of ergot 1.0 to 2.0 every half hour, or if the animal vomits give 0.50 to 0.75 of ergot hypodermically every half hour.

In some cases where the bitch is observed by the veterinarian, it is well to irritate the vagina and uterus between the birth of each puppy, and particularly so after the animal has delivered the last fœtus; the best solution is a mild solution of corrosive sublimate 1 to 3000, or boracic acid solution. When the fœtus is dead and the membranes are commencing putrefaction, the constant application of antiseptics must be made until either the fœtus and membrane are expelled or removed surgically.

Fig. 89.—Retractors, single and double.

When the fœtus is in an irregular position, and after failing to remove it by means of forceps, finger, loop, etc., or if the fœtus is so very large that it is impossible to get it through the pelvic opening, or if it cannot be reached, so that it can be cut into sections, or if the pelvis is contracted, due to permanent cicatricial contractions, or a tumor present in the uterus or vagina, we must perform the Cæsarean section.

Cæsarean Section, Hysterotomy, Secto Cæsarea.—This is a very dangerous operation. To have any chance of success the operations should be performed before the animal is in a state of collapse, or the fœtus is dead and commencing to decay, or the temperature has not
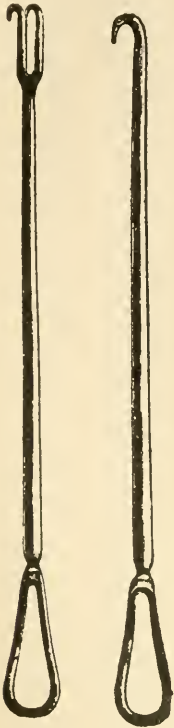
risen much above normal. Empty the bladder and the lower bowel; and having washed out the genital passages with an antiseptic solution, put the animal under ether. The bitch is laid on her back, the legs are held by an assistant, the forelegs together and the hind legs wide apart. The region where the incision is to be made should be thoroughly washed and the hair removed from the part. Make an incision on the median line of the linea alba anterior to the umbilicus with a sharp-pointed bistoury, and cut into the abdominal cavity, taking care not to injure the intestines or uterus; then insert a probe-pointed bistoury and make the opening
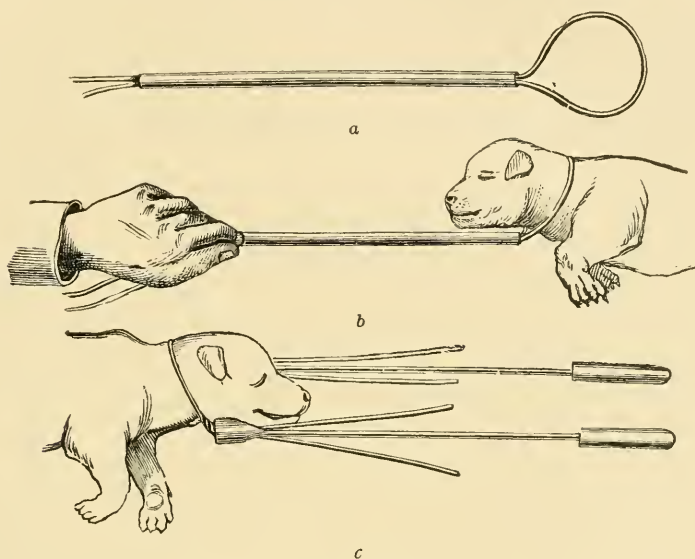
Fig. 90.—Apparatus for the extraction of the fœtus and method of extraction: *a*, Brulet's apparatus; *b*, method of application.; *c*, Defay's apparatus.

larger, cutting toward the pubis; then cut through the omentum; the uterus is now visible and can be lifted out and the fœtuses can be felt in the uterus, separated by a constriction of the body of the horn. Pull the uterus out of the opening as far as possible and have an assistant keep the opening of the abdominal wall closed, so as not to allow the intestines to escape, and also to avoid any of the fluids from the uterus falling into the cavity; and by means of a bistoury open the uterus by making an incision through its wall; the opening should not be any larger than is necessary to get the fœtus and the membranes out. It is not necessary to make an incision in the horn over each fœtus, but after one fœtus is removed the others can be pushed toward the opening and removed through it, taking care to remove the membranes also. The uterus is now thoroughly disinfected with corrosive sublimate solution (1 to 5000) or boric acid, 2 per

cent., or creolin; and close the incision by means of a Lamberts' suture (using the stitch illustrated in Fig. 20, page 70), using catgut ligature. If the other horn of the uterus contains fœtus, it must be treated in a similar manner, irrigated and closed, then sew up the abdominal muscles by an interrupted suture, using silk. The abdomen is covered with a piece of absorbent cotton soaked in a mild solution of corrosive sublimate and held in position by an eight-tailed bandage of muslin tied over the back. This has to be dressed daily. The animal must have absolute rest and be fed on food that is easily digested and not apt to constipate or ferment. Meat juice or extract is the best; vegetables are contraindicated.

Removal of the Uterus, Hysterectomy.—This operation is performed in inguinal hernia of the bitch, with strangulation, in uterine tumors, and chronic catarrh of the uterus, and when after the abdomen is opened as in the operation just described and it is found that the uterus is either lacerated, necrosed or that the uterus is in such condition that if it is not removed it will endanger the life of the animal. Open the abdomen on the linea alba or the flank, the former is much more satisfactory and to be preferred, and the uterus is brought down out of the opening, and a double ligature is put on the horn close to the ovary, or, better still, remove the ovary, then a double ligature is put on the uterus, close to the vagina. When the uterus is filled with fœtus, it is best to empty the uterus, taking care not to allow the escaping fluids to flow into the abdominal cavity; the ligated horn and uterus are cut between the double ligatures, and the broad ligament separated, and it is wise to apply the thermo-cautery to the stumps of the horn and the uterus, then close the abdominal wound, bandage the abdomen and treat the animal as in any grave surgical case.

Irregularities of Sexual Instinct.

Absence or Loss of Sexual Desire.—This condition may result from a variety of causes: (1) general debility, (2) anæmia, (3) irregular or improper food, (4) phlegma, especially in over-fed animals, (5) too frequent sexual intercourse, as dogs in the stud, that have suddenly become popular and have a great number of bitches sent to them, (6) onanism, where animals have no intercourse, and learn to masturbate on objects slightly elevated from the ground, a rung of a chair, the shaft of a wagon, and in the kitchens of families, where small pet animals are kept, the servant maids hold up their foot and encourage the dog to masturbate on that until they are exhausted, (7) from disease of the spine or of the genital organs. In the bitch sterility may result from catarrh of the uterus or vagina, causing a discharge of acid mucus, that destroys the spermatozoa. In certain male dogs they become so violently excited

that they are unable to perform the act properly, or there may be partial loss of erectile power in the corpus cavernosum and the dog does not hold long enough, for the sperm to be secreted and it is ejaculated after they separate.

Therapeutics.—If there are any pathological alterations they should either be alleviated or the case may be such as to be impossible to alleviate, or we may administer an aphrodisiac to the animal for some time previous to the time the animal is to serve the bitch. Tincture of cantharides 2 to 10 drops once or twice daily in wine or barley water or hydrochlorate of yohimbin two or three times daily, a fourth to a half tablet which contains 0.01 in solution of acacia. In the bitch yohimbin should be administered for five days and then the bitch is put with another bitch in heat, this as a rule, produces sexual excitement in ten days. If sterility is due to acidity of the secretion of the vaginal mucous membrane, irrigations of alkalines are advised such as carbonate of soda, 1 per cent, bicarbonate of soda 2 to 3 per cent.

Excessive Venereal Excitement. Satyriasis and Nymphomania.—This may occur as a result of certain diseases of the genital organs, but frequently occurs in the male, from unknown causes, (see also priapismus). Venereal excitement is a common thing in male dogs, their actions, in play or in excitement all tend toward stimulation of the sexual act, and frequently dogs learn to practice onanism, gradually becoming emaciated, accompanied by dulness of the senses, weakness or loss of sexual power, and frequently, partial or complete paralysis.

Therapeutics.—If the venereal excitement is not due to any pathological alteration of the genital organs, the animal should be kept on low diet, very little meat, and the administration of saline laxatives, and the salts of bromide of soda or potassium, and if these methods fail, resort to castration.

Castration of the Bitch (*Ovariotomy*).

This operation is generally performed to avoid the trouble that owners have when a bitch is in "heat," and also tends to make them good quiet house dogs. The operation is a very simple one and not attended by any great danger if the proper antiseptic rules are followed, provided the animal is not too fat, pregnant or in "heat" at the time of operation, or there are no tumors of the ovaries, that by either greatly increasing the size of the ovary or adhering to the adjacent tissues interfere with their removal. Normally the ovaries are small, elongated, somewhat irregular bodies about the size of a small bean, lying posterior to the kidney and encapsuled in a pouch and generally surrounded by fat. The operation is either performed through the flank or on the linea alba, while the animal is

either narcotized with morphia or anæsthetized with ether.   Before operating the animal should have food withheld for twenty-four hours, and the region of the incision carefully prepared, first by shaving all hair in the immediate region, and then carefully disinfecting it.

Operation on the Linea Alba.—The bitch is given a narcotic, or etherized, or both, and placed on a table on her back and an incision made in the linea alba at the umbilicus, with a sharp-pointed bistoury, and then the opening is enlarged by means of a probe-pointed bistoury, cutting toward the diaphragm, the size of the opening is just large enough to freely admit the index finger.   Some operators introduce a sound into the uterus previous to the operation, but this as a rule, is unnecessary, as familiarity with anatomy, will easily detect the difference between intestine and the fallopian tubes.   The finger is introduced into the abdomen close against the wall and the horn of the uterus is felt, the end of the finger is hooked under it and drawn toward the opening, and by careful traction, the ovary is drawn toward the opening and cut off with the scissors; sometimes it is necessary to tear the ovary from its attachments to get it to the surface.   The same procedure is followed in the other ovary and the wound closed with an interrupted silk stitch.

Many operators perform castration in very young and even in older dogs, by opening the abdominal cavity at the linea alba and ligating the uterus by two catgut ligatures about an inch apart on the body of the uterus, and cut through between the ligatures.   This method has the advantage of being very simple, and there is little or no danger connected with it, but the writer has tried a number of cases for experiment and found in a short time a great collection of creamlike matter, gathered at the ligated end of the uterus toward the ovary, and distended that portion very much, which was noticeable by an enlargement of the abdomen. This result can be prevented to a great extent, by ligating and cutting each horn separately, and as high and near the uterus as possible.   This complicates the operation, and as the prime object of the operation is to prevent the recurrence of the periods of "heat," as the ovary is not removed by this mode of operating the phenomenon recurs at the regular periods and while it is true it is impossible for the animal to become pregnant, it still is not an operation to be desired.

Castration by Flank Operation.—Many operators advise castration through the flank, and proceed in the following manner: Make an incision in the flank about 4 cm. long, midway between the last false rib and the thigh and the transverse process of the vertebra, in an anterior direction, cutting through the skin and muscular layer; then tear the peritoneum by means of the finger or knife, or lifting the peritoneum by means of a pair of forceps, cut it through with a scissors, then the index finger is introduced into the abdominal cavity, the fallopian tube is

found, hooked with the finger the ovary is pulled down to the opening and cut off either by scissors or twisted off with forceps, care being taken to remove the ovary entirely. Some authors recommend removing a portion of the horn with the ovary; this, however, is not really necessary. After removing the ovary, the Fallopian tube is traced back to the bifurcation at the uterus, the other tube found and followed back to the other ovary, which is removed in the same manner. In cases where the remaining ovary cannot be reached, laparotomy is made on the other flank, and the ovaries pulled through the opening and then cut off with the scissors, and the wound sewed up as described in the other operation. Friedberger has operated on hundreds of bitches in the above-described manner; he removes both ovaries through the one opening in the left flank. Gunther makes an opening in both flanks, taking one ovary out of each. The subsequent treatment consists of feeding the animal on small quantities of easily digested food, and treating the wound with the regular antiseptics.

DISEASES OF THE MAMMARY GLAND.

INFLAMMATION OF THE MAMMARY GLAND.

MAMMITIS. MASTITIS.

True inflammation of the mammary gland, due to bacterial infection is extremely rare. It may occur, however, in an acute or chronic state as a result of traumatisms, kicks, blows, cuts, or injuries incident to suckling puppies, or congestion of the udder from caking or drying of the milk, and consequently retention and tumefaction, and finally, the formation of abscess of the gland. This condition may be caused by sudden removal of the puppies, or the pups born dead and the udder filled with milk.

The udder may be swollen through its entire length or certain sections may be affected. It is warm and painful to the touch, the affected part is deep red or in white animals, purple red, and the swelling œdematous. Pressure on the nipple causes the milk to flow, and it is thin, grayish white, sometimes very thick and creamy, the latter generally containing pus or is streaked with blood. In more acute cases, there is fever, loss of appetite, the tissues become purple red and it forms an abscess, which fluctuates, points and allows the escape of creamy pus, streaked with blood; it may in some cases become gangrenous and a portion slough out, and in rare cases cause death. Occasionally cases become chronic and certain portions of the gland atrophy, or become corded or nodulated.

Treatment.—The puppies must be removed as soon as possible, the gland bathed frequently with warm water and lead water solution applied,

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or an ointment of extract of belladonna, 0.05 lanoline 3.0.   This is to be rubbed in or if the abscess is commencing to form pus, apply poultices or hot-water cloths, by means of the Priessnitz compress; when the abscess forms pus open freely.   The resulting hardening of the gland after an acute attack of inflammation may be removed by the application of iodine painted on once daily for several days, then apply an ointment of iodide of potassium in lanolin one to twenty.   This is to be rubbed in and daily massaging of the gland is recommended.   If the gland is swollen and hard from loss of puppies, or if one gland is not emptied by the pups, rubbing with camphorated oil, or an ointment consisting of belladonna extract one part and lanolin fifteen parts, with low diet, and mild saline laxatives.   The gland may be milked slightly, this procedure must be done very carefully, and then only when absolutely necessary, as it is not advisable to stimulate the secretion of milk.   Bitches that are not pregnant frequently have a swelling and enlargement of the udder, six to eight weeks after the "heat" is over.   This invariably disappears without any treatment and it is not necessary to treat it in any way, but in very rare cases, if the udder should become congested, it is to be treated as if it were a case of congestion of the gland.   Very rare cases have been known where bitches suck the nipples and stimulate the milk, a habit that is impossible to control, except by putting on a spiked muzzle, or getting the bitch pregnant will sometimes overcome the habit.

Neoformations of the Mammary Gland.

Various tumors and enlargements form in the mammary gland, such as fibroma, lipoma, chondroma, osteoma, adenoma, myxoma, sarcoma
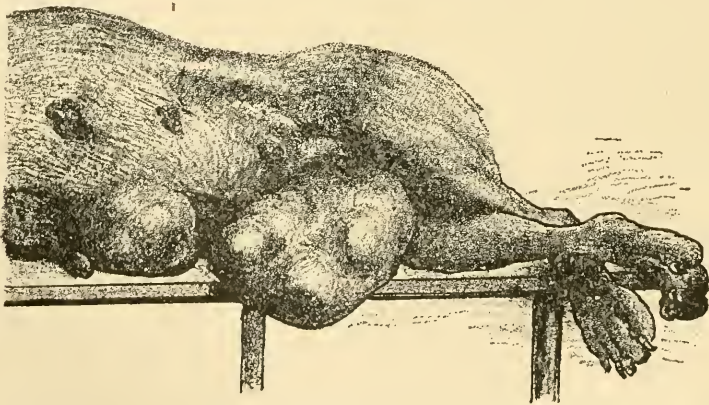
FIG. 91.—Tumor of the mammary gland.

and carcinoma, and frequently mixed tumors, such as adenosarcomas fibrochondromas, fibrosarcoma, chondrosarcoma, etc., and there may

also be cyst formations. Some of these mammary tumors reach enormous sizes, hang down and sometimes touch the ground, (Fig. 91). As a rule these tumors are round; flat tumors as a rule, are rare, these tumors may be round or apple-like externally or they may be nodulated and irregular and fluctuate at certain parts of the tumor. These fluctuating portions may or may not open, and discharge their contents and form an ugly, raw, unhealthy cancerous ulcer, which is constantly licked by the animal and generally we find enlarged infected lymphangitis in the surrounding tissues. Carcinoma is frequently found on bitches that are beyond middle age, in the form of carcinoma fibrosum, or carcinoma schirrosum, or partially as carcinoma medullare or myxomotodes and calcification, or ossification, as well as cyst formations.

Treatment.—These must be operated on when the tumor is well defined, they can be operated on and removed with comparative ease. When the tumor infects the interior of the gland and is malignant, the entire gland should be removed, and also any infected lymphatics. Frohner found that some of the tumors (carcinoma) become calcareous and unless they are very large are best left alone. Small benign tumors should not be interfered with if they are not growing.

DISEASES OF THE NERVOUS SYSTEM.

EXAMINATION OF THE NERVOUS SYSTEM.

Disturbances of the nervous system are marked by impairment of consciousness, sensitiveness, and motility. Besides these, there are complications in the functions of the eyes, ears, taste and smell, and also the digestive system.

1. **The Disturbances of consciousness** are variously defined according to their intensity. Dulness (indifference to any external influences), somnolence (drowsiness, sleepiness, when the patient is awakened easily), stupor (deep sleep, with difficulty in arousing the patient), coma (entire unconsciousness, where the animal is not disturbed by external influences). In extreme cases of unconsciousness, all sphincters of the body become relaxed. Such cases are found in the various diseases of the brain and its coverings and in cases of injury and concussions of the brain; it is also seen in poisoning by narcotics, in uræmia, in acute anæmia, and in all diseases accompanied by intense fever and pain. Short attacks of unconsciousness may occur in the form of dizziness, and are seen occasionally as the result of great excitement or pain (in operations); and also idiotism, which occurs in rare instances as a result of distemper, when it assumes the nervous form.

2. **Disturbance of Sensitiveness.**—This is not easily recognized in the dog. In all instances it is advisable to cover the patient's eyes, and compare the sensitiveness of the affected side with that of the healthy one. In cases of hæmaphraic diseases, we test the sensitiveness of the skin by pricking it slightly with a needle or letting cold water drop upon it, so as to produce some irritation or symptom of pain. A test may also be made by means of a battery; still this method is not as reliable and practical as the needle and cold-water test.

Total anæsthesia occurs, as a rule, from poisoning, and must not be mistaken for a want of reaction, when in a comatose condition. **Local anæsthesia**—that is to say, a more or less circumscribed or disturbed zone of sensibility—may be found in any part of the body. In such a case, if anæsthesia corresponds with a region of a special nerve or mixed nerve, or if it is extended over several nervous regions, or if it is even double-sided, we can distinguish it as peripheric anæsthesia. **Peripheric anæsthesia** indicates an injury of the terminal ends of the sensitive nerves and originates through local influences, intense cold, acids (es-

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pecially carbolic), also alcohol and certain narcotics (especially cocaine). Peripheric anæsthesia may be caused by some traumatism, compression, malformation, or inflammatory exudates; also through inflammations, such as degenerating process, etc., of the peripheric nerves. **Spinal anæsthesia** is seen and, as a rule, is double-sided; due to compression of the nerve or the spinal cord. Cases of cerebral anæsthesia are caused by hemorrhages, tumors, inflammations, etc., in the zone of the sensitive nerves. It may also be caused by the effects of various poisons—chloroform, ether, alcohol, morphia, or bromine.

Hyperæsthesia.—This is an increased sensitiveness of the cutaneous nerves, and is, as a rule, found in the early stages of certain diseases of the spinal cord. It is very rarely seen in the later stages of such diseases. In rabies it is indicated by gnawing of certain portions of the body, and in neuritis and secondary paralysis.

3. **Disturbances of motility** appear in paralysis and convulsions of the affected muscular system.

Paralysis.—We generally make a distinction between paralysis and lameness, that is to say, an entire loss of movement, and paresis or weakness, which is simply due to debility. In the first case there is not the slightest movement performed in a muscle or a whole group of muscles. In some cases, there are slight muscular movements, but they are weak, without strength, and do not last very long. In order to determine the origin of paralysis, it is necessary to have some knowledge of the psychomotor centres. These centres are located in the cerebrum, and are called the cortico-muscular leading tracts. Up to the present time they have definitely located the following motor centres in the external surface of the cerebrum, the position of which is indicated in figure 92: 1 is the centre for the movements of the muscles of the neck; 2 is that of the extensors and adductors of the anterior limb; 3 is for extending and turning the anterior limbs; 4 controls the movement of the posterior limbs; 5, the facial muscles; and 6, the lateral movement of the tail; 7, for the retraction and adduction of the anterior limbs; 8, for elevating the shoulders and stretching the front legs (walking); 9, for dilating and contracting the orbicularis palpebrarum and zygomaticus muscles. In the front of 9 we also find the centre for the movements of the tongue. Between the anterior and middle portion of 9 is for closing the jaw. On irritating 9 we have a retraction and elevation of the corners of the mouth. By irritating 6 the mouth is opened and the tongue is moved. c,c causes a retraction of the corners of the mouth; c lifts the corners of the mouth and half of the facial muscles as far as the closing point of the eyelids. The middle e (on irritation) opens the eye and dilates the pupil.

Any disease which becomes located in any portion of this cortico-muscular brain centre and inflames or stops the power of these centres

must lead to paralysis of the centre which it controls. We therefore can locate any disturbance in the motor centres of the brain by the paralysis which occurs in certain parts of the body. A diseased condition of the covering of the brain, if not very extensive, generally causes the paralysis of one part of the body, as the single motor centres are separated and very distinct from one another. Diseases of the brain, when they occur in the inner surface between the capsules and the pyramids, where all the motor fibres are close together, cause a more or less complete paralysis of one side of the body. That is to say, a hemiplegia (affecting one side of the brain) causes the paralysis of the muscles of the other side of the body. For instance, if the disease is located on the left side of the brain, the muscles of the right side become paralyzed. In diseases of the spinal cord the muscles affected are on the same side, except in the case of diseases of the cervical portion of the spine, when, as a rule, paralysis is seen in all the extremities, and in disease of the lumbar region paralysis of the posterior extremities is seen. We therefore summarize in a general way that hemiplegia is usually a form of cerebral paralysis (of the controlling centres); paraplegia indicates a diseased condition of the spine; and monoplegia is due to a paralysis of the brain as well as the spine. This description gives only the fundamental theories on this subject. Concerning more precise details we would direct our readers to some one of the various physiological text-books.

The most important peripheric paralyses which have been observed in the dog (by traumatism, compression, or exudation, inflammatory or degenerating processes of the affected nerves) are as follows:

1. *Motor Trigeminal Paralysis.* (Paralysis of the lower jaw.)— The lower jaw hangs down; mastication is impossible; saliva runs out of the mouth. This condition occurs very frequently as a symptom of rabies. In rare instances it has been observed as a result of some other disease.

2. *Paralysis of the Anterior Limbs.*—The front legs hang inert and all the joints flex very easily.

3. *Paralysis of the Posterior Limbs.*—The hind legs are dragged along the ground, the paws being flexed and drawn backward. If the paws are drawn forward and this flexion overcome, the animal is able to stand on its legs if the body is held.

4. *Paralysis of the Cruralis.*—In this condition the animal does not use the posterior limb. All the joints become flexed abnormally, and the thigh bends backward. This condition may also be due to some disease of the spine.

The electrical current is very useful to determine how much certain muscles and nerves can be excited by the current and is particularly useful in the diagnosis of paralysis of the nerves and muscles and nutritive
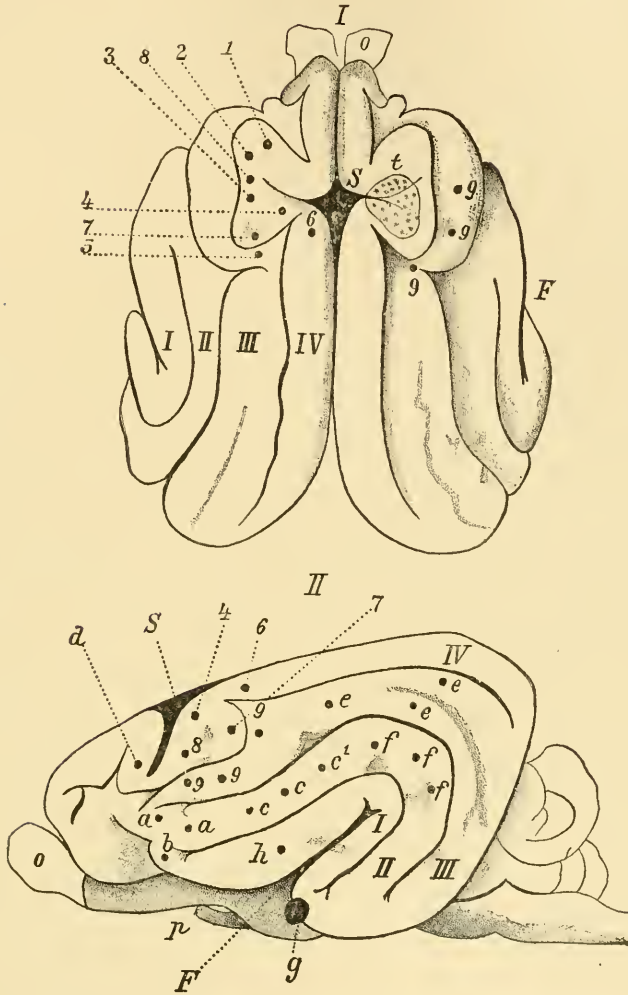
Fig. 92.—*I.*, shows superior portion of the cerebrum; *II.*, the lateral surface; and *I.*, *II.*, *III.*, *IV.* are the four convolutions.; *S*, is the sulcus cruciatus; *F*, the fissure of Sylvius; *o*, the bulbus olfactorius; *p*, is the optic nerve. The motor centres are: 1, for the muscles of the neck; 2, for the extensors and adductors of the anterior limbs; 3, for the flexors and rotators of the anterior limb; 4, for the muscles of the posterior limbs; 5, for the facial muscles; 6, for the lateral movements of the tail; 7, for the retraction and adduction of the anterior limbs; 8, for the lifting of the shoulder and extension of the front limb (walking); 9, 9, for the orbicularis palpebrarum, zygomaticus, and closing of the eyelid; *I.*, *t*, the heat-centre of Eulenberg and Landois. (LANDOIS.)

Fig. 92.—*II.*, *a*, *a*, retraction and elevation of the corners of the mouth; *b*, opening of the mouth and movements of the tongue; *d*, the opening of the eyelids.

disturbances of the same. The faradic or the open circuit can be used. One electrode is placed on the body, generally along the spine and the other is placed on the muscle to be stimulated. The first electrode, that is placed along the spine should be of large size and the other that is to be placed on any particular nerve of muscle, must be comparatively
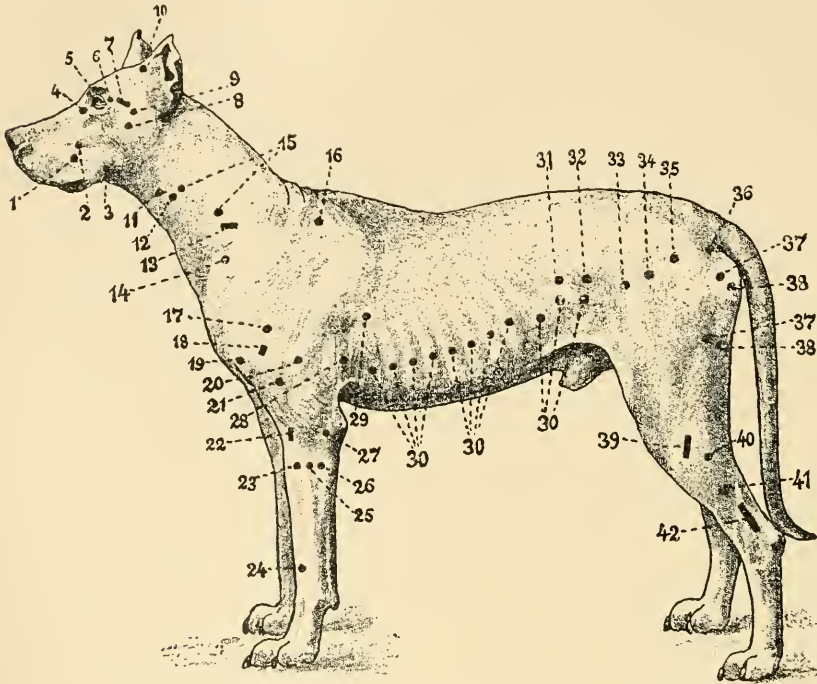
Fig. 93.—Motor centre points of the dog (after Nahrich): 1, caninus muscle; 2, levator; labii superioris; 3, orbicularis oris; 4, levator naso labialis; 5, currugator supercilii and orbicularis palpebrarum; 6, corrugator supercilii and orbicularis palpebrarum; 7, orbiculo-palpebralis nerve; 8, masseter; 9, zygomaticus muscle; 10, superior lateral retractor of the ear; 11, sterno-hyoideus; 12, sterno-cephalicus; 13, trapezius; 14, omotransversarius; 15, cleidocervicalis; 16, thoracic portion of the trapezius; 17, scapular portion of the deltoid; 18, axillary nerve; 19, acromian part of the deltoideus; 20, anconeus longus; 21, anconeus lateralis; 22, ramus profundus with radial nerve; 23, extensor digitalis communis; 24, adductor pollicis longus; 25, extensor digitalis lateralis; 26, extensor carpi ulnaris; 27, anconeus brevis; 28, cutaneus maximus; 29, latissimus dorsi; 30, obliquus abdominalis externus 31, illiohypogastric nerve; 32, illioinguinalis; 33, sartorius; 34, tensor fascia lata; 35, gluteus medius 36, gluteus superficialis; 37, biceps femoris; 38, semitendinosus; 39 peroneus nerve; 40, extensor digitalis lateralis; 41, peroneus brevis, 42, tibial nerve.

small so as not to cover more than the part to be stimulated. The electrode must be covered with linen or woolen cloth and moistened with a weak solution of common salt. The reflex movements are prompter when the electrode is placed on the so-called motive points which (Fig. 93) will give some idea of their location.

When a muscle is in normal condition it will answer promptly, when

the electrode is put on it, by a quick quiver. In a degenerated or atrophied muscle, the reaction is a slow vermicular quiver or in old cases where the paralysis has existed for a long time there may be no motion at all. The constant or open current will frequently stimulate muscular contraction, when the faradic current will give no movements whatever. When degenerative muscular atrophy has set in for any length of time no reaction can be obtained from either current. For further details see special work on this subject.

The most important test of paralyzed muscles is their size. In all cases of prolonged paralysis the muscles atrophy quickly. The muscle gradually becomes smaller and smaller until it resembles a cord or tendon. In cerebral paralysis this does not occur, while in spinal paralysis it is always present. Of course, in some instances an inactive muscle will atrophy without any actual disease being present. The amount of atrophy which may occur in certain cases is indicated by a communication given to the author by Goubaux. In this instance the paralyzed anterior limb of a dog weighed 103 grammes, while the perfect limb weighed 148 grammes.

Convulsions.—Convulsion of the controlling muscles is the very opposite of paralysis. Convulsions are diseased contractions of the muscles which are independent of the will. There are several varieties of them. Clonic convulsions are short muscular contractions that occur at intervals, and between the intervals the affected portion of the body quivers constantly. Tonic convulsions are muscular contractions in which the muscle remains constantly contracted. It may occur for a minute or two, or may last several days. Tonic clonic convulsions are the medium form of the two conditions before described. A mild form of clonic contractions is noticed in the original muscular twitchings. Trembling and shaking convulsions, seen in chill, fear, or sudden cooling after being very warm, epileptiform convulsions, or eclamptic convulsions, are seen and extend over the whole body. In very rare instances they may be restricted to one portion, such as the head or neck. These generally come on suddenly and disappear in a few minutes. They are generally seen in the early stages of distemper, in teething, in irritated conditions of the bowels, or from noxious and poisonous food and from parasites; in cases of pentastomum in the nasal cavities, in encephalitis, meningitis, or uremia, and occasionally in acute anæmia; they also occur from some injury or irritation of the peripheric centres, and are very prominent in epilepsy. Rhythmic twitchings are seen in some muscular regions where the affected part of the body makes regular motions; for instance, in the muscles of mastication, in the muscles of the chest during sleep, and also in the twitching of certain limbs. They are very often mistaken for chorea, and appear as a result of distemper

or some disease of the brain. They may also occur from disorder of the spine. These so-called cataleptic attacks consist of a rigid and contracted condition of all the muscles of the body, but are subject to passive movements. Nothing is known concerning their etiology. Tetanic convulsions are tonic convulsions of the whole muscular system of the body, They appear in tetanus and in some cases of poisoning (strychnine. brucine, caffeine, etc.). A variety of these tetanic convulsions is sometimes observed in the so-called cases of eclampsia in bitches who are nursing a large litter of puppies. Forced irregular actions of the body, such as walking backward or in a circle, or the animal rotating on its own axis, are seen as a rule in diseases of the cerebellum and in some cases of poisoning (cocaine). In rare instances we see, in the above mentioned, symptoms of "epileptiform attacks," which we will refer to further on.

Ataxia is due to disturbance of motility or an interference in the coordination of muscular action. Animals are unsteady on their legs, stagger from one side to another, and their action in walking is irregular. Ataxia is undoubtedly found in some diseases of the cerebellum, and may also be seen in disease of the pons and the fore ventricles, and, in very rare instances, of the spinal cord. Ataxia occurs very often as a result of distemper, and it occurs without any previous brain or spinal symptoms.

Concerning disturbances of vision, hearing and the action of the sphincters, they will be described under their special chapters.

Disturbance of Reflex Irritability.—Reflex action is those movements that are caused by some stimulus or irritation that produce a movement that is entirely independent of the will, unless the will is concentrated to oppose the movement. In this instance we call particular attention to what is known as patellar reflex. The animal is laid on his side with the hind leg to be examined on the upper side, the leg is slightly flexed and with the index finger or a percussion hammer a quick blow is made on the patellar ligament below the patella; under normal circumstances the quadriceps femoris muscle makes a quick contraction, the muscles of the leg contract and the leg is sprung forwards. The same reflex but to a lesser extent is also seen at the anterior face of the carpal articulation, the Achilles tendon, skin of the sole of the foot and the abdominal wall. An increase of the reflex is seen in the course of chronic diseases of the brain, in myelitis transversalis, spinal paralysis (first observed by Dexter) poisoning with strychnia, tetanus. A diminution of the reflex is sometimes found in acute diseases of the brain, which have been very rapid in their development, in certain diseases of the spinal substance, in disease of the peripheric nerves (in which case it is confined to the territory of the corresponding nerve) and in coma. The brain reflexes to be particularly considered are the conjunctival and corneal reflex seen by the closure of the

eyelids on touching the conjunctival bulbi or the cornea and the pupil with 'its contraction or dilatation on the impression of light.

DISEASES OF THE BRAIN AND ITS COVERINGS.

Hyperæmia of the Brain.

Etiology.—There is an active and passive hyperæmia. Active hyperæmia of the brain is caused by an increase of the circulation as the result of increased heart-action. This occurs in hypertrophy of the left ventricle, from excitement, in young animals, from heat (sunstroke), in great bodily exertion, in teething, high temperture; blows, nervous temperament, from overeating, the effects of certain narcotics, and as a secondary symptom of certain diseases.

Passive hyperæmia (stagnation) occurs in compression of the jugular veins by tumors, such as large goitres, by obstructed respiration, from tight collars, in acute bronchitis, and in compressed conditions of the lung due to hydrothorax, extended indurations of the lungs, defects in the venous openings of the heart. Hyperæmia of the brain accompanies various acute internal diseases, and as a secondary symptom of a large number of disorders; it is also seen as a result of various poisons, such as alcohol, certain narcotics, etc.

Pathological Anatomy.—As a rule, hyperæmia of the brain occurs in connection with congestion of the coverings of the brain, especially the pia mater. When hyperæmia is very intense, or where it has existed for a long time, we cannot definitely separate the conditions. We find the dura mater distended, but very little changed. The vessels of the pia mater are much injected, the torsions of the vessels are flattened, and the sulci are perfectly flat as if pressed out of shape. We find the gray matter is darker than usual, while the white brain substance is dull gray or yellowish red, and presents numerous bloody spots which may be easily removed. In chronic conditions of this disease, we find venous hyperæmia. The brain appears in such cases pale and anæmic, very moist and soft, and on section has a brilliant, mirror-like lustre. It is lessened in size and doughy in consistence and the subarachnoidal fluid is increased.

Clinical Symptoms.—The symptoms of active hyperæmia of the brain are characterized by a sudden development of excitable symptoms. These consist in great restlessness, running around, making frequent changes of position, irritability, a tendency to biting and attacks of delirium, partial or general convulsions, and an increased activity of the action of the heart. The pulse is quick and irregular; the respirations are short. There is congestion of the mucous membranes of the head, and the upper portion of the head is warm to the touch. There is contraction of

the pupils and sometimes vomiting. These symptoms of excitement rarely last very long, and generally disappear quickly; although in rare instances, they may last some time without leaving any trace on the general system. They may, however, alternate with periods of apparent rest to recur again in a short time. The writer has observed this in cases of apoplexy of the brain. In this condition there is dulness, unsteady gait and if there is entire stupor, stertorous respiration is apt to be present with this last symptom. It is doubtful in such cases, if we have to deal with actual hyperæmia; more likely, a more of less serious alteration in the brain.

Therapeutics.—Bleeding, as a rule, is contraindicated on account of the debilitated condition of most dogs when they develop hyperæmia. We would, however, recommend enemas (soap and water) and purgatives with quick action, such as sulphate of magnesium in large doses, senna leaves, or castor oil. Cold compresses (ice bags) around the head are also useful, while violent purgatives such as croton oil, are not advisable, as they excite the animal, produce great irritation and generally do more harm than good. The animal should be put in a cool room and kept as quiet as possible, avoiding excitement or heat and also feed the animal very light. In cases where marked symptoms show themselves, an injection of morphine is generally indicated.

Anæmia of the Brain.

Etiology.—The most common cause of anæmia of the brain, is impoverished blood, acute hemorrhage, prolonged debilitating disease, or from some obstruction of the arterial system, such as tumors, hemorrhages, or inflammatory exudations within the skull; also compression of the carotid arteries by emphysema, and in some instances from contraction of the small arteries of the brain, caused by excitement. Chronic anæmia of the brain may be caused by the presence of intercranial tumors, or hemorrhage, chronic hydrocephalus pachymeningitis.

Pathological Anatomy.—The white substance in rare instances has a few bloody points. As a rule, however, the brain appears on section dull white, the gray matter being unusually bright, without any trace of coloration. The meninges and coverings of the brain may possess their normal quantity of blood, even in intense anæmia.

Clinical Symptoms.—Acute anæmia, especially when it has been caused by hemorrhages, is indicated by a small, weak pulse, dilatation of the pupils and a coldness of the extremities, with attacks of dizziness, and loss of conciousness. Convulsions are rarely present in chronic anæmia of the brain, and very often stupidity, quivering of the muscles, great

fatigue on the slightest exertion, loss of appetite, and a tendency to vomiting is noticed, and even general convulsions.

Therapeutics.—The therapeutic treatment consists in stimulants, such as wine, ether, camphor, atropia, caffein, friction to the skin, smelling spirits of ammonia, stimulation of the phrenic nerve by the faradic battery, etc. In the chronic form nutritive diet, blood-producing food, and tonics.

Cerebral Hemorrhage.

(Apoplexia Sanguinæ; Hemorrhagica Cerebri.)

Etiology.—The chief cause of cerebral hemorrhage is an increased pressure on the vessels containing the blood, and where the walls of these vessels present some abnormal condition by which they are debilitated or weakened. This condition of the walls of the vessels may be caused by atheromatous degeneration, or by some disturbances in the nutritive process of those parts, as in serious diseases of an infectious nature, such as distemper, leukæmia, and also in certain forms of poisoning. Great exertion, intense physical excitement, or great heat may also produce this condition.

Pathological Anatomy.—Hemorrhages appear, as a rule, on the cerebrum, and occur from a capillary hemorrhage and are indicated by a slight red coloration which cannot be wiped off; but in the most serious forms you may find a distinct number of spots which become confluent. In some cases there is a considerable bloody discharge, indicating the breaking down of some large blood-vessel. If the blood-vessel is located in the hemisphere near the surface, the dura mater appears distended at the affected location; the convolutions of the brain are flattened and the furrows depressed. The substance of the brain is always more or less destroyed, and, if the animal does not die quickly, the discharged blood lying in the tissues forms clots very rapidly. Its fluid parts become absorbed, fibrinous substances are formed, and the blood-corpuscles destroyed, being altered into a chocolate-colored emulsion which finally becomes absorbed. The coloring matter of the blood remains on the brain as a rose-colored pigmentation. The centre becomes smaller and smaller, until the development of numerous connective-tissue adhesions unite it to the wall, or an apoplectic cyst is formed, which has a smooth inner wall filled with serum. This cyst takes the shape of the surrounding tissues.

Clinical Symptoms.—Capillary hemorrhage appears occasionally in some of the grave infectious diseases, and may cause little or no disturbance of the general system that can be recognized during life, or there may be slight manifestations of the condition, such as dizziness, partial loss of

consciousness, staggering or giddiness, and in some cases, vomiting; these however, are only temporary. In extensive hemorrhage, on the contrary, there is the sudden appearance of grave cerebral symptoms. The animal falls down without any premonitory symptoms, or else shows, for a short time, dizziness, staggering, trembling and uncontrollable movements, or convulsions, and then loses entire consciousness. The pulse becomes weak or irregular, or rapid and very small. The respirations are deep, stertorous, and irregular. The mucous membranes of the head are intensely reddened, and in the early stages of the attack, convulsions are very frequently noticed and involuntary evacuation of urine and fæces. This is followed by partial or complete paralysis, which is due partially to destruction of the brain substance, and partially to the blood pressing on the brain. This paralysis may affect the extremities, both anterior and posterior, that half of the body which is opposite to the extravasation in the brain being the one affected. The animal may also become blind. This disease may result: 1, in death, which occurs either in a few moments or may take days; 2, in complete recovery—this however, only occurs where there is a small hemorrhage, and in one of the centers of the hemispheres; 3, in complete recovery, with partial or complete paralysis, according to the amount of hemorrhage.

Great hemorrhages of the cerebral membranes are marked by the same symptoms as apoplexy of the brain. **Apoplexia meningia,** occurs generally in connection with violent traumatisms of the skull, such as shocks, concussions, fractures, etc. The blood is generally found in the cerebral membrane, between the dura mater and the skull. It may also be observed in the subarachnoidal chamber and in the brain-cavities. The symptoms are similar to those of apoplexy of the brain, but, as a rule, convulsions appear earlier, and the animal, while he may present symptoms of coma, makes a much quicker recovery.

Therapeutics.—Absolute rest, cold compresses on the head, stimulants when the pulse is weak, ether and camphor, either internally or subcutaneously, after the coma disappears, purgatives and injections of soapy water per rectum to stimulate evacuations of the bowels. To relieve congestion of blood vessels, administer iodide of potassium.

Traumatic Lesion and Concussion of the Brain.

Concussion and Commotis Cerebri.

Etiology and Pathological Anatomy.—The cause of this condition is some traumatism to the skull bones, such as butting the head against a wall when running fast, being hit with a stone or quoit, or struck with some vehicle, or falling on the head out of a window. Some portion of the

skull is depressed, cracked or splintered, pressing on the brain substance, and causing more or less extensive hemorrhage of the interior of the cavity of the brain. The hemorrhage is generally most extensive in the dura mater, between it and the cranium, but it may also be observed between the pia mater and the cerebral cortex or even in the brain substance itself, and while under the microscope we may not find any change in the brain substance in spite of the fact that there is grave cerebral disturbance, it has been called concussion of the brain and is due to a mechanical displacement of the brain substance and the fluids of the brain are compressed in the ventricles.

Clinical Symptoms and Therapy.—Any pronounced traumatism of this kind generally causes death. There may be bleeding from the nose or ears, with acute congestion of the conjunctiva. Give the animal absolute rest, cold local applications, surgical treatment of the injured portion of the skull, and also the injured soft tissues, evacuation of the fæces and the administration of stimulants.

Inflammation of the Brain.

From a pathological standpoint we have to make a distinction between inflammation of the hard cerebral substance (pachymeningitis) and that of the soft cerebral membrane (leptomeningitis). This classification, however, need not be used in a clinical way, because in the dog, the described forms run their course with the same symptoms.

Etiology.—Inflammation of the brain may be the result of some traumatism, or from sunstroke, great physical excitement, over-exertion, etc. This condition also occurs secondarily from disease, such as distemper and pyæmia, causing suppuration within the skull, in inflammation of the frontal cavities as a result of the irritation caused by the presence of parasites; in purulent inflammation of the ear (in connection with external otitis), and from abscess of the middle ear and orbital cavity. Inflammation of the brain is seen in certain infectious diseases, especially distemper, and is also associated in rare instances with pharyngitis, bronchitis, gastritis, and also from unknown causes. In dogs that died from inflammation of the brain, Trolldenier found a pathogenic streptothrix, allied to the group of actinomycetes. Over-exertion and great physical excitement are also said to be predisposing causes of this disease.

Pathological Anatomy. 1. Inflammation of the Dura Mater. Pachymeningitis.—The dura mater is covered with a number of small hemorrhages. It is loose, easy to tear, and over the surface is a collection of bloody, purulent masses of exudation. In the later stages of the disease we see a circumscribed or extended thickening and adhesion of the covering to the base of the skull or to the soft cerebral-membrane.

2. **Inflammation of the soft Cerebral Membrane.   Leptomeningitis.**— The arachnoid is loosened and dull.   The subarachnoid chambers are filled with more or less turbid fluid.   The pia mater is hyperæmic, loosened, and covered by fibrinous exudation.   The coverings of the brain are almost always infiltrated and detached from the pia mater with difficulty and in some cases we find a serous or purulent fluid in the ventricles.   In a chronic case we find a circumscribed thickening of the cerebral membranes and adhesions uniting the coverings with the brain, etc.

3. **Inflammation of the Brain Mass.   Encephalitis.**—This disease, as a rule, involves single centres and causes a general irritation of the healthy tissue without any distinctly marked limit.   In the affected regions the substance of the brain is swollen, hyperæmic, and frequently filled with small hemorrhagic centres.   In the course of time, the inflamed cerebral substance becomes softened and pulpy.   This condition may be present without any hemorrhage, but as a rule, the brain matter becomes red and finally yellowish.   This latter color is due to metamorphosis of the coloring substance of the blood or to fatty degeneration.   These conditions are divided into white, red, or yellow—softening of the brain.   Finally cicatrices and cysts are formed, as in apoplexy, or an abscess may be developed which is filled with thick yellow or greenish pus, which later becomes encysted and sometimes solidified (calcareous).   In some cases small encephalitic centres may heal without leaving any trace.   Occasionally we see the development of a (non-inflammatory) softening of the brain with thrombosis and embolus of the arteries; and, as a general rule, we find symptoms which resemble apoplexy.

Clinical Symptoms.—The symptoms of inflammation of the brain in its early stages resemble those of hyperæmia.   The animals are excited; they run aimlessly from one side to the other, and are fretful and irritable. They whine and howl constantly.   The head is hot; the conjunctiva is more or less reddened, the pupils are contracted, and reflex action is very slight.   The appetite is lost; constipation is generally present, with more or less vomiting.   The patient is indifferent to the impressions of external objects, being sleepy and apathetic.   Soon the disease changes in character.   We see acute convulsions, especially those of the jaw, or eclamptic convulsions.   The animals cry and howl.   At the same time the sphincters are relaxed, the animal apparently having no control of them. Then there is an interval of quietness, in which the animal falls back into a deep semicomatose condition, and between these periods of quietness, we very often see automatic movements, such as quivering or twitching of one or two of the legs; also the corners of the mouth may be retracted. Many cases either howl constantly, and at the same time seem to be semicomatose, or they may bark hoarsely (delirium).   As a rule, the temperature is a little above normal.   Within a short time the animal becomes

gradually paralyzed, losing all power of the muscles. The patient is dull and unconscious of external influences. The breathing is rattling and stertorous. The pulse is increased a number of beats, but is almost imperceptible to the touch. The temperature now begins to rise. In some cases the temperature may remain normal, and in rare instances falls below normal. As a rule, the animals die shortly after the convulsions make their appearance. Complete recovery is very rare, and slight attacks terminate as a rule either with paralysis (partial or complete), idiotism, or blindness.

The course of this disease varies greatly in affections of the cerebellum. If the hemispheres are affected, we may have extensive alterations of the brain, which may run their course without any decided symptoms being shown; but as soon as the cerebellum and one or both hemispheres become affected, we then see the various symptoms peculiar to this disease, and a diagnosis can be made with almost absolute certainty. In disease of the cerebellum there is generally an unsteadiness of the gait in walking and peculiar movements, such as walking around in a circle and rolling on the ground, when both hemispheres are involved. We may also find paralysis of the posterior extremities. In rare instances, however, these symptoms may also be presented in cases of poisoning (by cocaine or apomorphia).

The differential diagnosis between inflammation of the brain, congestion of the brain and rabies is taken up under another head.

Very similar symptoms to those already described appear in cases where the cysticercus cellulosæ is present in the brain or its membranes.

Therapeutics.—The treatment of inflammation of the brain corresponds with that of hyperæmia of the brain. Rest, confinement in a dark, but not warm, room, cold applications to the head, clysters, laxatives, especially calomel and in cases of great excitement, sedatives (morphia sulphas 0.02 subcutaneously, chloral hydrate 2.0 to 4.0, by the mouth, or per rectum, in the form of clysters). The violent irritants which were formerly used on the skin, such as croton oil or cantharidal ointments rubbed on the inner fascia of the thighs and along the spine, are of no particular benefit, in fact do more harm than good. Food should be light, and easily digested, such as soup, broth, etc., and to assist in the reabsorption of the exudate, iodide of potassium may be administered internally.

Comparatively Rare Diseases of the Brain.

The following diseases of the brain are rarely seen, but a description may be useful to the practitioner.

Chronic Hydrocephalus.—This condition is similar to what is known

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as a "dummy" in the horse, and it may be congenital or it may follow distemper. Frohner found twenty-nine cases in 70,000 dogs. The following symptoms are observed: dulness, head inclined to one side, uncertain, irregular gait, with a tendency to go to one side, amaurosis, deafness, and loss of the sense of smell. On post mortem, the brain on section is found to have a sero-lepto-meningitis, with large collections of fluid in the ventricles; in some cases only a pachymeningitis has been observed. The treatment consists in giving laxatives. Injections of pilocarpin, as a rule, only produce a slight amelioration of the symptoms.

Sunstroke.—This is very rare, but it is occasionally seen in the working dogs of European countries, where on extremely warm days the animals pull very heavy loads. In cases where the animals die, we find the same phenomena observed in congestion or inflammation of the brain. In one case the entire muscular system was filled with small hemorrhagic centres, much hyperæmia, and a considerable quantity of sero-sanguinous fluid. Between the dura mater and the arachnoid the surface of the brain was covered with small hemorrhages, the lungs were congested, the heart dilated and flabby, and full of dark coagulated blood. Occasionally an animal may die without any premonitory symptoms, or may collapse suddenly, having a very strong throbbing pulse, dyspnœa, mouth open and tongue hanging out, and an increase of temperature.

Treatment.—This is similar to the treatment of congestion and inflammation of the brain; rest, cool room, cold compresses to the head and if there is great depression, stimulants may be administered.

Turning Disease.—This condition is indicated by the animal turning in circles. These movements are involuntary and are due to some morbid process of the brain particularly in the cerebellum, especially its peduncles, such as hemorrhage, inflammation, embolus, etc., and it may also result from blows, injuries to the skull, it may result from nervous distemper, or it may also be from some reflex action. Frohner observed it in constipation, and he also found this disease in twenty-nine animals in an observation covering 70,000. The treatment consists in keeping the animal perfectly quiet and the administration of sulphonal, hypnon and urethan.

Edema and Parasites of the Brain.—Edema is generally found on post mortem and is especially interesting, for as a rule there is not the slightest indication of this condition seen during life; in rare cases edema is found to be the cause of a variety of symptoms during life, such as monoplegia, hæmiplegia, hemianæsitasia, involuntary muscular movements, ataxia, convulsions, and from the increased pressure on the brain we may find stupidity, clumsiness, giddiness, and fainting spells.

Parasites produce certain brain phenomena and particularly from the presence of the cysticercus cellulosæ, such as great nervous excitement, attacking persons without cause, involuntary movements, great depres-

sion, coma and blindness, and frequently every sign of rabies is present.

Progressive Paralysis of the Medulla Oblongata.—This is called in man a progressive atrophy of the medulla oblongata. This condition presents partial paralysis of the tongue, of deglutition, of the larynx, of the lips. It is extremely doubtful if this condition does, *per se*, occur in the dog, it being due to some other condition being present in the brain. Hutyra and Marek have, however, seen a number of cases of acute paralysis of the medulla, particularly paralysis of deglutition and paralysis of the tongue (see further under that head).

Cerebro-spinal Meningitis (Meningitis Cerebro-spinalis). Etiology.—Nothing is definitely known of the causes of this disease. It is extremely rare in the dog. Renner and Kempen have made several observations on the subject, and the writer had one case of his own.

The anatomical foundation of the disease seems to be an acute suppurating inflammation of the brain and spinal membranes, a purulent exudation in the arachnoid, especially on the hemispheres and the base of the brain, which is infiltrated by a quantity of serous fluid. The same condition is also found in the spine.

The symptoms are disturbances of the sensory nerves, in some cases the animal becoming unconscious. There were loss of appetite, fever, and after a few days a marked unsteadiness of the gait, beginning with a slow, dragging walk, and difficulty of deglutition, becoming complicated with tonic convulsions which finally became epileptic, staggering gait, convulsive movements of the muscles of the neck, opisthotonos, and lastly stupor, coma, and death.

The treatment consists in the administration of sedatives such as chloral hydrate, sulphonal or hedonal.

DISEASES OF THE SPINAL CORD AND ITS MEMBRANES.

Inflammation of the Spinal Cord and Its Membranes.

(Myelitis and Spinal Meningitis.)

Etiology.—A common cause of myelitis and spinal meningitis is traumatisms of some kind causing direct injuries to the spine, such as violent blows, shocks to the vertebral column by falling out of a window, etc., and further by concussions of the spinal cord, such as being struck by an automobile or wagon. Violent muscular exertions frequently produce this condition. In very rare instances, the disease may follow the presence of an abscess on the outside of the spinal canal, by extension of the suppurating process through an orifice of the vertebra, and occasionally

you see it originate, in connection with some infectious or toxic disease
(distemper, rabies, pyæmia) due to the specific toxic material locating
in the cord. It may also be caused by cold, being continually wet and
frozen, as in retrievers.

Pathological Anatomy.—The inflamed pia mater appears thickened,
infiltrated, and may be injected in some places and, as a rule, adherent to
the vertebra, due to the organization of the exudation. It is covered
on its upper surface by a serous, fibrinous, or purulent exudation. The
arachnoid exudation is covered by a milky, false membrane and greatly
thickened. The dura mater is rarely involved, but when such is the case
it becomes thickened and loosened and covered with a thin serum. The
spine itself shows the inflammatory process either extended over large sur-
faces or else confined to small centres. In the early part of the disease,
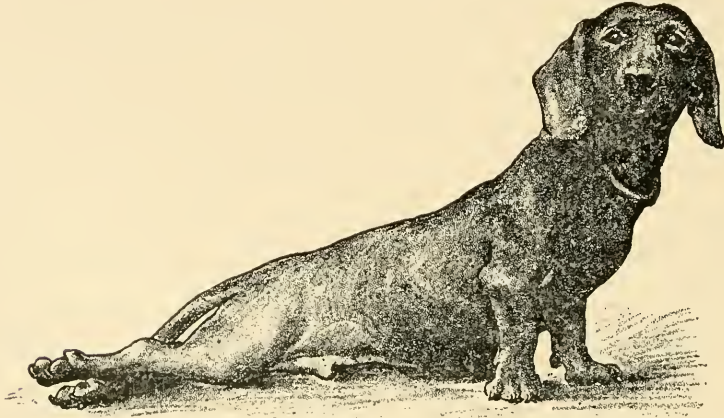
Fig. 94.—Paralysis of the posterior extremities.

the cord is slightly swollen; the gray substance is somewhat reddened,
dark and soft. Later the cord becomes a yellowish-red, breaks down and
undergoes white, yellow, or red degeneration. In the chronic course of
the disease we see atrophy of the nerves as a consequence of malforma-
tions of the connective tissue.

Clinical Symptoms.—As a rule the symptoms of alteration of the spinal
cord appear gradually and become more intense as the disease progresses.
Where the disease is due to violent traumatisms, producing a direct
destruction or laceration of the nervous centres, or pressure, caused by
hemorrhage and blood being discharged and pressing upon the spine the
symptoms are immediately seen or appear in a very short time. In all
diseases of the spinal cord it is very important to recognize the fact that
consciousness is rarely affected. We will take up all these symptoms in

the following description, which may be observed in affections of the spinal cord:

Motor symptoms of paralysis are, as a rule, the first symptoms presented. The patients have a dull heavy look, staggering gait, but not irregular (in this the condition differs from disease of the cerebellum). Finally, they begin to drag their hind legs after them (Fig. 94), the posterior extremities are invariably the parts paralyzed. When they are placed on their legs they stand with them spread apart, or they may simply drop sideways on their hind quarters. In rarer cases, not only the posterior extremities but also the anterior are paralyzed, and it is evident that in cases of paralysis of all the members the spinal substance of the cervical region must be affected, while paralysis of the posterior extremities follows, no matter what part of the cord is affected. In these cases we always have the double-sided paralysis, and in very rare cases the paralysis may be more intense on one side than the other; but in such a case we can only suppose that in one-half of the spinal cord the disease is more advanced than in the other.

In the early stages of the disease there are slight, irregular twitchings of the extremities, rarely of any great consequence, and seldom leading to convulsions. There may be marked hyperæsthesia and the animal gnawing continually at certain points of the body, muscular twitchings, drawing in of the hind legs toward the abdomen. There may also be a continual erection of the penis, and the evacuation of the urine and fæces may be interfered with on account of the convulsive contraction of the sphincter or paralysis of the detrusor urinæ and muscles of the intestine. We also observe disturbances of sensitiveness either in the form of hyperæsthesia or of anæsthesia. The former is invariably observed in the early stages of the disease; the patients show intense pain, especially when touched, lifted, or pressed upon the spinal cord. (This they indicate by biting, howling, etc.) In the latter case they do not show the slightest reaction in the affected regions, even when subjected to serious irritations of the skin. It must be remembered, however, that symptoms similar to hyperæsthesia may also be present in rheumatism.

In mild stages of this disease the sphincters, such as the bladder and rectum, appear slightly affected. In the more serious stage we observe complete paralysis, loss of control of the sphincters, and frequently complete paralysis of the sphincter vesicæ. More details will be found on this subject under Diseases of the Bladder. Such paralytic conditions of the bladder may occur in all diseases of the spine. There is difficulty in the passage of fæcal matter, producing constipation, caused to a certain extent by the loss of abdominal pressure. Paralysis of the sphincter is evinced by a gaping rectum and the involuntary escape of fæcal matter which accumulates in the lower bowel. Through want of active exercise,

the muscular system of paralyzed animals, especially the extremities, becomes flabby, soft and atrophied. The temperature is reduced in the paralyzed portion, the extremities being cold and anæmic. In cases where there is paralysis of the spinal cord caused by compression, and in cases of atrophy due to hemorrhage on the spinal cord, and also in certain luxations or fractures of the vertebræ, we practically see the same symptoms. Paralysis of the extremities, particularly the posterior, may result from the following conditions:

a. Paralysis of the spinal cord caused by compression may result from thickening of the membranes and pressure on the spine itself. It may also occur in some diseases of the vertebræ, for instance in exostosis, but both of these conditions are very rare. In such cases the symptoms come on very slowly and gradually increase in intensity.

d. Apoplexy may occur, due to the presence of some blood escaping on the spine and causing pressure. In these cases the paralysis appears very suddenly, but may gradually disappear after some time.

c. Luxations of the spinal column only happen in the vertebra of the neck, and cause a peculiar oblique position of the head, as if it were twisted to one side. This is due to displacement of the ligaments. At the same time there is present a series of what might be called "special symptoms," which are not very pronounced in any of their characters.

b. Fractures of the spine: These are generally recognized by some change in the position of the region in which they are located (bending inward, flattened depressions, and in rare instances slight distortions of the spinal cord), and also by the extensive sensitiveness to pressure in this location. In certain instances there may be an abnormal mobility of the part. Crepitation, as a rule, is absent. In fractures of the cervical vertebræ, we generally notice an oblique position of the head. If the symptoms just described are absent, when an animal has had a severe fall on the spine, unless paralyzed, or remains without loss of consciousness, it is always doubtful if there is a fracture of the vertebræ or a hemorrhage within the vertebral canal. In such cases we simply have to await developments, or if paralysis does not immediately follow the injury, but comes some time afterward, it is due to compression of the spine from a gradually increasing hemorrhage. We must remember, however, that a fall, shock, or blow upon the back, or ordinary irritations of the spinal substance may occur, like a concussion of the brain, in which there is not the slightest alteration to be found in the spinal substance or its membranes. In many cases we may expect a recovery as long as there are no myelitic complications.

Chronic Inflammation of the Spinal Cord.—This condition follows as a sequence to the acute form or it commences at the onset as a gradual progressive affection. It has been contended that overstimulation of the

sexual organs is an exciting cause, but this is not admitted by all observers. Chronic inflammation of the cord is indicated by disturbances of mobility, the animal is easily tired on very slight exertion, shows a want of coordination in walking, great difficulty in rising after lying down for some time, regular or irregular twitching of the muscles in the affected extremities, or complete paralysis of the hind quarters and in very rare instances of the anterior limbs, more or less disturbance of the sphincters, and gradual atrophy of the affected muscles. The appetite is invariably good and there is no rise of temperature.

Pachymeningitis spinalis ossificans, that peculiar disease indicated by a gradual ossification of the spinal membranes, is not at all uncommon in
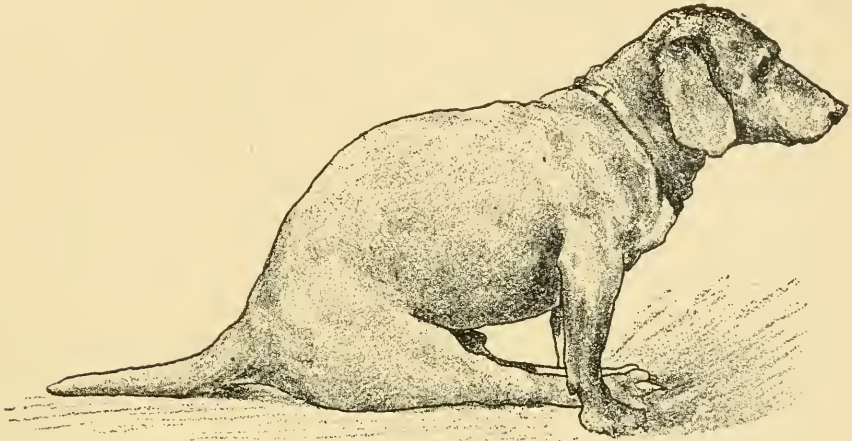
Fig. 95.—Paralysis of the cord.

dogs of an advanced age. This disease consists of a gradual inflammatory process of the dura mater, in which that tissue gradually becomes filled with numerous irregular or massed collections of tolerably firm bony scales, situated on the ventral surface of the tissue, particularly in the region of the cervical and lumbar regions of the cord. The whole dura mater may become converted into a hard bony tube, and in exertion of the body the roots of the nerves may be torn from the spine.

The ossific hardening of the dura may be present for a long time before any actual clinical symptoms are present (Cadéac) and are generally produced by laceration of the sensory nerve fibres, by violent or unusual movements, or movements in a certain direction of the spine. The voluntary movements of the animal are cautious, stiff, or stilty, either on walking about, lying down, getting up or climbing up stairs; the latter he may refuse to do, and on forcibly bending the spinal column the animal

may evince pain.   The back is turned or crooked to one side, the hind legs being carried forward under the abdomen (Fig. 95).   Frequently the animal may cry out, howl or show great pain on certain movements or positions of the body, the same movement apparently he may have done a few moments before without showing the slightest pain.   This condition is frequently mistaken for acute muscular rheumatism.   In rare cases the animal carries the hind quarters in the air and balances the body on the anterior limbs (Fig. 96), and gradually there is a great increase in the muscular development of pectoral and thoracic muscles; as a rule there is a tendency to retention of the fæces and urine, but there may also be involuntary passage of urine and fæces.   The appetite is generally impaired, the reflexes are impaired and the penis may either be erected or protruded
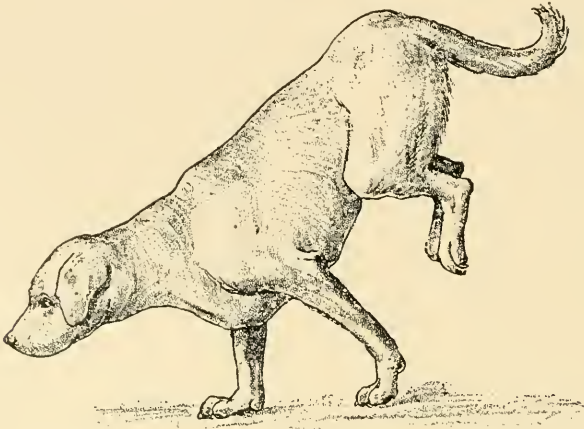
Fig. 96.—Dog with pachymeningitis ossificans.   Characteristic position of body in walking.

beyond the prepuce.   The disease may vary to a certain extent in intensity, but sooner or later the paralysis increases, either involving one leg more than another or the entire hind quarters are affected; gradually the sensibility decreases and the animals show entire loss of muscular power and pain in the affected parts.

Therapeutic Treatment of the Diseases of the Spinal Cord.—In the early stages of the disease when fever, hyperæsthesia, and convulsions give pronounced evidence of the disease, it is advisable to give antiphlogistic treatment, consisting of cold compresses (ice bags) upon the spinal cord, and vigorous purgatives (calomel), saline purgatives, and lastly enemas.   In cases where the paralytic symptoms predominate, we use irritants along the spinal column, such as painting with cantharidal, collodion, or dilute croton oil, viz., oleum crotonis 0.5, ol. terebinthin 15.0; this preparation is rubbed into the skin along the vertebral

column by means of a woolen cloth; blistering with biniodide of mercury or the use of the actual cautery, in the form of pin-point firing along the spine. Sometimes in mild cases use an inunction of mustard oil. If great pain is present use morphine, chloral hydrate, or sulphonal. If we succeed in lessening the convulsions, or if the paralytic symptoms predominate, we must use stimulants such as strychnia and electricity. The first should be used internally in the form of tincture of nux vomica, from five to twelve drops, or subcutaneously in a strychnia solution; the latter method is better. We must remember that one daily injection is sufficient, and that a medical pause of from thirty-six to forty-eight hours ought to be made every four or five days in order to prevent the cumulative influence of this drug.

R. Strychnia muriate, 0.005
    Aqua, 5.0

Electricity is applied in the following method: after having previously dampened the region with a concentrated saline solution one pole of the battery is placed on the spine and the other at the termination of the paralyzed limb. For instance, one is put on the foot and the other in the middle or side of the spine, gradually increasing the current. In such cases, besides administering a purgative and cleansing the bowels, we must also see that the bladder is emptied by means of a catheter. Electricity is also a useful agent in peripheral paralysis, which has been mentioned. The faradic current is preferable. Place one of the poles as close as possible to the point of central location of the affected nerves and gently run over the paralyzed muscles with the other pole. This treatment should be renewed every day for ten or fifteen minutes. Alcoholic frictions, such as spirits of camphor, tincture of arnica, bay rum, opodeldoc liniment, are to be recommended when used in connection with true massage (pinching, friction, and massage of the paralyzed muscle in its proper direction). Warm baths are said to be useful. As a means to promote reabsorption, administer iodide of potassium 0.09 internally. Subcutaneous injections of eserine and pilocarpine, or pilocarpine alone may be used if it is suspected that a large amount of fluid exudate is on the cord. On account of the toxic properties of these drugs, great care must be used in their administration. The bladder must also be emptied by either pressure on the abdominal wall or by catheterization, and the rectum emptied by means of clysters and the food must be such as will digest easily.

In cases of ossific pachymeningitis, Cadéac and others recommend friction with strong liniments, actual cautery, or setons, along the spinal column as well as painting the spine with tincture of iodine, and also the internal administration of iodide of potassium, salicylate of soda,

salol, salophen, antipyrin, etc. As a tonic strychnia should be used in combination with arsenic or quinine and lastly the galvanic current has produced good results in some cases.

 R. Strychnine muriate,   0.005
   Aqua distil.,   5.0
 M. F.
 Sig.—As a hypodermic of 1.0 to be injected once daily.

 R. Physostigmin sulph.,   0.05
   Pilocarpin muriate,   0.1
   Aqua distil.,   20.0
 M. F.
 Sig.—1.0 injected every three days.

Certain Diseases of the Spinal Cord.

The following diseases are caused directly and indirectly by some change or morbid condition of the spinal cord.

Compression of the Spinal Cord. Myelitis by Compression.—By this name is understood a slow compression of the cord; due to a pathological process which alters and straightens the vertebral canal; this may be due to thickening of the membranes as in pachymeningitis spinalis ossificans, already mentioned, from tumors of the vertebra or meninges, exostoses or inflammations of the intervertebral discs. As to tumors in the vertebral column very little is known in dogs; sarcoma; cholesteatoma, and melanoma have been found by a number of observers, exostoses projecting into the vertebral column may be caused by periostitis of the intervertebral discs of the lumbar region; this is frequently seen in old dogs. Inflammation of the intervertebral discs is caused by violent and continued jumping, particularly in performing dogs. These formations are at first soft formations, which later become hard and project into the vertebra and in advanced cases project from one vertebra to another in spine-like processes. While the dorsal lumbar vertebræ are the most frequently affected, it has also been observed in the cervical portion of the column.

Clinical Symptoms.—The symptoms are those we would find as a result of compression of the spinal cord and the origin of the nerves. The animal at intervals shows pain, moaning, barking or howling, stiff cautious movements, and evidence of partial or complete paralysis of certain muscles of the body, also motive disturbance of the bladder and rectum, erection of the penis. Certain valvular diseases of the heart, causing a venous hyperæmia, arterial anæmia of the medulla spinalis or thrombus of the femoral arteries produce symptoms similar to this disease, and it is well to carefully examine the heart in a case of spinal paralysis. The treatment is useless, as it is incurable.

Hemorrhage of the Spinal Cord. Apoplexia Spinalis.—Hemorrhage may occur between the membranes of the cord as well as in the cord itself, and in most instances is due to traumatic influences. One observer found in a dog that fell while running very fast a profuse subdural hemorrhage extending from the second cervical vertebra to the sacrum; there was also more or less hemorrhage in the central sections of the spine of the cervical and lumbar regions; the animal lived three days.

The clinical symptoms either as convulsive twitching or paralysis appear, but may disappear very quickly if the blood is reabsorbed, or the animal dies in a short time. In some cases partial or complete paralysis may follow as a result of the hemorrhage.

The treatment consists in absolute rest, cold compresses to the spine, and the internal administration of iodide of potassium. Much better results are to be expected if the case is treated at its onset.

Fractures, Luxations, Diastasis of the Vertebral Column.—Fracture of the vertebral column is caused by blows, falls, being run over by a wagon or automobile, and is detected by deformity or curve of the vertebral column, by pain on pressure and want of mobility of the spine. It is extremely difficult in fracture of the spine to get actual crepitation. In fracture of the lumbar vertebra and of the sacrum, the place of fracture may sometimes be felt by introducing the finger into the rectum and feeling along the column. Fracture of the cervical vertebra invariably causes death in a very short time, that is if the arch of the vertebra is broken, but frequent recoveries are made where the fracture is of the transverse or oblique processes. If the latter are injured, they heal leaving a torsion or crookedness (torticollis). Fractures of the lumbar or sacral region, while not necessarily fatal, cause such helplessness and misery that the animal should be mercifully destroyed.

Luxations (**diastasis**) of the spine without fracture are extremely rare, although we may occasionally find distortion or sprain of the cord with compression and tearing of the vertebral discs. In such cases the prominent symptoms are great rigidity of the vertebral column, stilted gait, local pain on pressure. The symptoms may disappear quickly or they may increase rapidly and develop into acute inflammation of the intervertebral discs (see page 250). Rest, Priessnitz compress on the lumbar region, later on local friction or massage of the affected part.

Concussion of the Spinal Cord. Commotis Medullæ Spinalis.—This is apt to occur from the same causes as produce commotis cerebri. This condition may be present and the animal be completely paralyzed and no change is found in the vertebral column. Frequently animals affected in this way make a very speedy recovery and it is not wise in doubtful cases to destroy the animal too hastily.

Tabes Dorsalis.—This disease is a degeneration and atrophy of the

spinal cord, found as a result of syphilis in man. Friedberger and Frohner thought they found it in the spinal cord of several dogs that had ataxia. The writer is of the opinion that it does not occur in the canine race, for among the thousands of dogs he has posted he has yet to see a case that he could consider was affected with the disease.

Syringomyelia.—Lienaux describes one case of this peculiar disease, which is characterized by fissures and hollows in the cord. The disease developes very slowly; at the onset we find disturbances of mobility, weakness, paralysis of the posterior extremities, the animal has a peculiar hyena-like walk, urination and defecation remain normal, the appetite is good, sensation in the posterior extremities and later in the anterior extremities is gradually lost. On examining the spine, it is found to contain a number of cavities filled with clear serum; these cavities are in the gray matter, particularly in the posterior section, and in the commissures of the anterior section of the cervical and dorsal regions.

Paralysis of the Nerves.

Paralyzed nerves may be due to some morbid process of the central nervous system, also to traumatisms, such as tearing or bruising of the nerves, or compressing the nerves by neoformations, hemorrhagic extravasations, exudates, enlarged lymphatic glands, swollen tissues, dislocated bones, etc. Inflammation and subsequent paralysis of the nerves may also be caused by cold (neuritis rheumatica), by paralysis or paresis, causing an atrophy of a muscle or group of muscles, and in the case of a mixed nerve going to a certain part, to have disorder of sensation, neuralgia, or anæsthesia. Convulsions are extremely rare and if they appear would indicate some central pathological process.

We will take up particularly paralysis of the peripheric nerves.

Paralysis of the Facial Nerve.—The most frequent cause of this condition is disease of the middle ear, caries of the petrous bone, neoformations or inflammatory processes of the region of the parotids, traumatisms at the place where the nerve goes around the maxillary or the periphery of the nerve, cold—this latter cause, however is rare; also to pathological processes in the skull and base of the brain, or it may follow as a result of distemper. Generally the affection is unilateral (monoplegia facialis). A bilateral paralysis (diplegia facialis) is invariably of central origin.

In the case shown in the accompanying figure (Fig. 97) the symptoms were as follows: The end of the nose, the superior and inferior lip and the chin turned to the right side, the left eye was wide open and could not be closed, the left cheek was relaxed and sunken, the left ear hung downward and backward and could not be lifted by the animal, as was

the right ear when the animal was called, or his attention attracted, the animal ate with difficulty but drank water normally. The cause of this condition was not defined. The animal was treated with the faradic current and in ten days was discharged cured. A number of observers report favorable recoveries.

Motor Paralysis of the Trigeminus. Paralysis of the Masseter Muscle. Submaxillary Paralysis.—This form of paralysis is a common symptom of rabies; therefore all cases of this kind must be regarded with suspicion.

It is observed following distemper, in hemorrhagic gastro-enteritis, and also as a result of certain forms of bacterial poisons, and also in some

Fig. 97.—Facial paralysis of the left side.

affections of the brain, morbid processes at the base of the cranium, such as hemorrhages, neoformations, gliosarcoma. It would appear at times as if the motor nuclei of the trigeminus are squeezed by the muscles of mastication, for instance when great effort is made to bite and crush particularly large bones. Rheumatic influences are also said to cause it.

The chief symptoms are as follows: the mouth remains open, the inferior maxillary hanging limp; if paralysis continues for any length of time, the muscles atrophy. Recovery is rare.

Paralysis of the Radial Nerve.—This is very rare and occurs as a result of traumatism or a sequela to distemper or cold. As the radial nerve controls the muscles of extension of the leg, the anconeus muscle and extensor muscles of the forearm the animal is unable to extend the leg but

keeps it bent with the foot turned back and steps on the front of the foot in walking as it is dragged along, the muscles of the leg become atrophied, and the animal stumbles and staggers when walking. Partial paralysis may result from tumors or fractures of the scapula or to injuries to the region of the shoulder, particularly when an animal going at great speed strikes the shoulder against some hard object. Recoveries from this condition are quite common.

Paralysis of the Ischiadicus.—This is rare and occurs as a result of blows, falls, as a result of distemper, and from unknown causes; there may also be observed a cross paralysis of the hind quarters and also one anterior limb. The hind leg is dragged and the skin worn off the dorsal face of the toes, but the animal can sit on the affected leg if it is brought into position. One observer has seen paresis of the peroneus in a hunting dog; in walking about every ten or twelve steps the animal made an extra long step and when the animal sat down the hind leg was turned backward and upwards. One case was caused by the animal being injured while creeping under a bed.

Paralysis of the Cruralis Nerve.   Paralysis of the Femoralis and Quadriceps.—In this case the animal cannot step with the hind leg as the articulations flex abnormally; this condition is quickly followed by atrophy of the quadriceps. One observer could define no cause for the condition, and the animal made a good recovery in five weeks.

Paralysis of the Obturator Nerve.—One case of this kind was described by Schimmel in which a ladder fell on the animal. When the animal walked, the one leg was curved and at each step it was thrown outward and forward and there was great atrophy of the adductor muscles. Regular exercise led to a gradual improvement of the condition.

Prognosis and Treatment of Paralysis of the Nerves.—The prognosis can never be regarded as favorable; it is true certain cases already mentioned have recovered, but the majority of cases are always to be regarded as doubtful, particularly when their peripheric nerves have undergone some pathological change.

The first thing to endeavor to do is to try and remove the cause of the irritation of the nerve; if this is due to the presence of a tumor, extravasation of blood or serum, cicatricial tissue or dislocation of an articulation we endeavor to remove the exciting cause or lessen the inflammatory or purulent conditions in the neighborhood of the nerve. If a rheumatoid cause is suspected, administer salicylic acid, salol, aspirin, or antipyrin. Massage may also be used combined with a certain amount of well regulated exercise. The electric current may be employed, the negative electrode being applied as near the root of the nerves as possible, and the positive pole is moved along the branches of the nerve and the affected muscles.

Polyneuritis Infectiosa.—Under this name Sellman describes a case of an adult terrier which is similar to primary multiple neuritis in man. The posterior extremities of the animal were completely paralyzed, and their temperature was slightly lower than the rest of the body, the spinal reflexes were gone, with slight opisthotonos, and hyperesthesia in various parts of the body, the heart being weak. As the disease advanced, a herpes eruption appeared, and nodules appeared along the course of the following nerves: tibialis, ischiadicus, peroneus and cruralis. The animal was given warm baths, later cold showers and massage, and gradually the symptoms disappeared and in three months the dog had entirely recovered.

Facial Twitchings. Facial Spasms.—Muscular twitchings occur in the region of the facialis, as a sequence to distemper and also in chorea; and occasionally they occur in meningitis and certain forms of encephalitis; one case described by Cadiot, Gilbert and Rogers was named "Tic de la face," where the twitching followed distemper, and was cured by the removal of the bulbus (original nuclei) of the facialis. There is no relationship between facial twitchings of the dog and the "tic convulsiva" of man.

Epilepsy.

(*Falling Sickness.*)

Epilepsy is a disease of the brain, which is not rare in the dog. It is chronic in its course, and appears to be hereditary. Its chief symptoms are irregular attacks of unconsciousness and in older cases accompanied by acute characteristic muscular convulsions. True idiopathic epilepsy, generally incurable, is frequently confounded with the so-called symptomatical epilepsy, that is the epileptiform convulsions which appear as a symptom of grave pathological conditions of the brain, or some other change in the skull such as reflex irritation of the peripheral nerves.

Etiology and Pathological Anatomy.—The causes of epilepsy are unknown, but at the same time there is no doubt that certain diseases of the brain and its membranes, especially chronic diseases, have recently been demonstrated by Otto to be hereditary. This disease may appear at any time during life, and even in advanced age; great excitement and fear seem to play some part in its development. Wasting diseases very frequently cause epileptiform seizures which are similar to true epilepsy, and we may also observe in some cases a reflex epilepsy which does not resemble true epilepsy in any way except in some general symptoms. These will happen after traumatic lesions of the peripheral nerves, in animals harboring intestinal parasites, and in animals having poisonous substances in the intestines. We may also observe epileptiform convulsions in distemper.

In true epilepsy there are no anatomical alterations to be found in the brain itself. Whenever they are found they cause epileptiform convulsions. It is therefore certain that in a case of epilepsy it is only due to some temporary irritating condition, and that the membranes of the brain are the starting-point of the irritation.

The experiments which have been made upon dogs in connection with this disease by Ferrier, Eulenberg, Landois, and others, are very interesting. They found that with great irritation of the motor regions of the large brain (the cerebrum) a complete attack could be produced. This begins with twitching of the muscles which belong to that centre. It then becomes extended over the corresponding group of muscles on the other side, producing shocks and twitching of the whole muscular system of the body from tonic and, later, clonic convulsions. The convulsions extend from centre to centre, and they never miss any region, but run consecutively from one to the other. If the chief centre is cut out, the convulsions will not be present in that region during the epileptiform attacks. Irritation of the subcortical white substance of the brain also causes epilepsy. This begins, however, in the muscles of the same side. Bromide of soduim administered for some time has been found very valuable in preventing epilepsy caused by membranous irritation.

From the above experiments it can be readily understood that the cortex of the cerebrum is the original centre of epileptic attacks. It is hard to explain, however, the actual cause of this irritation. Epilepsy can hardly be caused by overstimulation or feeding, for, as a rule, the largest number of true epileptic subjects are weak, delicate, and anæmic; but at the same time we often see vigorous, well-fed dogs of all ages suffering from this disease. There are many cases in anæmic animals which, under treatment, gradually improve, at the same time the epileptiform attacks becoming less and less as the animal improves. It is doubtful if these cases can be called true epilepsy.

Clinical Symptoms and Course of the Disease.—In acute attacks of epilepsy the symptoms begin suddenly, or they may start with slight premonitory symptoms, or we may see both forms alternately in different seasons in the same individual. In the early stages the animals run in a circle, are restless, have a staring look out of their eyes, or remain standing with outstretched legs and shake their heads from side to side. We have seen clonic convulsions followed by loss of consciousness, and in some cases a rapid change into tonic convulsions. The muscles of mastication are especially affected, the jaws are clamped, the saliva turned to froth, the tongue may be bitten, and the blood turns the saliva red. Single muscle contractions follow one another with astonishing rapidity, so that the saliva which lies in the mouth is turned into foam. The convulsions which are now tonic extend over the whole muscular system. The

body and neck are drawn backward or sideways; there is twitching of the ears, the legs are stretched; the respirations seem to cease. This tonic form of convulsion lasts but a short time. A few seconds after its appearance it has altered into clonic cramps of the muscles, especially noticed in the legs, which are frequently twitched, and the legs may move rapidly as if the animal was running. After a few minutes these twitchings stop; the animal lies on the ground for some time; it finally rises and recovers very quickly; some animals, however, are dazed and everything seems strange, they are afraid of their owner, or do not recognize him. They creep around and hide in dark corners, and after the attack has passed off they are greatly fatigued, frequently sleeping several hours at a time, and in rare instances show a tendency to bite. The pulse and temperature during an attack of this kind present no alteration of any consequence. The mucous membranes of the head are reddened and congested, sometimes cyanotic. This is noticed at the termination of an attack, and is probably due to the interruption of respiration, and the slight respiratory movements, and frequently an involuntary passing of fæces and urine is noted during these convulsions.

There are also certain forms in which the animal is restless, running from side to side, or having fainting spells (dropping on one side), slight muscular twitchings of the head or extremities, and occasionally, in mild attacks, a very slight twitching of the jaw, rolling or winking of the eyes. The duration of these attacks varies, as a rule not lasting very long, generally only a few minutes, although severe attacks have been known to last for five or six hours. Their frequency is very uncertain; some animals have had several attacks daily, while in others they have appeared at intervals of months. A peculiar feature of some cases of true epilepsy was the frequent attacks on the slightest excitement. In the interval between the attacks, the animal seems perfectly normal, and only in very rare instances are the animals subject to these attacks dull or stupid. This disease is rarely fatal but an animal may either injure itself during an attack or a very severe attack may cause death by suppression of respiration or paralysis of the heart. The differential diagnosis between this condition and a simple fit, or convulsion, is easily made on getting an exact history of the case.

In connection with this disease we must devote a few words to **epileptiform convulsions** in young animals. We very often see epilepsy in weak, debilitated animals which are backward or poorly fed, and which have rickets; they also occur as a consequence of reflex irritability during the course of catarrhal diseases of the digestive tract and of the nasal cavities. We also notice them after the absorption of large quantities of fermenting, indigestible food, in constipation, from the presence of pentastoma, and in cases of intestinal parasites, at the time of teething,

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in acute affections of the ear, or parasites of that organ, and also as a conse-
quence of great physical excitement. We often see spontaneous convul-
sions; these are very similar to epilepsy, and are probably of reflex origin.
In some of these cases we may have to deal with true epilepsy, but, as a
rule, they may be ascribed to an undeveloped form of distemper, or to
some poisons, or uræmia. In some cases it may be due to some brain
affection, such as congestion of the membranes. It cannot be denied,
however, that there are a great number of convulsive attacks for which
the cause remains obscure.

We may therefore conclude that we can only obtain an approxima-
tive insight into these convulsions by the symptoms which are presented.
Frequent occurrence of eclamptic attacks with a short interval between
must be considered as a very serious symptom.

Therapeutics.—No agent seems to have any decided effect upon
epilepsy. The writer has tried a number of remedies, one after another,
without result. Bromide of sodium seems to be the best (this is prefer-
able to bromide of potassium, as it has no detrimental effect upon the
appetite), provided it is given in substantial doses and kept up for months.
With this drug it is always possible to prolong the interval between
attacks; they are also shortened and relatively less serious. Sometimes
bromide of potash, soda, and ammonia are administered together in the
proportion of 2–2–1 and seem to have a more desirable effect. Other
agents such as oxide of zinc, arsenic, nitrate of silver, belladonna, hyoscya-
mus, valerian, bromohydrate, cold water, and electricity are now rarely
used.

The therapeutic treatment during the convulsions consists in the use
of applications of cold water to the head; prevent the animal from injuring
itself. If one attack follows closely after another, use inhalations of
chloroform, or clysters of chloral hydrate; and give internally large doses
of bromide of sodium, morphia, or similiar sedative agents, and endeavor
to keep the animal as quiet as possible after the attack.

> R.   Bromide of sodium,   15.0
>   Aqua,   150.0
> S.—One tablespoonful three times daily.

In epileptiform convulsions in young animals we endeavor to remove
the cause and administer the salts of bromine, chloral hydrate, sulphonal
(0.5 to 4.0), hedonal (1.0 to 4.0), hypnon (0.5 to 2.0), veronal (0.5 to 1.5).

> R.   Chloral hydrate,   5.0
>   Mucilage acacia,
>   Syr. aurenti cort., āā,   20.0
>   Aqua distillata,   100.0
>   F. M.
> Sig.—A tablespoonful every two hours.

R.   Hedonal,   12.0
F. M. capsule et divid. No. 12.
Sig.—One daily.

Chorea.

(*St. Vitus's Dance.*)

Etiology.—Chorea we no longer consider an independent disease, but the result of a number of complications which should really be classed under other heads; for instance, in young dogs that are insufficiently fed, or from obscure cerebral diseases. It is also seen in myelitis, and some cases of symptomatic chorea, but in the majority of cases it must be attributed to some pathological change as a result of distemper.

In true chorea of man we do not see any pathological alterations of the brain, and in the few cases which the writer had to consider as true chorea on account of the anæmia, absence of any symptoms of distemper, or other diseases of the brain and spine. The toxic effect of bacteria present in the intestines has been advanced as a possible cause by some, but there is little probability that the convulsions were restricted to certain special muscular groups, and not, as in human chorea, to irregular regions—that is to say, in the various muscular centres of the body. In some of these cases the animals were destroyed, and their post-mortems gave an entirely negative result, there being no apparent pathological change in the central nervous system. As a rule, the affected animals are in an anæmic condition and show all the effects of bad nutrition. and, after some observation, we are convinced that with improvement in the general system the choreic symptoms become very much lessened. Joest in the Zeitschrift für Tiermedizin, 1904, gives a detailed account of the disease.

Clinical Symptoms and Course.—We define this disease as a persistent clonic convulsion of some muscular group in certain parts of the body. For instance, we see shaking of the head, twitching movements with one or two legs, regular, and also an automatic opening and closing of the mouth, irregular movements of the tongue, and an undulating action or movement of the whole body. If the patients are left to themselves, the twitching action is generally less marked, and under physical excitement becomes much more aggravated; and are also increased when eating, and during catarrhal conditions of the air-passages, or the intestines, stomach, etc. The clonic movements lessen during sleep and under the influence of ether, chloroform, and bromo-ether, but morphia and chloral have little or no influence upon them. The course of this disease is slow, and may extend for months and years; but, as a rule, the symptoms lessen

and in very rare instances may disappear entirely. A fatal termination is only to be feared when complications arise.

Therapeutics.—The author has tried all the various agents recommended in this disease, but without any decided results. Arsenic, either in the form of Donovan's or Fowler's solution, or alternated with some preparation of iron, has given the best results. Schimmel recommends cacodylate, but these drugs must be given for some time, and it is only after prolonged administration of salines that any favorable result is observed. The writer thinks that more benefit is derived from quiet and nutritive diet, particularly meat, than anything else.

Antipyrine, which is used in man, is of not much service in the dog. Electricity in one case produced decided lessening of the symptoms after regular application of slight galvanic stimulation of the head and along the vertebral column.

Eclampsia.

Eclampsia, which is not a very good definition, is a tonic-clonic convulsive spasm which is observed in bitches, and, as a rule, during the attacks the animal is perfectly conscious.

Etiology.—The causes of this disease are very little known. According to Hertwig it may be caused by cold, stagnation of the milk in the udder, taking away the young too soon, and sometimes by worry. In two-thirds of the cases of true eclampsia all the young are still with the mother, and invariably we find the animals attacked to be excellent mothers, and the litters are generally strong, and healthy, and lay on flesh very quickly while the mother loses it. The onset of the disease is generally seen at the end of the second or third week, but the animal may be dull and not right for several days before the acute symptoms show themselves. In some cases observed, the disease developed after either one or more pups had been taken away from the mother. In the onset of the disease the mammary glands contain much milk, and the bitches most frequently attacked are small, delicate (house dogs and pet animals), and, as a rule, have a light coat. Friedberger and Frohner are of the opinion that the disease may originate from anæmia of the spinal cord or, in a reflex way, from the mammary glands and uterus, as they found anæmia of the papilla of the nerve by making an examination of the retina with the ophthalmoscope. Hutyra and Marek state it may also be produced by the direct action of toxines on the sexual organism or on the motor cells of the anterior horns of the spinal cord, and other observers think that there is a similarity between this condition and puerperal fever of the cow. With this last theory the writer is inclined to agree. According to the statements of several authors, severe anatomical disturbances

of the brain may be caused directly from the mammary glands. Fried-berger has observed two bitches that had eclampsia without having puppies.

Clinical Symptoms.—The disease may appear in from forty-eight hours to thirty days after whelping; very rarely later than this time; in the majority of cases appearing at or about four weeks. In one case of Friedberger's fifty days elapsed. It comes on suddenly without any marked symptoms. The animals become restless and anxious; they have a staring expression of the eye, short, rapid respiration, reddened mucous membranes; they show no pain on pressure on the walls of the chest, neck, or abdomen. After a short time (about a quarter of an hour after the appearance of increased respiration) they become paralyzed, are no longer able to stand on their feet, and remain for some time with their legs stretched from them. A slight increase of temperature has been observed in several instances at the onset of the disease. The dog lies on her side with her legs firm and tense; the muscles of the body hard and quivering to the touch; the joints are stiff and hard to bend; and at intervals we see clonic convulsions of all the muscles, especially those of the extremities, and the respiratory muscles are especially involved. The respirations become more rapid as a consequence of this, and finally the mouth is opened and the tongue protrudes, while the animal breathes with great difficulty. The pulse is small, firm, and sometimes irregular, and always quick; the eyes are staring and protruded, and there is an anxious look in the face. All the visible mucous membranes are cyanosed. The saliva which accumulates in the mouth is either swallowed convulsively at certain intervals, or, as is generally the case, it dribbles out of the corners of the mouth. As a rule, consciousness is not disturbed. The pupils are normal in size; reflex action is present. The animal seems to notice external objects or impressions, such as calling the patient, or noticing one it knows coming into the room. The appetite is lost; the normal discharges are entirely suppressed; although the urine and fæces may be involuntarily voided during the attack; the urine, after such an attack, gives an albuminous reaction. The attack may last for twenty-four hours, but generally varies a little in intensity. If the attack is very acute, the animal falls into a deep comatose condition and dies in about forty-eight hours after the onset of the disease from apoplexy and paralysis, or the cases commence to recover, regain consciousness, and frequently make good recoveries.

Therapeutics.—Taken in time and treated energetically the animal invariably makes a good recovery. The first thing to do is to remove the puppies, and either feed them artificially or get a foster mother for them. Any of the narcotics can be used, and, as a rule, produce good results. Give morphia, 0.002 to 0. 005 gm. of the muriate, diluted with water.

As a rule, a few minutes after the hypodermatic is administered the animal becomes quiet and rests easily. Inhalations of chloroform, chloral hydrate, bromide of potassium, etc., are also recommended. Warm baths and friction produce relaxation of the tense muscles; the "cold pack" is also particularly useful; take a bed sheet or some such large piece of muslin, saturate it with cold water, wring it out thoroughly and wrap the animal up in it, enclosing the whole body, of course, letting the head free, allow the animal to lie in this for two or three hours. Valerianate of zinc in 05. gm. dose every two hours. Urethane 5 to 20.0. Hypnon 0.25.

Divers Diseases of the Nerves.

Diseases of the nerves in which there is no anatomical change.

Catalepsy.—Catalepsy, or "cataleptic rigidity," is a rare disease in which there is a peculiar rigidity of the muscles, and the animals may be placed in certain positions and remain perfectly rigid. Consciousness and sensitiveness seem to be suppressed entirely. Such an attack lasts for hours and recurs daily, this condition lasting for weeks. The rigidity may start in the muscles that are in action at the time the animal is seized with the attack, and rapidly extend to all the muscles of the body, until the animal remains fixed like a statue, and may finally die of starvation, being unable to eat or drink. In many cases they finally relapse and die in a short time, or they have been known to die in six or seven days, or the condition was followed by general muscular weakness, in which the muscular walls of the bladder and intestinal tract were also involved. There is invariably subnormal temperature and coma. If this is really a disease, or merely a symptom of some brain complication, the writer has not been able to positively determine.

Hertwig mentions as causes of catalepsy, cold, fright, overloading the stomach with indigestible food, and metastases in various diseases. Frohner considers this disease as a purely functional neurosis of the brain and spine; he could not find any definite alterations in the central organs, in catalepsy, but he found occasionally certain secondary alterations in the muscles; namely, hemorrhages, dark venous swellings, and fatty degeneration of the muscles, also degeneration of the fibres of the heart.

No practical therapeutic treatment is known. Sedatives such as bromide of potassium and morphine, electricity and cold douches, are used as a means of restoring the disturbed reflex irritabliity of the nervous system.

Psychosis.—It is a question whether psychological disturbances can occur in the dog which has not intellectual elements of the cerebrum possessed by man, but it is reasonably certain this question can be answered in the negative. It is evidently some disturbance in the sphere of the will. In one case of a dog ten years old, the muscles affected were the limbs and those of mastication. If the animal had a portion of food in his

mouth and an attack came on, he could not masticate it, but if it was small he would swallow it. The attack lasted about a minute and during that time the animal kept his eyes half closed, and the pupils remained normal, as was sensation and consciousness. The attack could be produced if the animal was struck on the lumbar region. Gradually the attacks became more frequent, until the animal lost power of the limbs, became emaciated and was finally destroyed. Careful microscopical examination of the cerebrum failed to find any change from normal.

Convulsions of the Diaphragm, Convulsive Hiccough.—A convulsion of the diaphragm, similar to hiccough in man, may be caused by a central or peripheral irritation of the phrenic nerve, or by reflex irritation from the digestive tract. It is rarely seen in the dog; in one case the animal had catarrh of the stomach, and the contractions of the diaphragm were the same in number as the heart beats, certain muscles of the head, neck, and extremities were also affected. The treatment consisted in the subcutaneous administration 0.01 of morphia, if the convulsion continues over any length of time, but as a rule, the attack lasts only from fifteen to thirty minutes.

Basedow's Disease.—A disease similar to that found in man, has been observed several times in the dog. The three following symptoms are characteristic: Exopthalmus (staring or bull's eye), tachycardia (palpitation and acceleration of the pulse) and struma (enlargement of the thyroid gland, with an altered secretion of that organ). It must be regarded as a general neurosis. In an animal not quite a year old, the eyes protruded from the orbit, movement of the eyelid (lowering and elevation) was absent; the patient was restless, moving from place to place, the pulsations were 130 and the respirations 30 to 35. The pulsations of the heart could be easily felt through the thorax. The appetite was irregular. The animal had quite a large. goitre. After being treated eight days the animal was destroyed. The brain was anæmic and the thyroid gland was greatly increased in volume and there were three secondary glands, and the right ventricle of the heart was greatly dilated.

Treatment of this disease, which is generally chronic, consists in rest, the animal must be kept away from any excitement given food of a nourishing and substantial kind, and must be easily digestible. Administer iodide of potassium, bromide of potassium or iodide of sodium. In one case in an old pug dog, the animal made a good recovery after four months treatment. Iodine in the form of tincture of iodine by inunction, has given good results in some cases. Iron preparations, Fowler's solution, thryoid serum or rodagen, both prepaired in animals that have had the cultivated serums of the thyroid gland, injected intravenously. If this method of treatment does not produce results either remove the enlarged thyroid (struma) or ligate the thyroid arteries.

Cachexia Strumipriva.—When the thyroid gland is removed, there appear certain pathological phenomena that are the opposite to Basedow's disease. In two or three days after removal of the gland, sometimes a later period, the extremities become stiff, clonic muscular twitching and convulsive movements of the muscles of mastication are seen with trembling, dyspnœa, acceleration of the heart, stupor, albumen in the urine, emaciation and death in about a month. In cases where only one-half of the gland was removed, there is no systemic disturbance, and the same occurs if there should be secondary thyroid glands which perform the functions of the extirpated gland. It is possible to prevent a fatal termination by injecting the animal with thyroid preparations, or administering the preparation internally.

Bronchocele, Hypertrophy of the Thyroid Gland, Goitre, Struma.

As Morbus basedowii and Cachexia strumipriva belong to the group of true diseases of the nerves, and Goitre has so many characteristics in common with these diseases, it will be classed with them. Goitre is a chronic hypertrophy of the thyroid gland. It may either be a simple hyperplasia of the gland (struma simplex, struma parenchymatosa, struma follicularis) or it may be more or less of a cystoid degeneration with the formation of cavernous cysts, filled with gelatinous contents (struma cystica) or it may be of a fibrous character, united by connective tissue (struma fibrosa), or an enlargement of the veins (struma vasculosa, struma varicosa) or finally we may have a carcinomatous or even sarcomatous degeneration of the gland (struma maligna). One observer found ossification of the gland (struma ossea). In young dogs when the first named condition, simple hyperplasia, is found to be soft, it is termed struma mollis, and it is said to be congenital, while in older dogs we more frequently find the hard fibrous goitre and the struma carcinomata. In Switzerland 30 to 40 per cent. of all dogs over middle age are affected with goitre, and generally of the cancerous type. Goitrous degeneration generally involves the whole gland, but in fibrous or the malignant types we frequently find only one-half is affected, or may be unequally distributed over both halves of the gland. Malignant forms frequently involve not only the gland but also the surrounding tissues, affecting the lungs, called struma aberrans. In two such cases, the enlargement was in the mediastinum in one, and in the other, in the middle third of the neck. These growths which originated from the secondary thyroid were cancerous in structure.

Etiology and Clinical Symptoms.—The true cause or origin of goitre has not as yet been defined: In man, horses and cattle, it is supposed to be due to the effect of mountains and the absence of sun in deep valleys, or to the soil (rich in calcium and magnesia, and the absence of the iodides), but in the dog this cause can hardly be said to hold good, as in canines, it

occurs in all countries and conditions, and appears where goitre in other species is extremely rare. One observer is inclined to think it is caused by the straining of a collar in harness, or to any active exercise; chronic heart disease seems to have some bearing on the disease, but why, has not up to the present time been definitely stated. Without a doubt, heredity is a predisposing cause (struma congenita). Young animals have proportionately a very large thyroid and it becomes reduced gradually as the animal grows older, but occasionally the opposite occurs, and instead of growing less it gradually increases.

Goitre is very easily recognized, directly below the larynx on both sides of the trachea. It is painless, there is no local increase in tempera-
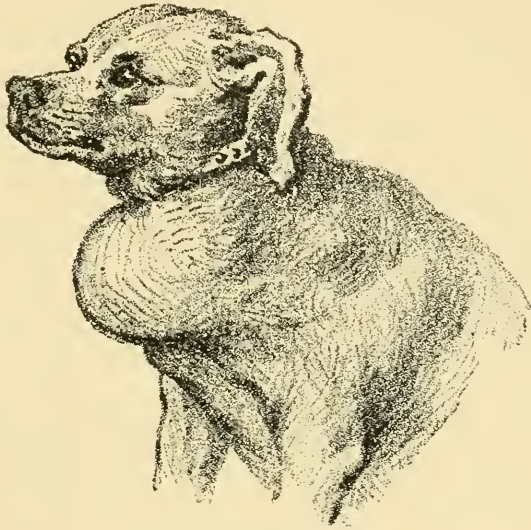
Fig. 98.—Malignant struma.

ture, it may be hard or soft, sometimes irregular, sometimes as large as a closed fist, and in extremely large ones from its weight it hangs down from the throat. If the goitre is very large it may interfere to a certain extent with deglutition. In cystic goitre the cysts can be easily distinguished on manipulation. The malignant forms are frequently uneven, irregular and nodulated, and vary in consistence (Fig. 98).

Treatment.—It is either medicinal or operative. Medicinal treatment is only useful in the parenchymatous or cystic goitre, the latter only when it is not too far advanced and consists in the administration of iodine either internally in the form of iodide of potassium, or iodide of sodium in moderate doses, (0.1), or friction externally, iodine or iodide of potassium ointment, oleates of iodine, or Lugol's solution of iodine. In

one case a 10 per cent. solution of papayotin (vegetable pepsin) was injected into the tumor and in forty-eight hours the digested parenchyma of the gland was aspirated in the form of a milk-like liquid. The interparenchymatous injection of Lugol's solution of iodine are rather dangerous, but the writer has found a solution of iodoform 1.0 in ether and olive oil 7.0 much better.

Recently, preparations have been made from the thyroid gland of cows, thyroidin tablets (Merck), thyradin tablets (Knoll); these tablets are prepared commercially, each tablet contains 0.3 of normal thyroid gland, and we give 1 to 3 tablets daily. In weak animals at first give the smallest dose and carefully watch the animal. In the administration of too large doses you may have all the symptoms of Basedow's disease. Frequently, when the treatment is continued for some time and with favorable results, if the treatment is stopped, immediately the gland commences to enlarge again.

When medicinal treatment has no results, or the struma is malignant, surgical treatment is necessary. In cystic goitre that is well developed, it can be opened, drained and filled with iodoform gauze. The malignant and fibrous goitre must be removed, but it must always be remembered that entire removal of the gland generally causes death in a short time (see Cachexia strumipriva). Only one-half of the gland must be removed, and in a case of bilateral, the one that is affected the more, as it is a question if iodothyrin or any of the thyroid preparations will arrest cachexia strumipriva, if it follows removal of the gland. On account of great vessels, recurrent nerve etc., in the neighborhood of goitre, the operation must be classed as one of the most dangerous operations in the dog.

Inflammation of the Thyroid Gland. Thyroiditis, Struma Acute.—This condition is extremely rare, and is generally of traumatic origin (bites, gunshot wounds, etc.). It forms large quantities of pus. This condition must not be confounded with those enlargements of the thyroid that occur in young dogs and are the result of catarrh of the larynx and pharynx. The periodical swelling of the thyroid that is seen in very young dogs, that swells and in a few days returns to normal size, is not in any way related to thyroiditis. The treatment of inflammation of the thyroid gland is to treat it as a surgical wound.

DISEASES OF TRUE INFECTION.

Distemper and Contagious Catarrhal Fever.

The definition of the word "distemper" describes a disease which is peculiar to the canine race, and it is caused by a specific poison which finds its way into the system, as a rule, through the lungs and air-passages. It generally attacks young animals and runs its course as a catarrhal fever, affecting all the mucous membranes of the body, and is almost invariably accompanied with certain nervous symptoms, and pustular skin eruptions.

Etiology.—Distemper is a disease which is contagious in the highest degree, and is only communicated by infection. It does not seem to have been recognized or described by the ancients or the writers of the middle ages. An animal affected with distemper can remain but a short time in any locality and affect every animal there, or it may be transmitted from a person or object that has been in contact with an affected animal. As a rule, few young animals escape distemper, generally contracting it before they are a year old, and dogs over that age very rarely take the disease. That, however, may be accounted for from the fact that dogs having arrived at that age have either come in contact with the disease previous to that and they have had it in a mild form, or the system was in such a condition, that they did not contract it. The disease affects animals but once during life, although a few exceptions are presented where animals have contracted it a second time. As a rule, delicate, weak, poorly-fed animals (vegetable diet), or animals which have been affected by some catarrhal disorder of the respiratory mucous membranes, contract the disease in its acute form; while, on the other hand, dogs which have lots of exercise, especially animals in the country or small cities, are mildly affected with the disease, and the rate of mortality is much less.

Distemper exists in all countries of the world. In the large cities it is found at any season of the year, while in the country it is generally more prevalent during the warm weather. The specific poison of distemper is not definitely known. It is undoubtedly a fixed and volatile virus* which enters the system by the mouth and nose, and it exerts its first

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* By a " fixed and volatile virus " we understand a fixed virus that when secreted in the lungs, is carried out in fine division, in the particles of moisture in the expired air, and easily held in suspension in an atmosphere that contains a slight quantity of humidity.

influence on the respiratory passages. Vaccination of young animals by means of the mucous secretions from animals affected with the disease has been tried, and, as a rule, reproduces the disease.

Semmer believes that he has definitely defined the contagious germ in the blood, and also found it in the lungs, liver, and spleen, in the form of small, dagger-shaped microbes, which he calls the "bacilli of distemper." Rabe has found in the secretion of the nose and connective tissue, also in the blood, small cocci, which accumulate in heaps, or were connected together in small groups of three or four in a line, or they may hang together like a string of beads. These he considers the specific contagious matter of distemper; but Friedberger does not agree with this theory. Mathis found in the contents of the pustule a diplococcus which could be colored with fuchsin. He used bouillon cultures of this diplococcus for the inoculation of ten dogs. These dogs were affected by symptoms which resembled very closely those of distemper. Marcone and Meloni found a micrococcus in a dog which was affected by distemper, and considered that this was the true pathogenic agent, as it produced the skin eruptions, broncho-pneumonia, and gastro-enteritis in dogs which had been inoculated with pure cultures. Legrain and Jaquet obtained pure cultures of micrococci, when held in certain media, from fluid obtained from the pustules in the exanthema of distemper. These were gathered together in the form of diplococci and chains. In dogs vaccinated with these cultures only the skin eruption, with the development of pustules, was seen, but the subjects so treated seemed to enjoy immunity from the disease. Millais made cultures from the nasal excretion of the dogs affected by distemper upon gelatinous media, of two different bacilli, which mixed together, on inoculation, produced distemper. Galli-Valerio has isolated ovoid bacilli, 1.25–2.5μ. in length, which grows freely in gelatin. These he found in abundance in the lungs and central nervous system, but did not find them in the blood. The inoculation of the cultivations produced characteristic distemper in puppies, but did not give the same results in adult dogs. Jensen is of the opinion that the pneumonia of distemper is caused by a streptococcus, but he has found in the bronchial mucous membranes other bacteria, particularly the bacterium coli. Babes and Bazanesco, in two cases isolated from the lung, liver and blood, found a very fine short motile bacillus, about 0.3 to 0.4μ. long. Nine young dogs were inoculated and seven died in from ten to eighteen days of typical distemper, and the various organs contained the bacilli inoculated. Zelinski, Neucki, and Karapinski, maintain they are positive distemper is communicable to man, and give as the mediary cause a microorganism similar to the white staphylococcus of Resenbach, but differing from the same in its bio-chemical properties. Taty and Jacquine have found in the spine and cord of a dog that died

of nervous distemper a peculiar diplococcus to which they ascribe import-
ant pathogenic action. Jess cultivated a bacillus, found in the conjunc-
tival, nasal and other mucous membranes and organs of the body, which
was 1.3μ. long and 0.6μ. wide. Injections of the culture were made both
intraperitoneally and subcutaneously; three or four days afterwards a
fever appeared which was accompanied by great flow of tears, and diar-
rhœa, and in the vicinity of the inoculated spot there appeared isolated
red spots. Petropawloski found, in all cases of distemper, a bacillus which
resembled that described by Galli-Valeris, and also that described by
Babes and Barzanesco but differed from the first by its negative action to
Gram's coloring method and, from the latter by its easy cultivation on
potato. Mari thinks that the baccilli of Petropowlowsky as well as those
of Schantyro are in all probability coli-bacilli and really not related in any
way etiologically to the baccilli of distemper. Casol claims to have
found a micrococcus, which is both isolated and in groups, and claims it is
colored by Gram's method. From these he made pure cultivations and
transmitted it successfully. Lignieres places distemper among the
hemorrhagic septicæmias and calls it Pasteurellosis canum, and is due to
a particularly virulent bi-polar bacillus (Pasteurella canis). Trasbot, on
the other hand, thinks that the microorganism cultivated by Lignieres is a
pneumo-inciter and only produces the secondary phenomena in the disease
and is not the original cause of the development of the disease. Wunsch-
heim has isolated a short rod, very similar to the bacteria of chicken
cholera. Piorkowski found in the spleen and lung a small staff bacillus, the
cultivations of which when inoculated, developed the disease and death
in two or three weeks. Ceramicola cultivated an ovoid polymorphus
taken from dogs which had died, particularly of virulent distemper, and
the bacteria possessed all the morphological properties of the inciter of
hemorrhagic septicæmia, and the animal inoculated died with all the
characteristics of true distemper. Carre is of the opinion that none of
the organisms visible to the microscope can be considered the exciters of
distemper in the dog; he took nasal mucus from an infected dog, passed
it through a filter, the filtrate when spread on different nutritive media
remained sterile, and the defibrinated blood of an animal inoculated with
the filtrate produced fever of the nostril and pustules. This blood was
also spread on various nutritive media and also remained sterile. Cadiot
and Breton and others are of the opinion that in distemper there is an
ultra-microscopical organism which can be filtered, and with this microbe
there is also a microorganism which may have some influence on the course
of the disease (fœtid bacillus and Pasteurella canis).

Direct vaccinating methods have been practised by various practi-
tioners. For instance, Trasbot transferred secretions from the nose and
pustules of animals affected with the disease, by means of a number of

small incisions in the abdominal wall of healthy young animals. The disease appeared after eight days.

Krajewski vaccinated numerous young animals with secretions of the nose and pustules, these inoculations being on the mucous membrane of the nose, and under the skin, and arrived at the following conclusions:

1. The contagious germ of distemper is confined to the secretion of the nose and eyes, and the blood.

2. The germ does not lose its virulent properties in any degree when dried at a normal temperature, or frozen at 18° to 20° of cold. However, its virulence becomes attenuated when kept for any length of time in a dry place.

3. The disease, when it is produced by vaccinating, runs a very mild course, and kills, as a rule, from 10 to 15 per cent. while the ordinary disease kills from 32 to 70 per cent. Laosson has obtained the same results after vaccinating ninety-eight animals, and found also that the contents of these pustules are generally inactive, and that the nasal secretion loses its virulence after eight days. Friedberger's observations are diametrically opposite, for he contends that he has caused infection by means of the contents of the pustules. He also recognized in cases where the disease originated from vaccination that there was a short intervening stage of incubation and, as a rule, was much less in intensity, ran a very rapid course, and that the groups of pustules were confined to the region of vaccination.

Schantyr has lately published certain observations concerning the microbes of distemper. He agrees with Pütz that distemper of the dog resembles distemper in horses to a remarkable degree, and his theory of the subject is that distemper may be classified into three diseases, according to the presence of three microorganisms of different characters. These diseases are: Abdominal typhus, true distemper of the dog, and canine typhoid. Their clinical as well as their pathological symptoms have a great similarity with one another, and it is only with a careful microscopical examination that the specific microorganisms can be separated. The bacilli of typhoid (small, slender bacilli, which are almost exactly like the typhoid bacilli in man) are generally found separate in the blood, while the bacilli of distemper (small, and somewhat curved) and the bacilli of typhoid (typhoid are very small and slender) are generally arranged in groups. The bacilli of typhus are hard to color with fuchsin, and become colorless with Gram's test. This is not the case with distemper and the bacillus of typhoid. Typhus and typhoid bacilli give characteristic cultures upon agar, gelatin, and potato, while the bacillus of distemper is extremely hard to cultivate under any circumstances. Megnin divides distemper into two groups. Cadiot and

Breton describe another contagious broncho-pneumonia, but present no pustular rash, probably being infectious bronchial catarrh.

Clinical Symptoms and Course.—The stage of incubation of distemper is generally from four to seven days. In rare cases it may linger, for eight to twelve days, after contact with the diseased animal, and Krajewski states that cases of infection through cohabitation may sometimes take from two to two and a half weeks to develop. The first actual symptom is an increase of temperature. In the initial stage it rises to 40°, and in some cases 41° and over. An increase in temperature has been observed by the writer in all cases of distemper, when the examination was made early in the disease. Later on the temperature falls slightly, but in some cases very rapidly, and it may even go below the normal point, according to the individuality of the anmial, and to the intensity of the attack. Very mild cases have little or no elevation of temperature, but as a rule there is a regular increase and decrease of temperature, as the disease runs its course. In fatal cases toward the end the temperature is invariably subnormal. In cases developed by inoculation we occasionally find a marked increase in temperature. The next symptom is the disturbance of the general condition. The animal is depressed, restless, has little or no appetite, seeks the heat, becomes easily fatigued, is chilly and shivering, the nose is hot and dry, the skin is inelastic, and the hair becomes harsh and dry, the animal refuses to play or to go out for a walk, lies most of the time and gets into dark places. In some instances vomiting occurs, but can hardly be called a characteristic, initital symptom of the disease. This stage of the disease is short, from 24 to 48 hours; the symptoms increase rapidly, and develop the four characteristic forms, which are as follows:

1. Catarrhal distemper (eyes and nose and lungs), muco-purulent discharge of the nose and eyes, cough, which is very persistent and may be so severe as to cause great depression or vomiting, more or less increase of respiration, which in some cases may be labored.

2. Gastric distemper (intestinal distemper), coated tongue, loss of appetite, thirst, vomiting mucous in thick tenacious masses, diarrhœa, yellow in color and fæces that are muco-purulent, and may even contain blood.

3. Nervous distemper (irritation of the brain and spinal cord). Fear, uneasiness, great irritability, dulness or sleepiness, twitching of the muscles of mastication, or epileptiform convulsions, chorea and complete paralysis.

4. Exanthematical distemper (distemper pustula, dog pox), pustules on the abdomen and internal surface of thigh.

The following phenomena of distemper may appear during the course of the disease:

1. **Symptoms on the External Membranes.**—These appear in the majority of cases and are of great importance in diagnosis. We see a number of small red spots upon the inner fascia of the thighs, the abdomen and, in rare instances, the mouth and eyes, on the internal surface of the ear flap or even on the vestibule, and still more rarely covering the entire body. They are generally scattered, very rarely confluent. They rapidly form small bladder-like blisters filled with serum, and later on this serum changes to pus. They are about the size of a lentil or small bean, and soon dry up, forming yellowish scabs and crusts. When the eruption is very extensive, the animal gives off a very unpleasant odor from the affected parts. These pustules are rarely itchy, and if so, it is only to a very slight degree. After these scabs fall off (generally in about one week), they leave a red circular spot on the skin which disappears slowly. In other cases we find more or less depth to the cicatrix, leaving pit-like ulcerations. They are probably due to the animal scratching or gnawing the sore. In rare cases the rash has appeared on the lips, extended over on the mucous membrane and caused extensive ulcerative processes of the mouth or it may spread all over the body and in occasional cases it is found in the prepuce causing purulent catarrh of that organ. This is the only skin eruption that characterizes this disease and it dries up very quickly, so that in from eight to fourteen days we see no other marks except those light, granulating spots (exanthema of distemper, distemper pox). Hertwig and Friedberger have observed some cases in which this eruption made its appearance without any other symptom of distemper.

2. **Symptoms Indicated by the Eyes.**—There is generally more or less purulent catarrhal conjunctivitis. The animal avoids the light. There is redness and swelling of the conjunctiva. In the early stages the secretion is serous and very fluid. Later on it becomes a muco-purulent secretion, either light gray or yellowish in color. This sometimes occurs in large masses (blennorrhœa of the eyes). This fluid collects in the corner of the lower eyelid or trickles down over the face, drying in yellowish crusts in the edges and borders of the eyelids, frequently gluing them together. The corrosive action of these secretions, and also the inflammation of the surrounding membranes, may cause lesions of the cornea, sometimes from the animal scratching and rubbing the eye, especially in animals with prominent eyes (such as pugs and King Charles spaniels). In some cases it may be due to deficient nutrition of the cornea. This ulceration starts with a slight swelling on the external surface of the cornea and the subsequent formation of an ulceration. (Other details will be found in the chapter on Diseases of the Eye).

We see cases where there is a deep pericorneal injection of the cornea, (keratitis parenchymatosa), in which a blue grey, blue white, or milky white opacity commences at the outside edge of the cornea and spreads over its en-

tire surface. It may affect one or both eyes at the same time, and the opacity may disappear leaving no trace or it may go away slowly and in rare cases leave permanent white star-like spots on the surface of the cornea. In rare cases keratitis parenchymatosa and some fever may be the only symptoms observed during the course of the disease The ulcerations are apt to appear in the middle or most prominent part of the cornea, and penetrate into the corneal tissue, and the pit-like depression on the cornea may become vascular, and it may also perforate the cornea, evacuate the contents of the anterior chamber, cause prolapse of the iris, and formation of staphyloma. Loss of the eye, by purulent panophthalmitis, is very rare, the eye clearing up and leaving more or less pigmentation of the cornea. Diseases of the interior of the eye, by extension of the inflammation of the cornea, are very rare in distemper. This may be complicated with a permanent opacity of the sclerotic membrane, and in rare cases the whole eye becomes acutely inflamed and breaks down (see Diseases of the Eye).

3. **Symptoms of the Respiratory Apparatus.**—These are generally a catarrhal inflammation of the mucous membranes of the upper air passages, and, if the disease is acute, the finer sections of the bronchi become inflamed. The first symptom is a catarrh of the nose, which is marked by sneezing and the animal rubbing or wiping his nose with his front paws. This discharge increases. In the early stages it is simply serous; later it becomes mucous, grayish-white or grayish-yellow, sometimes bloody, and in some cases even purulent, with more or less odor. We also see a "sniffling" respiration. This is particularly noticeable in short-headed dogs (such as pugs or bulldogs). In all cases there is catarrh of the larynx, and bronchioles. Catarrh of the larynx is generally marked by a loud, hoarse, dry cough, which is particularly distressing to the animal, especially at night. As the disease advances it becomes moist and looser, and is easily produced by a slight pressure on the larynx. Where there is simple laryngitis, we do not generally see any visible increase or difficulty in respiration. This is changed, however, as soon as the large bronchial tubes become involved. In such cases we see a marked increase in respiration, which gradually becomes more intense as the inflammatory process goes downward into the finer bronchi. Any pressure on the sides or tapping upon the walls of the chest causes a very distinct, painful, distressing cough. On auscultation we hear an increased vesicular breathing, as well as dry and moist rattling bruits, which are of various forms and intensity.

If the inflammatory process has extended to the fine bronchi it is not rare to see the formation of lobular pneumonic centres—that is to say, catarrhal pneumonia. Difficulty in respiration now appears more pronounced; respiration is superficial but laborious, as is proved by the infla-

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tion of the cheeks. The number of respirations may increase from 60 to 80 or even more. The cough is very painful, dull, and weak; the pulse is greatly increased, and the temperature may increase to a marked degree, but it is remittent. On ausculting we hear in the lungs, snoring, groaning, and wheezing sounds and rattling bruits (these last are moist and numerous), also more or less blowing sounds in different regions. We notice an increased vesicular respiration with sharp, prolonged, expiratory bruits, of a mixed character. In the same region we may notice bronchial respiration. Percussion, as a rule, is not very instructive.

4. **Symptoms of the Digestive Tract.**—The chief of these is catarrh of the stomach, which may vary in intensity. There is entire loss of appetite, vomiting of a thin, frothy, turbid liquid which is shiny or muco-purulent. There are frequent discharges from the bowels of a thin, muco-purulent fluid, occasionally streaked with blood, and always accompanied by a painful tenesmus. We may also find the abdomen very painful on pressure, and, as a rule, contracted and tense. Yellow coloration of the visible mucous membranes (icterus) is occasionally observed.

5. **Symptoms of the Nervous System.**—The animal is very dull, especially its senses. There is a marked apathy and depression, and in some cases deep coma. In a great many cases this condition may be accompanied by periods of excitement, nervousness, great restlessness, and even true delirium. These periods, which might possibly be mistaken for rabies, are not of any great length, as a rule, the animal sooner or later showing signs of marked depression. Motor disturbances, such as twitching of various groups of muscles, mostly the head and extremities, are noticed, and, in some cases, convulsions or true eclamptic attacks. These follow one another at long intervals, or keep the animal irritated for days. Clonic convulsions of the maxillary muscles are very frequently seen. They consist of a rapid and regular twitching of the muscles of the lower jaw, sometimes confined only to chattering of the teeth, and occasionally sufficiently strong to make a foam of the saliva. Besides this, we may see symptoms of motor paralysis. The patients are unsteady and irregular in their actions. In some instances they drag their hind legs, or occasionally their posterior extremities lose their power and the animal is unable to stand; in rare instances, due to paralysis of the sympathetic, the bladder and the lower bowel lose the power of their sphincters and urine and fæces are evacuated involuntarily.

Other General Symptoms.—As has already been observed, the temperature may rise or fall, and follow an irregular course, and it is apt to be subnormal in the majority of fatal cases. When bronchitis increases in intensity and a catarrhal pneumonia develops, it is apt to be accompanied by considerable increase in temperature. In some cases, due to parenchymatous degeneration of the cardiac muscle, the pulse is small, thready

and irregular. The urine frequently contains more or less bile coloring matter, sometimes albumin and tube casts are found. In some cases the general nutrition and condition may keep up well all during the disease and in other cases the animal at the onset of the disease rapidly loses his vital force, even when it is eating a fair amount of nutriment, goes down in strength each day. Frequently the expired air has a particularly unpleasant penetrating odor.

The anatomical alterations of the nervous system, produced by this disease, which are shown in the section of the brain, are sometimes very slight, and it is rather remarkable to find such acute nervous symptoms with so little pathological alterations. The microscopical examination shows little change, or few alterations you might expect from many of the infectious diseases of other animals. We must, therefore, admit that the microbes of distemper are not as yet well known. Like all other pathogenic micro organisms, they produce "ptomaines." It has been proven that the severity of the nervous symptoms depends to a certain extent upon the natural disposition of the animals, and also their bodily health. When they take the disease, as weak, anæmic, poorly fed animals, they are very apt to be severely attacked with a nervous form of the disease. Occasionally symptoms appear in this disease which should be mentioned, such as serious weakness of the heart. This may be due to a parenchymatous degeneration of the heart muscle. It is generally fatal, as it produces œdema of the lungs. Albuminuria is produced by parenchymatous degeneration of the kidneys, and in rare instances from true nephritis; decubitus is seen occasionally in severe cases in the elbow- and knee-joints, also at the femoro-tibial articulation. This sometimes causes septicæmia and produces death.

The large number of the above-described symptoms show how completely the whole body may be affected with this disease; generally, however, the gastri-catarrhal forms predominate and run a regular course. We also observe in some instances peculiarities and symptoms which may, to a large extent, come from a general want of nutrition, or want of resistance in some cases, while in others, especially in the terrier classes, they seem to be able to throw off the disease and stand more acute attacks than other animals. There are some forms of the disease which are so mild in character as to almost escape observation. Thus we may have a mild exanthema or a slight respiratory or intestinal catarrh which may be difficult to recognize. The duration of this mild form of the disease may be from half to one week. Of the different forms of the disease the catarrhal and gastric forms are most frequently seen, the nervous next, and the exanthema least.·

Course and Prognosis.—Distemper generally runs its course in two or three weeks, although we occasionally see cases where the disease is, as we

have just stated, particularly mild which runs its course in one week to a week and a half, and in severe cases is prolonged for a much longer period. In such cases this prolongation is not due to the influence of the disease directly, but rather to secondary complications. We may count among these, certain nervous diseases which frequently remain or appear after the disease has run its course. For instance, paralysis of some of the muscles, of the hind-quarters, or of all the extremities, and rhythmic movements resembling St. Vitus's dance in some of the muscular groups, especially the muscles of the face or of the legs, and is indicated by a constant twitching, clonic in character, sometimes severer at one time than another, but more especially after excitement. Blindness, loss of sense of smell, or bark may also result from alteration of the nerves; or the animal becomes an idiot, has hallucinations (thirion), difficulty in respiration, persistent anæmia, and a chronic catarrh. Amaurosis and deafness may occur in some cases.

Prognosis.—The prognosis of distemper, as a rule, should be regarded as unfavorable even in those cases which are apparently mild, for in this disease the symptoms may change in one day, from the mildest to the most acute. Of course, the danger of the disease increases with the intensity of the nervous symptoms, and especially if the symptoms are prolonged, and with them a persistent high temperature, and even in cases where we have a subnormal temperature. Another series of cases which must be regarded as unfavorable are those which are in their course complicated by serious nervous symptoms or by symptoms of catarrhal pneumonia. Young dogs which are delicate (especially when not fed on meat) anæmic, or rachitic, will succumb to the disease sooner and, as a rule, present severer symptoms than those which have been fed with meat and have had plenty of open-air exercise. A marked decrease of temperature, without a similar improvement in the general condition, is always to be looked upon as an extremely serious symptom. Death may occur in two ways: through paralysis of the brain or œdema of the lungs, and occasionally from septicæmia or from general exhaustion. From the experience of the writer, the death-rate is from 20 to 30 per cent. It depends to a great extent whether there are a number of cases together or solitary cases —in the former the percentage is much higher; but at the same time it is impossible to give any positive statistics, because in cities the death-rate is much higher, and in small towns and in the country, where distemper runs a comparatively mild course, the death-rate is much smaller. The writer finds that in a large city the death-rate amounts to 60 to 70 per cent.

Pathological Anatomy.—The most prominent and constant anatomical alterations found at post-mortem are those in the respiratory and digestive organs. In the former there are all the phenomena of an acute

catarrhal inflammation of the larynx, trachea and bronchi, and also of lobular pneumonia and catarrhal inflammation of the stomach and intestines. For details, see under their respective chapters.

We find also more or less pathological alteration in the central nervous system, such as hyperæmia and small hemorrhages in the coverings of the brain; œdema of the brain is sometimes present with flattening of the convolutions and serous infiltration into the subarachnoids. In the ventricles and base of the skull we have more or less marked venous hyperæmia. As a rule, the spinal cord shows nothing abnormal except that it is pale and seems soft in consistence.

Under the miscroscope decided changes have been noticed in the brain. Kolesnikoff detected an infiltration of brain-matter and walls of the brain vessels with lymphoid cells as well as a distention of the capillaries and smaller arteries. These were filled with red and white blood corpuscles. In the infiltrated walls of the vessels of the brain were found dark-colored, homogeneous granulations and accumulations. Krajewski found also the perivascular spaces and the ganglionic cells filled with lymphoid corpuscles, and he mentions particularly that those cases had died without showing any prominent nervous symptoms. Muzulewitsch found inflammation of the spinal cord in acute nervous distemper, in which there was marked hyperæmia. He also found alterations in the walls of the vessels, and an albuminous exudation in the upper third part of the spinal cord along the blood vessels, as well as in the interstitial tissue of the gray substance. As a sequence of the acute nervous form we have a chronic interstitial myelitis with partial atrophy of the spinal cord.

Carougeau found an infiltration of leucocytes in the gray matter of the entire cord, particularly in the anterior horns, a myelitis disseminate which he believes was originated by the toxic action of distemper contagiosum; this observation was made on a dog affected with chorea as a sequence of distemper. Bohl and Rexter have reached the same conclusion from their observations of the central nervous systems of dogs affected with distemper.

Other abnormal conditions are found in distemper, such as anæmia, parenchymatous or fatty degeneration of the heart, liver, kidneys, and an abnormal swelling of the lymphatic glands and changes in the skin and eyes.

Prophylaxis.—The animal affected with the disease should be kept away from all animals that have not already had the disease, particularly young animals; strict disinfection of the kennels or sleeping places of the affected animals and also the various articles used by them. Preventive vaccination, while it cannot be called a success, is worth consideration. Dogs that are not too highly bred, but bred on rational lines, and

are well kept and substantially fed, are better able to stand the disease and, after it has run its course, come out of it stronger and make quick recoveries; it cannot be said, however, that in this disease this always holds good, for frequently an animal that is in perfect health and fine physical shape may contract the disease and die, and another animal in not nearly so good condition throws off the disease and makes a very quick and prompt recovery.

Preventive Vaccination.—In the last century numerous attempts have been made to find some inoculating material which would produce immunity to distemper, either entire immunity or at least for a certain period, and the results of certain observers have been mentioned already, notably Krayewski. Ligniere, who considers distemper should be classed among the hemorrhagic septicæmias, recommends a serum which he prepares and calls polyvalent immune serum. Phisalix vaccinates with greatly diluted cultures of the bacilli of distemper. The immunizing action of the vaccine has been confirmed by Grey, Spicer, Howtaker, who claim that this vaccine when injected into the animal at the time it is affected with the disease has to a certain extent the property of lessening both the intensity and course of the disease. Ligniere, Jewell, Hobday, Parker and a committee appointed in England to test this vaccine obtained unfavorable results. An immunizing agent called antidistemper serum, prepared by the Jenner Institute of London, has been sold commercially. Meyer, who has used a large quantity of the serum, reports that after the animal is vaccinated it produces a mild form of distemper which is catarrhal in form, and after the acute symptoms disappear there may be nervous debility, unsteady gait, and in one case the animal became deaf. The vaccinated dogs, when brought in contact afterward with dogs affected with acute distemper, either did not contract it at all or they had a very mild attack. This serum injected into an animal affected by distemper seems to have in certain cases a decided beneficial effect.

An antidistemper serum prepared by the bacteriological institute of Piorkowski in Berlin, does not seem to produce the results claimed for it. This serum is recommended not only for immunization (5 to 10 c.c. is injected subcutaneously in any part of the body, the best location being the neck) but also for curing the disease (in doses of 20 to 50 c.c.), and according to the statement of Piorkowski 85 per cent. of animals having both catarrhal and nervous forms are cured.

Baden used a large quantity of this serum and came to the conclusion that in some cases it produced very good results, but these were generally in the mild catarrhal gastric forms and when the treatment was commenced immediately after the onset of the disease. In more acute cases when the disease had gone on for some time, and there were

either convulsions or chronic twitchings or catarrhal diarrhœa, the injection of the serum produced no effect whatever.

Wagner and Pinkammer declare it is valueless, while Lange and Creutz claim to have had very good results when used in the early stages of the disease. Opinions are also divided in regard to other serums, for instance that of Gans, as well as what is known as Dutchman's serum, obtained from animals fed with yeast. This latter serum is used only as a therapeutic agent; some observers claim good results from it.

Numerous tests have been made by the writer, but it cannot be said positively that the results are such as to say the serums are of any practical value, and when we consider that up to the present time the active agent in the production of the disease has not been definitely isolated, or its actual nature and structure known, we can hardly cultivate a serum to combat it.

Some of the agents mentioned as being specific for distemper are Gurnine (ganglionary serum) which has not been found to produce any beneficial results. Yeast and yeast preparations, furonculine (distemper antigurmine, creolin, etc.), seem to have some influence in controlling intestinal catarrh. Calomel has also a certain effect in the early stages of gastric distemper. Creolin inhalations are good in pulmonary and bronchial forms of distemper, as also inhalations of benzoin and balsam of Peru. Trichloride of iodine which Ellerman, de Brun and others injected subcutaneously, 3 to 5 cm. in a solution of 1 to 100, has a very favorable influence when administered in the early stages of the disease, but in the more advanced stages of the disease it has little or no influence. Ichthargan in 3 per cent. solution, iodipin, tallianine, 1 to 5 cm. intravenously.

Therapeutics.—No special therapeutic treatment can be given for distemper—that is, no agent has been found up to this time which has the property of destroying or rendering harmless the specific micro-organisms present in this disease. Certain antiseptic and antibacterial remedies, like quinine, salicylic acid, antipyrine, etc., may generally reduce the fever, but they produce no influence on the general course of the disease. The use of agents for reducing the temperature is objectionable, as they not only deprive us of the symptom of temperature, which is of the greatest importance during the course of the disease, but cause more or less depression of the heart. According to Frohner's experiments, calomel is supposed to have a slight claim as a universal agent, but this is on the same order as black coffee, which was formerly advocated by Trasbot. Common salt has been recommended by Zippelius, and ergotin was highly recommended and frequently used a few years ago. None of these remedies, while they prove beneficial in some cases, is to be laid down as a specific for the treatment of the disease, therefore we must

continue to treat it in a purely symptomatic manner. Antipyrine, which was advocated as an absolute specific, does not in the least deserve this recommendation. The diet must be easily digested food, but at the same time as nutritious as possible. Milk, bouillon, soup, and scraped raw meat (which is generally taken with a relish) have much to commend them. In grave cases where there is entire loss of appetite, we must use concentrated food, such as peptonized meat, extract of beef, and clear broth. This may be given with some mild alcoholic stimulant, wine, etc. There are some forms of extract of beef which are not to be recommended, on account of their slight nutritive value and as they also contain a large proportion of sodium salts. When the temperature rises above 40° we must try to reduce it by means of frictions of alcohol and mild antiseptics.

The "antipyretic" treatment can only be used in rare instances in the dog. The chief medicinal agents are quinine, salicylate of sodium, antifebrine, and antipyrine. The older remedies (digitalis, veratrum, etc.) have been abandoned for some time on account of their direct action on the heart. This is also the case with kairin, thallin, and phenacetin. The writer, as a rule, does not advise the use of quinine on account of its action upon the heart.

It must be said, however, that in this disease good nursing, attention to dietetics, fresh air and cleanliness are the greatest factors in producing good results. The animal must be kept in a dry, clean, warm (not hot) well lighted and ventilated kennel, but avoid the slightest suspicion of a draught or dampness, and to prevent the spread of the disease through contagion, disinfect the place when the animal has recovered, as well as the surroundings used by the animal from time to time. The food should be substantial and easily digested, such as milk, sago, egg and milk, mutton broth and eggs, thick soups and small quantities of raw meat must be given at short intervals.

When the animal refuses to eat, he must be given food in concentrated form, such as thick meat broth, with a yolk of egg in it, extract of meat, extract of malt, hæmatogene, hæmo-albumen, or use some of the various extracts of beef.

To maintain the strength, or when the acute symptoms have subsided but the animal is weak, the digestion poor, or the mouth sore and solid particles of food cannot be eaten, we use concentrated food, such as some of the various meat extracts and peptonized products, commercial meat juice and liquified peptone; nutritive preparations containing albumen, such as samatose, plasmon, etc. If the stomach cannot retain food but is vomited up immediately after it is given, nutrition can be administered by means of clysters. This can be meat broth, yolks of egg, and thick starch water, to make it of enough consistency to be

retained in the rectum. Very frequently by this means an animal can be carried over the grave stages of the disease, and it is surprising how long an animal's life can be sustained by this means. Albrecht mentions one dog that had chronic nephritis, and was nourished for forty-two days by this means. In the administration of a nutritive clyster, the rectum must be first cleansed by an injection of luke-warm water, and in about ten minutes, not sooner, the nourishing clyster is given; the amount varies from a tablespoonful to a cupful, according to the size of the animal. The injection must be made slowly and carefully, care being taken not to excite the animal any more than is necessary, and when the nozzle of the injection pipe is withdrawn the anal opening must be held closed for a short time, and, if possible, elevate the hind quarters of the animal.

The following nutritive clysters are recommended:

1. Two or three beaten up eggs, 250.0 thick bouillon.

2. Two beaten up eggs, 200.0 concentrated bouillon and a spoonful of starch.

3. Two beaten eggs, 10.0 peptonoids, 120.0 sherry wine, 250.0 bouillon.

4. One beaten egg, 600.0 bouillon, 150.0 port wine, 0.5 bicarbonate of soda, 0.02 common salt, and 60.0 peptonoids.

5. Two beaten eggs, 4.0 salt, 20.0 port wine, 250.0 milk.

6. Two or three eggs beaten up with a little cold water, and a pinch of starch; these are laid to one side, then a tablespoonful of sugar, a half cup of milk and a wineglassful of port wine are mixed together and boiled for a short time, when it is allowed to cool. When it is nearly cold add the combination to it with a small pinch of salt, care being taken to see that the solution is not warm enough to coagulate the milk.

In the early stages of the disease, the stomach can be emptied by means of an emetic, such as the subcutaneous injections of apomorphia, antimonial wine, etc. It is a question whether an emetic by its subsequent depression does not do more harm than good. As a rule, constipation is not present and the bowels had better be left alone; if the animal commences to eat and the intestinal canal returns to its normal condition, the lower bowel will be emptied naturally without the assistance of drugs; if, however, it is necessary to evacuate the rectum, use a glycerine suppository.

Other therapeutic measures will have to be employed as the symptoms arise, and we would refer you to the diseases of the nose, larynx, bronchia, and air-passages, also to those of the stomach and intestine, particularly where there is persistent diarrhœa, and lastly diseases of the brain, spinal cord, and eyes. As a rule, no treatment should be used for the skin eruption in distemper. If any irregularity arise, however, this

may be treated according to the methods recommended under Diseases of the Skin.

Conjunctivitis is generally treated by a solution of sulphate of zinc (1 to 100), or painting the diseased membranes with a solution of nitrate of silver (1 to 70). This must be followed afterward by a 1 per cent. solution of chloride of sodium. "Blennorrhœa of the eyes" should be treated by bathing the parts with some antiseptic solution, such as creolin (1 to 100), corrosive sublimate (1 to 2000), or boric acid (1 to 40), or by painting the mucous membrane by means of a camel's hair pencil with a 2 per cent. solution of sulphate of copper. Ulceration of the cornea should be treated with a 3 or 4 per cent. solution of boric acid. Parenchymatous keratitis may be treated with a few drops of a 1 to 100 solution of atropine. After the acute inflammatory symptoms of the eye have subsided blowing calomel directly on the cornea produces good results.

Infectious Bronchial Catarrh.

(*False or Bench-show Distemper.*)

Within the last twenty years bench shows have become very numerous, and kennels both large and small are legion, and from each kennel one to ten or more of the dogs are being exhibited from time to time, we frequently observe in these kennels shortly after dogs return from the shows a disease that resembles and is frequently taken for distemper. This disease for a better name has been called "Bench-show Distemper." It is decidedly infectious and attacks the large bronchi producing catarrhal bronchitis and a muco-purulent discharge from the nostrils and eyes; with this there is also catarrh of the intestines. The writer has also felt that there may possibly be such a condition, and has intimated that fact under the head of Catarrh of the Bronchia (page 137).

Etiology.—It is generally seen in large kennels, attacking one animal after another or several at once. It may also be observed where several dogs have been sent to a bench show, developing shortly after they return. The period of incubation is three to five days. Another peculiarity is that one attack does not insure immunity from another. The writer has observed several dogs that have developed this disease, and the next year repeated the attack after returning from a show.

Pathological Anatomy.—The lesions found are very similar to those of true distemper, but milder in character. The alterations in the lungs are those of catarrhal pneumonia. The most frequent condition observed is great irritation of the mucous membrane of the intestines, with more or less swelling of the whole intestinal tract. The follicles and glands of the intestines may be swollen or enlarged, and in rare instances ulcerated, but not to the marked degree seen in distemper.

Clinical Symptoms.—The animal is dull and listless for two days, when the temperature will be found to be 39° or 40°; slight running from the eyes; and invariably diarrhœa. This last symptom is generally observed from the first, the stools being liquid the first few days, and later filled with gelatinous mucus. At the end of a week there way be some passed in the stools, but this is not commonly seen.

The appetite may be very poor or even lost, but generally in three or four days the animal will commence to eat, but stop again if the diarrhœa should be severe, or eat very small quantities. Vomiting is rarely seen except at the onset.

The discharge from the nose and eyes is difficult to distinguish from distemper, except that it is thinner and muco-purulent. The cough is stronger, and not the soft, shallow cough observed in distemper. Frequently we find acute laryngitis or bronchitis. The exanthema of distemper is absent but the hair is dry and harsh, and frequently the hair falls out very rapidly in the long-coated dogs, especially collies.

The mouth very frequently becomes sore and the gums may ulcerate. In rare cases a series of aphthous ulcers are seen on the lips and around the free end of the tongue. This condition rarely causes death unless the diarrhœa is persistent and the animal will not eat; and any attempt at forced feeding is followed by vomiting.

In some cases shortly after the acute symptoms commence there may be evidences of congestion of the brain, accompanied by severe and continued convulsions, which frequently cause death.

The treatment is practically the same as in distemper. Keep the animals warm and dry, give easily digested food, lean meat, carefully removing all fat, and quinine, iron, and some of the pepsin preparations, and allow them to run if they are not too weak. Penning them up closely does harm.

℞.	Ferri et quininae citras,	12.0
	Elixir simplex,	96.0
	S.—One teaspoonful three times daily.	

If the diarrhœa is severe, give

℞.	Bismuth subgallate.	0.75
	F. charta No. xii.	
	S.—One powder three times daily.	

Infectious Hemorrhagic Gastroenteritis.

(Canine Typhus, Stuttgart Dog Disease, Dog Plague.)

This disease may be described as a grave infectious disease, having some of the characters of distemper. The characteristic lesion being an

acute hemorrhagic inflammation of the intestinal mucous membrane and frequently accompanied by an ulcerative stomatitis. This disease attacks animals of all ages; occasionally a milder form is observed, indicated by severe pharyngitis and gastric catarrh and is differentiated from simple gastric catarrh by the more acute symptoms and the fact that it does not respond to the ordinary treatment used in simple catarrh.

The disease was described by Hoffer in 1850 as dog typhus; and during the latter portion of the nineteenth century it spread over the greater part of Europe and destroyed numbers of animals. Then the outbreak lessened in severity and only sporadic cases were observed, but recently it appears with increased severity.

Etiology.—The disease attacks animals of all ages, but seems to predominate in older animals. Klett made a record of 100 cases and found five cases in animals under one year, sixteen in second year, twenty-one in third year, eleven in fourth year, nine in sixth year, seven in seventh year and eighth year, two in ninth, six in tenth, etc. Sex, constitution and breed do not seem to hinder or have any bearing on the course or severity of the disease although Rabus observed the delicate, highly nervous animals that are very carefully housed seem to be more susceptible and succumb to attacks of the disease.

The actual cause of the disease or medium of infection has not been definitely described. Some observers think the fæces is the medium of the infection, some the urine, some the vomited material, others the urine, blood, or other tissue fluids, but the majority of observers agree that the disease gains entry into the system by means of the digestive tract. It is not definitely known if it is directly transmissible to another animal, and the direct inoculation of the disease is only accomplished with great difficulty and after repeated experiments, and even then it is governed by certain favorable circumstances. Albrecht injected a healthy dog with blood taken from an animal affected with the disease. Into a second dog he injected subcutaneously a certain amount of bile from the gall-bladder of another infected animal. Into the third animal he administered a quantity of the contents of the stomach of a diseased animal. The animal that had the subcutaneous injection of bile developed a severe abscess at the point of puncture and made a good recovery. The other animals were not affected at all. Scheibel fed finely cut up portions of the stomach and intestines of affected animals without any ill affects, but when he had given an animal a solution of bicarbonate of soda, rendering the mucous membrane of the stomach alkaline, the animal developed the disease two days later. Scheibel came to the conculsion that a mixed infection of the coli-bacteria and micrococci was more apt to reproduce the disease. Pirl found in the blood taken from the heart of the diseased animal an organism which was similar to the bacterium

hemorrhagicum. Zschokke found in the serum of the kidneys of an animal that had just died numerous slender cocci-bacteria. The majority of French observers believe that the disease must be classed under the head of the pasteurellas. Bimis and Seris contend that this disease is simply a very malignant form of distemper. Hutyra obtained from the mucous glands of the mucous membrane of the intestine and from the intestinal contents virulent coli-bacilli. The intravenous injection of an experimental bouillon culture produced fatal hemorrhagic gastro-enteritis, whereas, if the stomach was previously neutralized, the bouillon could be fed to the animals and produce no effect whatever.

Pathological Anatomy.—Severe inflammatory alterations will be found along the digestive apparatus. The stomach is found to be be contracted to very small compass and rarely contains any food of any kind. The mucous membranes are swollen, red to black-red, containing more or less hemorrhagic spots and covered with a fœtid brown colored mucus which is alkaline in reaction. Similar changes but not so severe are found in the duodenum. The rest of the intestinal tract may be affected but it is the exception; the rectum, however, is frequently inflamed. The peritoneum is injected, the liver and kidneys are more or less hyperæmic. Zschokke found the kidneys presenting all the symptoms of metastatic suppurative nephritis. The bladder is usually distended and filled with urine, the mesenteric glands and spleen are generally slightly enlarged. The cavity of the mouth is ulcerated with necrotic processes in various places, particularly about the gums, and there are more or less inflammatory changes of the mouth and swelling of the tonsils.

Clinical Symptoms and Course.—The first symptom is a want of appetite, which is soon entirely lost, great depression and want of animation, frequent vomiting and great thirst. The vomited matter is at first streaked with bile but frequently it is brownish-red or the color of blood and in the latter stages the vomited matter is very fœtid, brownish in color. The animal defecates with difficulty, and if the temperature is taken the thermometer is found to be streaked with blood. After a few days the animal has a bloody diarrhœa with an intensely offensive odor. The urine is decreased in quantity and frequently the urine is passed with more or less difficulty. It is found on examination to contain albumin and bile coloring matter. The abdomen is drawn and tucked up and palpation of the abdomen, particularly in the region of the stomach, is very painful. The eyes are sunken deep in their sockets. The conjunctiva is intensely injected and in severe cases the congested conjunctiva is brownish-red and the pupils are fixed and dilated. There is more or less discharge of tenacious yellow mucus from the nostrils, the pulse is small and thready, and the heart has a full throbbing beat. The temperature is not particularly high, generally about 40 degrees; only in

rare instances it rises above that and in cases of a fatal termination it is invariably subnormal. The mouth is frequently kept tightly shut by the animal and efforts made to open it cause the animal great pain. The mouth and breath have a particularly fœtid odor, particularly when the disease is well developed, and we find the gums and jaws and cheeks covered with deep ulcerous patches. The tongue varies; it may be brownish-red, bluish-gray, or extremely pale and on the upper surface of the tongue it is coated by dirty brownish-red mucus. Frequently the tongue lies on the floor of the mouth apparently paralyzed. In some cases the mouth, throat, and mucous membrane of the tongue are covered by sticky moist, purulent mucus and occasionally we find necrosis of the tip of the tongue. In some fatal cases we find little change in the mouth and pharynx other than deep redness of the mucous membranes.

When the disease goes on rapidly to a fatal termination, the animal becomes emaciated very rapidly, lies motionless in one position and dies within a week. In rare instances the animal may have convulsions before death. Mettel found pneumonia and hæmaturia and Richta found hemorrhage in the anterior chamber of the eye. If the disease lasts over ten days without fatal results, the mouth commences to clear up, the ulcers become covered with a brownish scab, the vomiting ceases, the appetite returns, and in two or three weeks the animal has fully recovered. Paralysis of the body and extremities may result, and deafness may occur as an after-result of this disease. In milder cases there are generally all the symptoms of acute gastric catarrh with pharyngitis. It is rather difficult in sporadic cases to diagnose between this disease and simple attacks of gastric catarrh and pharyngitis, but when we find a number of cases and where the odor from the mouth is particularly offensive and also the fæces, the chances are it is hemorrhagic gastro-enteritis.

The prognosis is very unfavorable. The mortality is from 50 to 70 per cent., and even the milder forms of the disease seem extremely hard to treat and frequently terminate fatally; young animals seem to be able to throw off the disease better than older animals, and young animals are much more apt to have a milder attack.

Therapeutics.—Treatment in well-developed cases is generally hopeless. As a rule it is well to give the animals easily digested food, keep the animal in a warm place free from draughts, and if there is abdominal pain apply the Priessnitz compress. In case of persistent vomiting, use hot applications to the region of the stomach, or wash out the stomach with weak solution of creolin, alum, borated water or .8 per cent. sodium chloride. Small quantities of broken up ice frequently administered may check the vomiting, also morphia (Klett), tincture of iodine and chloform, āā 5.0 in 3 to 10 drop doses in water or milk (Cadiot). Creasote solution, (one drop in ess. of pepsin). For stomach and intestinal irritation, salicylic

acid, salol, tincture of rhubarb, ichtargan, calomel and opium, bismuth sub-nitrate, adrenaline solution, all have been recommended for this condition. For lessening the fever, phenacetin and quinine have been recommended.

For the local treatment of the ulcerated mucous membrane, washes of permanganate of potash, 1 to 200, creolin 1 to 100, peroxide of hydrogen solution.

To combat extreme weakness give camphor, caffeine, atropia. Klett used a subcutaneous injection of physiological salt solution. Alcohol, pure or in spirits, is not recommended. For violent fœtid diarrhœa give pinch of tannoform, tannothymol or xeroform. For intestinal cramps or colic give salts of bromine, morphia or sulphonal.

The treatment of the paralysis that may follow as a sequel is taken up under Diseases of the Spine and its Coverings.

SEPTIC AND PYÆMIC DISEASES.

Septicopyæmia.

Etiology.—This disease is caused by staphylococci or streptococci, frequently by the bacterium coli, and occasionally by proteus or micro-organisms related to them. The microbes may collect in a wound or they may accumulate in some centre in the body, later find their way into the blood and give rise to the characteristic symptoms of the disease, that is, high fever and great depression and these pus-forming organisms settle in the capillaries and form metastatic abscesses which appear in different organs of the body, and pyæmia when accompanied by the formation of abscesses and suppuration. It is termed septicæmia when there is high fever and general depression. It is extremely hard, however, to make a sharp distinction between the two, for undoubtedly the nature and intensity of the disease depends not only on the nature of the bacteria, but also on the toxic effects of the same and the individual resistance of the animal affected.

This condition can originate from purulent, ichorous, or gangrenous wounds, ulcers, circumscribed or diffuse phlegmons, complicated fractures, decubitus, puerperal diseases, putrid abscesses of the stomach and intestines, acute inflammation and sloughing of the buccal cavity and pharynx, abscess of the prostate. In many cases the original cause cannot be discovered.

Clinical Symptoms.—Fever, ushered in by chills, high temperature—this may fluctuate and towards the end it may be subnormal—small accelerated pulse, great weakness of heart, livid red mucous membranes; in rare instances the mucous membranes are yellowish (icteric); sometimes hemorrhages of the mucous membrane and skin, great dulness and then

complete prostration, no appetite, skin cold and inelastic. When the skin is drawn from the body it remains in position instead of flying back as healthy elastic skin will do; fœtid stools, albuminuria. As a rule death comes quickly. In less acute cases we find symptoms of nephritis, hepatitis, endocarditis, or evidences of localization of the condition in the formation of abscesses of the lungs, liver, or in the articulations.

Therapeutics.—There has been no specific serum that seems to have any effect on the disease, so the symptoms must be treated as they appear. Try to keep up the strength of the patient, administer alcohol in the form of wine, whiskey, or brandy frequently, and strong liquid foods. Digitalis and strophanthus have not given good results in keeping up the heart's action in septic diseases; to cut down the fever use antipyrin, antifebrin or quinine; the latter should not be given if the heart is particularly weak. To assist in eliminating the microbes, administer a hypodermic injection of from 30 to 300.0 c.c. of an 8 per cent. solution of chloride of sodium. It is well to keep in mind the importance of antiseptics in all wounds and operations, and any process of disease that will tend to produce septicopyæmia.

Malignant Œdema.

(*Œdema Maligna.*)

This disease is extremely rare in the dog. It is an acute infectious disease caused by a specific bacterium (bacillus œdematis malignæ). It begins at a certain infected point in the form of a hot, painful œdematous, pitty swelling which afterwards becomes an emphysematous (crepitating) swelling which extends very rapidly into the surrounding tissues. This crepitation is peculiar to the disease, and can be separated from simple emphysema by the fact that in simple emphysema there is no fever present. Immediately after death the bacilli are found in the serum of the œdematous swellings and in the blood.

This Bacillus œdematis malignæ is not only found in animals but also in garden soil, dust, putrid organic materials, excrement of herbaceous animals, etc. It has been demonstrated recently that the œdema bacillus only develops when in combination with other bacilli such as the staphylococci, diplococci, etc.

The treatment of malignant œdema must be very energetic, as the disease causes death in a very short time. It consists in opening and breaking down the infected connecting tissues and thoroughly disinfecting them, first cleaning them out with peroxide of hydrogen, and then washing with a 1 to 3000 solution of corrosive sublimate.

Anthrax.

(*Charbon.   Malignant Pustule.   Splenic Fever.*)

Anthrax is rare in the dog, and when it occurs it is generally caused by the animal eating portions of cadavers of animals that have had this affection.   This is an acute infectious disease which is caused by the Bacillus anthracis, and is accompanied by high fever and local manifestations in the skin and mucous membranes.   All forms of anthrax have been observed in the dog, but generally the seat of the disease is in the mouth, throat and in the intestines, and generally there is more or less tumefaction of the head.   One observer saw a typical case of anthrax of the tongue and lips caused by an animal licking the blood of an animal that had that disease.   Another case observed was where a terrier had eaten a bone of an animal affected with anthrax.   Lüpke found on the inferior wall of the throat a carbuncle, which was probably caused by an erosion of the epithelium, in which there was great inflammatory œdema of the adjacent regions.   In regard to the susceptibility of the dog to anthrax, one case is cited where 150 dogs ate the flesh of a horse that had died of anthrax; 100 had swelling of the lips, throat, forehead and head, and sixty of them died.   Young dogs seem much more susceptible than older animals.   Different breeds of dogs are said to be less susceptible to anthrax than others; this, however, is a question.   When a number of animals are affected with symptoms of anthrax, particularly packs of hounds, when the dead cadaver is fed to the hounds, the proper method of diagnosis would be to examine the blood microscopically and make a trial inoculation of an animal that had not been near the infected animals.

Therapeutic treatment is generally useless on account of the rapid progress of the disease.   If any treatment is attempted it may be in the line of the internal administration of antiseptics, creolin, carbolic acid, salicylic acid, and preparations of iodine particularly Donovan's solution.   Where the carbuncle is formed then local incisions and the injection of corrosive sublimate solution, 1 to 1000, and tincture of iodine.   The actual cautery has been recommended to destroy the tissue of the carbuncle.   Concerning sanitary laws, the following apply to this disease:

Animals which suffer from or are suspected of anthrax cannot be slaughtered for consumption.

Any operation that will cause bleeding of the animal suspected of anthrax can only be performed under the supervision of the official veterinarian.

All cadavers of animals which are affected or suspected of having

anthrax must be rendered harmless by burning the cadavers. Skinning the animal is strictly forbidden.

Rabies.

(*Hydrophobia.*)

This is an acute disease of the entire nervous system caused by a specific poison, and distinguished by a variable period of incubation, as well as by an absence of any marked anatomical alteration.

Etiology.—Rabies is a true infectious disease, and never occurs spontaneously, but is only transmitted by direct infection through the bite of affected animals. This disease, as a rule, is confined to the canine race (dog, wolf, fox, hyena, and jackal). It is seen in rare instances in the cat, horse, cattle, sheep, goat, deer, guinea-pig, rabbit, rat, mouse, chicken, pigeon, and in man. The dog is the animal that contracts the disease quicker than any other. Country, climate, care, nursing, age, and sex do not seem to have any influence upon it. The disease is more frequently seen in central Europe and in New England and Middle States than anywhere else. This may be accounted for by the fact that dogs in large numbers run at large, and also to the fact that the owners do not conform to the rules of sanitary police. Rabies does not seem to be influenced to any great extent, by the seasons of the year, but cases are more frequently seen in the spring and summer than in the autumn and winter. The poison of rabies is as yet unknown, or at least it has not been definitely described. It is reproduced in the body of the animal only; never outside of it. It is mixed with blood, saliva in the salivary glands, and in the secretions of the lachrymal glands. It is also said to occur in the mammary glands. From direct inoculations, this disease appears in its most concentrated form in the brain, spine, and in the ganglionic nerves.

This poison is virulent in the spine and brain, during the incubative period, and retains its full strength for several days after the death of the affected animal. Roux and Nocard have found that the saliva is infectious two or three days before any symptoms of the disease appear, and one case recorded by Pampouki, in which a woman was infected by a dog eight days before the actual symptoms appeared in the dog. The actual excitant of the disease does not appear to be present in the muscles, the lymphatic glands, liver or spleen, and the urine or spermatic fluid has not been found virulent and the rabic poison has been found in very rare instances in the aqueous humor. The true cause of rabies has not as yet been isolated and described, probably it is an ultra-microscopical organism, at least it seems so to a large number of observers (Rimlinger, Riffet, Rey, Schander, Celli, Blase, etc.), who have passed a brain emulsion through

specially fine filters, and an inoculation with the filtrate has successfully reproduced the disease.

In 1903 Negri found both in inoculated and rabid street dogs, in certain parts of the cerebral nervous system, particularly in the horns of the ammon, in the Purkinje cells of the cerebellum, in the nerve cells of the pons, in the cord and the central cortex, when sections of these parts were stained by Mann's method, (methyl blue-eosin), certain bodies which took up the stain, and appeared a brick red, these bodies being round or slightly oval, periform, or even irregular triangles, and varying greatly in size, from 1 to 27μ; either isolated or grouped in the cells. These were found in dogs affected with rabies, as well as other rabid animals and man. They retain their characteristics even when the cadaver was in a state of advanced putrefaction and remain perfect in glycerine. Negri regards these as the various stages of evolution of a parasite which should be classed with the "protozoa" and claims these as the true excitors of rabies. It is true that for some time before Negri had announced his theory, a number of observers thought that the origin of rabies must be due to the protozoa, particularly Dijestal, who had described having seen in the spine and ganglionic nerves, small bodies like protozoa.

These bodies are to-day generally known as Negri's corpuscles or bodies, (see plate), and have since been observed and described by a number of other observers, and studied particularly with regard to their minute structure (Volpino, Williams, Bohn), and it must be admitted that they are found with great regularity in rabid dogs and their presence is regarded as diagnostic.

In 1903 to 1905, 457 dogs suspected of rabies were examined by Italian scientists; 297 were proved by inoculation to be rabid and in all but nine the corpuscles of Negri were found.

The claim of Negri that this specific parasite (protozoon) is the true and only cause of rabies is a question that is opposed by those observers who have filtered the emulsified brain substance of an affected animal and the filtrate reproduced the disease by inoculation; there is a possibility, however, that certain of these corpuscles may be so infinitesimal as to pass through the filter and so small as to be beyond the power of the microscope to render them visible.

Pasteur has demonstrated that a rabid brain loses its infectious virulence only when that part has become partially decomposed, that is to say, after four or five days; while it remains virulent in air-tight tubes or in moistened carbolic gauze. Neustube found that the brain of a rabid dog retained its virulent properties when kept under a slightly elevated temperature for ten or twelve days. Mergel found the virulence as strong as ever in the putrid brain of a rabid wolf fourteen days after

the animal had been killed. Galtier noticed the same conditions in the decayed brain substance of a rabid dog, when kept under a low temperature (12° Celsius). An affected brain was not rendered harmless even when exposed for three weeks at a time, but its virulence was attenuated when kept some time at a temperature of 61° Celsius. Blumberg found that an affected brain is rendered harmless when it has undergone a freezing process at 20° or 30°. Galtier was able to destroy the virulence of affected cerebral matter in four to twenty days by placing it upon plates and allowing it to become dry. Saliva and blood are much less resistant than brain matter. Both substances as a rule, lose their harmful properties twenty-four hours after leaving the animal. Dried saliva is inactive fourteen hours after it comes from the mouth of the animal, the gastric juice destroys it in five hours; bile kills it in a few minutes, and it is destroyed quickly by corrosive sublimate, chlorine water, permangate of potash, sulphuric acid, creolin, etc. The X-rays seem to retard the development of the virus.

As a rule, it is necessary to make a natural or artificial inoculation in order to obtain any successful transmission of the rabid poison, as no infection will take place if an animal is given the saliva, flesh, brain or spinal cord of an affected animal, or if the inoculation is simply rubbed on the cutaneous or mucous membranes; but if the mucous membrane is scarified first it can be reproduced. The most certain method to reproduce the disease is to introduce the virus directly on the dura mater of the brain or spinal cord, or in the anterior chamber of the eye. Heredity—that is, transmission of rabies by the mother to puppies or the production of the disease by infected saliva being in food—is very questionable. The most common method, of course, is the bite of the rabid animals; more rarely licking of a wound. In many cases the bite may not be severe enough to cause its development in dogs or in man. Deep bites, however, are certainly the most dangerous, especially when made on the unprotected parts of the body (hands and face in man). Wounds which bleed much are less dangerous, as the poison may be washed out of the wound by the flowing blood. Bites of dogs which have bitten numerous others are less dangerous than the first or second bite made by a rabid animal.

Infectious wounds which were made by biting or inoculation, according to Hertwig's observations, showed only 37 per cent. of positive results, and Renault's 67 per cent. Of 137 animals which were bitten by rabid dogs under observations for the last five years at the Veterinary College of Berlin, six only ultimately developed the disease. Zundel finds that about 25 per cent. of inoculated animals become affected, while Haubner found 40 per cent. At Alfort they have found the proportion to be about 33 per cent., and at Lyons, 26 per cent. In man 50 per cent. of the bitten subjects develop the disease, but if we sum together the cases of

true rabid and "suspected" dogs, the proportion is reduced to about 8 per cent.

The most dangerous bites seem to be those directly into a nerve or upon nerve tissue, even if it is on the smaller branches of nerves, whereas a bite on blood vessels or the lymphatic system is less so, and artificial inoculation proves that if it is made as near to the central nervous system as possible the disease makes its appearance more quickly, and the injection directly on the dura mater produces the disease in shorter time and more certainly than any other part of the body. Pasteur claimed that if there is the largest proportion of virus in the brain, it produces furious rabies, and if the virus predominates in the spine it causes dumb rabies. It is possible that the results of the material changes on the animal economy produced by the disease "toxines" may have some effect on the character and severity of the disease, the nature of which is at present really not known. Anrep prepared a serum from the brain of guinea-pigs affected with furious rabies; this serum injected into animals produced lowering of temperature, paralysis of the extremities, salivation, and death by paralysis of the respiratory centres.

Pathological Anatomy.—The post-mortem results are generally negative and vary in different animals, but, as a rule, specific alterations are noticed. These are as follows:

Great emaciation with very distinct muscular rigidity and a rapid tendency to decay; collections of mucus upon all the natural orifices, such as the mouth, nose, and the prepuce; prominence of the cutaneous veins, which are found to be filled with thick, imperfectly clotted blood; redness and swelling of the mouth and mucous membranes. The throat is covered with a whitish-gray mucous exudation; intense inflammation of the glands of the pharynx; in some cases slight swelling and hyperæmia of the salivary glands. In the cavity of the throat and mouth we find foreign bodies, such as hair, straw, coal, wood, etc.; they may also be found in the œsophagus, which is frequently very red and covered with clammy, gray mucus. This condition is seen in the stomach which contains little or no food but, as a rule, numerous indigestible objects of various kinds and sizes—straw, hair, wood, stones or pieces of leather or rags. The mucous membrane is reddened and swollen, especially on the surface of its folds, and marked with hemorrhagic erosions, which Johne describes as sepia-colored. The intestine may be empty or it may contain some of the foreign bodies. The mucous membrane of the pharynx is always very red, swollen, and covered with mucus in its anterior portions. These alterations are also seen in the trachea and the large bronchia. The lungs are, as a rule, filled with blood, but otherwise normal. In rare instances we find circumscribed centres of irritation due to foreign bodies being inhaled through the bronchial tubes. The heart and its envelope are generally

normal. The inner surface of the pericardium may show hemorrhagic spots. The chambers of the heart, as well as the large blood vessels, are filled with dark, imperfectly clotted blood. The liver and kidneys are hyperæmic. The spleen is always filled with blood, enlarged, and occasionally streaked with hemorrhagic spots; the bladder is found to contain little urine, and this on test is found to contain sugar. Cadiot was inclined to consider glycosuria as a regular symptom of rabies and of pathological importance, but Rabreaux and Nicholas took the ground that while sugar is apt to be in the urine of rabid animals, still its absence did not mean the animal did not have rabies.

The condition of the brain and spine was formerly supposed to present some reliable indications of the disease, but according to the investigations of the last few years it cannot be said that they present any constant pathological alterations. They vary greatly and in some cases may present no noticeable change at all. We frequently find hyperæmia of the covering of the brain and spinal cord, accompanied by slight hemorrhages, and the brain and spinal matter itself contains more blood than usual and is in a more or less œdematous condition.

Kolesnikoff found on microscopic examination of the walls and neighboring vessels of the brain (of dogs which have died with rabies) an accumulation of lymphoid cells and extravasated red blood corpuscles. The accumulation of discolored cells and red corpuscles in the small blood vessels of the walls and perivascular chambers indicates to a certain extent a condition which in rabies is of pathological importance. They are undoubtedly symptoms of inflammation. These changes vary in different cases. According to Czoker, it was noticed to a very slight degree in dogs affected with the furious form of rabies, but it was noticed to a marked degree as soon as the disease developed the dumb form (the perivascular spaces and their neighborhood were filled with leukocytes).

Babes found nodulated infiltration in the spinal cord of dogs that he called nodules rabiques (rabid nodules). Other observers have, however, found them in distemper. Van Gehuchten and Nelis found in the cerebrospinal and sympathetic ganglion of a street dog that died of rabies definite lesions, such as infiltration, tumefaction and ecchymosis, and great proliferation of the endothelial cells of the capsule that covers the ganglionary cells, and emigration of the mononuclear cells and a destruction of the ganglionary cells (neurophagy). The plexus nodus vagi is frequently attacked. These alterations in the nerve tissues are not always present in the disease and cannot be used as positive evidence of the disease. Valleea and Manonelian found similar infiltrations of the ganglia in very old dogs, and other observers found these modifications in less degree in other diseases. Similar alterations have been noticed in other diseased conditions, such as chorea, tetanus, distemper and meningitis.

Clinical Symptoms and Course.—The period of incubation lasts in the majority of cases from three to six weeks. In very rare instances the disease may appear in one week. According to Haubner's observations upon nearly 200 dogs, in 83 per cent. of the cases the disease developed in two months; in 16 per cent. of the cases within three months; and in 1 per cent. four months, or even later. Zundel has calculated that in 264 dogs 1 per cent. became affected within twenty-four hours after being bitten; 11 per cent. between the second and third day; 33 per cent. between the fifteenth and thirtieth day; 19 per cent. between the thirtieth and forty-fifth day; 10 per cent. between the forty-fifth and sixtieth day; 16 per cent. between the sixtieth and ninetieth day, and 10 per cent. after three months. The longest period of incubation was observed by Leblanc; this case developed in 364 days. The period of incubation is shorter in young than in older dogs. In the human race it is generally admitted that the average period of incubation is seventy-two days (this average covers over 510 cases).

There are two forms of rabies—a furious and mute (or dumb) form. The first is more frequent, but there are numerous transitions between the two forms; dogs that are at liberty or vagrant dogs are more apt to have the violent or furious form, while dogs kept as house pets or who are restrained are more frequently affected with the mute or dumb form, and in dogs that are well trained and under control and have lived in close contact with man, the tendency to bite is only present when they have reached the point of true delirium and mental control is gone. Pasteur found that intracranial injection produced furious rabies, while subcutaneous injection almost invariably resulted in the dumb form.

Furious Rabies.—This comprises three distinct stages, between which there is a very distinct line of demarcation—namely, the prodrome or melancholic, the stage of irritation, and the paralytic stage.

In the melancholic stage the dogs seem to change in their disposition. They are capricious, and at other times irritable or depressed. They show symptoms of anger, are easily excited, fretful, change from one place to another, are easily frightened on the slightest cause or may become very affectionate. They soon show a tendency to gnaw or swallow indigestible substances. They refuse their usual food, or they may take such food as they have a special taste for, holding it in their mouth for a few moments and then let it drop out of the mouth again. They will lick and gnaw, in a greedy manner, various objects, such as wood, coal, furniture, and eat straw, earth, stones, wood, blankets, and even their own fæces. In one case observed by Govard, the animal would howl loudly, have an evacuation of fæces and immediately eat it. There is commencing evidence of paralysis in difficulty in deglutition, cough, and labored respiration. The sexual desire is very much increased, and we see in the first stage an

uncertainty in the gait and a weakness in the hind-quarters. Constipation is invariably present. After a short space of time, generally from one to three days, the second stage appears. This is the irritable or maniacal stage. This is characterized: 1. By a tendency to escape and run away; 2. by a great irritation and an inclination to bite animals, objects, or man; 3. by a strange alteration in the voice, or bark.

The inclination to run off is very marked. They will eat through wooden boxes or floors, tear chains apart, or dig great distances through earth. As soon as they get their liberty they will run about aimlessly, covering very much ground in a short space of time, and return in one or two days, showing every indication of great excitement or of having travelled long distances. When they return they are covered with dirt and utterly exhausted, and may be very quiet and well behaved for a short time. During this condition they bite any object that comes in their way. Soon the delirium increases and they run around in an insane way, attacking and biting anything that is within their reach, snarling or biting all the time, and if they are confined they bite at the bars and frequently break their teeth, and if a stick is held toward them they attack it furiously. As a rule these cases do not tear or mutilate their own bodies, and, if they do, they generally bite the region of the wound where they were formerly bitten or the toes of the posterior extremites. In the first stage of the disease we have often noticed that they will lick and bite places where they have had wounds before. The patients snap frequently, as if they were catching flies, and, as a rule, will bite any animal that will come within their reach.

The biting and delirium are not constant, but appear after alternate periods of rest, followed by uncontrollable delirious attacks, especially if another dog should come near. These attacks may occur at intervals varying from one to four hours. The peculiar change in the voice is due to a paralysis of the vocal cords, and the sound of the bark is prolonged into a higher vocal sound, so that it makes a combination between a howl and a bark, which has been described by different authors as a "howling" bark. This is harsh and shrill. Repugnance to water does not exist in the dog as in man, but toward the end of the second stage, from paralysis of the muscles of deglutition, we see great difficulty in swallowing, and very often see an animal pick up some indigestible object, attempt to swallow it, and, not succeeding, drop it from its mouth. Frequently the animal will lap out of his bowl, but it is seen if observed closely that he does not swallow any of it, on the other hand animals may cower and draw away from water that has been spilled on the floor of the cage. Vomiting sometimes occurs. There is great difficulty in defecation, which seems to produce evident pain. There is very little alteration in respiration, but it may be slightly increased. The pulse is

increased; the temperature also rises, but falls toward the end of the course of the disease.

The duration of the second stage, which does not always present all of the characteristic symptoms of this condition, may last from three to four days. After the paroxysms have increased in intensity and the intervals between them grow shorter, the paralytic, or last, stage begins. The animals rapidly become emaciated; the eyes are staring, dull, and the eyeball is retracted into the skull. The conjunctiva is generally hyperæmic, the cheeks are sunken; the hair is erect; and we begin to see symptoms of paralysis. As a rule, the first sign of this is a paralysis of the muscles that close or raise the lower jaw. This allows the saliva to run out of the corners of the mouth and form threads which hang down, and we easily recognize the fact that the tongue and lower jaw have lost their power. The tongue becomes lead-colored and hangs out of the mouth. Soon we see paralysis of the posterior extremities. This begins with a staggering, unsteady gait, and finally total inability to use the posterior half of the body. Then the animals stretch themselves out and become completely paralyzed, or in the last stage we may see convulsions, but that is very rare. Death, as a rule, occurs in the fifth to the seventh day after the onset of the disease. In rare instances it may last ten days. Variations may occasionally occur in the regular course of the disease; for instance, paralysis of the posterior extremities has been the first symptom observed, and in others the paralysis of the jaw has not been observed, and dyspnœa has been observed for hours before death.

Dumb Rabies.—The mute or dumb form of rabies, according to Bollinger, comprises about 15 to 20 per cent. of all cases. The average given of this form of rabies is entirely too small, and should be at least 50 per cent., the great majority of cases observed being the dumb form. This is distinguished from furious rabies by the fact that the irritating or nervous symptoms are less marked, and in very rare cases entirely absent, also that the paralytic symptoms appear early in the disease. First, we see paralysis of the muscles of the lower jaw. The mucus or saliva runs out of the opened mouth, and an inclination to bite is entirely absent, although under certain conditions when the mouth is forcibly opened the animal will be able to bite. The voice is also changed, but it is very rarely heard. We see a loss of appetite, the animal being unable to seize or swallow foreign bodies. In this quiet form the three stages follow very closely on each other, the course of the disease being very rapid, and death, as a rule, appears in two or three days, never over five.

These two forms of rabies in rare instances may merge one into the other so that it is intensely difficult at times to separate the different

forms, for instance a case which we will cite illustrates this. The affected animal twenty-four hours before his death had a hoarse bark, no appetite, and the muscles of the mouth appeared normal, he allowed the mouth to be examined and the tongue pressed down to see the throat, there was not the slightest inclination to bite or show any signs of delirium or mental aberration; when the animal died he showed great sexual excitement. On post-mortem the stomach was found to contain hay, straw, as well as hair that did not come from his own coat.

This disease must always be considered fatal.

The diagnosis of rabies may be complicated by certain conditions present, due to other diseases. This is especially noticed in the mild form and in well-trained affectionate animals which obey their masters to the last. Two instances in which the English setter was under complete control; hunted in the field, obeying the whistle and call instantly, and at the same time had every symptom of dumb rabies. Often we see cases where the history is either insufficient or the owner can give none at all. On the other hand, in the furious form, a history, as a rule, is not required, as the disease can be instantly recognized from the appearance of the animal. Great excitement and restlessness, a tendency to escape, biting and delirious actions, rapid emaciation, and debility are characteristics of the furious form of this disease, while great depression and paralysis of the lower jaw are characteristic of the dumb form. In both forms there is a great inclination to gnaw objects. Sexual desire, in the early stage, is prominent. A depraved appetite and altered bark, more or less rapid symptoms of paralysis, and the cases being invariably fatal. The post-mortem confirms the disease when we find acute hyperæmia of the throat, pharynx, and hemorrhagic erosions on the mucous membrane, also foreign bodies, etc., in the stomach.

Regarding the presence of sugar in the urine of rabid dogs, that cannot be said to be of special significance, as it is found to be present in other diseases. The presence of the corpuscles of Negri in a suspected animal, on the other hand, must be regarded as a diagnostic symptom of great importance, particularly as it is a means of making a quick diagnosis. The horn of Ammon is where these corpuscles are found in the largest quantities, and it requires one to be thoroughly familiar with these bodies to recognize them quickly and easily. They are found in particles of the horn of Ammon fixed in Zenker's fluid, and treated with a 10 per cent. solution of osmic acid, then washed thoroughly and then laid in absolute alcohol; this method has the disadvantage of taking some time to accomplish it. The method of Bohne seems to be the most desirable. Mode of procedure: sections one-half to three-fourths mm. thick are cut from the horn of Ammon and put in 15 c.c. of acetone and

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A SMEAR PREPARATION OF THE HIPPOCAMPUS MAJOR SHOWING NEGRI BODIES,
STAINED BY THE METHOD OF VAN GIESEN, ENLARGED 1000 DIAMETERS.
[*See Rabies*].

Pink : Stained tissue.	*Brick : Negri bodies.*
Blue : Cells.	*Red : Blood corpuscles.*

left at a temperature of 37° until they become hardened, then the sections are transferred to liquefied paraffine and left there for an hour at a temperature of 60°, then the sections are put in cold water to which a small quantity of gum arabic is added and put in a stone and the paraffine carried off, then the sections are colored by means of Mann's process, which is to put the sections for one-half to four minutes in a coloring solution consisting of 35 c.c. of 1 per cent. aqueous solution of methylene blue and 35 c.c. of 1 per cent. aqueous solution of eosin and 100 c.c. of distilled water. The sections are rinsed with water and then put in absolute alcohol for 15 to 20 seconds, to which has been added some caustic soda (to 30 c.c. of alcohol add 5 drops of 1 per cent. solution of absolute alcohol). The sections are again put in absolute alcohol for a few moments and then washed in water for a minute; the sections are now put in water slightly acidulated with acetic acid, drained and sealed with canada balsam.

The following procedure has been the method employed for the rapid diagnosis of rabies in the laboratory of the Veterinary school of the University of Pennsylvania for several years: As soon as the animal's head arrives at the laboratory the entire brain and the plexiform ganglia, with the adjacent sympathetic ganglia are removed. A portion of the cerebellum is placed in sterile glycerine, in which the brain tissue may be preserved and retain the virus for many weeks. These glycerine-immersed specimens are only referred to for the animal inoculation test when the microscopic examination is unsatisfactory. Aside from preventing decomposition, the glycerine will also destroy bacteria and check decomposition of the specimens. From the fresh brain tissue, smears are usually made from the hippocampus major and cerebellum. A piece 1 mm. thick and several millimetres in diameter cut from the freshly exposed surface, after an incision is made through the hippocampus major at right angles to its length, or of the cerebellum in which an incision has been at right angles to the convolutions, is placed upon a slide near one end. Instead of using a cover-slip, another slide is placed over the small piece of tissue and gentle pressure is applied and the opposite ends of the slides are moved toward one another. The smears are then placed in absolute alcohol for two to five minutes, whereupon the alcohol is allowed to evaporate and the smears then stained. The stain as recommended by Van Giesen is used.

Loeffler's alkaline methylene blue,	1 part.
Distilled water,	1 part.
Saturated alcoholic solution of fuchsin added in drops until the mixture has a purple tinge, or until a metallic scum is seen on the surface.	

The mixture kept at a low temperature can be used for an unlimited

length of time, but it is apt to change quickly at room temperature, and for this reason a new batch of stain is usually made each day or as each specimen is prepared for examination. A smear properly fixed on a slide is taken up with a pair of forceps and completely covered with stain. The slide is passed through the flame of a Bunsen burner several times until steam arises from the heated stain, which is permitted to remain on the smear for five to thirty seconds. The smear is then washed in running water, and if the color of the smear is blue where the brain tissue is thickest, and red where the smear is thin, the slide is placed between filter-paper and dried. As soon as the slide is dry a search is made for large nerve cells with a low-power lens under the microscope. The protoplasm of the nerve cells should be stained a light blue, the nucleus a shade of purple, and the nucleolus a dark blue. If the cells are stained too deeply the stain may be weakened by the addition of more distilled water or in heating the staining fluid on a smear for a longer time, the intensity of the staining of the fuchsin will be increased at the expense of the blue of the Loeffler's alkaline methylene blue. When a nerve cell is found properly stained, it is examined with an oil immersion lens. Negri bodies with this staining fluid show the inner bodies a bluish black and the structure around the inner bodies a maroon-red. They are found within the cell, outside of the nucleus of the cytoplasm in the nerve cells of sections, but not infrequently in the smear preparations, a few Negri bodies not within the nerve cells are seen, which have been forced out of the nerve cell as the smear is made. In searching a smear for Negri bodies, only those bodies within the nerve cells should be considered.

In doubtful cases the disease can only be accurately diagnosed by vaccination—that is to say, by the injection of small quantities of horn of Ammon or a section of the cord, which have been diluted with distilled water, and emulsified and filtered through fine linen. The following methods are used at present:

(1) **The Intercranial Subdural Inoculation (Pasteur).**—The inoculating material (1 or 2 drops of the emulsion) should be injected into the dura mater of a dog or rabbit, after it has been trephined, by means of a small hypodermic syringe, and the wound sewn up. The operation is easily performed, and is especially valuable when the suspected animal may have bitten not only other dogs, but man. As this inoculation from the spinal matter of a suspected dog takes at least two or three weeks, sometimes longer, the animal develops all the phenomena of the disease, paralysis, etc., on the quiet. Leclainche recommends intracerebral inoculation, that is, direct injection of the inoculating substance into the brain itself; the persons bitten should not delay, while waiting for development, but all measures should be taken as soon as possible.

(2) **The Intraocular Inoculation (Gibier, Nocard, Johne).**—The emulsion (1 to 2 drops) which is thus obtained is filtered through a piece of linen and injected directly into the anterior chamber of the eye of the animal which is to be inoculated. They do this by means of a small hypodermic syringe, having first placed cocaine on the cornea, and then inject the solution directly into the anterior chamber. If the suspected animal is rabid, we will see the development of the disease in from twelve to twenty-three days, even if the chamber should suppurate from the irritation of the injected solution. Gal and Klimmer oppose this procedure by pointing out the fact that the stage of incubation may be much longer than this.

(3) **The Intraspinal Method (Labell).**—The emulsion is injected directly in the cord; this method takes somewhat longer to develop than the subdural inoculation.

(4) **Intramuscular Inoculation.**—One c.c. of the emulsion is injected into the masseter, the dorsal or the posterior crural. Klimmer finds that the active symptoms are developed somewhat earlier than by the intraocular method.

There are other methods of inoculation used but they are much less reliable, such as nasal, subconjunctival, subcutaneous and intravenous.

It is always well to inoculate two animals, because it frequently happens that an animal is immune to the disease or dies shortly after the inoculation (cerebral hemorrhage, etc.).

The following diseases are sometimes mistaken for rabies: Certain affections of the brain, such as teething, epilepsy, eclampsia, distemper, angina, intestinal parasites, inflammation of the intestines, pentastoma in the nose and frontal cavities, foreign bodies in the mouth (between the teeth) or in the throat, paralysis of the lower jaw, luxation of the lower jaw, due to irritation of the trigeminus, intense excitement in bitches that have had their young taken from them, great sexual excitement in male dogs, long confinement in cages or kennels, and from certain poisons. The course of the disease, however, and the after-symptoms always enable one to make a differential diagnosis.

Therapy and Prophylaxis.—As soon as the disease has reached a point where there is no question as to its character, the animal should be destroyed as soon as possible. When man is bitten it is a question whether thorough disinfection or cauterization of the wound is of much benefit unless it is done within a few minutes. In reference to the preventive inoculation of Pasteur, it is not necessary to enter into detail in this work, beyond the fact that it is the inoculation of an attenuated virus cultivated from rabies. A large number of experimenters have made repeated inoculations with a view of obtaining immunity to the disease, but they have not had very satisfactory results.

The most effective method of preventing the spread of rabies is to register all dogs claimed by owners, and all stray dogs should be destroyed, and when there is a case of rabies or a suspicion of such, all dogs should be put under observation, muzzled or put on a leash, and any dog known or suspected of having been bitten by a rabid dog should be confined and watched by a competent veterinarian and if found to develop the active symptoms it should be immediately destroyed and the head sent to the local live stock sanitary board laboratory for examination.

In the large cities all dogs, if they are worth keeping as pets, should be taxed and all vagrant mongrels taken up and destroyed. In America and England where they have made a close study of the spread of rabies and have reached the conclusion that while muzzling is a protective measure, it is by far the least point of danger, for an owner that will take the trouble to muzzle his dog is one who closely observes his animal and at the first sign of the disease has him examined. Invariably the outbreaks of disease originate either in the slums of cities or little villages, where the low class of ignorant shiftless masses live, who protect and have around their places a number of mongrel curs that are valueless; the owners or protectors of these pariahs will neither observe their animals nor restrain them when they develop rabies, but drive them off, or allow them to go on their travels to bite and tear every animal that comes in contact with them. Taxation has been tested out in Europe and in every case where mongrels were gathered up and destroyed rabies decreased one-half or more—in some cases not a single case was recorded.

Tuberculosis.

Under this name we class all affections which owe their origin to a peculiar specific bacterium known as "tubercle bacillus," discovered by Koch. These are found in all tubercular deposits in man or in animals, whether they occur spontaneously or are inoculated. Under the microscope they appear in the shape of very narrow non-flagellated rods often slightly curved, from 2 to 4μ long. The organism shows many variations in its morphology under different conditions. It often occurs in isolated clumps, either in cultures or in tissues. In certain cultures and in animal tissues it grows in the form of longer or shorter branching threads (Ricketts).

The tubercle bacilli should be considered as true parasites which multiply and live in the body only, but they also seem to possess the property of living outside of the body for a certain length of time, as the excretions of tuberculous animals can be used successfully to inoculate other animals. We therefore conclude that tuberculosis is only

produced by infection, or a better term would be transmission of tubercle bacilli, direct or indirect, from one subject to another.

While it is well known that tuberculosis of man and of certain domestic animals, such as cattle, is very common, it is rather rare in dogs. A number of schools have found that only from 2 to 5 per cent. of all of the animals brought to the clinics were affected with tuberculosis. Dogs seem to possess more power of resistance and are able to throw off the disease.

Certain experiments by inoculation and inhalation have demonstrated the fact that one-third of the cases develop the disease, and the feeding of tubercular matter in the food invariably produced negative results. Considering the rarity of this disease in the dog, we will not give any detailed explanation of any length concerning its etiology, pathological anatomy, etc.

Etiology and Pathological Anatomy.—A number of observers agree to the fact that, as a rule, an animal affected with tuberculosis has been at some time near or in the vicinity of some person who was in an advanced stage of consumption. In such cases the bacilli may be introduced in the form of fine dust and be respired into the lungs or may be taken up by the intestines, finding their way into the bowels mixed with food. In one case which the writer observed there were tuberculous ulcers in the parotid region, and also tubercular deposits in the lymphatic glands of the neck. The disease appears in the dog in the form of an acute or local tuberculosis. The disease may be found in the lungs, the mesenteric glands, the intestines, liver, kidneys, and peritoneum, and in rare instances affecting the entire body.

Pulmonary Tuberculosis.—This presents numerous anatomical alterations: over the entire lung we may find firm round gray nodules (miliary tuberculosis), or they may break down, forming caseous nodes and cavernous hollows or there may be a chronic indurated broncho-pneumonia; more rarely we find chronic interstitial indurating pneumonia with secondary alterations, acute and chronic bronchitis, peribronchitis, bronchiectasis, pulmonary hyperæmia, emphysema, and frequently adherence of the lung to the pleural wall.

In nearly 50 per cent. of all cases, the lymphatic glands of the thorax, especially the bronchial glands and the glands which are located above and behind the mediastinum, are invariably infected to a marked degree with tubercular deposits, and are found to be very often enlarged, forming large tumor-like masses. These consist of a lardaceous tissue, grayish-white in color, and generally contain a centre cavity filled with a cheese-like mass. True cheesy tuberculosis is rather rare in the dog, but, on the other hand, we find a peculiar process of absorption of the tissues, forming white masses, which on examination are found to be tuberculous deposits.

Pleural Tuberculosis.—When the process of breaking down, or disintegration, has gone on to any marked degree, the tuberculous mass forms a tumor-like body containing in its centre a whitish fluid held in fibrinous tissue. This was noticed in 50 per cent. of the cases observed in the dog where the lymphatic glands had undergone this degeneration. In the other half of the cases, the serous membranes of the abdominal cavities were covered with tubercular masses, the pleura being the most common seat of the disease. In the majority of cases of pleural tuberculosis it takes the form of what is known as the "pearl" tubercular masses. These are found to be deposits of soft connective tissue, occurring in the form of numerous conglomerating granulations or in large round tumors. In some cases there is extensive exudative inflammation present (sero-fibrinous and purulent pleuritis). Tubercular inflammation is found in the pericardium, with extensive adhesion to the heart, and a very peculiar alteration of the mediastinum has been observed in several cases. The heart rarely presents any tubercular formations.

In the digestive organs, the lymphatic glands of the head and neck are rarely invaded; and the writer found the submaxillary and retropharyngeal lymphatics to be affected in only one instance. On the other hand, the mesenteric glands were particularly affected, some cases presenting large tumor-like masses containing broken-down centres.

Tuberculosis of the intestines is rare, and is restricted to slight ulcerations or abscesses. The liver, as a rule, is generally involved to a marked degree, its substance being filled with small nodules or large granular masses which are milky white in color. In the centre of these is found a broken-down opaque fluid, the result of fatty degeneration. The spleen was found by the writer to be tubercular in two cases, and that only to a slight degree. In the liver are found numerous firm white fibrous nodules ranging from the size of a pea to the size of an egg. The kidneys are frequently the seat of more or less tubercular deposits, and in twelve cases scattered granulations were found in the spinal and membranous substance, but cheesy abscesses and centres were also found. These were accompanied by chronic indurative nephritis. Ulceration of the pelvis of the kidney was observed in one case. One dog showed but a slightly tubercular ureter and bladder. The sexual organs are, as a rule, found healthy and very rarely attacked by the disease. In rare instances a tubercular testicle is noticed.

Tuberculosis of the prostate has been observed, also in the ovary, the bones, articulations and in the brain. A tuberculous ulceration of the skin has also been seen. For further particulars as to the pathological character of tuberculosis, consult the numerous works on the subject.

Clinical Symptoms and Course.—On account of the various ways in which tuberculosis appears, no postive line of symptoms can be made.

Acute miliary Tuberculosis is very rare and runs its course with intense rapidity, and generally it is only by the presence of the tubercular bacilli in the blood that it can be recognized.

Chronic Tuberculosis.—The animal is easily fatigued, short breath, particularly after any slight exertion, irregular appetite, there is a dry hollow cough, generally on rising after resting or after eating, later the cough becomes more frequent and painful, and there may be a mucopurulent discharge from the nose, difficulty in respiration—this at first is slight, but sooner or later it is very pronounced; on auscultation there is a vascular murmur, and later bronchial râles of diverse forms and intensity; later a pleuritis and a hydrothorax. Valuable animals presenting these symptoms may have the diagnosis made positive by inoculating a rabbit (intraperitoneally) with the pleural exudate, and if the exudate was tubercular, three weeks afterward the spleen and the peritoneum of the rabbit will show the tubercular lesions, or we find a tubucular mass on the liver.

Tuberculosis of the lungs only will show marked symptoms after it has made considerable progress, and as the symptoms are very similar to chronic catarrh of the lungs or chronic lobular pneumonia, it is apt to be confounded with these two diseases (see this disease). Notwithstanding a good appetite, when there is rapid emaciation and a quick loss of strength we should suspect the animal has tuberculosis of the lungs but we can only be positive of our diagnosis by recognizing the tubercle bacilli in the secretions, although it is very difficult to find the bacilli as it is not only extremely difficult to obtain sputa from a dog, but to find the bacilli if we do get some of the sputa (see later, tuberculin test).

Tuberculosis of any of the abdominal organs is very difficult to recognize. The only way we might succeed is by manipulation of the abdominal cavity, recognizing swollen lymphatic glands or tubercular masses on the liver. We do find, however, great emaciation and symptoms of chronic catarrh of the intestinal tract. These last two symptoms are generally sufficient to make us suspect intestinal tuberculosis. In one case of tubercular ulceration of the intestines which was observed by the writer, the dog was very thin and had shown this emaciation for some time. There were also present symptoms of catarrh of the lungs, and upon the upper portion of the neck a deep abscess had formed. This was quite large and contained quantities of thin pus. In the region of the neck near the abscess we observed a granular mass the size of a chestnut. This could be pushed under the cutaneous membrane and moved about freely. There were also present a few enlarged lymphatic glands in the upper portion of the neck.

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A very important and constant symptom of tuberculosis is the gradual emaciation of the affected animal, accompanied by exhaustion on the slightest exertion, the hair is hard, dry and bristly, the eyes are sunken, the face drawn and wrinkled, the visible mucous membranes pale or yellowish, the mucous membranes are dry, the pulse small, accelerated, and the heart throbs, the temperature is elevated from time to time, the appetite is irregular but generally small, constipation alternates with obstinate diarrhœa, and finally the animal becomes a skeleton and dies in a state of collapse; at this stage the temperature is apt to be subnormal. The average duration of the disease is from six to eight months.

Microscopical Demonstration of the Tubercle Bacilli.—The tubercular matter is placed on a glass and allowed to dry in the air; it is then covered with Ziehl's carbol fuchsin solution (1.0 fuchsin, 10.0 absolute alcohol, 5.0 carbolic acid, 95.0 distilled water) and heated over the flame for two minutes. Then it is allowed to cool, then washed with distilled water and then put in Gabbet's solution (2.0 methylene blue, 100.0 of 25 per cent. solution of sulphuric acid); after lying in this for two minutes it is rinsed with water and is ready for examination. The tubercle bacilli are stained red, the other substances being blue; an oil immersion lens gives the best results. Where the examination must be made as soon as possible, if the preparation is thoroughly dried, it gives almost as good results (see Plates).

Tuberculin Test.—The inoculation of Koch's tuberculin to determine whether a dog is affected with the disease may be tried, but as a rule is unsatisfactory, the reaction is seldom very pronounced in character, and in the acute stages of the disease it may even give a subnormal temperature; in several instances an animal gave a reaction, but careful examination failed to give any evidences of tuberculosis. Recently the ophthalmic test has come into popular favor in diagnosing tuberculosis in the dog. The method is quite simple. It consists in dropping into the conjunctival sac 1 or 2 drops of tuberculin, especially prepared for this test. If the animal is suffering from tuberculosis, a reaction will be manifest by the development of a conjunctivitis in from eight to twelve hours. There will be excessive lachrymation, injection of the capillaries of the conjunctiva and even slight suppuration at the inner canthus. In chronic cases the reaction may be overlooked unless the animal is kept under close observation, inasmuch as the acute symptoms come on and pass off very rapidly. In cases of recent infection the reaction may last for at least twenty-four hours.

Therapeutic Treatment.—When you have once established the fact that the animal is affected with the disease, it is the duty of the veterinarian to warn the owner of the tubercular or suspected dog, of the danger

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CULTIVATION OF TUBERCULAR BACILLI
ENLARGED 1000 DIAMETERS.
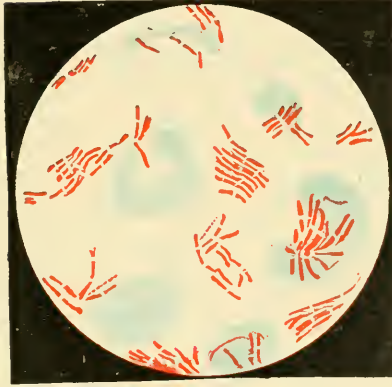
W. McDougall, del.

A SMEAR OF MUCOUS FROM THE
BRONCHIAL MUCOUS
MEMBRANE OF A DOG.

of infection, and advise him to destroy the animal. In the early stages of the disease and when there are no other animals kenneled with it, the animal can be fed with highly nutritious food and given inhalations of creolin or benzoin.

Hemoglobinuria and Piroplasmosis.

When there is any decomposition of red corpuscles in the body (hemoglobinæmia) the coloring substance is eliminated through the kidneys, staining the urine and producing hemoglobinuria. In this condition the urine is characterized by a dark red, dirty brownish or brick-red coloration.

This condition occurs when from some cause the coloring matter of the blood becomes liberated, either from destruction of the blood corpuscles or separation of the coloring matter from the stroma of the corpuscle or a delixiviation of the erythrocytes. If only a small quantity of coloring matter is freed it is taken up by the liver, but if a large

Fig. 99.—Blood of a dog affected with piroplasma canis, magnified 350 times. (*Kastner.*)

quantity is free in the circulation, it is also taken up by the urine.

The hemoglobin test consists of drying a certain quantity of urine in a small saucer, and with the dry mass we mix a small quantity of finely pulverized chloride of sodium, placing it on a plate. Then add two drops of cold glacial acetic acid. Now slowly heat the cup over an alcohol lamp and allow it to cool. As it does so, you will see a quantity of dark-brown crystals. If these are not easily distinguished by the eye, they are with a magnifying glass. While we cannot distinguish the presence of the coloring matter of the blood in the urine with the aid of the microscope, we may detect the presence of blood corpuscles in the fluid. We may also find by this means uric casts and epithelium of the kidneys, and small red granulations. These may be considered hæmoglobin. As to the causes of this condition we will mention piroplasma.

Piroplasma Canis, Malignant Jaundice.—This is an infectious, not contagious disease, due to the presence of a protozoon, piroplasma canis, in the red corpuscles; this disease is generally found in warm climates, particularly South Africa; it is very rare in Europe.

Etiology.—The cause of this disease was first described by Piana and Gali-Valerio as a protozoon of the order of hemosporidia, and was carried into the blood of the dog by means of ticks—in France by the Dermacenter reticulatus, in South Africa by the Hemophysalis leachi, and in Germany and Hungary by the Ixodis ricinus reduvious. The disease appears about thirty-six hours after infection of the red blood corpuscles; the corpuscle being colorless, the protozoa can easily be recognized if the blood is fixed with absolute alcohol and stained with methylene blue (Fig. 99). The size of the parasite varies from 0.7 to 3.4μ. They multiply very rapidly, particularly when the fever is high. After the destruction of the erythrocytes, the parasites appear in the plasma, and are more rounded in form, and then they appear in greater numbers in the internal organs, particularly in the lung tissue, than in the blood. Transmission, either by subcutaneous or intermuscular injection of the defibrinated blood containing the parasites, reproduces the disease and the animals die in a week; recoveries are very rare. The blood if kept in a cool place retains its full activity for twenty-five days, in warm weather the infected blood loses its activity in fourteen days, at a temperature of 44° it loses its power in one and one-half hours, and at 50° in one-half hour. Young dogs seem more receptive of the disease than older animals; bitches which have had the disease give their puppies a certain amount of immunity from the disease.

Pathological Anatomy.—If the disease is very acute, and runs a short course, with the exception of the alteration of the blood, very little change is noticed. In more gradual cases there is anæmia, jaundice and great enlargement in the volume of the spleen—it is frequently found to be four times its natural size—hyperæmia of the liver, kidney and marrow of the bones, extravasations in the pericardium and in the lungs, catarrh of the stomach and of the intestines, especially the duodenum. In the kidneys, spleen, marrow of the bone, as well as the blood, numerous piroplasma are found.

Clinical Symptoms.—The disease occurs in both acute and chronic forms. The acute form is ushered in by listlessness, depression, want of appetite, and increase of temperature to 40–43°, and a few days later by a rapid fall of temperature to subnormal; the visible mucous membranes are cyanotic, sometimes yellow, icteric; the pulse and respirations are increased and frequently labored; the gait sluggish and staggering, and finally there is complete paralysis. The urine contains albumin and biliary pigment, and in the majority of cases from

3 to 5 per cent. of hæmoglobin. The blood is thin, light red, and coagulates very slowly; the number of erythrocytes is diminished by half, and the leukocytes are greatly increased in number. Death occurs in from three to ten days.

In the chronic form the temperature is slightly increased or may even remain normal, the animal shows great muscular weakness, lassitude, want of appetite and rapid emaciation, urine contains albumin and biliary pigment, while hæmoglobin is rarely found, and there is a diminution of the red blood corpuscles and a corresponding increase of the white corpuscles. The duration of this disease is from three to six weeks; recovery is not at all rare. The diagnosis is easily ascertained by the presence of the piroplasma in the blood. Nocard suggests that where there is every evidence of the disease, but microscopical examination fails to detect the piroplasma, a young animal should be inoculated experimentally.

Therapeutics.—As there is no specific agent that can be said to have any beneficial effect on the disease, we must give good nursing, careful but nutritious diet. When animals, particularly hunting dogs, are taken to regions infested with ticks, such as woods, wet swampy ground, or low scrub pasture, the animals should be rubbed with emulsions of lysol, creolin or petroleum to protect them from invasions of the tick.

Preventive Inoculation.—When a dog has overcome the disease and become immune, the blood of this animal possesses the property of destroying the piroplasma; these immune animals are inoculated repeatedly with the virulent blood, and a serum is obtained which is used. Care must be taken to see that this serum retains its activity.

Tetanus.

(*Lockjaw.*)

This is a specific infectious disease characterized by tonic muscular contractions and caused by the tetanus bacilli. These organisms are rather long, slender—from two to four microns long—with a globular spore at the end; this is larger than the bacillus and gives the latter a drumstick shape. The organism is strictly an anaerobe and is obtained in pure culture with some difficulty; morphologically it is difficult to distinguish from the bacilli of malignant œdema and systematic œdema (Ricketts). These spores possess great powers of resistance and are found in soil, particularly in garden earth and rich meadows, and in the excrement of healthy horses, dogs, cattle and other animals; this explains why animals are so prone to develop the disease from wounds of the extremities, tail, etc.

When these microbes invade a wound they multiply with great rapidity and produce toxines which cause a strychnine-like convulsive contraction of the muscles. The virulence of the bacilli is in all probability influenced by the simultaneous invasion of other germs.

This very rarely occurs in the dog. The figure here presented (Fig. 100) is the only one the writer has seen, and was taken twenty-four hours before death; the muscles were contracted to such an extent that the animal could be lifted bodily by holding up one anterior limb. Tetanus may originate from a wound in any part of the body. No special class of wound can be said to be favorable to the production of tetanus.
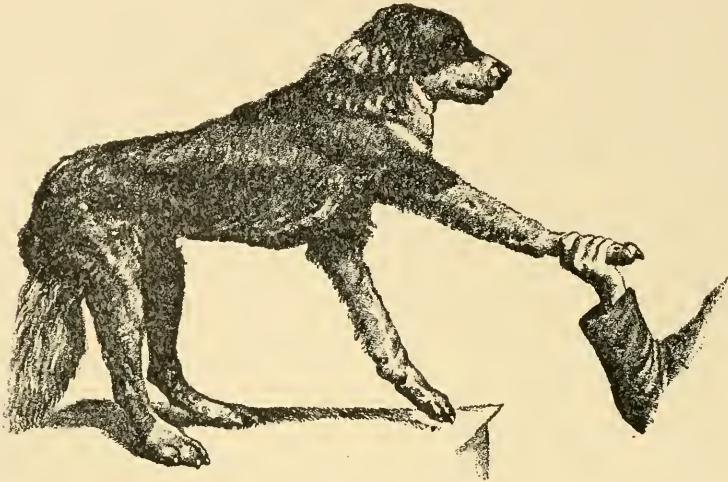
Fig. 100.—Dog with tetanus.

It may originate from a scratch or from a very large wound. The temporary trismus seen in young animals that have eaten decayed meat should be classed under ptomaine poisoning, and not under tetanus. The anatomical examination is almost always negative; hyperæmia and congestion of the cord which is occasionally seen is of secondary importance as it seems to have no actual bearing on the true cause of the disease.

Symptoms.—The period of incubation in a dog is not known positively, as the cases are so rare, but probably it is about the same as a horse—from five to twenty days—depending probably on the virulence of the bacilli. The general symptoms are stiff stilty gait, the neck and head are extended, the expression is staring and anxious, the ears are drawn forward and pointed, the membrana nictitans is drawn over the eye, wrinkling of the skin of the forehead, retraction of the angle of the

W. McDougall, del.

TETANUS (lockjaw.)

mouth, with difficulty in eating and drinking, the penis is erect and the muscles of the body are hard and outlined, the animal is nervous and anxious; the pulse and temperature are generally little altered. In one case there was an elevation of temperature; the case recovered. The duration of the disease is about a week, but it may vary. As recoveries are recorded from time to time, it cannot be regarded as always incurable.

Therapeutics.—The treatment is generally palliative. The wound must be examined and treated with antiseptics, and use such sedatives as morphine, dilute hydrocyanic acid, chloral; it must be remembered the most important matter is to keep up the animal's strength with easily digested food—scraped meat, beaten up eggs. Where the trismus makes it impossible to administer food by the mouth, it should be given in the form of nutritive clysters.

Tetanus antitoxin may be tried; the dose is 5 c.c. daily.

CONSTITUTIONAL DISEASES.

Anæmia and Chlorosis.

By anæmia in the strict sense of the word, we mean a lessening or thinning of the blood. This is especially noticeable after great hemorrhages. At the same time much greater importance must be placed on that condition of the blood where the number of red corpuscles is very much decreased. This diminution of the number of red blood corpuscles is the most important form of anæmia.

Etiology.—The disease occurs frequently in young, delicate animals of the improved or closely bred classes, in animals that are weaned too early, or when they are not properly nourished when puppies. It seems to be hereditary in some of these animals—litters from feeble, delicate bitches—and may depend to a certain extent on the defective development of the arterial system and an abnormally small heart. Anæmia occurs most frequently from the lessening in quantity of the vital fluids, such as the albuminous, or after a large or long-continued slight hemorrhage; from prolonged suppuration of the kidneys; and lastly a want of proper nutrition—for instance, young animals in a poor condition should be fed on meat. Very often impaired digestion prevents an absorption of certain nutritive substances in chronic disease, in fever, intestinal worms, dochmius, tæniæ or ascarides, or parasites in the blood (filaria), piroplasma, and from certain poisons in the blood, etc.

Clinical Symptoms.—The symptoms of the disease consist in a reduction of the coloring elements of the blood and a general condition of debility, showing every indication of loss of blood. The skin and visible mucous membranes are very pale in color.

The animals are easily fatigued and have a draggy way of walking; the pulse is often small and generally rapid. The temperature in many cases is below normal; in other cases it may be normal or even higher. Auscultation of the heart at times gives a soft, booming, systolic murmur. The respiration is increased with the pulse, and especially after very slight physical exercise. Reflex excitability of the brain in anæmic subjects is increased to such an extent that the animal will go into convulsions on the slightest provocation. Impaired digestion is a frequent symptom and naturally assists in complicating the disease. It is generally chronic, but proper treatment will often produce very good results.

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Therapeutic Treatment.—The treatment must all tend to one object—that is, the formation of more blood. This may be obtained by proper hygienic measures, feeding with light, easily digested substances, especially meat (not milk, which does not agree with the animals for any length of time), as well as medicinal substances—that is to say, ferruginous preparations. Among the latter, carbonate of iron, saccharated oxide of iron, and lactate of iron. These should be given in 0.4 to 0.5 gramme three times daily. Tincture chloride of iron, 10 to 20 drops daily. In many cases these iron preparations do not agree well with the patients, as the drug irritates the stomach and their appetite becomes impaired. These preparations should have some vegetable tonic added to them, the bitter principle stimulating digestion and counteracting the irritant effect of the iron. A very useful preparation in this disease is citrate of quinine and iron. This preparation is valuable not only for the iron it contains, but the tonic properties of the quinine, and also the very slight tendency it has to irritate the stomach. Arsenic, either in the form of Fowler's solution or the red sulphide, is useful as a general tonic.

Leukæmia.

This disease, which is generally chronic, is one that is characterized by an altered condition of the blood, due to the presence of an increased quantity of white blood corpuscles, which is the result of some pathological change in the blood-forming organs, viz.: the lymphatic glands, spleen, and marrow of bones. Formerly the disease was classified in three divisions: Lymphatic, lineal and myelogenic forms; according to the origin of the disease, the lymphatic glands, the spleen or the marrow of the bones. This, however, is now classified by Ehrlich into two chief divisions, namely (1) lymphatic leukæmia, which is the result of some pathological change in the lymphatic glands and causes the appearance in the blood of numbers of lymphocytes, *i.e.*, isolated cells the size of a red blood corpuscle, and (2) myelogenic leukæmia in which there is some pathological activity of the marrow of the bones in which there is an enormous increase of the ordinary polynuclear leukocytes and also large mononuclear cells which are only found in the marrow of bones. These distinctions are of no special value to the practitioner, and both these forms, as a rule, are combined in the dog as in other domestic animals. The myelogenic form has never been observed alone (Seidamgrotsky and others).

Etiology.—The cause of this disease is not definitely known at present. In the human race we find that middle-aged men are mostly affected with the disease; in the dog, while the middle or advanced period of age

seems to show the greatest number of cases, still young animals are frequently attacked, and the disease invariably runs an acute course. It is apt to follow certain traumatisms, but whether, in dogs, it follows as a result of grave infectious disease is a question. Attempts to produce the disease by transfusion of leukæmic blood in healthy animals gave negative results but produced a swelling of the glans penis and the lymphatic glands in its immediate neighborhood, and catarrh of the prepuce.

Pathological Anatomy.—The most important alteration always observed in this disease is an increase of white blood corpuscles and a lessening of the amount of the red corpuscles in the blood. This may become so great in the dog that we find the proportion of white to red blood corpuscles is 1 to 5 (Bollinger). We find the blood possesses a much lighter color than it does normally, has a lighter specific gravity. We also notice a great tendency to emaciation and a characteristic alteration of the spleen, which is greatly enlarged, and increased proportionately in weight. It is not rare to find it weighing at least 1000 grammes, and we find on section of the enlarged spleen, marks of true hyperplasia. Fenereissen found in a bulldog affected with this disease a spleen that weighed 3 kilogrammes. We also see at times enlargement of the lymphatic glands due to circumscribed hyperplasia of the glandular tissues. The marrow of the bones is occasionally involved and appears dark red. In serious cases the color is yellowish-

Fig. 101.—The blood in leukocythæmia.

gray, becoming soft and plastic. In very rare cases hyperplasia is seen in other organs, such as the tonsils, liver, and lungs.

Clinical Symptoms and Course.—The symptoms of the disease are similar to those of intense anæmia. First, there is a characteristic alteration of the blood, and, second, the symptoms presented by the spleen and lymphatic glands. In mild cases a microscopic examination of the blood and counting the number of blood corpuscles will insure a diagnosis. The best way to obtain a small quantity of blood for the purpose of making an examination is to make a slight slit in the upper surface of the outside of the ear. Place it under the microscope without adding any other substance to it, and we will recognize not only an enormous increase in the number of white blood corpuscles, but a difference in their normal size (Fig. 101).

While we may be able to correctly diagnose the disease from the condition of the blood during life, we may also notice certain alterations in the size of the spleen and lymphatic glands. In the glands of the head and neck we frequently find considerable enlargement. Normally,

the proportion of blood corpuscles in the blood is one white blood cor-
puscle to three or four hundred of the red blood corpuscles, but in
leukæmia the proportion is frequently one white to fifty red and in
extreme cases one to five. In making a count of the white blood cor-
puscles there is one point that must not be forgotten, and that is that
there is a normal physiological increase of the white blood corpuscles
when the animal has had a great loss of blood, immediately after the
digestion of a heavy meal, where there is chronic inflammation and
suppuration and in the bitch during pregnancy; hence a marked increase
in the number of white blood corpuscles, unless there are other symptoms
that confirm it, does not mean the animal has leukæmia. The altera-
tion in the lymphatic glands is easily detected in those glands that are
near the surface of the body. The lymphatic ganglions are found to be
enlarged, round, and sometimes irregular and are generally painless on
pressure. In some cases we may find solitary enlarged lymphatics in
different parts of the body. Frequently the region of the enlarged
lymphatics is œdematous. It is only when the spleen has reached a
considerable size that it can be outlined by palpation of the abdomen.
Another symptom of leukæmia is the marked increase in the pulse.
There is redness of the mucous membranes of the mouth, coated tongue,
disordered stomach, irregular attacks of diarrhœa, dropsical swellings,
ascites or chyle stasis, as a result of the acute hypertrophy of the
abdominal lymphatic glands, and we may occasionally see intestinal
hæmorrhage.

The course of this disease is invariably chronic with a gradual
increase of the severity of the symptoms, the condition of the animal
continually getting worse until finally the animal dies of exhaustion.

Therapeutics.—The treatment of leukæmia is practically the same
as that of anæmia. Give very nutritious food and arsenic, iron or
quinine. The inhalation of oxygen as well as the transfusion of
blood recommended in the treatment of this disease in man has been
tried in the dog and found unsatisfactory. The administration of certain
organic therapeutical preparations, such as spleen (lienaden) tablets,
lymphatic gland tablets, or bone-marrow tablets, has also been found
to be valueless.

℞.	Ferri et quininæ citratis,	0.2
	Saccharum,	0.6

M. F. pulv. divid charta, No. xx.

Sig.—One powder three times daily.

Pseudoleukæmia. Lymphadenia, Hodgkin's Disease.—This disease
appears more frequently in the dog than leukæmia. It is due to a
hyperplasia of the blood-forming centres, particularly the lymphatic

glands; these become greatly enlarged. The proportion of white over red blood corpuscles is also greatly increased. Cadiot found four cases where the proportion was 1 to 183 to 1 to 200. The cause of this disease has not been clearly demonstrated. Some observers ascribe it to tubercular processes in the lymphatics. The course is generally rapid, and while in the early stages there is no great alteration in the general condition; anæmia soon commences, and in consequence of the hyperplasia of the bronchial lymphatics we find dyspnœa, and as a result of the abdominal glands being in the same state of hyperplasia we have dropsy of the abdomen, later general œdema, and finally death.

Treatment is the same as anæmia and leukæmia. Arsenic is generally used; if it has no effect, iodide of potassium.

Diabetes Mellitus.

Etiology.—By diabetes mellitus we understand a peculiar chronic abnormal condition of the urine which contains a large quantity of grape sugar. The true cause of this peculiar disease is not exactly known, but from recent observations which have been made on dogs and other animals this disease seems to have some connection with diseases of the pancreas. Minkowski found that on removal of the entire pancreatic gland, sugar appeared in the urine in twenty-four hours—the amount of sugar was 10 per cent.—and death in a few weeks. A removal of a portion of the pancreas caused slight traces of sugar in a short time, and if the greater part of the gland is extirpated, leaving only a very small portion, sugar was immediately formed in the urine in large quantities, and resulted in death in a very short time. Lepine seems to think the pancreas has the property of taking up the sugar in the blood and when this gland is destroyed or its functions become impaired in any way, the sugar in the blood is eliminated by the kidneys. This is further confirmed by diabetic dogs, where one part of the pancreas is invariably found to be atrophied, either from functional loss of power or from carcinoma. Gebier mentions a case of transitory glycosuria, where a bitch of a very affectionate disposition and accustomed to be with other dogs, when separated from the other dogs and confined by herself, immediately had sugar appear in large amount in her urine.

While this disease is comparatively rare, and is more frequently seen in old dogs, occasionally large number of cases may be seen in certain localities; sex seems to have no influence on the disease, as it is seen equally in both sexes. Eber found it to occur most frequently in small pet dogs that have little or no exercise.

Clinical Symptoms and Course.—The disease develops gradually; the most important symptom is the gradual emaciation notwithstanding

the fact that the animal may have an enormous appetite and be fed with the most nutritious food. The animal is easily fatigued, is made to take exercise with effort, and in some cases moves about with more or less difficulty. The animal shows great thirst and drinks enormous quantities of water, at the same time passing large quantities of urine, which in most cases is pale and colorless and, as a rule, the specific gravity is particularly high (1030 to 1060) and it is only in very rare cases that the specific gravity is as low as normal. The odor of the urine is very characteristic; it resembles that of fresh fruit (aceton). The tests already described can be used to demonstrate the presence of sugar in the urine, the fermentation test being the best to use. Consult special works. The quantity of sugar present in the urine may vary in amount. Eichhorn states that in one case he found 11 per cent. and Haltenhof found 12 per cent. in another case. When an animal is fed on a pure meat diet it seems to lessen the amount of sugar in the urine, although there are certain cases where even this diet has little or no effect on the amount of sugar present. Albumin is sometimes found in the urine in this condition.

In many cases cataract may develop (opacity of the lens, gray cataract), appearing simultaneously in both eyes, causing total blindness, in some cases we find ulcerative keratitis. In other cases the hair falls out; vomiting, persistent diarrhœa, falling out of the hair, and some have noticed an inflammation and ulceration of the skin and bleeding of the mucous membrane terminating in chronic bronchial catarrh of the lungs. The course of the disease is gradual; emaciation and debility increase until finally the animal sinks into a deep coma, accompanied, as a rule, with convulsions, and finally death. The prognosis in all cases should be unfavorable. Post-mortem generally shows atrophy of the pancreas and hypertrophy and fatty degeneration of the liver.

Therapeutics.—The treatment of diabetes consists of feeding the animal on food which does not contain any carbon, or as little as possible. This may be accomplished to a certain extent by a meat-diet, and even this diet cannot be followed up for any great length of time. Give eggs and bran bread, vegetables and in cases where it cannot be avoided, milk; but wheat bread, sweets, sugar in the form of candy, cakes, rolls, rice, peas, lentils, potatoes, or any food containing starch in large quantity, must be avoided. A pinch of carbonate of soda must be given three times daily in the drinking water. Other preparations such as arsenic, salines, salicylate of soda, carbonate of ammonia or acetate of ammonia are useful. Where the animal is in a state of coma, use subcutaneous injections of ether or camphor in combination with the intravenous injections of normal saline solutions. It is always wise not to change the animal's abode, because animals sent to a hospital, affected with this

disease, show the effects of worry immediately, by the increase of the amount of sugar, if sent away from their habitual surroundings.

Diabetes Insipidus.

This condition is a chronic one in which there is no elevation of temperature, and a marked increase in the amount of clear urine secreted, which is of a low specific gravity and contains no sugar. The animal is constantly thirsty, drinking large quantities of water. This disease is less frequently seen in the dog than diabetes mellitus and must not be mistaken for ordinary polyuria which is seen where an animal drinks very large quantities of water, or as a result of the administration of diuretics or certain poisons or spices, or from atrophy of the kidneys after the rapid reabsorption of extensive exudates or transudates. It is also seen in a more or less pronounced degree in convalescence of an animal from many acute diseases, and it is also observed in certain organic diseases of the central nervous system. In this last group of sympathetic diabetes belong the case described by Holzmann; this dog was a very much emaciated hound three years old, having a pale mucous membrane and rectal temperature of 38.° The animal drank 12.57 c.c. of water daily, and passed about 12.79 c.c. of urine. The urine was yellowish, had a weak acid reaction, its specific gravity was 1.006, and contained nothing abnormal. On post-mortem nothing of any great consequence was found, except a myxoma hyalinum, which appeared in the shape of a yellowish, transparent, coagulated mass between the periosteum and the dura mater, entirely surrounding the spine with the exception of a small portion of the neck. There was also some hyperæmia and slight bleeding in the gray substance of the lumbar region. Five elongated osteoid sarcoma masses were found pressing on the dura mater. Holzmann could not decide which of these two conditions was the true cause of the disease. If we eliminate polyurias due to some organic alteration of the cerebral nervous system, as a result of chronic interstitial inflammation of the kidneys, then polyuria is distinguished from diabetes insipidus by the fact that the former is transitory in its character, and still it is only by close observation, lasting for some time, that we can distinguish between the two conditions; polyuria lasts only for a short interval and does not produce any great tissue changes, whereas, diabetes insipidus gradually progresses, becoming chronic, and is accompanied by great emaciation. The urine is pale, of low specific gravity, and contrary to chronic nephritis, contains no albumin. In all the cases observed by the writer which he took at first for genuine diabetes insipidus, he found where he could follow them closely, that after some time the polyuria and increased thirst gradually disappeared. Schindelka de-

scribed one case where the animal developed cataract and abscesses in different parts of the body, and other complications which are seen in diabetes mellitus.

Therapeutics.—The animal should be put on a strong easily digested diet and be more or less restricted in the quantity of fluid that it drinks; of course it is not only cruel but almost impossible to restrict the animal as to the quantity of water that it drinks if it is thirsty, but the food should be dry, and soup or other liquid foods should not be given. Medicinally the following drugs are recommended: bromide of soda, preparations of iron, opium, boldo root, antipyrin, ergot, extract of hydrastis, hydrastin and other vascular alteratives. Tannopin may also be tried. The treatment of symptomatic polyuria consists in attempting to remove the cause.

Obesity. Adipositas Universalis.

Etiology.—This disease is due to the absorption of large quantities of carbohydrates, and also to a lack of proper exercise, and in some cases as a consequence of improper oxidizing processes in the body. It may also be hereditary in some cases. This disease is especially seen in lapdogs or pet animals, and is also noticed in bitches after ovariotomy, and in dogs that have been castrated.

Clinical Symptoms.—The common location of fatty deposits is in the panniculus adiposus, around the region of the abdomen, and surrounding the internal organs—for instance, in the mediastinum, the pericardium, and the capsules of the kidneys. The circumference and weight of the body increase very much, and round prominences form in different parts of the body, especially the neck, shoulders, back, and hips. The abdomen is round and distended. The animals are lazy, dull, awkward, and tired on the slightest physical exertion. When this condition becomes very marked, and there is a large deposit of fat in different parts of the body, especially when it has accumulated in the thorax and neighborhood of the heart, we have a lessened heart-action and more or less difficulty in respiration, sometimes from the pressure of quantities of fat on certain blood-vessels, decreasing their size and thus requiring greater effort of the heart's action, until finally the heart becomes overtaxed, and we have symptoms of heart-failure, bronchitis, chronic catarrh of the stomach, and œdema.

Therapeutic Treatment.—The most important factor in the treatment of obesity is abundant and regular exercise in the open air and restricted feeding, the food must be albuminous, and fat and carbo-hydrates avoided. Sugar in any form, candy, sweets, etc., must be prohibited. Meals must be given at regular intervals, in a young dog three times

daily, a dog over a year, two meals daily; a small meal in the morning and the good meal at night; dogs that have very little exercise, one meal daily is sufficient, and as a rule they seem to do very nicely on it. Slight laxatives, especially the salines, such as Apenta, Hunyadi, or Veronica waters, in teaspoonful doses once daily, and a pinch of phosphate of soda in the morning. There seems to be some value in the administration of the preparations of the thyroid glands (thyroid, thyroidin, or iodothyrin tablets), these tablets contain the equivalent of 0.3 of fresh thyroid gland and are to be given according to the size of the animal, from 1 to 3 tablets daily. Seven dogs were treated with thyroidinum depuratum in doses of 0.15 daily, and in from one to four weeks the animals were reduced in amounts varying from 350 to 3460 grams. But these prepararations must be used with great care, beginning with a very small dose and gradually increasing it. Iodide of potassium, boracic acid and borax are not to be recommended as they are apt to cause disorder of the digestion.

Uræmia.

As a consequence of this disease and impaired activity of the kidneys, certain substances, that should be thrown out in the urine, remain in the blood; also the watery excretions of the body, acting as a poison, produce a condition known as "uræmia." The exact nature of the materials that cause this disturbance is not definitely known, but in all probability it is not due to one, but to several substances, such as albuminous decompositions and certain end-products. Uræmia is usually seen as a result of acute inflammation of the kidney, hydronephrosis, obstruction of the neck of the bladder, or urethra, by calculi; from tumors of the prostate, paralysis of the detrusor, and rupture of the bladder. The disease may be acute or chronic, and one form may merge into the other. The acute form is seen in acute inflammation of the kidney and retention of urine in the bladder, in this case there is persistent vomiting, convulsive twitching of the muscles, convulsions, coma and subnormal temperature. The chronic forms may appear following chronic nephritis, and from partial retention of the urine, it is seen particularly in stone in the urethra, when the passage is not completely obstructed, but only allows a very small quantity of urine to escape, when this is present there is depression, loss of appetite, irregular vomiting, occasional convulsions, diarrhœa. Certain experiments have been made on the dog to artificially produce these uræmic symptoms— for instance, by removing both kidneys or ligitating the ureters. Voit observed that when healthy animals were fed on food containing uric acid, and at the same time deprived of water, these conditions pro-

duced the disease. Grehant and Quinwuaud produced death in dogs when urea was injected into them subcutaneously to the amount of 1 per cent. of the whole weight of the body. This produces convulsions, apparently from suppression of respiration. Feltz and Ritter produced uræmic symptoms in the dog with injections of salts of ammonium. It is of practical interest to know that uræmia may also occur in acute nephritis, in cases of enlargement of the prostate and obstruction of the passage of urine, or from uratic stones filling up the urethra or the neck of the bladder.

The clinical symptoms have been described by Roll and others as high temperature alternating with chills, constant vomiting, convulsions, paralysis, coma, decrease in the temperature, and death within a few days. Roll also states that dogs which have suffered with hypertrophy of the prostate showed the same symptoms of this disease, but these were produced gradually and the symptoms were not so acute. In such cases we find dulness, disturbance of the intestinal canal, and convulsions.

Treatment.—The treatment of uræmia is based on an endeavor to remove or lessen the original cause (nephritis, etc.). If there is a calculus present, it must be removed as soon as possible; and to eliminate the poisonous materials from the blood, use mild saline laxatives and treat symptoms.

Scurvy.

It is doubtful if true scurvy occurs in the dog—that is to say, a hemorrhagic diathesis marked by a spontaneous bleeding of the mucous membranes of the mouth, and also from the muscles, joints, etc. This may occur as an epidemic; sporadic cases are extremely rare. It is a question, however, whether true scurvy does occur and whether it is not an attack of ulcerative stomatitis, which in the older text books was described as pesudo-scurvy, or it is possible that it is distemper, or septic or some condition due to the toxins in the blood. It may result from the feeding of tainted or decayed meat or particularly in packs of hounds where the dogs are fed, entirely on meat, and never any vegetables. Seltzner described one case that in some respects resembled Basedow's disease; a hæmorrhagic diathesis and in other respects it was similar to rickets.

There were numerous hæmorrhagic centres in the skin and cellular tissues. The buccal mucous membrane was somewhat swollen and filled with hæmorrhagic spots, or even necrotic. The gums were also in the same condition. There was loosening and falling out of the teeth, horrible odor from the mouth and salivation, bleeding from the mouth, bloody urine, and sometimes blood was vomited, in one case there was

blood in the anterior chamber of the eye, and an extravasation of the epiploon. Animals generally die of exhaustion, and post-mortem may show extensive hemorrhage of the intestinal tract, pneumonia and pyæmia.

Treatment.—Local treatment of the mouth with astringents, listerine, permanganate of potash, regulation of diet. Where animals like packs of hounds have been fed on nothing but meat, a combination with vegetables seems to be advantageous; the regular diet of cooked meat should have greens such as spinach or the ordinary dandelion, root and leaves cooked with it. General tonics, such as gentian or nux vomica, and when there is general hemorrhage the internal administration of hemostatics is useful.

Priessnitz's Bandage or Compress.

This compress is mentioned a number of times in the work, and as it has special advantages in the treatment of dogs, the translator will attempt to describe it, as the author has not done so, probably due to the fact that it is so very well known in German therapeutics that it needed no explanation, but to English-speaking veterinarians this is the reverse.

The object of the compress or bandage is to keep up a continual heat, either dry or moist, to certain parts of the animal's body. We first apply against the part affected a piece of absorbent cotton, thick wool, or dry felt; or if moist heat is required, it is soaked in warm water or a medicated solution and wrung out to remove the excess of fluid; this is then held in position by a covering of some light material—a wide bandage of cheese-cloth is the best—and next a layer of oiled silk or rubber cloth (the object of this is to retain the heat and in case of a wet compress, the moisture), and finally over this is placed a compress or bandage of flannel. This last is to prevent loss of heat by radiation. Sometimes the inner layer of cheese-cloth is omitted, or else it is put on the outside of all.

The above procedure may seem to the hurried practitioner a rather long and unnecessary method, but after one has tried it and found the great advantages it has in the retention of heat, especially in diseases of the lungs, in hastening the maturing of an abscess, or in the lessening of a tumefaction by the constant and direct application of heat and moisture, he will realize its benefits.

DISEASES OF THE ORGANS OF LOCOMOTION.

DISEASES OF THE BONES.

Rachitis.

(*Rickets.*)

Etiology.—The different theories which have been advanced concerning the origin of rachitis do not seem to answer in all cases. These theories are as follows; it is due to a deficiency of lime-salts as a consequence of disturbances of digestion; to excessive formation of lactic acid, in the blood and to salts of potassium in the milk or to a lack of hydrochloric acid in the gastric juice, which would dissolve the lime-salts; an alteration of the general nutritive condition on account of abnormal influences in young animals; inflammatory hyperæmia and an increase in the number and size of blood-vessels in the osteogenetic tissues, so that the lime-salts continue to circulate in the blood instead of being deposited in the bones. None of these theories stands the test of close observation, we therefore do not know positively anything relating to the character and origin of rachitis. It is, perhaps, better to admit that it is a specific etiological change (which has not as yet become positively known). We know positively, however, that rickets can be developed in the dog by deficient, improper food, by want of meat, and especially bones, as it has been demonstrated that animals with this disease if given these articles of diet seem to improve immediately. Insufficient food to the bitch during gestation, or trying to raise too large a litter, or early weaning, improper food, keeping animals in cellars or in dark, damp places are all factors that tend to cause rickets. A proper amount of exercise is especially important for puppies kept in a small place.

Rickets generally appears in young animals in the first few months of their life. It is often hereditary, as is frequently seen as a result of very close breeding and also in breeds where color or conformation is the chief object, such as bull terriers, collies, or great danes, and where a breed is not old enough to be established, as Boston terriers. The symptoms appear relatively in proportion to their growth. If the puppy grows quickly, rickets appears quickly; if it grows slowly, the disease comes on gradually.

Pathological Anatomy.—Rickets consists of a peculiar disturbance

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of the bones of the whole system, which can easily be distinguished on looking at the animal. It seems to be due to a deficiency of lime-salts in the bones, making them soft and flexible. At the same time the nutritive process in the periosteum seems to be changed. The bones are light and soft enough to cut with a knife, and the epiphyses of the long bones are very much thickened; the marrow and periosteum are reddened.

Fig. 102.—Radius and ulna of a dog affected with rickets.

When the periosteum is forcibly removed from the bones of the animal in this condition, certain portions of the bony tissue come away and remain attached to the membrane. This is especially noticeable between the epiphyses of the vertebræ. The inner layer of the periosteum is thickened and the diseased tissue seems to have undergone a spongy degeneration. Inside of the bone we find it soft and cavernous. In the normal dog the bones of the skull are joined evenly, but in the rachitic dog interosseous spaces (fontanels) have been found.

Clinical Symptoms and Course.—Omitting the animals that are born with rickets, the first appearance of rickets is gradual, and generally the veterinarian is not consulted in the early stages, but only when the skeleton shows marked alterations of form, especially the bones of the extremities and back. The animals are dull, walk very carefully and with more or less effort, have no desire to run about, but lie down as long as they can. We find periosteal alterations in the frontal bones and bones of the temple, so that the head shows a peculiar marked alteration in conformation. Schutz has found that in rachitic animals the bones of the skull are extremely thin and the sutures separated. In the thorax there is a weakening of the walls of the chest, and the animals present that one-sided or "chicken-chest" condition. There is a peculiar knot-like swelling of the ribs both at their upper extremities where they unite with the vertebræ, and in their inferior extremities where they unite with the sternum and false ribs.

In this latter condition there forms a series of small, round nodules known as "rachitic rosary." In acute forms of this disease the spinal cord is twisted or bent in different directions (kyphosis, lordosis or
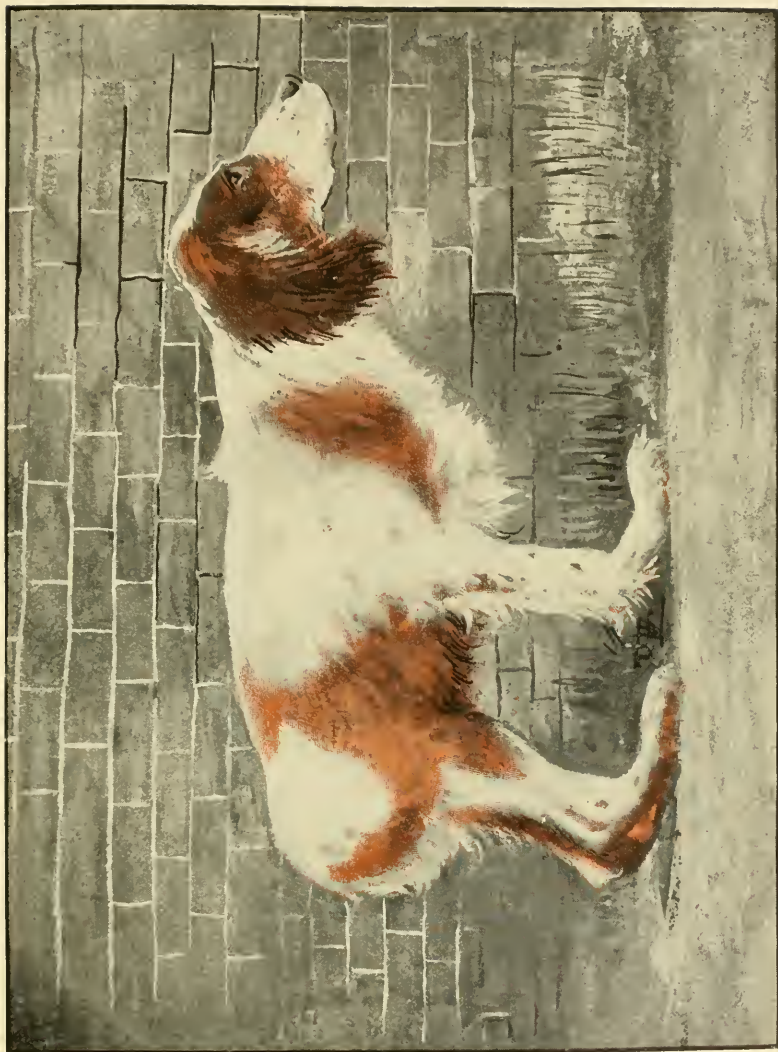
RHACHITIS (*rickets.*)

skoliosis). The most striking alterations are observed in the extremities. The long bones are thickened at both ends and bent on account of the softness of the bone and pressure of the weight of the body, when standing (Fig. 102). The upper portion of the front legs bends inward, rarely outward, and the animals have a peculiar, unsteady, awkward gait. They stand on the hind legs with the leg twisted under them, and in aggravated cases, the bones are bent in a circle, the bend of the astragalus coming down on the ground (Plate, Rachitis). As a consequence of the altered position of the bones, the ligaments become distended and stretched, causing an inflammation of the joints and consequently more or less enlargement of them. At the same time we observe emaciation, loss of appetite, and in some cases, catarrh of the stomach and air-passages, changes in the shape of the teeth, which are abnormally small and frequently devoid of enamel, or placed irregularly in the gums. The disease, as a rule, is chronic and the prognosis unfavorable. If the disease is taken early, it may be checked to a certain degree by means of proper feeding; but when the deformity is once formed, it is only in extremely rare cases that it does not show as the animal grows to an adult age either in the form of a peculiar bending or bow-legged appearance of the front legs, or a twisting, or show halt-shape in the hind-legs.

Therapeutic Treatment.—The treatment of rachitis consists of improving all the nutritive conditions and encouraging digestion as much as possible. Give the animal plenty of meat and bones, adding to them certain amount of phosphate of calcium, egg-shells, and lime-water in the drinking water. Phosphorus, while medicated, generally causes irritation of the intestines. Improve the digestion as much as possible by tonics, nux vomica, gentian, etc.; keep the animal in a clean, dry place and see that there is good ventilation. If there is diarrhœa, give bismuth subnitrate. To avoid bending of the articulations, the animal must be prevented from taking unusual exercise, running, jumping, etc. Splints are sometimes used to correct the curving of the long bones.

℞.	Ferri lactis		5.0
	Calcium phos.,		
	Calcium carbonate,		
	Saccharum lactis,	āā	20.0
F. M. pulv.			

Sig.—One small teaspoonful in the food twice daily.

Fractures of the Bones.

By a "fracture of the bone" we mean a breaking or disunion of a bone or a bony cartilage; fracture is quite common in the dog, particu-

larly the bones of the extremities, femur, radius, tibia and fibula, ulna and humerus and metacarpus and pelvis being the commonest, less frequently seen are the metatarsus; the sternum, ribs, cranium, vertebræ, and scapula are very rarely seen.

Etiology and Prognosis.—Most fractures are caused by external forces, and the bone fractured is at the region where the force or shock has expended most of its force—for instance, from blows or being run over, hit with a stone, or in some instances a fracture may be some distance from the region where the greatest amount of force has been made, such as falling for some distance, or concussions. We also see fractures of small projections of bones caused by great muscular exertion. Very old and very young dogs have a predisposition to fractures and rickets, or a tendency that way may also produce fractures from a weakened or softened condition of the bone.

We separate fractures under different names according to their position, severity, and the complications accompanying them.

In the first class belong infractions, splits or cracks, impressions or depressions.

In the second class belong oblique, transverse, longitudinal, and fissure fractures.

In pups the epiphysis and diaphysis are sometimes fractured through the symphysis, due to traumatic influences. This fracture, which is rather common, especially in the humerus and radius, is always confined to the immediate neighborhood of the symphysis. The general course of these fractures is the same as ordinary fractures, and no special mention is necessary regarding fractures of the soft bone, which in the young animal has not yet hardened.

The condition of the soft tissues in the neighborhood of the fractures and the amount of injury that they have had are of great importance in the prognosis. All fractures in which the soft tissues are not very much injured, and where the skin has not been torn, heal very much more quickly than those where there is an open wound extending into the fractured end of the bone. The first are termed simple fractures, and the latter, compound fractures. Where the fracture has involved a joint, it is called an intra-articular fracture. The compound and intra-articular fractures are very slow and difficult to treat, and present such symptoms as synovitis, either with or without serous or purulent inflammations. In such fractures, even when we have union of the broken ends of the bone, we may have as an after result a stiff joint or ankylosis from complications in the joint.

Clinical Symptoms.—The symptoms of fractures are generally indicated by partial or complete loss of the use of the whole or part of a limb. There is pain on pressure, deformity in the symmetry of the broken

bones of that part of the body, and on moving the fractured ends there is a rubbing sound (crepitation) similar to rubbing two hard, rough surfaces against each other. The amount of loss of power in a broken bone depends to a great extent on the amount and severity of the fracture. This is very marked in fractures of the extremities; great pain on pressure, especially on the line of the fractured bones. This may also be of especial diagnostic importance in case of cracks or fissures of the bone. In such a case, while the symptoms are all present, the ends of the bones are not displaced. This is generally seen in the longitudinal form and in very young animals where the bone pivots on the
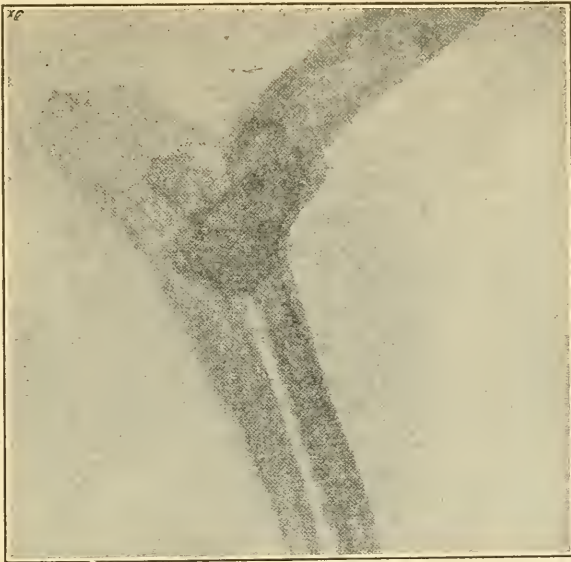
Fig. 103.—Skiagraph of fracture of the humerus.

fractured epiphysis. Crepitation and an abnormal movement are easily recognized by taking hold of the part above and below the fracture and moving it in different directions. Both of these symptoms are absent in incomplete fractures and in such fractures where the bones will close together with very little displacement. This is especially seen in longitudinal fractures of the short compact bones. We occasionally find a mild, rubbing bruit or sound produced by dry blood-extravasations or fibrinous coagulations between the surfaces of joints. In cases of fracture where the periosteum has not been torn, we will have a certain amount of swelling in the fractured region, pain on pressure, loss of appetite, and a certain amount of fever. This last symptom, however, is rarely noticed. When there is any uncertainty about the diagnosis

it is well to have a skiagraph (X-ray) made of the affected part (Fig. 103).

Where there is an external wound which becomes rapidly closed by the blood and the purulent agents cannot penetrate between the fractured ends of the bone, we have a form of fracture that is not so difficult to treat; but if any septic materials should have penetrated into the wound and found their way between the ends of the bones, the condition is generally indicated in the following manner: There is a marked inflammatory swelling in the neighborhood of the wound. At first the discharge from the wound is blood-colored, then rapidly becomes pus-like, and finally purulent in character. If the discharge becomes obstructed in any way, we quickly notice a purulent, œdematous swelling all around the part, which is always a very grave symptom. If the course is favorable, the injured part becomes rapidly filled with red, granulating tissue, which finally dries, becomes hard, and forms a scab. By means of strict antiseptic treatment this is possible, and we can reduce the danger and time of an open fracture by strictly following the usual antiseptic forms of treatment. In the dog, however, this is always rather difficult to accomplish, as the animals are hard to confine, moving about constantly and pulling or tearing the bandages.

Fig. 104.—Diagram of union of fracture in the tibia of the dog: *a*, outer callus; *b*, periosteum; *c*, inner callus; *d*, inflammatory deposit.

The Phenomena of Union in Fractures. —The healing and union of the fractured ends of a bone are very similar to those of wounds, either by first intention (primum intentionem) or by second intention (secundum intentionem). In simple fractures we generally get union by first intention, and in compound fractures, unless the union be extremely small, we get union by second intention (Fig. 104). In both cases the union is accomplished by means of a callus growing around the ends of the bone—that is to say, a soft cellular tissue which forms an envelope surrounding the bone and gradually becoming hard through the ossific action of the periosteum and the marrow of the bones. The ring-shaped or external callus surrounds the fractured parts. This cellular tissue is formed of osteoblasts. The inner callus is formed by the marrow, forming a peculiar plug-shaped body and filling up the open ends. The periosteum is the true factor in making union between broken ends of bones. This is especially noticed in fractures where the periosteum is exposed, and where that envelope is torn or injured, union is almost twice as long as where the peri-

osteum is preserved. The extravasation of blood found in the early stages of a fracture which lies in the surrounding parts does not in any way assist in the actual union, but helps to a certain extent in holding the bones together until the callus is formed. The callus, in the beginning, is a spongy mass, especially in bones containing a large quantity of marrow. This gradually changes into a bony cicatrix or callosity. This becomes thinner and denser, lessening in diameter, and finally becomes smooth on its surface, forming what is known as "final callus." Reabsorption commences at the same time until the body masses, which are useless after the bone is united, finally disappear, but there is always a certain amount of enlargement around the fractured ends of a bone at the point of union. Cracks and fissures undergo the same process.

Period of the Process of Union in Fractured Bones.—The time required to obtain complete union of a fracture—that is to say, until the animal can use the part without any pain or difficulty—depends largely on the size and position of the bone, the age of the animal, and the amount of use the patient makes of it. According to the observations of the writer and others, in fractures in which the periosteum is not torn, or simple fractures of the large bones containing marrow, the time is from eighteen to twenty-four days in adult healthy animals. Fractures of the ribs unite in from ten to fifteen days; in metacarpal and metatarsal bones, ten to eighteen days. In young animals the process is a few days shorter; in very old animals it is much longer. After the union of the fracture, as a rule, the affected leg is not used with as great freedom as it was before. This is especially noticeable in young animals that are growing. Very often there is a subsequent atrophy and impaired development of the muscles of that part. While this may be due to a certain extent to the inactivity of the muscles, when tied up in the splint, and also to pressure of the dressing, it is often noticed after the dressing is removed, and sometimes for weeks afterward, the animal walks stiff or is even lame; massage of the affected leg is useful.

Therapeutic Treatment.—In simple fractures the treatment consists of returning the broken ends of the bone to their proper anatomical position, and holding them securely in place.

The bringing together of the fractured ends of the bones must be done as soon as possible, and it is accomplished by pulling or extending them in a longitudinal direction until the fractured ends fit together. In some instances where the tissue is loose they have to be pressed back in their normal position. The animal should be held by an assistant while the operator manipulates the ends into position. In cases where there is extreme pain and in order to keep the animal from struggling, it is advisable to etherize, or better, give the animal a subcutaneous injection of morphine. In such cases as fractures of the metacarpal bones, bones

of the face, etc., reduction can be made without an assistant. When the bones have been placed in position as near as possible to their normal shape, we must then apply a dressing which will keep the fractured ends in their position until they have united.

The best dressing for fractures in dogs are those which dry rapidly, such as plaster or silicate of sodium solutions. In some cases it becomes necessary to apply a temporary splint apparatus for a few days. This temporary splint apparatus must be used where there is great swelling, or where the condition of the wound or part would lead you to expect much swelling. The writer finds the best thing for fracture dressings is a

Fig. 105.— Plaster splint on fracture with support around body.

broad pasteboard splint. This should be dipped in water and kneaded by the hand until flexible. There are various other materials for making splints—gutta-percha, wire gauze, spongio-piline, felt, sheet tin or zinc, wood, etc. In some cases where there is an open wound wire gauze may be used, fastened above and below the fractured ends of the bone, leaving the wounds exposed. This gives it sufficient support, and admits of proper antiseptic methods being followed. A plaster-of-Paris or silicate of sodium dressing may be applied immediately after the frac-

ture, provided there are no wounds. Where there are wounds or swellings we must wait until the swelling is absorbed.

We apply a permanent dressing, or a temporary dressing may be put on in the following manner: Cover it thoroughly with cotton wadding and apply the ordinary bandage, taking care not to make it too tight. In plaster-of-Paris dressings, the ordinary gauze, crinoline, or cheese-cloth may be used, and the plaster, in powder form, rubbed into the bandage while it is being rolled. Then rub a small amount of oil (sweet) into the skin about the point of fracture to prevent the bandage sticking. At the same time place the plaster bandage in water for a few minutes and then wrap it carefully around the splint, following the methods adopted in ordinary bandage rolling, being careful not to place it too tightly. Smoothe the water out of the part, making the bandage as level as possible. In some cases where you want a very stiff bandage, it is advisable to put a certain amount of plaster between the folds of the bandage and finally give a good coating over the entire bandage. After the dressing has been applied, the animal must be kept perfectly quiet for at least ten to twenty minutes to allow the dressing to become hard. A plaster dressing will dry and harden a little more quickly by the addition of a small quantity of alum or common salt; a little glycerine added to plaster makes it much harder. A pair of curved scissors are the most practical for the removal of the dressing. Tripolith dressing (a mixture of plaster-of-Paris and soot) can be applied in the same manner as the plaster. Its composition is said to be much lighter and it dries much more rapidly. Silicate of sodium dressing has the advantage of lightness, durability, and of being removed easily, but it has one disadvantage, and that is it dries slowly, sometimes taking a couple of hours. The writer likes this form of dressing best, and to overcome the drawback of slow hardening has placed thin layers of wire gauze between the dressings. Flannel may be used as an under layer. Another dressing is a mixture of benzoate of sodium and silicate of sodium. In fractures situated in the upper sections of the leg where the extremity is cone shaped, it is necessary to build up the bandage in numerous layers to give it body so as to hold to the position of the leg, in other cases the bandage should be carried around the body so as to make the bandage firmer (Fig. 105).

The starch bandage (common boiled starch) is very useful, easily made and can be used in the smaller dogs, the bandage being put on first in one layer, this carefully covered with the starch, this covered with a layer of muslin, then starch over this and finally the third layer covered with starch and allowed to dry. This bandage takes longer to dry than the plaster.

Pitch plaster bandages are put on those parts of the body where an

ordinary bandage cannot be applied, as in fracture of the scapula, femur and humerus. The pitch can be spread on strips of coarse muslin, and heated and applied to the injured part (Fig. 106). Burgundy pitch 100.0 wax 50.0, mix this into a plaster. The dressing may be left in place until we feel sure that union has taken place. In cases where the dressing has been too tight, or if the patient shows restlessness, whining, crying, loss of appetite, or fever, indicating that something is wrong in the fractured region, the dressing must be removed at once (Fig. 107).

When the average period of union of fracture has passed remove the dressing carefully and see that the fragments are united. If we recognize any mobility in the fractured region, we then understand that we have a slow, callous formation, and nothing else is to be done but to renew the dressing as soon as possible, having first rendered the parts antiseptic by means of sublimate, soap and water. Put on the bandage again and let it remain for two or three weeks more. If we do not obtain a cure at the end of that time
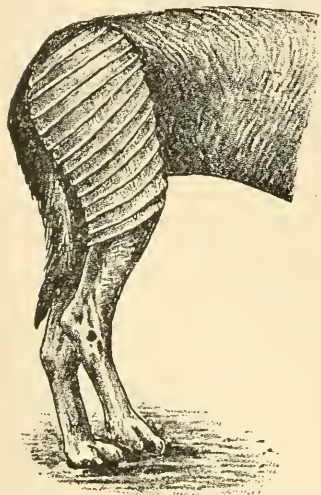
Fig. 106.—Pitch plaster put on in layers. (*Cadiot-Breton.*)
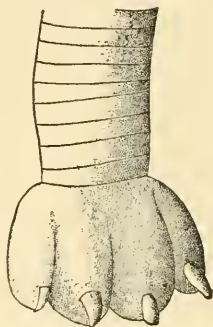
Fig. 107.—Effects of tight bandaging of a splint.

we may conclude that we have a false joint (pseudarthrosis).

The methods pursued in man of introducing ivory or bone pins into the bone or screwing it together by means of clamps or resecting the ends with a saw, is hardly practicable in the dog. If, however, we discover that there is any danger of the formation of a false joint, we may daily irritate the ends of the wound by rubbing the broken ends together, and tying a thick elastic band around the leg above the fractured ends of the bone for one-half to one hour each day to allow an engorgement of blood around the fracture, this bandage should not be made too tight so as to interfere with the arterial circulation but sufficient to cause venous engorgement about the fracture; others recommend injections of 3 per cent solution of carbolic acid, or 60 per cent. of alcohol, and applying a dressing, giving the animal phosphate of lime or phosphoric acid.

In complete fractures we follow the same rules as in the subcutaneous forms—that is to say, we endeavor in one way or another to hold the broken ends of the bone together while the wound is healing, and at the same time to dry up the wound with antiseptic applications. This is rather difficult to do in the dog, but it may be accomplished by making a "window" or hole in the dressing. The wound must first be thoroughly cleansed, dressed antiseptically, and then we apply a plaster dressing, according to the usual method, and place a piece of wadding upon the wound. When the dressing becomes hardened, we cut a hole over the wound by means of a probe-pointed bistoury, coating the edges of the opening with a small quantity of plaster-of-Paris or collodion in order to prevent the discharge of pus, etc., from running under the dressing.
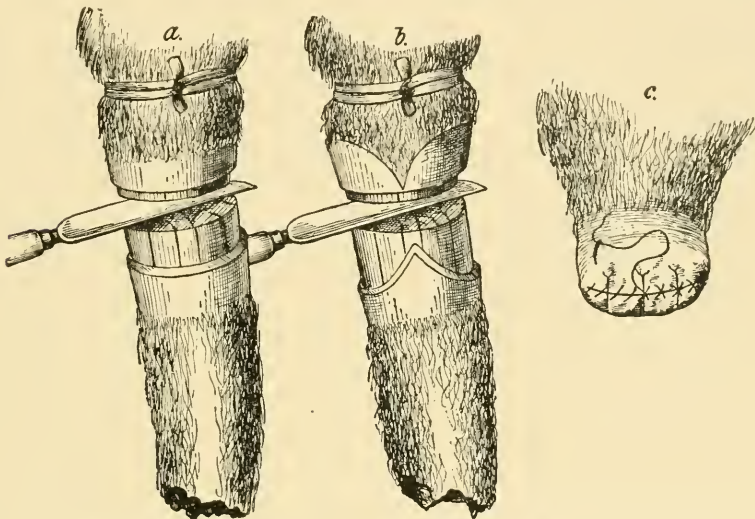
FIG. 108.—Different methods of amputation: *a*, straight section; *b*, flap operation; *c*, method of sewing the wound.

The rest of the operation is performed according to the general rules followed in the treatment of wounds. In cases where the fracture is fresh and the wound is very small, we cover it with an antiseptic dressing (for instance, tincture of iodine and several layers of corrosive sublimate gauze). Then apply the closed dressing of plaster-of-Paris entirely over it. If the wound is slight, as a rule you do not have to remove the bandage. Care must be taken, however, to take the temperature and watch the leg to see if it swells, and if the animal is restless and uneasy. In cases where there is a wound and several broken bones, making a compound, comminuted fracture, the patient can only be saved by amputating the leg. Amputation of the leg, as well as exarticulation, has been performed a number of times in the dog, and generally success-

fully, the animals soon becoming accustomed to the loss of the leg, using the other three with almost as much ease as they did the four.

Amputation.—Before the operation clean the affected leg with soap and with a brush; then disinfect with powerful antiseptics (5 per cent. solution of carbolic acid, 1 to 1000 solution of corrosive sublimate, or 2 per cent. solution of creolin). In operating, the animal is put under ether or narcotized in some way; do so with as little loss of blood as possible. To accomplish this, use a rubber bandage as a tourniquet. All of the rules of antisepsis must be strictly adhered to, and at short intervals, during the operation the wound must be irrigated with some antiseptic. Avoid any serious manipulation or compression of the soft parts, The skin must always be cut in such a manner as to cover the stump when the two ends or flaps are united. All the vessels, arteries as well as the veins, which have been cut must be taken up separately with the forceps, and ligated with catgut or silk. All stumps of nerves which lie loose upon the wound are to be drawn out with the forceps and cut off as close as possible. The bandage must not be removed until all the blood vessels have been ligated (Fig. 108). The wound and its neighborhood are then thoroughly irrigated with an antiseptic solution and closed with stitches, as illustrated on page 333, Fig. 108, *c*; and 367, Fig. 118, *a* and *b*. The whole wound is to be covered with a permanent antiseptic dressing. For further details, see Treatment of Wounds.

There are three methods at the disposal of the operator.

(1) **Amputation by Means of a Circular Section.**—Cut through the skin of the affected extremity to the fascia, making a complete circle around the member. Pull back the skin and have it held by an assistant, he pulling the skin toward the body as far as possible. It may be necessary in some instances to dissect a small portion of the skin and the cellular tissue from under the layer of the skin. After that make a sharp, clean circular cut, close to the edge of the skin which is pulled back, amputating all the muscles, and then cut the bone with bone forceps (Fig. 108, *a*), or saw through the bone. While cutting through the bone it is necessary for the assistant to pull back the soft tissues as far as he possibly can toward the body, either with his hands of by means of a linen compress which has been dipped in an antiseptic solution. In cases where amputation of the extremities is to be performed, where there are two bones, as in the forearm, it is necessary to cut the soft tissues that are located between the bone.

Flap Amputation.—This is made by cutting two half-moon-shaped flaps of the skin and separating them from the fascia in which they are located as far as their base, turning them upward and backward. The muscles are cut close to the flaps, the tissues pulled back, and the bones sawed through and the ends of the flap carefully stitched (Fig. 108, *b*).

Exarticulation.—Separate the soft parts exactly as in amputation by means of a circular or flap operation. Then open the affected joint by bending it, producing a tension of the ligaments which are located in front of it; then cut through them with a bistoury. To get quicker adhesion of the tissues it is best to scrape the cartilage on the face of the articulation. Exarticulation is finished by separating the other ligaments and the capsule of the joint; then proceed exactly as we do in ordinary amputation. The operation of removal of the tail is taken up later.

Minor Diseases of the Bones.

Other disease of the bones in the dog are of slight importance but the following are mentioned:
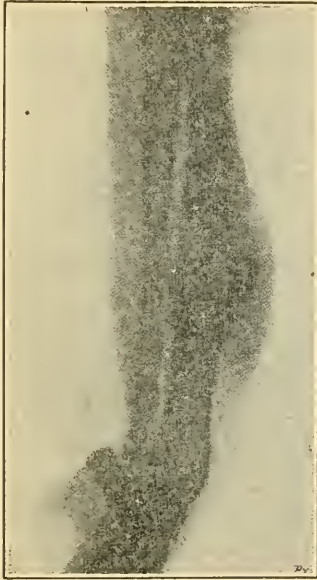
Fig. 109.   Fig. 110.

Fig. 109.—Skiagraph of osteosarcoma of the radius with opening in the upper part of the bone.
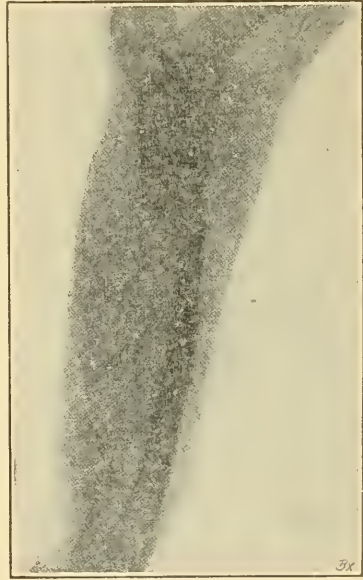
Fig. 110.—Skiagraph of the ulna with middle and lower third of the bone nearly gone.

Osteomalacia. Softening of the Bone.—This condition has no connection with rickets, but a softening of a bone after the bone has become hard and perfectly formed. It is a question if this disease really exists in the dog. Zscholke states he has seen numbers of cases where there was great loss in the substance of the bone, but at the articulatory surfaces there was no evidence of rickets; another observer treated a dog

with an enormous swelling of the inferior maxillary and on minute examination of the bone there was lacunary atrophy.

Ostitismus Universalis and **Hyperostosis et Myostosis Universalis Progressiva.**—This is a peculiar affection of young dogs. It is indicated by numerous nodules of bone at the insertion of many muscles of the body, and great increase in the lime salts of bones and also of weight of the skeleton. It has been observed by Kitt where an animal had an enormous swelling of the head the lower jaw and the bones of the legs particularly the bones of the forearm, while the other bones of the body were entirely free from any sign of the disease. The animal suffered no inconvenience from the condition, had no fever, appetite good and general health was excellent. The deformity of the skeleton made walking irregular and difficult, and the animal moved around with a wave like motion of the body.

Multiple Periostitis.—This condition is extremely rare, there is generally more or less rheumatism and deposits in the articular ends of the bones, probably a complication of gout.

Neoformations of the Bones.—Osteophytes and exostoses, so often seen in other of the domestic animals, are extremely rare in the dog. Sarcomata (osteo sarcoma), on the other hand, appear in a variety of ways developing from the periosteum or directly from the marrow canal of bones, or in the inferior maxillary causing a tumefaction of the gum. The writer has observed two cases in the radius and ulna, which were illustrated by means of the Röntgen rays (X-rays), the destruction and alteration of the bones could be readily distinguished, numerous cases have been observed by other observers.

DISEASES OF THE ARTICULATIONS.

INFLAMMATION OF THE JOINTS.

General Pathological Anatomy of Inflammation of the Joints.—A common affection of the joints is synovitis. In a simple case of inflammation of the joints, we see an increase of blood vessels, an infiltration of the small cells, and even disintegration of the endothelial cartilage; the tissue under it becoming granular. We find quite frequently an accumulation of fibrinous or "croupal-like" membranes, followed by a cicatrization of the synovial membrane. In all acute forms of synovitis we see hemorrhages in the form of small, tick-like bodies. In inflammation of the joints, when it takes a chronic form, the synovial membrane becomes thickened, is tougher, with marked indentations on the membrane which are tree-like in form. The synovia appears in large quantities, is yellowish, clear, or slightly turbid, and dulled by cells or fibrinous flakes. If the synovia is gathered in a large quantity, we find a distention of the capsule, producing a hernia-like protrusion of those parts of the joint, where there is the least resistance. Occasionally we find the synovial membrane covered with thick clotted masses. These occur from the excessive secretion of synovia in the joints. Sometimes small bodies appear in the joints due to some parts of the hard cartilage becoming detached and in rare instances by a breaking off of small pieces of bone, and, finally, we may see the development of a cicatricial contraction of the synovial membrane; which is due to an acute or chronic inflammation of the joints, or when for any cause (for instance, dressing of fractures) a healthy joint is rendered immovable for some time. This condition may produce a temporary stiffening of the joint, but this, as a rule, is overcome in a short time.

The fibrous capsule of the joint is occasionally inflamed, but, as a rule, in acute and chronic inflammation of the joint it remains unaffected. Where there is suppuration present the capsule may become detached from the periosteum with the bone, and also may be perforated by the pus. The ligaments also become impregnated with the pus from a purulent inflammation, but, they are rarely destroyed. Occasionally, however, we may see chronic inflammation of the joints in which there is a cicatricial contraction, where the joints become firm and united, and their mobility is lost. Sometimes from traumatisms we find only the soft parts which surround the joint, such as the external ligaments or the neighboring tendons, become involved in the inflammatory process, while the inner joint seems to be very little affected.

The cartilage of the end of the joints is rarely affected by the various inflammatory conditions. In acute cases of suppuration of the joints, the cartilage may be softened, perforated, or partially destroyed, so that the bone is bare in some places. In many chronic cases of inflammation of the joints the cartilage becomes macerated and dissolved into fibres, or it may be overgrown with abnormal synovial extensions. As soon as the bone proper becomes involved in the inflammatory process, extensive granulations form, causing a peculiar spongy growth on the cartilage. These granulations crowd and perforate the bone here and there and also affect a cartilage of the opposing bone, leading to a cicatricial growth on the end of the joint. In some cases we also see the fibres and cells of the cartilage becoming soft and finally growing up with numerous raised cartilaginous cells, and presenting an acute inflammation of the ends of the joints. From these periodical conditions we may find a marked alteration in the form of the joint in which the edges of the joint protrude, and the inner surface is hollowed and grooved. A peculiarity of deforming inflammation of the joints is an inflammation of the synovial membrane, with abnormal excretion of synovia and a great enlargement of the free or loose portion of the membrane which may develop into papilla-shaped masses.

The bone, as a rule, does not become affected in acute inflammation of the joint; but if it should become uncovered from suppuration of the cartilage, the inflammation extends to the spongiosa, and we see occasionally the formation of purulent or granular centres on the surface of the bone. In rare cases the periosteum becomes covered with osteophytes.

Acute Synovial Inflammation of the Joints.
(*Synovitis Acuta Serosa.*)

The joint is swollen and hot, and the animal shows pain on pressure or movement of it. These symptoms indicate an inflammation of the synovial membrane and a lessening of the secretion of synovial fluid in the joint. It is very rare that we see intense fibrinous excretions (synovitis sero-fibrinosa), and still more rare are those cases of colorless blood-cells mixed with detached epithelia. The animals are lame when the joint is moved, especially at the beginning and toward the end of any movement of the joint. Very frequently small dogs will only walk on three feet, carrying the inflamed member.

The following causes may produce synovitis: Crushing or concussion of the joint, blows, sprains (such as falling from a height). In cases of injuries of the joints, we may expect only a simple synovitis when the injuring object is clean and the wound is cleansed immediately after the injury (removing the blood-clots and applying antiseptic

dressing). According to the observations of the writer, acute synovitis occurs most frequently in the carpal joint, joints of the toes, in the knees, and hip-joints. Paint the affected joint with iodine and keep the leg at rest as much as possible. After the acute symptoms have subsided, massage the joint and allow light exercise.

There are several irritations of the joints that are observed in the work dogs of Europe that are not of interest to the English speaking reader.

The course of synovial inflammation of the joints is, as a rule, rapid. If the patient receives proper treatment, in a short time we see an improvement (especially if the animal gets complete rest). In other cases the disease takes a chronic form——that is, it may form one of the following conditions: (1) **Chronic Serous Inflammation of the Joints (Synovitis Chronica Serosa).** In this the joint is slightly swollen and painful, also very feverish. In some cases we may see a fluctuating swelling as a result of enlargement of the capsule by serous secretion. If the disease is still more acute, we may have a thickening of the fibrous capsules, and very frequently quite an enlargement starting from the edge of the joint. Chronic synovitis may appear in the onset of the disease, but, as a rule, it results as a consequence of the acute form. The writer has seen these cases in the carpus and knee-joint. The lameness is not especially marked, but any active movements increase it very much. (2) **Purulent Inflammation of the Joints: Suppuration of the Joints (Pyarthrosis).** While the two forms which have before been described are rarely accompanied by fever, it is quite different in suppuration of the joint. In this there is great fever from the onset, which is ushered in by a chill. We may see a more or less rapid swelling of the joint, which is extremely painful. The joint is kept in a bent or flexed position, and the patient walks on three feet. We may also see an œdematous swelling extending both above and below in the neighborhood of the joint. The temperature is considerably increased in some cases; the skin appears either normal or reddened, sometimes even bluish red. The pus may eventually break through the skin in the neighborhood of the joint or it may lie in the joints, become absorbed, and cause pyæmia.

This termination will occur even when the pus has broken out externally, and in some cases where the inflammation has been very acute we may have a subsequent adhesion of the joint (ankylosis).

Suppuration of the joints is frequently produced by infected wounds at or near the joint. In rare instances it may be the result of a phlegmonous inflammation in the neighborhood of the joint; concussion or crushing may also cause it, or it may occur in a metastatic way. Such inflammations of the joints may also occur as a purely suppurative inflammation; but, as a rule, the inflammations are sero-fibrinous or sero-

purulent, and with it we may see purulent centres of abscesses, and followed by pyæmia; or the development of the disease in several joints at the same time, or developing one after the other at short intervals. The writer saw metastatic suppuration of the joints of the knee, carpus, and toes.

Rheumatic Inflammation of the Joints.
(*Rheumatic Arthritis.*)

Articular Rheumatism, Polyarthritis Rheumatica.

This condition is evidently an infectious disease accompanied by more or less fever, being rare in the dog, and indicated by a sero-fibrinous synovitis of several of the articulations.

Etiology.—The actual cause of the disease has not been separated and described, some observers are inclined to think that it is not due to a specific microorganism, but that it is produced by a series of different bacteria, particularly the streptococci and staphylococci, and these produce a mild septic infection. If this theory is correct, then this disease is closely related to these inflammations of the articulations which occasionally follow infectious disease. It is caused by cold, especially in shooting dogs, if used in cold weather or during winter, when they become very wet and lie around in a draught or from cutting the hair off in cold weather and keeping animals in cold kennels.

Clinical Symptoms and Course.—There are two forms of this disease: an acute and a chronic form. The former appears suddenly, the animal becoming very lame in one or more of the articulations in which there appears a serous, but more rarely sero-purulent synovitis accompanied by great pain, high fever, loss of appetite, great depression, and constipation. The lameness is much greater than in any other form of joint-irritation, Very often several joints become diseased at one time, or the disease may go from one joint to another; if the joint is moved, or the animal disturbed it causes great pain, sometimes agony; and while any articulation in the body may be attacked, the elbow and the carpal articulations seem to be attacked most frequently, less so the ankle and hip. Occasionally we find as complications of this disease, pericarditis, pleuritis and peritonitis.

When the disease takes a chronic form, either from the onset, or merges into the chronic from the acute stage, it resembles very much chronic sero-synovitis. There is great thickening of the capsule, and sometimes the formation of adhesions between the surfaces of the joints and the connective tissue, and in rare instances we may have ankylosis of the joint. While the diagnosis is rather difficult where the disease is confined to one joint it is easily distinguished when you see it appear

in several joints at once, and also from the fact that it may move from one joint to another.

Therapeutics.—The treatment is the same as in muscular rheumatism. Keep the animal warm, quiet, and wrap the affected joints in flannel, raw cotton, and frictions of spirits of camphor, oil of camphor, ichthyol, or thigneol ointments. Internal adminstrations of salol, salipyrin, salophen, plenacetin, and mild saline laxatives. When the case is chronic, joints may be painted with tincture of iodine, and when the fever lessens daily massage the joints. A careful examination of the heart should be made from time to time during the course of the disease.

Disease Producing Malformation of the Joints.
(*Arthritis Deformans.*)

The cause of this disease is very little known. It is very probably due to a chronic rheumatism, or to some inflammation of the joint. It may also be due to great exertion, and is especially seen in Holland or Canada and Alaska where animals are used to pull carts and vehicles or sleds and in coach dogs that run after carriages, and occasionally seen in pointers and setters that are constantly hunted. The first symptom of this disease is a slight lameness in the diseased joint. This lameness may be overlooked, as it is generally very slight, and after the animal has taken a little exercise it gradually disappears, although in some rare cases the lameness may continue, or even with exercise become aggravated. In the early stages of the disease there is no indication of pain on movement or pressure of the joint, but later on, pain on pressure and motion begins to show itself. At the same time there is a gradual swelling and thickening of the capsule of the joint, with apparently a loss of the normal amount of synovia. Sometimes we notice a slight heat. A peculiar symptom of this disease, which is noticed from the very onset, is a peculiar creaking or crepitating sound when the joint is moved. After a time stiffness of the joints becomes more marked. There are hard swellings on the cartilaginous borders, also a tendency of the ends of the joint to enlarge, and finally marked alteration in the form of the joint. By these changes we are enabled to distinguish between arthritis deformans and chronic serous inflammation of the joints.

The anatomical alterations have already been mentioned. Arthritis deformans, as a rule, occurs in the knee-joint, the elbow and shoulder. The prognosis of this disease is always to be unfavorable, because it seems to defy medical treatment, going on until finally the joint becomes a large unsightely mass.

Therapeutic Treatment of Inflammation of the Joints.—In all cases, except those of slight synovitis, the joint must be kept as quiet as pos-

sible. In simple cases the animal should be kept in a kennel or in a room for several days. In serious cases where no operation seems to be required, and there is no danger of poison breaking through the joints, and where the inflammatory swelling is not very great, it is best to apply the bandage of cotton and dress over that with a plaster or silicate of sodium bandage, treating it the same as a fracture. The writer has obtained very good results with this method in the carpal, tarsal, and toe-joints. Albrecht advises that the joints should be rubbed with a thick layer of citrine ointment before applying the dressing. (For further details, see under head of Dressings, etc.)

It is well, however, to take into consideration one point: that the dressing must be in such a position as not to interfere with the use of the leg. With the above treatment we generally obtain good results in a short time. In the serious forms of the disease, and where the dressing cannot be used on account of the position of the joint, we must apply such local applications as will abate the inflammation. As a rule, the best treatment is cold-water applications containing lead or arnica. In cases where there are great pain and acute rheumatic inflammation of the joint, it is better not to apply too much cold water, but use instead Priessnitz's compress. Wrap the joint in a piece of linen which has been folded several times, similar to a handkerchief, and then cover it with some impervious object, such as oil-cloth, silk, rubber, or a woolen cover. If, for some reason, neither the cold nor moist treatment is practicable, we must paint the part with tincture of iodine once or twice daily, and the fluid must be rubbed into the skin by means of a rag. The writer has never had very good results from this method of treatment, but painting with iodine produces better results than any of the liniments, such as camphor or soap liniment. Massage has been found to produce good results in many diseases of the joints in dogs, although it has not been used very extensively by canine practitioners. In chronic cases where there are great thickening and a large quantity of secretion of the capsule, as in cases of acute inflammation of the joint, or in purulent arthritis, massage with cocoanut oil is particularly adapted. In cases of rheumatic inflammation of the joint, which have been recognized as such, we must use internal remedies, such as recommended in muscular rheumatism.

In many traumatic and purulent inflammations of the joint we can only get good results by an operation which varies according to the condition. The general procedure is as follows:

Puncturing.—This method of treatment is indicated in all chronic serous secretions of the joint. As soon as we find that the measures which encourage reabsorption, such as tight dressing and massage, do not produce good results, and where the secretion causes great distention

of the capsule, and where there are great lameness and indications of suppuration, we proceed in the following manner:

(*a*) The part to be punctured must be rendered strictly aseptic; (*b*) the part must have a particularly tight dressing over it for a few days after the operation.

If this latter method is not practicable on account of the position of the joint or some other circumstance, puncturing the joint will not give favorable results and may even lead to very serious conditions (suppuration, etc.). The method of operation is very simple.

After having removed the hair from the region of the joint and washing with sublimated soap, disinfecting it with a 5-per cent. solution of carbolic acid and 2 per cent. of creolin or 1 per cent. of corrosive sublimate, we then puncture the part with a good-sized hypodermatic needle and slowly evacuate the sac by drawing it into the syringe. If the syringe becomes filled and the joint is not entirely emptied, the syringe must be detached from the needle and the opening closed at once by means of the finger, as any air that may find its way into the joint will produce bad results. Empty the syringe and proceed as before.

This method, as a rule, is absolutely harmless, evacuating the sac in cases of serous secretions. If, however, we find in the fluid withdrawn from the joint many cellular elements—that is to say, if it possesses a marked purulent character—we must use at the same time an injection of antiseptic fluid directly into the joint, so as to make it aseptic. For that purpose we use a slightly warm solution of corrosive sublimate 1 to 1000 or a 2-per cent. solution of carbolic acid and a Lugol solution of iodine (1 per cent. tincture of iodine, 2 per cent. of iodide of potassium, and 50 per cent of water). Either of these solutions may be injected

Fig. 111.—A large hypodermatic syringe for puncturing enlarged joints.

through the needle into the joint; then, by manipulation, try to work this solution inside of the capsule by means of careful pressure, allowing it to flow out through the needle in one or two minutes. The needle is then withdrawn and the perforated opening is closed at once by means of an iodoform tampon, and over that an antiseptic dressing is placed. This should be allowed to remain on the wound for a few days.

(For further particulars, see the chapter on Treatment of Wounds.)

In chronic inflammations or great secretions we may also use simple injections of disinfecting solutions, such as iodide of potassium, as a means of reducing the inflammation or destroying its products. We perforate

directly into the cavity of the joint by means of a hypodermatic needle and with a syringe inject a quantity of fluid in proportion to the size of the joint. This operation has to be repeated every three or four days, following the same procedure before and after the operation as has been already described.

The joint may be opened by means of a puncture with a lancet. This is advisable where there is extensive suppuration going on in the joint and where the diseased part shows every indication of a septic condition. The joint to be opened should be punctured by means of a lancet or bistoury, making a wound just sufficient to empty it freely. It must then be cleansed with an antiseptic solution and any clots or detached portions of tissue washed out; then close the wound by means of sutures. In some cases it is well to leave one corner open for drainage, that, of course, being the lower one. We then place an antiseptic dressing over the whole part.

Injuries of the Joints.

These may be divided into several groups—true wounds of the joints, contusions, distortions, and luxations.

Wounds of the Joints.—Wounds of the joints—that is to say, injuries which expose the joint proper to the atmosphere—are divided into perforating or cutting wounds, being produced by laceration, contusion, and shot.

Clinical Symptoms and Course.—The first symptom of injury to the joint, as a rule, is a discharge of synovia from the wound. This, however, may be absent in cases where the wound is very fine, or where the puncture runs in an oblique direction; the amount of discharged synovia, as a rule, is very slight at the beginning, and of normal consistency. If the wound is not closed immediately, it increases in amount and becomes thinner. In some cases it is difficult to tell positively whether the synovia comes from the joint or from the sheath of a tendon. In the latter case, however, the amount of synovia is generally very slight. Blood may accumulate in the cavity of the joint and develop a hæmarthrosis. In some cases where there is hemorrhage, the wound may be very small and close up quickly, or it may lie in an oblique direction and prevent the escape of blood. This flows into the joint and fills it up. Hæmarthrosis is distinguished from serous or purulent secretions by appearing shortly after the injury, and the absence of all inflammatory symptoms—that is, at the onset of the disease.

The other symptoms of wounds of the joints are acute sensitiveness, the animal limping and showing great pain, holding its leg in a flexed condition. Generally the external opening of the wound can also be distinguished.

The course of this disease differs greatly according to the character of the wound and whether the object that caused it was clean or not. Small perforating wounds heal quickly, and the animals limp only for a few days. In serious wounds where the joint has been exposed, and dirt or other foreign bodies have obtained entrance into the joint, the prognosis is less favorable. In such cases we notice a great discharge of synovia. This is clear in the early stage of the disease, but soon becomes turbid by the addition of pus-corpuscles and fibrinous clots. It then becomes flaky and finally purulent. At the same time there is great fever around the joint, which is swollen very much, and the neighboring tissues become œdematous, extending in all directions. We may see numerous abscesses forming all around the joint or in the intermuscular connective tissue, and finally the animal dies from general exhaustion or pyæmia.

According to the circumstances and condition of the wound, the course may be much more rapid. The synovia becomes purulent in a short time; septic fever shows itself quickly; there is a rapid pulse; the animal sinks into a coma, and dies from septicæmia. This may even occur in slight wounds, if they have not been treated properly, and where thorough disinfection has not been followed.

Therapeutic Treatment.—The first thing to do after an injury has occured is to thoroughly disinfect the wound and its immediate neighborhood. Clip the hair from all around the part, then wash it with a solution of corrosive sublimate, and, in cases where the puncture is very narrow, clean it out by means of a syringe with a 2 per cent. solution of creolin and a 5 per cent. solution of carbolic acid, or a 1 per cent. solution of corrosive sublimate. If you find the object which caused the puncture was very dirty, the wound must be enlarged and thoroughly washed with any of the above-named solutions. The wound should then be closed by means of sutures, taking care when stitching it up not to include the synovial membrane or any part of the joint in the sutures. It is well, however, in some cases, to place a small piece of catgut or silk in the lower surface of the wound in order to assist in emptying the joint. We then place the joint in an antiseptic dressing and cover it up.

If we have to deal with a wound that has been neglected and where suppuration has been going on for some time, and the owner does not wish to destroy the animal, we must enlarge the wound at once, and all pockets, or sacs, in the joint must be emptied and washed with a solution of corrosive sublimate. Any clots, masses, or pieces of tissue must be removed, and the operation finished as before described. In all these cases the animal must have absolute rest, and the dressing be renewed frequently.

Contusions of the Joints.—Under this head we class injuries to the

joints which have been caused by compression of the soft parts against the bones or from shocks, such as jumping or leaping from a height, kicks, and where the extremities have been run over by vehicles. In this we may have a series of results, such as crushing or laceration of the capsule of the joint, with formation of hæmarthrosis, or a concussion or crushing of the bone with little escape of blood. In rare instances we may see a laceration of the cartilage.

Clinical Symptoms.—The animal shows great sensitiveness and pain on manipulation of the joint, and, as a rule, carries it in the air. There is a rapid swelling of the joint and œdema of the surrounding parts, also a high temperature.

Therapeutic Treatment.—The treatment consists in cold-water applications, if the position of the joint admits, renewed constantly. The best method is to soak a piece of absorbent cotton in water, lay it on the joint and bandage it up lightly, moistening it in cold water from time to time. In old cases use friction (massage) of the joint in a circular direction (twice daily for ten or fifteen minutes), or use a tight bandage. Any stimulating liniments, such as camphor, soap, or arnica, may be used, but it is questionable whether the good effects are not due more to the massage than to the drugs themselves.

Distortions of the Joint (Sprains).—By this is meant a twisting or temporary displacement of the joint, as a rule, in a lateral direction, caused by slipping or sliding, or falling out of a window and landing on the feet, tumbling over the side of a chair, bed or step. The capsule and the ligaments may be partially torn and in some cases entirely ruptured on one side. The round ligament of the hip-joint is sometimes torn, as are also the tendons of the knee-joint; there is extravasation of blood in the injured region. With rest, the disease may disappear in a few days, or it may remain, causing partial loss of power of the legs for the rest of the animal's life.

Clinical Symptoms.—When the sprain occurs there is violent pain. The animals use the joint irregularly, or may carry the member. The lameness increases, and in the region of the joint swelling soon appears. Any manipulation of the joint produces great pain, and we may be able to recognize a laceration of some of the ligaments, and the joint shows greater mobility on one side than the other. Where there is tearing of the broad ligaments of the hip-joint there is nothing indicated beyond the lameness and symptoms of pain when the joint is turned or twisted.

Therapeutics.—The treatment of distortions, or sprains, is the same as that for contusions—compresses of cold water, lead water, lead water and laudanum, fuller's earth or antiphlogistine and wrap up the joint in warm flannel. If the swelling is great, paint it with tincture of iodine, and when the swelling subsides, use massaging and rubbing

with spirits of camphor or soap liniment, alcohol, etc., but it must be borne in mind that rest is the most important treatment.

Luxations of the Joint (Dislocations).—While distortions of the joints disappear in a short time when the luxation is reduced, if it is not reduced it is lasting, for soon some anatomical change occurs that it is impossible to reduce. If both surfaces of the joint are no longer in contact, it is called an entire dislocation. If they are partially in contact, it is called an incomplete luxation (subluxation).

The causes of dislocation are, as a rule, mechanical, from falling out of windows, jumping from high objects, getting the foot caught, and hanging, as in jumping over a fence; concussions and blows by being run over by vehicles, etc. In all dislocations there is invariably laceration of the capsular ligament. This membrane only remains intact in dislocations of the lower jaw. As a rule, the accessory ligaments are seldom torn except in such cases where a portion of the bone is torn with them. The cartilage of the joint may be torn or detached in some cases by the subsequent inflammation. The ends of the bones may be unaffected and in some cases broken. Other alterations are seen in the muscles and tendons in the neighborhood of the joint. They are abnormally extended on one side and flabby on the other side. They may be torn, lacerated, or even crushed. It is only in rare instances that the large blood vessels and nerves are lacerated. The joints which are dislocated are surrounded by a large quantity of blood which infiltrates the tissues and is gradually reabsorbed.

When the reduction is not performed quickly—that is to say, the displaced end of the joint remains in its abnormal position—we have what is called nearthrosis as a consequence of the irritation which it produces in the immediate neighborhood of the joint. In such a case there is slight immobility due to partial adhesions of the affected part, and also due to a certain extent to atrophy of the muscles surrounding it. In some cases motion of the joint is entirely lost.

Clinical Symptoms and Prognosis.—When a dislocation has just occurred, and when it has been there for some time, the symptoms are more marked than they are in the intermediate stage, for the reason that the hemorrhage produces so much swelling as to render obscure, to a certain extent, the position and character of the luxation. In some cases the condition can be very easily recognized by comparing it with the perfect joint on the other side; at other times, it is only by careful manipulation in the region of the joint that the alteration can be felt. We may find a projection of bone at one place and depression in another, where they do not occur in the healthy side. We may even feel the luxated end of the joint. In some cases where the deformity has been concealed by the rapid swelling of the surrounding tissues, the leg may

be shorter, or it may be on a longitudinal axis with the other leg. Another characteristic symptom is the loss of movement in the luxated joint, especially when the case is seen early, although in some cases where the ligaments have been lacerated or torn, or where a piece of bone has been broken off, there is abnormal flexion in that part. This is especially important, as it enables us to locate a fracture of the bone that is in the neighborhood of the joint. There is also a slight crepitation. This, however, is soft, and not the hard, rough crepitation that we find in fractures.

Luxations are not dangerous to life except those of the vertebræ, but they are very troublesome, and, as a rule, make slow recoveries. Dislocations can be reduced quickly where the animal is seen a short time after the injury; but in rare cases, on account of the lacerated condition of the capsule and ligament, it is rather difficult to hold the injured joint in position after it has been reduced.

Therapeutic Treatment.—The treatment consists of: 1. Reduction of the dislocation. 2. In holding the joint in position after the reduction has been made.

It is rather hard to lay down any rule to be followed in all cases, but try if possible to return the joint to the same position as before, comparing it with the joint of the opposite leg, following, as a rule, the same procedure as that followed in fractures of the bone. As soon as the reduction is made the joint must be dressed and allowed to remain if possible for a period of three weeks (further particulars will be found in the chapter relating to fractures of the bones and wounds), so that the soft parts which are lacerated—the capsule and the ligaments—may have an opportunity to grow together and return the joint to its normal position. If the dressing cannot be applied in cases of dislocation of the hip, the animal must be kept in a cage or in a small room, in order to keep it as quiet as possible. We may find more or less stiffness of the joint when the dressing is removed. This can be assisted to a certain extent by means of massage.

The following dislocations appear more frequently in the dog and require special mention:

Dislocation of the Lower Jaw.—This is extremely rare, and may occur in some instances where a setter or retriever endeavors to carry a very large bird, opens his mouth, and distends it in such a way that it is dislocated. In some cases this luxation is confined to one side, and in others both articulations are out of joint. The lower jaw projects forward, the incisors project beyond the upper incisors, giving the animal an "undershot" appearance, while in a lateral direction the jaw is pushed to one side, the mouth remains wide open, and cannot be closed except with great exertion. In many cases, on account of the pressure which is

caused by the coronoid process pressing on the posterior portion of the eye, it is bulged, causing what might be termed an incomplete prolapsus of that organ. Other symptoms are salivation, great pain, restlessness, blue coloration of the tongue. (For differential diagnosis of paralysis of the lower jaw, see Diseases of the Mouth.)

Therapeutic Treatment.—According to Stockfleth, the animal must be held by an assistant. The best method is to hold him between the legs and steady his head while the operator by means of a lever-like action upon the lower jaw endeavors to reduce the dislocation. To accomplish this, wrap a cloth around the hand, place the thumbs on both teeth of the lower jaw, and by means of external pressure attempt to reduce the bone into its normal condition. Another method which the author finds is not so reliable, consists in placing a strong stick between the jaws, as far back as possible, then by pressure on the anterior portion of the jaws, allowing the stick to act as a fulcrum, the jaw will very often fly into position. In order to prevent a recurrence of this, the dog for some time should wear a particularly (Fig. 112) tight-fitting muzzle and should receive nothing but soft food.
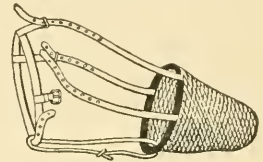
FIG. 112.—Muzzle.

Dislocation of the Elbow.—In the dog the bone of the forearm forms a pivot joint with the elbow. Each of these joints has a capsular ligament. The upper is fitted with a ring-like band, and in the lower portion the radius is kept in position by means of transverse ligaments. A slight rotation of the radius may occur independent of the elbow-joint itself. A dislocation of this articulation may occur from jumping from tables, chairs, falling from some height. In the former case the bone of the forearm is dislocated backward and outward. In dislocation of the lower pivot joint the bone of the forearm way project forward as well as backward. If dislocation of the upper joint occurs in the dog, the forearm is kept flexed; it becomes immobile in the elbow-joint, the animal using three legs and carrying one in the air. The joint is wider, and the dislocated portion of the forearm may be felt distinctly, also more or less marked sensitiveness or swelling may be seen. If, on the other hand, we have a certain amount of movement on extension of the elbow-joint and great elasticity in the joint, too much for the normal condition, the animal evinces great pain on movement. This dislocation is easily corrected. The joint may be moved freely, but as soon as the animal stands upon its feet again the displacement occurs. This is due to the annular ligament, which holds the joint to the forearm in place, being torn. If this dislocation is not reduced and left for some time, the leg will be held constantly in a flexed position, and the animal will not use it.

In cases of lower dislocation of the joint the animal walks upon

three legs, and on examination we find that the lower end of the bone of the forearm is displaced in a posterior direction, and more rarely in an anterior direction. This dislocation is easily reduced, but on the slightest movement reappears again. The prognosis is not favorable, as it is a rather difficult condition to treat. The weak ligaments (the annular ligament and transverse ligaments) do not heal quickly, and the dislocation has a tendency to become chronic, especially in the upper joint.

Treatment.—In the treatment of the upper joint the forearm becomes extended and the legs should be crossed and an attempt be made to push the forearm backward and outward into its normal position. It must then be held there by means of a tight bandage. This bandage must be changed once a day, as it is apt to produce tenderness of the skin from being so tight. If the dislocation affects the lower joint, the bone of the forearm will have to be pushed into its normal condition with more or less force and a silicate of sodium bandage applied.

Dislocation of the Patella.—This is only seen in small dogs. Stockfleth states that the patella may become dislocated on both sides, but not upward, and that the dislocation is generally on the inner side, on account of the forced extension of a very much flexed tarsus and a tendency of the muscles to turn inward. This is seen occasionally in circus dogs (grayhounds) making high jumps. In cases of inside dislocation the patella lies on the inner side of the joint where it moves on the tibia, and in external dislocation it lies on the outside of the external condyle.

Inner Dislocation of the Patella.—In the early stages, shortly after the dislocation occurs, the animal holds its leg in a very flexed position. The hock is flexed and the heel turned outward. At the joint the patella may be found lying sideways, and is easily moved laterally. If we take hold of the foot and flex or extend it, the animal evinces great pain. The leg must be bent backward and straightened as much as possible, then by means of manipulation of the fingers the patella can be made to slip into position. This is very easily performed, and the animal walks away as if nothing had occurred. This dislocation, however, may recur when the animal jumps any distance. When the disease becomes chronic and dislocation occurs often, the animal runs on three legs, or walks lame on the affected leg. The stifle-joint is uneven, thick, and the patella can be dislocated, or put into position simply by pressure of the fingers. If the dislocation affects both legs, these are kept in a flexed position, the animal making peculiar jumping movements, using both legs at the same time, when he attempts to walk. If he lies down, the hind legs are extended backward and crossed. The prognosis is favorable in new cases, but unfavorable in old ones.

Treatment.—The tarsus must be extended in order to overcome

the tension in the straight ligaments and extensors, and the patella may be easily shoved into position. If the animal is then kept quiet for several days, as a rule, no after-treatment is required. If the dislocation of the patella is old, treatment is useless.

Stockfleth has used a dressing in this disease which he describes as follows:

He attached a broad linen bandage around the tibia, and fastened a wide girth around the abdomen, and a breast-piece to prevent it from slipping backward. The bandage was then fastened to the tibia, close to the girth around the abdomen. The affected leg was then pulled up close to the abdomen, so that the animal must stand on three legs. The dressing remained on for twenty days, and when it was removed the
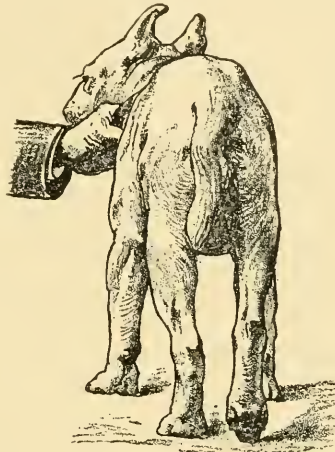
Fig. 113.—Dog with dislocation of the hip.

animal was entirely cured. In another case he had a double-sided dislocation of the knee. After returning the patellæ to their position, the knee- and ankle-joint were covered with thick wadding, and a capsule of gutta-percha, which had previously been soaked in hot water, was applied to each leg, surrounding the leg from the knee to the toes. In order to prevent bending of the gutta-percha, before it was sufficiently hardened, a wooden support was fastened to the outside. The dog, which had formerly crept upon its hind legs, walked upright as if on stilts. The dressing was left on the animal for two weeks, and on removal of the dressing the dislocation did not recur.

External Dislocation of the Patella.—This accident is very rare. Stockfleth saw but one chronic case in both legs in a small dog. The subject was lively, walked rapidly, but had very flexed ankle-joints, giving him very much the appearance of a weasel. The tarsus appeared thick and uneven; the patella, which was located in the muscles of the

outside, could easily be pushed back into its normal position; but if left, it immediately slipped out of position, and became dislocated again. This was due to the fact that the crest of the joint had disappeared, offering no resistance to dislocation. Treatment is useless, as the tissues are relaxed and will not hold the patella in place.

Dislocation of the Hip.—Other luxations occur in the dog—for instance, in the hip-joint. In this the head of the femur becomes pushed upward after laceration of the capsular ligament, and out of the acetabulum, and being drawn upward and by the muscular contraction the leg is shortened (Fig. 113).

The animal must be held by the assistant, keeping the body firm, then grasping the leg at the tarsus and drawing it along from the body
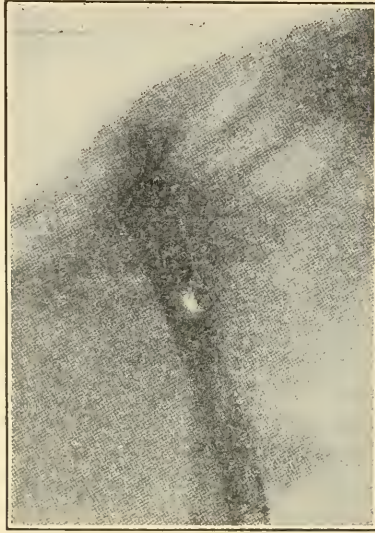
Fig. 114.—Skiagraph of luxation of the hip upwards and backwards.

downward and outward as far as possible, and keep moving the leg forward and backward; at the same time, with the other hand, seize the trochanter major in the finger, or use the flat of the hand, to manipulate the joint into position. It is impossible to keep a bandage on this part unless it is a pitch plaster, which should be applied and the animal kept as quiet as possible.

The joints of the phalanges sometimes become dislocated. These do not possess any special symptoms that may not be easily recognized by the indications stated under Clinical Symptoms of Luxations.

DISEASES OF THE MUSCLES.

Muscular Rheumatism.
(Muscular Pains, Rheumatismus Musculorum.)

Muscular rheumatism is a primary affection with more or less complication of the muscular system. In some cases there is little or no inflammation present, no fever, and the only indication of rheumatism being present is stiffness of gait and pain on pressure; it may occur as acute, subacute, and chronic.

Etiology.—The cause of rheumatism, which has been described as a certain poisonous substance, may also be due to cold, atmospheric influences, etc., or dampness, animals lying in kennels that do not get the sun, or being kept in the cellar, particularly with asphalt floors hunting dogs becoming wet, and after great exertion, sleeping with wet coats. We have, undoubtedly, a number of diseases of the muscular system which do not develop from rheumatism—for instance, abnormal muscular exertion and consequent laceration of some of the muscular fibres—also from disturbances of the circulation, from chronic toxic influences, etc., from some infectious agent as in acute articular rheumatism, certain affections of the spinal cord, also pleuritis, nephritis and other affections. It would be much better to discard the name "muscular rheumatism" and simply call it "muscular pain." Experience has taught the writer that muscular rheumatism is seen frequently in old, delicate, or fat dogs, and is oftener observed in winter than in summer.

Pathological Anatomy.—It is very difficult to make any definite statement as to the cause of rheumatism. We speak of rheumatic muscular inflammation, but at the same time we do not, as a rule, find any different muscular alterations on post-mortem from animals which have suffered from muscular rheumatism. We may find slight alterations which have occurred from other causes, such as hyperæmia, slight exudations in the muscles, tendons, and fascia. Deposits occur in the connective tissue (rheumatic callosities). These occur in a man who has suffered for a long time from muscular rheumatism, and in old rheumatic dogs we may also observe characteristic alterations in acute or chronic inflammations and the connective tissue between the muscular fibres has increased.

Clinical Symptoms and Course.—Muscular pain is a most marked symptom. This is observed in slight cases by the muscles in an affected

animal having a contracted appearance, or when by pressure upon them they are found hard and tense. We also observe that dogs affected with this disease move with fear, showing great disinclination for any movement, and occasionally they cry out with pain when touched or lifted in certain parts of the body or if any portion of a particular muscle is touched. If compelled to rise, they do so in a slow, fatigued way. Their movements are stiff and strained, and when fæces are passed the animals do so with pain, frequently crying or howling, or it may be they make no effort to evacuate the bowels, which results in obstinate constipation.

As rheumatism is generally located in the regions of joints, these symptoms become modified in certain parts of the body and intensified in others. We very often see rheumatism of the back and loins, when rising and stretching of the extremities and all movements of the trunk are very painful. The region of the back and loins is very sensitive, so that the animals cry at the slightest movement. The muscles in the neck are also subject to this disease (myalgia cerviculis, torticollis rheumatica). Animals show great pain while eating on account of being compelled to bend their neck in stooping down to reach their food. The muscles are distended and painful to the touch. If the head is bent, the animal shows great pain. In rare cases we see rheumatism in the masseters (a great difficulty in mastication). Only in very rare cases is any fever noticed.

The course of the disease is sometimes acute and occasionally chronic. In the former case the disease runs its course very quickly, and may disappear without any special treatment, but there is always a tendency to relapse. In the latter form the disease may be prolonged for months, varying in degrees of intensity, also showing a tendency for the pain to move from one part of the body to another, this peculiarity enables one to readily distinguish the condition from one of traumatic origin.

Therapeutics.—When the disease is limited to a certain group of muscles, it is only necessary to keep the animal in a warm dry kennel, and feed with easily digested food and rub the affected parts with stimulating ointments such as oil of camphor, aconite and soap liniment. In rare instances the animal requires to be muzzled to prevent it from biting the affected part. Where the pains are violent, morphine should be administered hypodermically. As far as the use of electricity is concerned, the opinions concerning it are much divided. The writer has never been able to obtain any very marked results by using this form of treatment. Vibratory massage, however, seems to produce very good results in the milder and chronic cases. Internally the agents recommended for the dog are salicylic acid, salol or salipyrin, aspirin,

tincture of colchicum, or antipyrin. The first three drugs produce the most favorable results.

In the chronic form of the disease, various cutaneous stimulants have been used, such as spirit of camphor, opodeldoc, spirit of mustard, but we must remember that their influence is more due to the massage than to anything else. It is advisable to rub the stimulating embrocation into the skin, either by the hand or with a woolen rag. Albrecht has found that this therapeutic treatment may be greatly improved by putting the patient into a bath of 28°, rubbing it dry and wrapping it in hot blankets.

Cysticercus and Trichina.

Cysticercus.—Reference has already been made to the presence of cysticercus in the brain and they also appear in numerous other organs, particularly the muscles, and there is special interest in the fact that their presence in large numbers in the muscles may cause symptoms very similar to those of muscular rheumatism. One dog which was very stiff during life and kept the head bent to one side after death, in a section of the psoas muscle about an inch square there were found eight or ten cysticerci the size of a pea. Trasbot found in a dog that during life showed violent pain on touching the skin, pressing the muscles and on making certain movements of the body, after death numerous cysticerci of the Tænia solium in the entire muscular system. (For further details concerning cysticercus, see Internal Parasites).

Trichina.—Trichina is extremely rare in the dog. It is observed more in some countries than in others. Of 858 dogs examined in one clinic, 11 or $\frac{1}{4}$ per cent. were found infected with trichina. In 2910 post-mortems one-half of 1 per cent. were found effected with trichina. The symptoms which appear after a dog has eaten meat containing trichina in large numbers are for two weeks a bloody diarrhœa, loss of appetite, pain, convulsions, and after the animal was destroyed on microscopical examination of the muscles they were found to contain numerous migrating trichina. Leistikow fed three dogs with trichinous meat which afterward developed diarrhœa, great exhaustion and then became normal; they were killed six weeks later and the flesh was found to contain incapsulated trichina. Paroncito obtained similar results from feeding dogs with meat containing trichina, and two were killed after a few days and the others died in four weeks. In all cases trichina was found in the muscles.

Diseases of the Tendons and Bursa Mucosa.

Of the pathological processes of the tendons and bursa mucosa, we will only take up the laceration of the achilles tendon and hygroma.

Laceration of the Achilles Tendon.—This condition is occasionally met with as a result of violent exercise or injuries caused by falling out of a window, or having the tendon cut either by jumping on glass, particularly on green-house sash, scythes, reaper knives, or maliciously cut by some person, etc. Occasionally it results from the bites of other dogs, causing
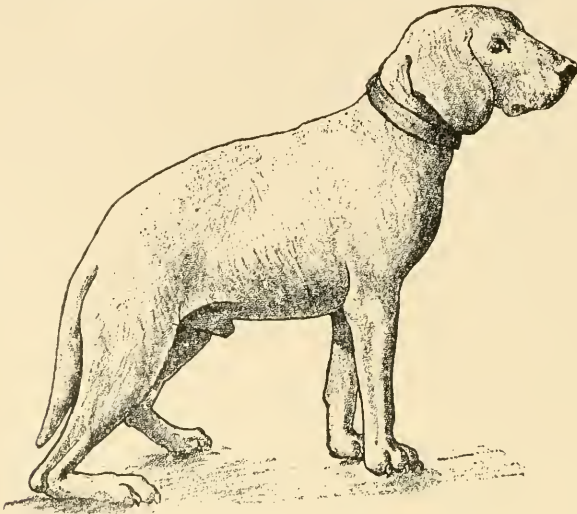
Fig. 115.—Laceration of the tendo achillis.

wounds which are followed by necrosis of the tendon. On the tendon being completely severed, the ends are drawn violently apart and the animal cannot step or put any weight on the other leg without putting the posterior surface of the astragalus as well as the whole of the metatarsus flat on the ground (Fig. 115). On local examination we may find either an open wound or the skin intact, but there is a complete separation in the continuity of the tendon. The appearance of the animal is very similar to congenital plantigrade or in cases of general rickets. The articulation of the knee is excessively extended (Fig. 115).

Boyer saw in a mastiff a complete severance of the tendon just at its union with the gastrocnemius muscle. The ends of the ruptured tendon were drawn apart about 5 cm. In incomplete laceration we find more or less exaggeration of the astragulas and bending of the knee.

The prognosis is generally favorable. In case of a wound with severance of the tendon, the wound should be thoroughly disinfected,

the two ends should be sewed together by means of catgut or silk, and the joint should be covered by a splint, plaster or silicate of soda, so as to hold it immovable. Where there is no injury to the skin, but a rupture of the tendon, a splint should be put on and the leg held in the normal
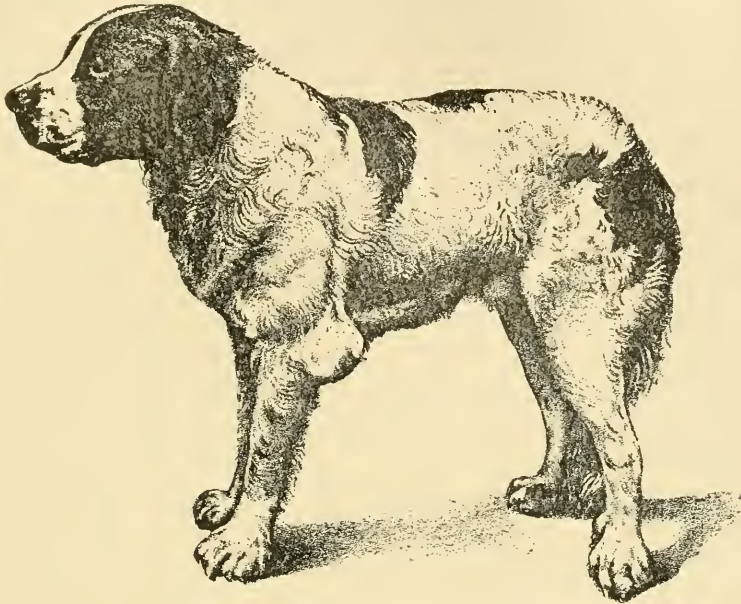
FIG. 116.—Dog with elbow boil (hygroma).

position for at east two weeks. If this is not successful the skin should be opened over the lacerated tendon, the ends freshened by scarification and united by a stitch. This is generally successful.

Hygroma of the Elbow.—Large heavy dogs, particularly mastiffs, St. Bernards and Great Danes, have a habit, when recumbent, of lying on the point of the elbow, causing pressure and a gradual thickening and swelling of the skin and frequently serofibrinous inflammation of the bursa olecrani. This is shown in a round oval protuberance at the elbow, varying in size from a hazel nut to a goose egg. It is generally hot, painful and frequently fluctuating and contains a quantity of serous sometimes serofibrinous fluid (Fig. 116). As it is a great eye-sore, affecting the appearance of the animal and at the same time interfering more or less with the animal when in a recumbent position it generally is emptied by making an incision in a dependant part of the serous sac, and heals very rapidly with local treatment. It is very apt, however, either to fill up again as soon as the opening closes, or to leave more or less thickening of the skin or a hard fibrinous mass. If, however, it fills up again it should be injected with dilute tincture of iodine, or Lugol's

solution. Sometimes it is necessary to open the tumor and to curette the inside of the sac to get it to heal properly. If the tumor still remains, it should be removed by complete extirpation of the enlargement. The operation is not particularly difficult, the only thing to contend against is that some animals by extreme flexion of the elbow are apt to burst the stitches. The operator must first shave off all the hair in the immediate region of the tumor, thoroughly disinfect it and make a long incision in a longitudinal direction through the skin over the body of the tumor, taking care not to penetrate into the body of the tumor. The tumor is now carefully dissected out and the inside of the wound carefully washed with an astringent solution, such as lead or zinc, and having cleaned out the blood clots, the freshly cut surface should be carefully touched with a pledget of cotton soaked in pure carbolic acid; this application tends to lessen slow hemorrhage and frequently heals the wound very quickly. The edges of the opening are then united by sutures. In dissecting out the tumor, care must be taken not to remove the periosteum of the ulna. A bandage should be applied if possible; it is, however, very difficult to hold it in position. The animal should rest on deep straw or some other elastic material.

WOUNDS AND THEIR TREATMENT.

By a wound we mean any injury which lacerates or punctures the skin, no matter what is the depth. Wounds are classified according to various authors in the following manner:

1. Their location, whether they are in the head, neck, chest, or extremities.

2. According to their depth into the muscles or bones, they are called penetrating or non-penetrating. Those that injure the skin slightly are called lacerations or excoriations.

3. They are also termed longitudinal, transverse, or oblique, according to their direction or length. Regular or irregular—that is, indented or flap wounds.

4. Their cause is also considered, whether produced by cuts, blows, lacerations, concussions, bites, or gunshot. These causes, however, are of no special importance.

Clinical Symptoms.—All wounds are accompanied by three symptoms: the open, gaping condition of the edges of the wound, hemorrhage, and pain. As a rule, the wider the wound the deeper it is. If the wound is long but does not gape, it corresponds with the direction of the muscle or the tissue beneath it. On the other hand, wounds across muscles are much wider and gape more, this being due to the retraction of the muscles.

The bleeding is either arterial, venous, or capillary. The former may be recognized by the fact that the blood from the wound is mixed with more or less light-colored arterial blood. The danger of such arterial bleeding depends on the size of the arteries and how severely they have been injured. In small arteries the bleeding generally stops of its own accord, due to contraction of the severed blood vessels; but in large arteries the animal will frequently bleed to death unless surgical interference stops it. In cases where the artery is cut in a transverse wound the hemorrhage is more severe than when it is in a longitudinal wound. There is more bleeding in cleanly cut wounds than there is in those produced by laceration or concussion, but the latter present more complications than the former, due to consecutive hemorrhages. In venous bleeding dark-red, evenly colored blood flows out of the wound. Hemorrhages in small and medium-sized veins generally stop without any surgical interference, but the large veins, especially those in the neighborhood of the heart, are dangerous and should be taken up quickly. Capillary bleeding

consists in a slow trickling of blood, which, as a rule, lasts for a very short time and is of no great importance.

A serious hemorrhage endangers the animal's life, and the more rapid it is the greater the danger. The following symptoms are presented: general coldness of the skin and extremities; paleness of the mucous membranes, especially the mouth and eye; great prostration; staggering gait; and often inability to rise from weakness. In some cases we have unconsciousness, dyspnœa, enlargement of the pupils, uncontrollable evacuation of urine and fæces, finally slight convulsions, and death. This conclusion is to be expected if about half or even one-third of the blood contained in the body is lost in a very short time.

Many experiments have been made upon the dog in order to find what are the consequences of slight hemorrhages. One-fourth of a dog's blood may be withdrawn without causing any appreciable lessening of the blood-pressure in the arteries. The pulse may become very indistinct while the blood is withdrawn, but it is soon restored to its ordinary pressure if the hemorrhage is stopped, from the fact that the arteries contract in proportion to the smaller quantity of blood. The rapidity of the current and the number of contractions of the heart remain the same as before the hemorrhage. Any loss of blood amounting to more than one-third of the blood-mass reduces the blood-pressure very much. The current becomes slow and contractions of the heart are much less. At the same time the composition of the blood is changed. At first we observe a compensation of the water of the blood, and the salts which are thereby being reabsorbed from the tissues when this is exhausted; then albumin is drawn into the blood. It requires a much longer time to form new blood cells after the animal has been bled an amount of blood equal to one-fourth of the weight of the body. The red blood corpuscles become normal and return to their original number in from seven to thirty-four days.

The pain of a wound is indicated in the dog by howling and crying when the injury occurs, or later when the wound is examined. The pain evinced by the patient also depends upon the individuality of the animal. Some dogs are great cowards and show great sensitiveness to the slightest pain, while others will stand any amount of it; and we must, therefore, always carefully examine a wound, seeing its depth, situation, and character, and not in any way be guided in making a diagnosis by the symptom of pain indicated by an affected animal. Wounds of the lips, lower extremities, external genitals, and of the bones are the most painful. In the dog we see occasionally a series of symptoms which are identical with what is known in man as "shock." This, as a rule, occurs immediately after any painful injury, such as extensive crushing of tissues or bone, and during or after operations. The visible mucous

membranes in the skin become pale, then cold; the eyes are fixed, the pupils dilated; the pulse becomes irregular, reduced in volume; and the respiration weak and irregular. The animal appears indifferent or unconscious. These symptoms may disappear very rapidly or in some cases go on until the animal dies without rallying in spite of any form of treatment that may be tried.

Symptoms of a very similar character, as a result of extensive hemorrhage, are sometimes presented, and must not be mistaken for "shock." The same may be said to occur occasionally in the dog when under the influence of chloroform. It is believed that the symptoms of "shock" presented are due to an irritation or concussion of the sensitive nerves, producing reflex paralysis of the vasomotor center of the medulla oblongata.

The Course of the Healing Process in a Wound.

The healing of a wound depends to such a large extent on its form, condition, location, and treatment, that from a practical standpoint we may generally separate the processes into, first intention, or healing by primary union; second, healing by second intention or suppuration; third, healing under a dry scab; fourth, healing under a moist scab; the various processes of wound healing can be studied in works on surgery.

Diseases Resulting from Septic Infection of Wounds.

There are a number of conditions which appear in wounds that are due to microbes or germs, producing certain irritations of the tissues surrounding the wounds, especially the blood vessels and the lymphatics.

Phlegmon.—By this we mean the inflammation of the soft tissues which has a tendency to formation of pus, especially in the loose subcutaneous connective tissue between the muscles and under the fasciæ. There are two forms of this condition—a circumscribed and a diffused phlegmon.

Circumscribed Phlegmon.—The symptoms are very prominent, especially when it is near the skin. We find in a certain circumscribed region a hot, painful, very red swelling, firm and tense in the early stages, but soon becoming soft, doughy, and finally fluctuating, due to the tissue breaking up and forming a purulent liquid. From the pressure of the pus the skin becomes gradually thinner and thinner, until the pus finally makes its exit through the skin and escapes. If, for some reason, the skin is too tough, or if the pus has not been allowed to escape by means of an incision, it may cause a purulent infiltration of the surrounding tissues, which is very serious and ends with necrosis of the parts, espe-

cially of the fasciæ, tendons, muscles and bones, and it may be taken up in the blood, and portions of the diseased tissues are carried in the circulation to different parts of the body.

Diffuse phlegmon is generally a very serious condition. The local symptoms are the same as the circumscribed, but the fever is much higher, and the purulent pus rapidly extends in all directions in the loose connective tissue, undermining and frequently causing extensive necrosis of the skin, fasciæ, muscles, tendons, etc. Death occurs, as a rule, from septicæmia or pyæmia.

The treatment of diffused phlegmon consists of scarification and incisions. Numerous slight incisions are made to reduce the inflammatory tension of the tissues and to encourage the pus to escape, also to prevent it from burrowing in different directions, and to make an opening into the parts so that they can be disinfected by means of injections or irrigations of 1 to 1000 solution of corrosive sublimate, 3 to 5 per cent. of carbolic acid, or 2 per cent. of creolin. In circumscribed phlegmon it is better, as a rule, to wait until the abscess is in that condition known as "ripe," or until it "points." This can be distinguished from the fact that the swelling fluctuates or is soft in the centre. In a light skin it may be even yellow. As soon as the incision is made it should be emptied and irrigated and injected with an antiseptic solution, afterward treated as an ordinary wound.

Inflammation of the Lymphatics (*Lymphangitis*).—This is caused by poison absorbed from an unclean, unhealthy wound, although in some instances it may be caused by a high nitrogenous condition of the blood due to overfeeding. The author has observed several cases in dogs where one or more of the legs was hot, painful, and swollen, and there were also lameness and an increase of temperature. On examining the subcutaneous lymphatics they were found to be enlarged, presenting a peculiar corded appearance and running in the direction of certain of the lymphatics. These were enlarged and very tender to the touch. In cases of this kind we may see two terminations: first, a rapid recovery; second, the formation of an abscess containing a large amount of purulent pus in the swollen lymphatic glands, producing extensive inflammation, blood-poisoning, and the animal eventually dying from septicæmia.

The therapeutic treatment consists first in the irrigation of the parts with cooling applications, and, if the glands show indications of forming abscesses, apply hot poultices and open as soon as possible.

Inflammation of the Walls of the Blood Vessels (*Phlebitis*).—This is especially interesting to the veterinarian, as it is quite frequently seen in the dog. Purulent inflammations of the blood vessels are seen in connection with infectious purulent wounds, and originate as a secondary symptom by extension of the suppurating process from the surrounding

tissues. This is especially noticeable where the wall of the vessel is crushed, forming a thrombus, and this thrombus, lying in the blood vessel, becoming infected from the wound, produces suppuration and breaks down, and is carried into the general circulation and deposited in some part or organ of the body, setting up an irritation, and a consequent formation of an abscess. This condition is termed "metastatic abscess."

The therapeutics are the same as those of lymphangitis. Open the wound as soon as possible and thoroughly disinfect the abscess.

Fever.—Concerning the clinical symptoms of fever, we have given all necessary details on page 9. The fever which accompanies wounds varies greatly in intensity according to the cause. The following are the different varieties of wound fever:

1. **Aseptic Wound Fever.**—This is produced by entrance into the circulation of the blood of harmless substances (water, irrigating fluids, non-decomposed wound secretions, and fibrinous ferments). This occurs in the majority of cases shortly after the animal receives the wound, and causes very slight disorder in the general condition. The rise of temperature is generally the only visible symptom in the dog. There is no alteration in the appetite, and the temperature is reduced within a few hours; in very rare cases it may be slightly increased for two or even three days.

2. **Septic Wound Fever and Septicæmia.**—As soon as putrid or decayed substances find their way into the system by means of a wound the symptoms of fever appear rapidly. If they are mild in character, it is called "septic wound fever;" if they are acute, presenting symptoms which may endanger the life of the animal, it is called "septicæmia." Septic wound fever and septicæmia are only separated by their degree of intensity, otherwise they are similar. There is one difference that we will point out between septic poisoning and septic infection, and that is, in the first form, the micro-organisms which produce putrefaction are to be found only in the centre of infection and not in the blood, while in the second form the centre of infection is in the blood and in the tissues.

Septicæmia appears, as a rule, thirty-six to forty-eight hours after the injury with an increase of temperature as high as 40.5°, rarely above, and showing a remittent character marked by depression, fatigue, and loss of appetite, the last being very rare. If the wound is treated quickly and rendered thoroughly antiseptic, the symptoms rapidly disappear. The most dangerous forms of septicæmia which occur most frequently in the dog appear two to four days after the injury, showing a general disturbance of the system, and frequently without presenting any unusual symptoms in the wound itself. The temperature is rarely increased to any extent. More often it is normal or subnormal. We are not able, therefore, to place any dependence on the temperature as far as prognosis

is concerned, the only value being when the normal temperature is presented and the acute symptoms already described begin to abate.

We sometimes see very peculiar cases—for instance, the author has observed a case of septicæmia with normal temperature the first day accompanied by weakness, depression, loss of appetite, etc. In the next few days the temperature gradually increases; sleepiness, fatigue, and rapid emaciation; the symptoms increase in intensity; the pulse becomes weak, rapid, and much slower, until it falls below the normal rate, and finally ends in the death of the animal. In many cases diarrhœa is present, and in rare cases convulsions.

Therapeutics.—Antiseptic solutions must be used vigorously and the wound irrigated frequently. If there is any dead tissue that is hard to loosen, the thermo-cautery should be used to render it aseptic. The animal must be stimulated by means of ether, alcohol, and camphor. The writer finds subcutaneous injections (4.0 to 6.0 doses) of spirit of camphor or camphorated ether, 1 to 10, of great value in such cases. This drug he is inclined to call a specific agent in septicæmia. It must be injected every two or three hours under the skin until the alarming symptoms have disappeared. Slight muscular contractions which sometimes follow the use of camphor are not to be regarded as anything especially serious.

3. **Purulent Fever and Pyæmia.**—When a suppurating wound becomes very much inflamed and infects the surrounding tissues, it is generally followed by the entrance into the blood of some microorganisms. If the symptoms of fever are slight, the patients may recover, with only a chill and a slight increase of temperature. If the fever is very serious and the temperature rises high, it is called pyæmia. In this disease you will find that the majority of cases are followed by metastatic suppuration in various organs of the body. This is due to the fact that the thrombus undergoes purulent destruction in the blood vessels, breaks down, and the infectious matter is carried into the circulation, and from there it finds its way to different organs or locations in the body. The symptoms of pyæmia in the dog are not very easily distinguished from those of septicæmia, and it is very hard in the majority of cases to make a positive diagnosis. Very frequently we see symptoms of septicæmia and pyæmia combined, forming what is known as septico-pyæmia. In this case the animal dies before any deposit of the suppurating poison has produced abscesses. In pyæmia the symptoms are marked by chills in the early stages, and by intermittent fever. The appetite is often good, and, as a rule, rarely entirely absent, as in septicæmia. Later the disease presents much more serious symptoms: the fever loses its intermittent character, the temperature remaining high; the appetite disappears; fatigue and weakness may occur; the patients become rapidly

emaciated and finally die. With these symptoms we see metastatic suppuration in the internal organs.

The therapeutic treatment of pyæmia is similar to that of septicæmia.

Treatment of Wounds.—In the treatment of wounds we must pursue the following directions to obtain good results: 1. That the edges of the wound must be brought together as soon as possible to encourage union. 2. That in the treatment of wounds we must protect them from all kinds of irritation, and especially from the invasion of micro-organisms.

A wound may be infected with microbes through the hair, or by direct infection from unclean hands, instruments, dressing materials, or septic fluids. It is also possible to infect a wound from the blood. The main point in the treatment of wounds should be to prevent the direct entrance of microbes into it, or to destroy the infectious substances which have entered the wound, and finally to put it in such a condition as to prevent the further development of any microbes that may still remain there. The first is rather difficult in the dog even under ordinary circumstances; the last can be followed out to a certain extent, as the treatment of wounds is greatly influenced in the dog by two facts: first, many dogs will not allow a dressing to remain in place; and, second, a wound is interfered with to a certain extent by the tendency that all dogs have to lick the injured part. For this reason we frequently have to modify the treatment of wounds in the dog. We must, however, apply a dressing in all cases where we can keep the patient quiet and prevent him from removing it. The veterinarian has two powerful agents at his disposal for the treatment of wounds: the first is, primary disinfection of the wound and its neighborhood; second, keeping the wound as dry as possible.

1. The First Disinfection of Wounds.—This is of special importance, and especially during and after operations where there is much blood lost. The wound and everything coming in contact with it, also the tissues surrounding it, should be carefully rendered antiseptic. The hair has to be shaved or cut very close, the skin washed with ether or benzine in order to remove all the fatty matter lying in the skin. Follow this by washing with antiseptic fluids (1 per cent. solution of sublimate, 3 per cent. carbolic acid, 2 per cent. creolin). Any existing wound has to be treated in the same manner. If there is a wound the shape of which forms a cavity, an antiseptic solution must be injected into it and come in contact with all parts. The irrigator shown in Fig. 117 is especially adapted to that purpose. For cleansing wounds do not use sponges unless they are thoroughly aseptic, also disinfect the gauze and dressings (tampons). Instruments and the operator's hands must also be carefully attended to. The former should be placed in an antiseptic solution of carbolic acid, 5 per cent., or a 2 per cent. solution of creolin. Do not use corrosive sublimate solution for instruments, as it leaves an insoluble

coating of mercury on the steel. The hands and nails have to be brushed and washed with carbolic solution, or sublimate soap. During the operation the wound should be disinfected from time to time—that is to say, it should be washed or wiped with the solutions referred to above.

2. **Future Treatment of the Wound.**—This consists of various measures, according to whether there is hemorrhage and the condition of the wound.

Stopping all Hemorrhage.—If the blood which runs into a wound is left there, it has a bad effect, preventing an adhesion of the surfaces of the wound, and also being a favorable ground for the development of microbes.

Drainage of the Wound.—By this we mean the removal of wound secretions, especially pus, by means of drainage-tubes. The regular drainage-tubes are made of rubber, having numerous holes cut in them. These are placed in the deepest part of the wound, and fastened by means of a stitch in the skin, or the wound closed around it. In small wounds, instead of the rubber tube we use small pieces of silk thread or catgut which have been twisted together in the shape of a cord. In wounds which are not deep, but cavernous, and where it is difficult to get quick adhesion in order to insure proper drainage, it is best to leave the wound open, covered with antiseptic powder, such as sulphonal, boric acid, naphthalin, salicylic acid, etc. The first-named agents possess special properties for the treatment of surgical wounds, drying them rapidly and depriving the microbes of a proper medium to develop in, and thus rendering it impossible for infection to extend.

Fig. 117.—Apparatus for the antiseptic irrigation of wounds.

It is advisable to use some material that will take up the secretions of the wound quickly, and assist in drying them. For this purpose, we cover the wound with salicylic- or carbolic-acid or corrosive sublimate gauze. In a wound where there is a deep cavity, it is well to fill it for twenty-four to forty-eight hours after the operation with a tampon of sublimate gauze, then, having removed the gauze, clean the wound and by means of sutures bring it together and cover it with antiseptic gauze.

The following is the ordinary treatment of wounds:

1. **Controlling the Hemorrhage.**—This may be accomplished in various ways. The best method is by means of a ligature. As a rule, this is performed by carefully ligating the bleeding blood vessel, either directly on the vein or artery, or taking up a certain portion of the tissue with a

pair of forceps, including the blood vessels, and tying it behind the point of the instrument with a ligature. When the bleeding end of a blood vessel is located in very firm tissue, out of which it cannot be drawn far enough to ligate, we pick up the blood vessel with the end of the forceps, draw it out as far as possible, and twist it in a spiral direction; by this means we usually succeed in controlling the hemorrhage. If, however, the above does not answer, we pass a thread through the tissue underneath the blood vessel and tie it tightly, and by this means close the opening.

Compression is sometimes used as a means of stopping hemorrhage. This we can accomplish by pressure of the finger above the bleeding region, or, if it is an extremity, ligate the member above the part by
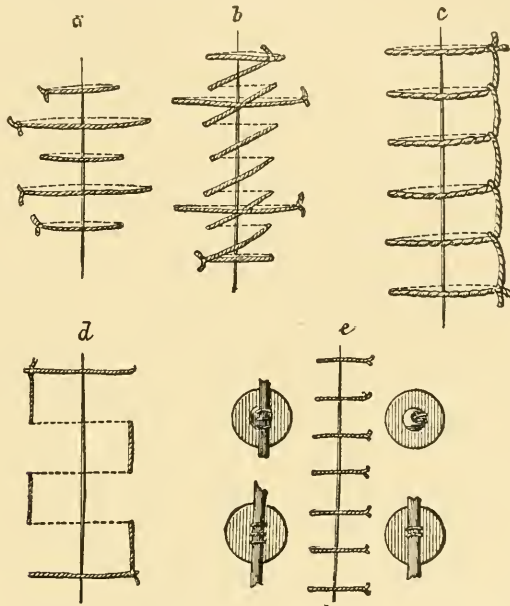
Fig. 118.—Different forms of stitches used in the dog and method of tying: *a*, head-stitch; *b*, continuous oblique stitch with cross-stitch; *c*, deep continuous cross stitch; *d*, mattress-stitch; *e*, button and interrupted stitch.

means of a rubber band or tube, or even a handkerchief. Another means of stopping a hemorrhage is by using a cauterizing iron (thermo-cautery). These, however, should only be used in wounds where you do not expect healing by first intention. All agents which have the property of stopping hemorrhages, as a rule, coagulate or draw the tissues in such a way as to prevent healing by first intention.

Capillary or slight subcutaneous hemorrhages can be stopped by pressure or irrigation with cold water. Hot water is also sometimes used to control hemorrhage.

Wounds which can heal by first intention, such as all operative wounds which have been thoroughly disinfected according to the method described above, and where the hemorrhage has been stopped, we bring together by stitches or ligatures (Fig. 118). As a rule, the ordinary knot-stitch with antiseptic silk is used, although we may connect it with other forms, such as the extension stitch (Fig. 118). Small wounds do not, as a rule, require drains. The wound should be compressed for several minutes by means of an antiseptic sponge, and after that covered with collodion. If the position of the wound allows, we must apply a firm, compact dressing over every wound that is stitched; if it is a simple one, the dressing may remain until it is entirely healed— that is, for about one week. If we have a large wound, however, with flaps, caverns, etc., it is advisable to place drains in the wound and change the dressing after three or four days. Instead of collodion dressing in such wounds, use antiseptic powders, such as sulphonal, dermatol, bismuth subnitrate and boric acid. These should be dusted on the wound itself, directly on the line of the severed skin.

The writer has been in the habit of covering ordinary sewed wounds with a thin layer of antiseptic gauze, and covering over that a dry, antiseptic muslin bandage, and finally over these two covers a damp starched gauze bandage. The latter has the advantage of forming a stiff envelope, becoming dry on account of its starchy contents, and exerting a certain hold on the injured member. If a serious rise in temperature takes place, the dressing must be immediately removed and the directions followed which are given under the head of "Wound Fever." When the bandage has been displaced, and when it has been moistened by the wound secretion, it must also be changed.
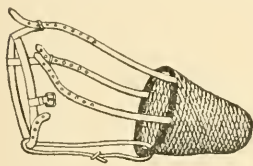
Fig. 119.—Muzzle.

Wounds which heal under a dry scab are generally superficial. These do not require to be closed by means of stitches, and they seldom are licked or irritated by animals. In these cases we use the following method of treatment.

After thoroughly disinfecting the wound and its neighborhood with some antiseptic solution—dilute corrosive sublimate or creolin solution— allow it to dry, and by means of a camel's hair brush paint the irritated dermis. We produce an artificial scab, or we cover the wound surface with collodion. The latter is recommended in common lacerations. As a rule, no dressing is used. The scab loosens after some time and falls off. When we are obliged under certain circumstances to leave a wound open it is advisable to muzzle the animal (Fig. 119), not only to prevent the patient from licking the wound, but in order to properly apply a sprinkling powder, and get good results from it. The best powder to

use is boric-creolin (1 part of creolin to 40 or 50 parts of boric acid), naphthalin or sulphonal (1 part to 5 parts of starch), dermatol, airol, aristol, bismuth subnitrate or zinc oxide. An open wound generally requires antiseptic washings daily. It frequently happens that granulating wounds, especially when they have been subjected to exposure to air or are constantly irritated by the animal, may at some period lose their power of healing and become converted into ulcers.

Ulcers or Ulcerations.—By this we understand a granulating surface which does not heal on account of the purulent destruction of the granular tissue. Wounds are changed into ulcers when they are continually irritated by some mechanical or chemical irritant, or as a consequence of the skin becoming inflamed or necrosed from pressure (muzzling, etc.). Callous ulcers and fistulous ulcers are the most difficult to treat. The former are superficial ulcers with hard, callous centre, having raised edges, and a whitish, hard, bacon-like surface. This is covered with a thin unhealthy secretion. They may form sinuses or canals, which very often contain, at the bottom of the sinus, a foreign body or necrosed tissue. They may also lead to some of the glands. These pipes are called fistulæ or fistular canals.

The treatment of ulcers is, to a certain extent, the same as that of wounds—that is, to follow all the antiseptic rules. The use of dermatol, airol, aristol, subnitrate of bismuth, salicylic acid, naphthalin, powdered camphor, or boric-acid ointment is advisable. We may also remove callous ulcers by surgical means and convert them into fresh wounds by taking a knife, paring the tissue at the bottom of the ulcers, and treat them as indicated in cases of fresh wounds. Caustic agents produce little or no good effects. If the tissue surrounding the ulcers is hard and rigid, preventing contraction of the ulcerated area and the healing process, we must perform circumcision of the part, as transplantation is not practicable in the dog. We cut about 1 cm. from the border of the ulcer over its entire thickness, keeping the wound open by means of vaselin. When we treat a fistulous canal and the location of the fistulous sinus admits of it, we split open the fistulous passage and convert it into an open wound. When the fistulous canal is not very deep we may also try to produce healthy granulations by means of actual cautery, or the injection of caustic fluids or the introduction of crayons of caustic (nitrate of silver or caustic potash). Always try to slit open the canal, if possible, as it produces the best effects. Nitrate of silver or any of the mineral acids, and in obstinate cases a small piece of corrosive sublimate, is pushed down into the bottom of the wound; these caustics produce more or less irritation and consequent sloughing of the wall of the canal and allow the growth of healthy granulations.

Contusions.—In subcutaneous wounds of the soft tissues (bruises

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and contusions) we find a different condition of the tissues. These injuries are generally caused by some blunt object—for instance, a blow, kick, shock, or fall. The soft parts are bruised and injured according to the intensity of traumatism; very slight resistance is offered by the loose connective tissue; small blood vessels are ruptured from crushing or bruising the soft parts, and the hemorrhage that follows percolates all through the torn tissues. The greatest amount of resistance is found in the skin, face, sinews, and large blood vessels.

Clinical Symptoms of Contusions.—One of the first symptoms of a subcutaneous bruise is a swelling in the region of the injury. This appears, as a rule, immediately after the injury, and is due to the blood running out of the torn vessels. The fluids in the enlargement always contain lymphatic substances on account of the laceration of certain lymphatic glands. In rare cases we see a lymphatic secretion only, which is distinguished from the blood secretion by being very slowly absorbed. The fluid which appears lies either in the loose connective tissue under the skin or between the muscles, and, as a rule, is irregularly divided, or we may find the condition presented in a number of ways; for instance- we may find a "doughy" swelling in one case, or it is accumulated in centres in another, or we see a fluctuating swelling or a "blood boil" (hematoma), or it may run into a cavity, and we have a bloody secretion of the joint (hemarthrosis), or we find a bloody secretion in the cavity of the chest (hematothorax). The swellings, as a rule, occur shortly after a contusion, and in the early stages rarely show any inflammatory symptoms. Later, however, inflammatory symptoms may appear.

Beside the swollen condition of the tissues, the animal may present symptoms of pain, especially at the time of the injury, and later on we find the injured region very tender to the touch.

The further course of the wound depends to a great extent on the amount of the injury. If the skin is crushed in such a manner that all the vessels are torn, it will become necrosed from deficient nutrition, and, as a result, is indicated in the discharge, which contains septic blood and broken down tissue.

In the treatment of contusions, to get good results we must have one object in mind—that is, the rapid reabsorption of the secretion. For that purpose we use cooling compresses soaked in lead-water (Goulard's extract), or arnica-water, or we may try to get absorption by means of massage—that is to say, make a centrifugal friction with the thumbs, fingers, or hand for fifteen or twenty minutes at a time. We may also squeeze the excreted blood into the tissues and lymphatic passages, and apply a tight bandage immediately afterward to prevent any recurrence of the subcutaneous bleeding. This latter treatment is not to be

practised unless the swelling is very small and there is very little fluid in it.

The therapeutic treatment is not simple in all contusions. In large "fluid-boils" we rarely can wait for an absorption of the secretion, but are compelled to open the swelling at the point where it is soft and where the skin is thinnest. In animals we must always try to make an opening in the dependent part of the enlargement, so as to get perfect drainage. After having opened the tumor, clean it out, removing all clots, etc., and treat the inner surface of the wound according to the usual method, applied in such cases. If the location of the wound prevents such a procedure, the fluid may be emptied by means of a hypodermic syringe, and an antiseptic solution injected in its place, and, if possible, this should be followed up afterward by a compress-dressing.

In all cases where the skin is very much injured, or where extensive destruction of the soft parts has taken place, or even fracture of the bone has occurred, we cannot use massage, but instead compressing antiseptic dressings must be applied. As a rule, treat the slightest injuries of the skin according to the best antiseptic methods.

Inflammatory symptoms are observed as soon as fever appears. The skin becomes hot and painful; finally fluctuation is found in some parts. Then we must immediately remove the secretion, clean out the wound, and by drainage keep the cavity empty, at the same time inject into the wound a 1 to 1000 solution of corrosive sublimate or a 5 per cent. solution of carbolic acid, and use an antiseptic bandage.

Burns and Scalds.—In cases where a high degree of temperature acts on the skin it causes hyperæmia in milder cases, to necrosis and sloughing in severe cases. For convenience of descriptions, we divide burns into three classes or degrees. The first degree of burning is indicated by great pain, redness and swelling of the skin; the second degree causes violent serous exudation in the stratum mucosa and is indicated by the formation of blisters containing a yellowish serous fluid which dries or may burst the vesicle when it is followed by more or less suppuration. Burns of the third degree are indicated by more or less extensive necroses of the skin. The necrosed portion of flesh forms a scab which is separated from the surrounding healthy tissue by a demarcating line of granulating tissue. Extensive burns may cause death in a few hours. In such cases the animal shows violent pain, is greatly excited and restless, the pulse is very high, hard and wiry. The respirations are increased, subnormal temperature and death follows in a short time. Sometimes there is violent vomiting, followed by convulsions; the prognosis depends on the severity of the burns or scalds. Very frequently a scalded animal is disfigured for life as a result of the extensive destruction and subsequent necrosis of the epidermis, which destroys the hair bulbs and prevents future

growth of hair. Treatment in all cases consists in applying cooling applications that prevent the air from reaching the burned surface, such as flour, starch, boracic acid, or talcum powder, applications of solutions of lead water, acetate of alum or cresol, or unction of petrolatum, zinc or lead oxide ointments, also ointments of ichthyol or thigenol (1 to 10), lead liniment 1 part of acetate of lead and 10 parts of olive oil, calcium liniment (so-called carron oil), lime water and linseed oil equal parts, or mixture of equal parts of carron oil and carbolized oil (1 to 20) or a mixture of a beaten up egg and linseed oil. Blisters of very large size should be opened with a fine needle, taking care to make a very small opening in the covering of the blister and endeavor to prevent it from being rubbed off. In case the epidermis—that is to say, the covering of the blister—is rubbed off, the above-mentioned salves and liniments can be used, but drying powders such as dermatol, airol, aristol, subnitrate of bismuth, oxide of zinc are much to be preferred. These drugs are generally rubbed up with starch or talcum and dusted on the sore by means of a pledget of absorbent cotton, a perforated tin dusting box or blown on by means of an insufflator. Powders of salicylic acid or magnesia in combination with talcum powder should be employed where there is suppuration or scalding of the third degree. Some recommend a solution of picric acid 1 to 100, or a 5 per cent. solution of nitrate of silver. Where the animal is in very violent pain, we should use cocaine in solution as a local application. A bandage of absorbent cotton is put over the scalded portion. This is rather difficult, however, to keep in position, as in cases of severe scalding the animal constantly moves or twists the body in endeavoring to lick or bite the wounds. This must be prevented if possible. In cases of acute or extensive scalds the animal must be covered with cotton batting and given some of the various stimulants such as alcohol, camphor, or ether, and also the subcutaneous solution of common salt is to be recommended.

Frost Bites.—Freezing is comparatively rare, probably due to a certain extent to the fact that frost bites, if they happen to be mild in character, are either overlooked or mistaken for other affections. Frost bites occur in hunting dogs, in the work dogs of Europe, and also the sled dogs of Canada and Alaska. Freezing generally appears in the feet. Müller and Frick found freezing to be rather common in hunting dogs, but, except when it is more or less extensive, is not observed by the attendants of the animal. Schneidermuhl observed a bitch that had a frozen udder. Schindelka saw one case where a dog had his ear frozen. As in burning, we divide freezing into three degrees depending on the severity of the symptoms. In freezing of the first degree we find in the frozen portion slight dark red or blue colored swellings. In freezing of the second degree, there appear a number of bladders or

blisters, containing yellow hemorrhagic serum, and after the vesicles burst there is more or less loss of tissue and the wound heals very slowly leaving a very pronounced cicatrix. Freezing of the third degree is accompanied by more of less gangrenous mortification of the frozen portion. Chilblains (perniones) are seen occasionally in dogs that are kept chained in yards and pointers that hunt in the snow or over frozen ground. The treatment of frost bites of the first degree consists in attempting to remove the venous stasis by means of friction or a liniment, such as spirits of camphor or aconite or paint the affected portion with tincture of iodine. The application of moist, warm compresses is also beneficial. For freezing of the second degree, in which blisters have been formed, apply drying powders already mentioned and if gangrene has commenced, the wound must be treated with antiseptics. Where the animal is completely frozen, as is indicated by the rigidity of the body, avoid warming the animal too quickly. The animal must first be rubbed with a cloth which has been dipped in cold water or given a bath in cold water and gradually the heat of the water increased up to the bodily temperature; at the same time the body is to be rubbed constantly. Subcutaneous or intervenous injections may be administered, such as ether or camphor. Artificial respiration may also be resorted to.

Snake Bites.—In Europe there are three species of venomous snakes which may bite dogs. They are the common viper (vipera berus), the asp (vipera aspis radii) and the sand viper (vipera ammodytes). The first serpent is found all over Europe, the asp in Switzerland, the sand viper in Dalmatia. In America we find the rattlesnake (crotalus) and the copperhead (trigonocephalus contortrix) and moccasin (toxicophis piscivorus) and puff adder. The poison of the snake lies in two glands which lie at the base of the long teeth. Sporting dogs and shepherd dogs are generally bitten on the legs and sometimes on the mouth. A short time after the animal is bitten, we find about the bitten portion a bluish-red tumefaction which is extremely painful and has a doughy-like feel to the finger. The pulse is small and thready, the respirations frequent. The animal attempts to vomit and finally may become totally paralyzed. As a rule the animal makes a good recovery and it is only in rare instances that it results fatally. The treatment consists in putting a tight ligature immediately above the affected portion and this must be left on until the effects of the poison have passed off. Subcutaneous injections of spirits or ammonia diluted with three parts of water. The following drugs are also recommended to be applied directly to the wound: calcium chlorate, chloral water, tincture of iodine, hydrate of potassium or nitrate of silver. The thermocautery can also be used. It is to be understood that any of the preparations to be of any service, must be used immediately after the animal has been bitten. Karlinski recommends subcutaneous

injections of solution of chromic acid (1 to 100).   Lacerda advises sub-
cutaneous injections of permanganate of potash (1 to 60).   Where the
animal exhibits great weakness, we should administer alcoholic stimu-
lants—brandy, whiskey, or sherry—and to these add a few drops of spirits
of ammonia.   Ether, camphor, atropia are all advised as stimulants.
A serum has been prepared to combat the effects of a snake bite.

Wounds of the Tip of the Tail.—Wounds or injuries to the tip of the
tail are generally found in short-haired dogs with long tails, particularly
great danes, pointers, and beagles.   Wounds of this character are caused
by the dog shaking the tail and hitting against solid objects, particularly
where dogs are kept in narrow kennels and wag their tails and strike the
sides of the kennel.   It is a peculiar fact that while injury of the tip of the
tail is insignificant, it is one of the most difficult to treat and cure.   This
is caused by several facts; first dirt and scabs collect on the wound which
causes the animal to constantly lick and gnaw the sore.   Another fact
is an animal will keep gnawing at the tail when there is apparently no
reason for it.   The tail seems sometimes to be intensely itchy, due prob-
ably either to neuritis or to itching eruptions of the skin.   The animal
gnaws and bites the tail as if in a fury of pain or irritation until the vertebra
is exposed causing necrosis of the bone and slough of portions of the tissue
or even one or two bones of the coccyx.   Sometimes we find certain ecze-
matous eruptions that extend from the back and root of the tail along the
entire body of the tail, and the animal is constantly licking and biting it.

The first line of treatment is to endeavor to lessen the irritation and
to heal the sore.   First clean the tail carefully and thoroughly with warm
water and soap and remove all dirt, scabs, etc., from the injured or
irritated portions, and after drying the tail, dust on antiseptic powders
such as boracic acid, airol, dermatol or tannoform or even paint the
injured portion with collodion or compound tincture of benzoin.   Where
there is an ulcerated portion of the skin, it should be stimulated with a
stick of nitrate of silver or in cases where there is deep ulceration it may
be necessary to touch the affected portions with the thermocautery.
After applying the antiseptic dusting powder it is necessary to apply a
bandage on the tail and for this purpose there is nothing better than a
bandage held in place with carpenter's glue.   This is applied in the fol-
lowing way: Strips of muslin or linen are covered with glue (ordinary
glue that is warmed slightly to render it more liquid) then the affected
portions are covered with the antiseptic dusting powder and a small
portion of absorbent cotton filled with the powder is applied.   The
strip of muslin covered with the glue is laid on lateral sides of the tail
from the root of the tail around the tip and back and the glue-covered
side directly on the hair (Fig. 120).   Another strip may be put on, cover-
ing the superior and inferior surfaces of the tail, then strips are wound

around the tail to hold on these strips, either at the root and tip, as shown in Fig. 120, or along the entire tail as shown in Fig. 120. Care should be taken not to wind the circular strips too tight as the bandage is apt to contract quite considerably when the glue dries. The bandage sticks closely to the hair and has many advantages over adhesive plaster. It is impossible for the animal to shake it off, and if he should show an inclination to gnaw at it a muzzle should be put on the animal. The bandage should be changed every five or six days. The bandage is removed by putting the tail in warm water or covering the bandage with
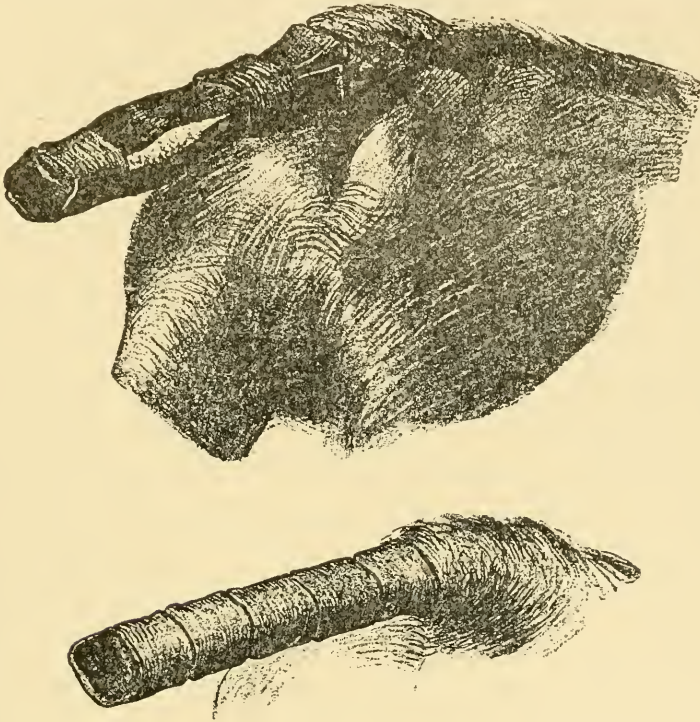
FIG. 120.—Bandage for injuries or amputation of the tail.

a cloth saturated with warm water and allowing it to remain for ten minutes, when the strips are easily taken off; the tail washed, dressed and another bandage applied, taking the precaution to have the tail dry before re-applying the glue bandage. A leather cone for the protection of the tail, called a " tail-muzzle," generally causes great irritation and the animal is in a constant state of irritation while it is on and is constantly trying to get it off.

Amputation of the Tail.—The necessity of amputation of a portion of the tail may not only originate from the causes already enumerated but from the tail being run over by a wagon wheel, from being caught

between swinging doors, or being tramped on. It may also be caused from fracture of the tail or from malformations. Occasionally it may be the seat of a diffuse swelling as a result of phlegmons or from septicæmia from the wound of the end of the tail becoming infected. In such cases, however, it is best to make a series of longitudinal incisions in the tail where the swelling is greatest and allow the serum to escape and at the same time give an energetic course of antiseptic applications and if these measures do not succeed, then we have to resort to amputation. Amputation of the tail is also performed in pointers to shorten the tail and prevent them from getting the tail sore going through brush and lacerating the end. And lastly certain breeds of dogs have their tails amputated when young as a matter of fashion.

When local applications do not have the desired effect and the tail
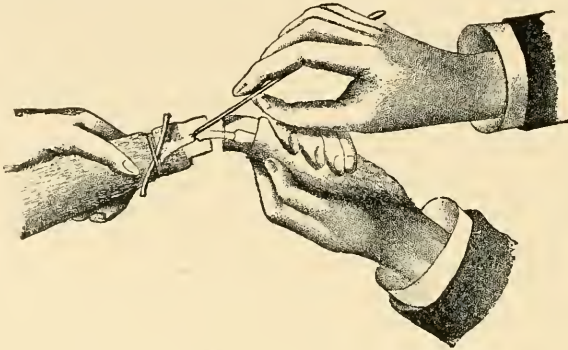
Fig. 121.—Amputation of the tail (circular operation).

becomes gradually worse or the vertebra becomes necrosed the only means left is to amputate the affected part.

The operation is a form of exarticulation. An amputation between two of the vertebræ is much better than cutting through one of the bones. The operator must distinguish the slightly enlarged portion (Fig. 121) where the articulation lies. Put the animal under ether or give a hypodermic injection of morphine or a subcutaneous one of cocaine; have tied an elastic band around the tail above the point of operation, then proceed by means of the flap or round operation, whichever is preferred. As the vessels bleed slightly they can easily be stopped by means of a thermocautery. The circular operation, cutting posterior to the bony protuberances of the articulation; pull the skin back, cutting through the muscles and tendons just below the articulation; then, with the help of an assistant, pull up the tissues and cut between the cartilaginous discs. Then bandage the tail as shown in Fig. 120. In cases in older dogs where there is much hemorrhage the artery may be taken up by means of a catgut ligature or touched with the thermo-cautery. The edges of

the skin are united by interrupted suture and an antiseptic dressing is applied, taking care not to make it too tight. The flap operation is the same as has already been described.

The operation of cutting puppies' tails in fox terriers, spaniels, poodles, is best done just before the puppies are weaned. When, after judging the proper length the tail is to be, in proportion to that of the body, the tail should be cut through with a sharp knife. It is not necessary at that age to attempt to cut exactly through the articulation.

DISEASES OF THE CLAWS AND FOOT PADS.

The claws, the third phalanx, of the toe (the bone of the claw) articulates with the second phalanx; near the articulatory surface is an annular fold (claw fold) which receives the free border of the claw. The phalanx tertia is covered by the cutis vera. This develops and grows from the matrix of the claw plate (coronet), the claw bed, and the muscular sole which is an extension of the corium which extends over the third phalanx after dipping into the circular furrow at the base of the bone (Fig. 122). In order to protect the ends of the claws when not
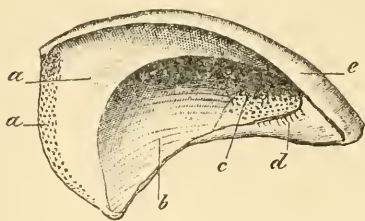
FIG. 122.—Nail. Longitudinal section of nail. *a*, Matrix of nail horn; *a'*, papillary zone of nail horn; *b*, bed of nail; *c*, matrix of cushion; *d*, cushion; *e*, nail. (*Siedamgrotzky*.)
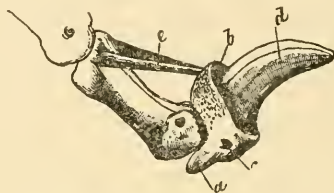
FIG. 123.—Diagram of the first and second phalanx. *a*, Tubercle of pad; *b*, horn groove; *c*, groove of sole; *d*, third phalanx; *e*, dorsal ligament. (*Siedamgrotzky*.)

in use there is an elastic tendinous band which draws back the nail and when the foot is on the ground the nail is retracted (Fig. 123) and the weight of the body carried on the pads, those pillow-like elastic bodies, a large one in the centre and four radiating in front of it, corresponding to each toe, the thumb toe being too high up, does not get pressure (Fig. 124).

Ingrowing Claws. Incarnatio Unguis.—Animals that are house pets and have little or no exercise do not wear the nails properly and they become long and are apt to strike the ground when walking. Occasionally these nails become so long as to turn under and the weight of the animal presses the claw into the pad and the claw is gradually buried in the flesh. The dew or spur claws on the posterior extremities frequently grow entirely round and grow into the pad, causing great irritation, swelling and suppuration. It is extremely painful, the animal constantly licking the affected part. It can be cut through by a pair of jeweler's wire clippers, care being taken not to cut it too close and involve the matrix.

Splintering, cracking and breaking of the claws are generally due to some traumatism, although occasionally the claw falls off from purulent

inflammation of the matrix.   The broken ends of the claws must be filed or pared down to make the surface smooth and prevent it catching in carpets, rugs, etc., and tearing it further.   Occasionally a dog with long crescent-like nails, due to want of wear, catches it in a carpet or rough boards in a floor when he is running and the claw is torn loose from the matrix, hanging by a small piece of very sensitive flesh, and every time the animal moves or it touches an object, it causes extreme pain.   As it is generally hanging by a small portion of flesh it can be seized by the fingers and quickly torn off, or if it is more firmly fixed, it can be cut off by means of a pair of small wire cutters, care being taken not to cut too close to the matrix.

Where there is extensive injury to the matrix, it may be necessary to exarticulate the part.

Where the nail is torn from the matrix and that is exposed, it is not advisable to bandage it.   Paint it once daily with compound tincture of benzoin.

Inflamed Claw.   Panaritium.—This may originate from traumatisms, such as being stepped on, crushed between doors, or the extension of inflammatory process from the leg, from unknown causes

FIG. 124.—Pads of foot. *a*, Carpal pad; *b*, sole; *c*, 1 to 5, toe pads.

which develop an inflammation of the matrix of the claw, and is also seen in dogs that are very highly fed and are plethoric. There frequently appears a gouty inflammation of the second phalanx and the matrix, causing considerable congestion, pus and sloughing of the nail.   Eczematous eruption of the local epidermis is also common in overfed dogs; the two conditions are apt to recur in these plethoric dogs from time to time.   In rare cases pus is found and may burrow under the tissues, causing fistula or after the acute inflammation subsides, a thickening of the toe.   Occasionally one toe is attacked and when the acute symptoms subside, then another is attacked; it has been thought to be contagious, but this condition is so frequently seen in overfed animals that it evidently is gouty in character. Frick found that salt water produced irritation of the claws in animals that were at seashore places during the autumn and winter.   Rabe ascribes this condition to a microbe which he calls Cladothrix canis.

In acute inflammation of the claw the animal is very lame and on examination of the toe it is found hot, swollen and very tender to the touch; the skin surrounding the affected toe is tumefied and congested; the claw is very painful; the animal gives evidence of acute agony if it is touched; the claw is dull, the natural lustre having entirely disappeared, and frequently the claw may have changed its position, that is, it may

curl under or turn to one side; in one case observed the claw was flattened
like the nail of a man.

Treatment.—Fomentations and poultices, painting the affected toes
with tincture of iodine. It generally is best to repeat this application
two or three times. If the claw is purulent, it must be treated with an
antiseptic dressing of corrosive sublimate, 1 to 2000 solution; when the
claw is loose, it must be removed, taking care not to injure the matrix

Fig. 125.—Dog's shoes: Laced leather shoe showing shape of sole, and rubber shoe.

or the skin at the edge of the nail and destroy the secreting power of
the claw. Frick has prevented the further extension of the disease by
intraparenchymatous injections of tincture of iodine, the internal
administration of Fowler's solution, and touching the affected claw with
nitrate of silver. The nail can be protected by means of the shoe illus-
trated in Fig. 125.

Contusions and Wounds of Pads.—Contusions of the pads are most
frequently observed in sporting dogs, particularly in animals that have
not been used for active work or when they are first trained, going over
stubble fields, or in dogs going over long distances on snow or frozen roads.
Occasionally we find extensive œdema and sloughing caused by the
presence of an elastic band placed around the foot or toes by a child in
play.

The animals walk very stiff, or in some cases it may be almost
impossible to get them to walk. The pads are hot and painful on
pressure; if the pad is very much worn the dark external skin is worn off
and the red tissue shows on the surface; in cases of extreme wear there

is suppuration and sloughing of the pad. Occasionally foreign bodies, nails, glass, stones, tacks, splinters of brass wire, etc., stepping in acids, particularly when emptying electrical batteries, or stepping in fresh slacked lime. In the latter case the external portion of the pad is frequently entirely sloughed off.

Treatment.—In simple contusions rest is all that is needed; in more severe conditions, paint the pad several times daily with compound tincture of benzoin, or use compresses of sugar of lead water or acetate of alum. When the skin is separated, clean it with an antiseptic wash and remove the loose portion of tissue and cover it with tincture of benzoin and apply a compress. In the first examination of an animal in this condition it is always necessary to make a careful examination of the part to see if there are any foreign bodies buried in the pads. When the soles are very tender the shoe shown in Fig. 125 is very useful. Sole protectors are also made of chamois leather.

HERNIAL RUPTURE.
Abdominal Hernia.

By the word "hernia" we understand a protrusion of a certain portion of the abdominal contents through a normal or abnormal opening in its walls, and where the displaced portion is covered, or partially covered, by the peritoneum. In the majority of cases hernia appears under the external skin, although we may find it in other parts, such as hernia of the diaphragm. There are several different forms of hernia.

We distinguish the following parts in a hernia: first, the intestines or contents which protrude from the abdominal cavity; second, the hernial pouch; third, the envelope, or covering of the rupture; and, fourth, the entrance or constricted portion of the rupture, or where the intestine passes through the abdominal wall. By "hernial pouch" we mean that part of the peritoneum which is around the part protruding from the abdominal cavity, and we distinguish it where it is near the constricted portion by forming at the neck. The portion which lies in the hernial sac is the body and lower portion. The hernial pouch is absent in some cases—as a result of some injury, and the injury has been severe enough to tear the peritoneum, or where the hernial pouch collapses or draws together. Hernial coverings of the pouch are the names given to that portion of the skin and subcutaneous cellular tissues which cover that part; in some instances we also include the muscles and aponeuroses. The contents of the hernia consist of some portion of the abdominal organs enclosed in the hernial pouch. As a rule, it is the intestines, in most cases the duodenum, and in some cases the jejunum. Very frequently the duodenum may be found lying in the hernia with

some portion of the large intestine or uterus, and more rarely the bladder or stomach. Under certain conditions we find a certain quantity of fluid lying in the sac. This is generally serum and originates from venous stagnation.

According to the location of the hernial orifice we distinguish umbilical, ventral, inguinal, scrotal, and hernia of the diaphragm.

The causes of hernia are generally described as direct and indirect. In the former we have a certain number of abnormalities which are due to diseased conditions. For instance, an umbilical hernia is due to an imperfect closure of the opening of the umbilical ring. The latter may occur from the abdominal walls being flaccid, from cicatricial contractions after operations, and occasionally from great abdominal pressure in prolonged straining, vomiting, etc., the muscular wall is ruptured, or from kicks or blows on the abdomen.

In traumatic hernia which has been caused by blows, the hernial pouch is sometimes absent and its contents are surrounded by a hernial envelope—in most cases by the skin—and in rare instances certain muscles are included in the sac.

Clinical Symptoms and Course.—The symptoms as well as the course show a marked difference, according to the character of the hernia, and it depends to a large extent on the "possibilities"—that is to say, if the hernia can be reduced and replaced in the abdominal cavity or not.

Reducible Hernia.—This is generally seen in the region of the wall of the abdomen. We find a swelling which does not present any inflammatory symptoms, and is especially prominent when the animal is walking or standing. It is also seen during abdominal pressure, especially after the dog has eaten a hearty meal. If the animal is turned in such a way that the hernia occupies a superior position, as a rule it immediately disappears, as the contents fall back into the abdominal cavity, or they may do so on a slight pressure of the hand. If we examine the abdominal walls the orifice of the hernia can be distinctly felt, and we may even be able to penetrate the abdominal cavity with the finger.

Further symptoms depend upon the nature of the prolapsed intestines. This intestine will be recognized as a soft, elastic swelling, having to a certain extent the round or tubular form of an ordinary intestine. It may also be further distinguished by a slight distention which is generally due to gas or air. The omentum is soft and doughy to the touch, having an uneven surface and dull on percussion. Hernias of the horns of the uterus are only distinguished from a loop of intestine after conception and during whelping.

Mechanical influences, such as bites, blows, contusions etc., may cause inflammation of the hernia with a thickening of the pouch, and

an adhesion between it and the contents of the hernia. If the injury is severe enough, we may have suppuration in the pouch. In such cases we may have a subsequent mechanical contraction and reduction of the hernia, especially when the pouches are small, or in some cases the hernia has only been large enough to admit a fold of the omentum.

Irreducible Hernia.—This may be due to an adhesion of the intestinal contents with the hernial pouch, the union of the intestinal contents with each other (for instance, adhesion of the intestines), from thickening of the omentum which lies in the hernial pouch, or from strangulation of the hernia. This is especially important, as it may occur in all cases of abdominal hernia and at any time.

Concerning the causes of strangulation there are three important groups: Strangulation by extreme distention of an intestinal tube by fæcal matter; a distention of the opening of the hernia, which subsequently closes on the intestine and strangulates it; by the intestines becoming twisted in the sac. Invagination is very frequently seen in young animals.

In many cases we distinguish three stages of hernia, according to the anatomical alterations produced as a consequence of strangulation in the prolapsed parts. First, we have a venous hyperæmia, then inflammation, and lastly suppuration. In the first stage the veins and capillaries are engorged with blood, and serum is exuded in different directions. In the second stage we observe inflammation of a septic character, which extends from the mucous membrane to the serous membrane, as a consequence of the noxious or poisonous contents of the intestines. In the third stage the prolapsed parts become necrosed, due to the stricture of blood circulation. The intestinal portion becomes black, easily torn, dull in color, and covered with gray or greenish spots on its surface; the hernial fluid becomes purulent, and the inflammatory processes in the intestine above the strangulation cause septic peritonitis.

The clinical symptoms of strangulated hernia are very marked in most cases. The hernia can no longer be reduced or pushed back into the cavity, or a swelling suddenly appears after any traumatism, or after great abdominal pressure, and cannot be reduced even with careful manipulation. The hernia is distended, harder and fuller than usual, becoming very sensitive to pressure, and especially so as the inflammation becomes more intense. The skin covering the hernia is normal in the beginning, but later becomes red, swollen, and warm to the touch. Another symptom generally present is vomiting. This may be so constant and violent toward the later stages that the animal will vomit fæces. At that period symptoms of severe intestinal obstruction present themselves. The hernial swelling becomes cold, insensible to pressure, and symptoms of collapse appear, and death occurs in from

twenty-four to forty-eight hours after strangulation first appears. The temperature can hardly be said to have any diagnostic value, as we very often find it normal or even subnormal up to the time of death.

In rare instances we have the formation of a fæcal abscess; this is caused by the sloughing of a certain portion of the intestine, allowing the contents of the intestine to escape into the sac; this is due to the circulation being cut off and subsequent mortification of the part; this is quickly followed by purulent inflammation of the hernial covering. If an incision is made in the hernial swelling, fæcal matter and pus flow out externally without being followed by any grave symptoms, except that it may subsequently form a false anus in the cavity.

Fæcal fistula, intestinal fistula, or preternatural rectum is seen in very rare instances. The expression "fæcal fistula" or "intestinal fistula" is used where there is an external intestinal orifice, but the greater mass of fæcal matter is passed through the rectum. The term "preternatural rectum" (anus præternaturalis) is used when all the fæcal matter passes through this opening. Such an opening may also be produced by penetrating wounds or the entrance of foreign bodies.

In strangulation of the omentum the symptoms are less marked, but there is great pain on pressure. We frequently find adhesions between the omentum and the orifice of the hernia. This inflammation produces a complete immobility of the hernia and gangrene, followed by the formation of an abscess, and finally the escape of pus externally. Death is rare in such conditions, and if it should occur it is caused by septicæmia.

The prognosis of irreducible hernia depends greatly on the length of time that the strangulation has been present and also on the character of the contents of the hernia. In cases where a loop of intestine is strangulated and is gorged with fæcal matter the results are generally serious; but, on the other hand, strangulation of the omentum is not serious.

Therapeutics of Hernia.—In cases of reducible hernia we cannot use a truss, which is the favorite mode of treatment in man, it being impossible to keep a hernial bandage steady in any position for any length of time on the dog. When hernia has been caused in a traumatic way, and followed by a subcutaneous rupture of the abdominal wall, or in umbilical hernia of very young animals, we may close the orifice in such cases by means of a dressing, and the hernia may be entirely removed by the following method:

Place the animal on its back or in such a position that the hernia is placed as high as possible. Then reduce the sac by working the contents back into the abdomen. In some cases this is accomplished very easily, but in others it requires a certain amount of careful and patient manipulation. Then place a tampon of wadding or a small piece of

cardboard upon the hernial orifice. This will have to extend over the borders of the hernia far enough to entirely cover the opening. Now fix small pieces of adhesive plaster across the cardboard and attach them in a circle around the piece of cardboard. These will adhere easily if the skin has been cleansed and any fat or other material has been removed by means of ether or benzine. [Ordinary shoemaker's wax made liquid is put on the end of the plaster strips.] We now place a gauze bandage around the adhesive-plaster dressing and the whole posterior part of the body, in order to protect the dressing from being torn or shifted by the animal. The dog should be fed on light, easily digested food, avoiding any that has a tendency to flatulency or constipation, at the same time assisting defecation by means of laxatives. The safest and most certain method, however, of removing hernia is the operation of herniotomy, or hernial section.

Where we have strangulated hernia we must attempt to reduce it by pushing the contents of the hernia back into the abdominal cavity. This may be accomplished either by means of taxis or by hernial section. The former method is only to be used when the strangulated intestines have not yet undergone any serious alterations, namely, when they are not affected by gangrene, and when there are no serious symptoms of a local or general character. In the operation of taxis the patient must be placed in such a position that the hernia occupies the highest region in the abdomen and assists the relaxation of the abdominal covering and the orifice of the hernia as much as possible. We first try by manipulation upon the orifice of the hernia with one hand, and by pressure of the flat of the other upon the periphery of the swelling to push the contents of the hernia back into the abdominal cavity. When the animals are under the influence of ether or a narcotic, the reduction is easier. Taxis must be considered successful when the swelling of the hernia has disappeared and when the aperture of the hernia can be felt, and also when the symptoms of distention have gone. If the latter still continue, notwithstanding the fact that the contents of the hernia seem to have disappeared, we have a false reduction—that is to say, the hernial contents and pouch have been shoved entirely through the orifice into the abdominal cavity, or we have to deal with a volvulus or invagination of the intestinal portion in the cavity; or it may be that the hernial contents are crowded between layers of the abdominal muscles. In the first instance the orifice of the hernia seems free, and in the latter instance it is closed.

If the attempts at taxis to produce reduction fail, or if the above-mentioned contraindications are present—that is, where the hernia has been left too long—we must proceed at once to perform herniotomy, which must be done under the strictest antiseptic rules.

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Herniotomy is, as a rule, a rather easy operation in the dog. It may be performed in two ways: with or without opening the hernial pouch. The former is especially used in recent cases of hernia with wide orifices and in old cases of hernia with extended adhesion of the hernial contents, where the whole mass is firmly fastened together. The latter method of operation is used in cases of hernia which are not complicated with a hernial pouch, in strangulated hernia with considerable alteration of the contents, or with a very narrow hernial opening. These conditions, however, are only distinguished during the course of the operation, and we are then forced to change from the first to the second method of operation. In both methods the skin of the operated region must be shaved and carefully disinfected. We then lift up a fold of the skin corresponding with the axis and the length of the hernia and split it open with a longitudinal incision. This must be made very carefully until we reach the hernial pouch. This is recognized by its irregular surface, which is of a grayish-yellow color; also by the fact that it is impossible to get an ordinary sound directly into the abdominal cavity, and when the sac is pressed by the fingers, the hernial contents will slip back, if the hernia is an old one, it is whitish-gray in color but if strangulated, it is deep purple-red in color.

Having carefully dissected out the sac until it is completely separated from the surrounding tissue, taking care not to injure the contents, we follow one of the two methods before spoken of—that is, not opening or opening the hernial pouch.

In the former case we introduce by means of the index finger a probe-pointed bistoury or herniotome between the neck of the hernia and its orifice, turning the cutting edge of the knife toward the neck or restricted portion, the dull side of the knife being toward the hernia pouch. By means of a very small incision the tension becomes greatly relaxed, and reduction is easily accomplished. If the opening of the hernial pouch is required, we hold up one of its folds with a pair of forceps and split it by means of a knife held flat or a pair of scissors. After the discharge of the fluids in the hernial sac a notch is cut in the hernial pouch by means of the herniotome. The exposed loop of intestine is reduced by the method just described, by cutting through the constricted portion and working the intestine back in such a way that the portion of the intestine which was prolapsed last must be reduced first.

If the intestine is much distended by gas, it may be emptied by means of a puncture of a very fine trocar (or the canula of a large hypodermic syringe). Any degenerated portions of the epiploon must be amputated after being ligated. If the intestine is intensely inflamed or gangrenous, we must either resect it or make an artificial anus.

After reducing the hernia we must close the hernial orifice. This is

forcibly drawn out and twisted round and round in a spiral direction, and a single or double ligature applied as high up as possible. In cases where no hernial pouch is presented or it has been shoved back into the abdominal cavity it is advisable to freshen the borders of the orifice by means of a blunt knife or curette; then stitch it up by a continuous suture of catgut. After thoroughly disinfecting it for the second time, the external
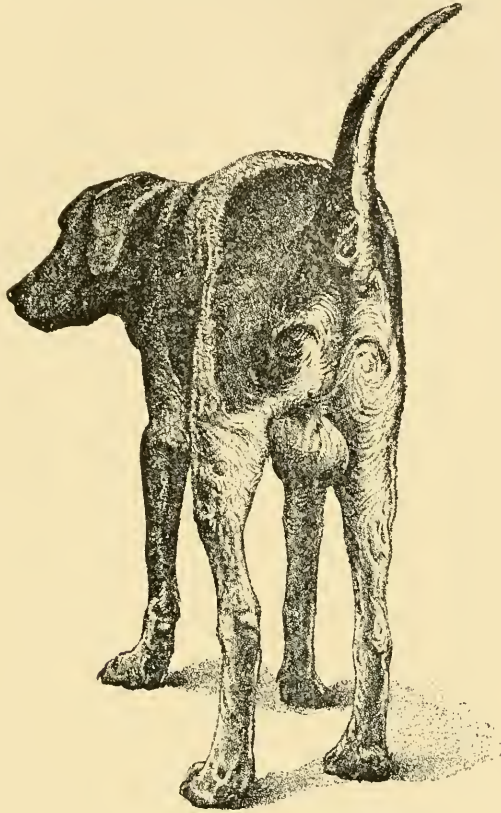
FIG. 126.—Scrotal hernia of right side.

wound is to be stitched and covered with an antiseptic dressing held in position by means of a bandage (eight-tailed) around the body.

Inguinal and Scrotal Hernia.
(*Hernia Inguinalis and Scrotalis.*)

The inguinal canal of the dog is located in the abdominal muscles with the seminal cord, and runs from the testicles into the abdominal cavity. In the bitch we find a round ligament from the end of the Fallopian tube toward the subcutis. Inguinal hernia may be produced by a

portion of the intestine passing from the abdominal cavity into the inguinal canal. If this is the case in the dog, and the loop of the intestine goes as far as the scrotum, we call it scrotal hernia. If it simply lies in the canal, it is called inguinal hernia.

Clinical Symptoms of Inguinal and Scrotal Hernia in the Male Dog.

This condition is very rare in the male; most cases are congenital; the contents are generally small intestine and omentum. In an ordinary case of inguinal hernia, we must understand that from the external abdominal ring as far as the scrotum the canal is almost cylindrical, and we find tnat when this canal is filled either with a loop of small intestine or omentum it has a peculiar elastic softness and "doughy" feel under the skin. There is generally no local increase of temperature. In large hernias we may reduce this partially or altogether by placing the animal on its back and holding up the hind quarters and gently pressing or rubbing with the finger upon the hernial swelling. If the intestine has entered the scrotum (Fig. 126), the affected side appears full and large, and may be reduced by the manipulations indicated above. In hernias of this character the testicle is apt not to descend into the scrotum, and is soft, immature, and can be distinguished in the canal. The abdominal ring is found to be larger than natural. In cases of strangulation the symptoms which have been described before become apparent, and, if the symptoms are very acute and all attempts at reduction are futile, we must perform the operation of castration.

Castration of the Male.—In normal conditions—that is to say, when no hernia is present—castration of the dog must be performed by laying the animal on his side, rendering all the parts aseptic, and holding the skin tightly over the testicle, compressing it between the finger and thumb. Then make an incision the entire length of the scrotum, cutting through the scrotum, the tunica dartos, and tunica vaginalis, so that the testicle is exposed (compare with Fig. 127).

The testicle is drawn out and then the common intersecting membrane is opened up as far as possible by means of a pair of scissors; then place a strong silk suture around the seminal cord, close up to the inguinal ring, and ligate it. When this is done, the seminal cord, with all the superfluous portions of the interstitial membrane, is amputated about 1 cm. below the ligature. The other testicle must be removed in the same manner. After carefully cleansing the wound with a strong non-irritant disinfectant, the wound of the scrotum has to be closed with an ordinary stitch, and it is advisable to place a small drain, like a silk thread, into one of the corners of the wound. No dressing is required provided the animal is muzzled. Healing occurs generally within a few days. If, however, we have a case in which we wish to operate for inguinal or

scrotal hernia, we deviate from the above-described method of castration by ligating the intersecting membrane externally and as close as possible to the external inguinal ring, having first twisted the sac several times, the wound is sewed up and a bandage put on for several days. In valuable breeding animals the testicle of the affected side only is removed.

Inguinal Hernia in the Bitch.—This is generally observed in bitches that have had puppies, although it has also appeared early in life from no apparent cause. It is also congenital. Gutman saw a bitch three months old that had an inguinal hernia. This condition is either lateral
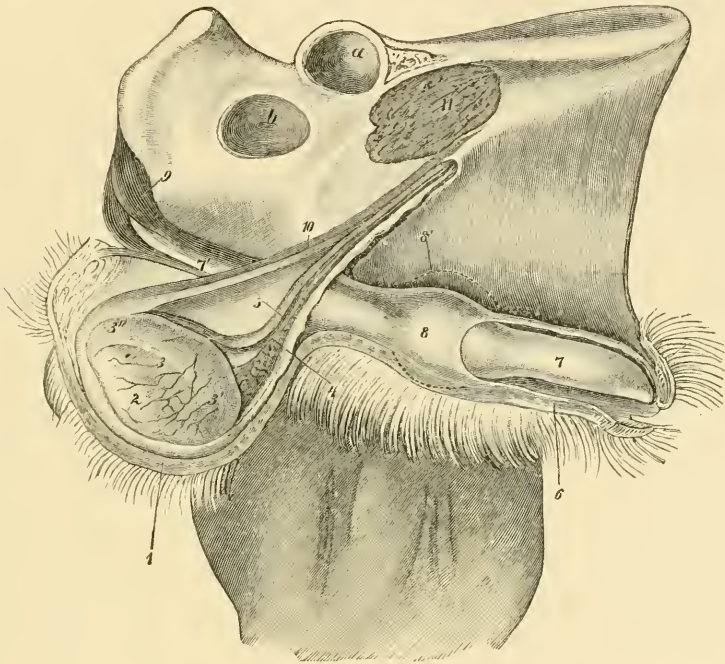
FIG. 127.—Genital organs of the dog: 1, Scrotum opened; 2, right testicle; 3, body of the epididymis; 3', globus major and, 3'', globus minor; 4, spermatic cord; 5, vas deferens; 6, prepuce (partially dissected); 7, free portion of the penis; 7', posterior attachment of the penis; 8, erectile masses (bulbous bodies); 8', size of erectile masses when distended by blood.

or bilateral. The hernial sac in this condition is double, the internal being peritoneum, the external the skin and part of the mammary gland. In a hernia of any size we find it invariably contains the uterus, particularly when that organ is heavy with foetus, or other abdominal organs, for instance the bladder, loops of intestine, or the omentum. Cadéac found in a unilateral inguinal rupture the size of a child's head on the right side, the entire intestinal tract and on the left side the omentum, the spleen, uterus and the bladder. An

inguinal hernia in the bitch if it is of any size is easily recognized (Fig. 128). It is found in the posterior part of the mammary gland, an enlargement varying in size, elastic, painless, with no increase of the local temperature. When the animal is placed on her back, it either returns to its normal position by natural gravitation or else it is reduced with very little manipulation. On the return of the contents of the hernial sac the abdominal ring is found to be very much dilated above normal. In rare instances it may be found impossible to reduce the hernia entirely, and this is found to be due to certain adhesions of the abdominal contents to the pouch or else to a pregnant uterus; in the latter case the fœtus can
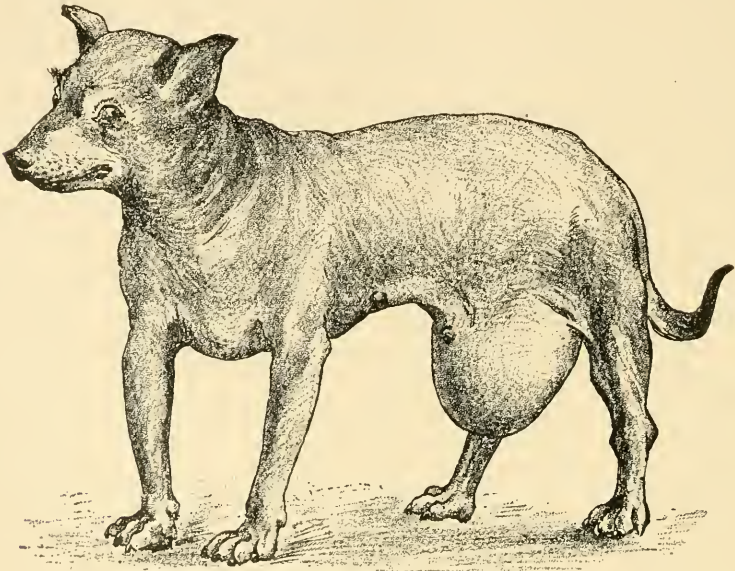
Fig. 128.—Inguinal hernia of bitch.

easily be detected by manipulation. In certain cases where there is a doubt as to the exact nature of an enlargement in the position of inguinal hernia, if it is the uterus in the sac, on introducing the finger into the vagina, that is found to be elongated and deviated to one side, due to the stretching and weight of the uterus, and it is also found that it is impossible to reach the os uteri with the end of the finger. In very rare cases when the round ligament of the uterus (false inguinal hernia) is greatly hypertrophied, it might be possible to mistake it for inguinal hernia. (False inguinal hernia.) As a rule inguinal hernia in the bitch is rarely involved in strangulation, and if she should be in whelp, she has her puppies without trouble.

A bitch affected with inguinal hernia must be carefully fed, avoiding

food that is hard to digest, or has a tendency to cause flatulence or to constipate. If it becomes necessary to remove the hernia, either from size or strangulation, herniotomy should be performed with the animal under an anæsthetic, and operated on as already described (see Herniotomy).

Sarcocele.—This is a collective name for all kinds of tumors of the testicles, especially for sarcoma, carcinoma, enchondroma, and cysts. The testicles are swollen, the swelling, as a rule, being hard, tough, and sometimes fluctuating; never warm or very painful. The condition can only be remedied by castration.

Hydrocele.—By this we define an accumulation of fluid (serum) in the scrotum. The affection is often associated with œdema of the lower extremities and of the scrotum. It is frequently seen with ascites, hydrothorax, etc., appearing in the shape of a fluctuating swelling of the testicular pouch, which disappears when the animals lie on their backs.

Therapeutic Treatment.—This consists of puncture and emptying of the sac, also injection with any of the following stimulating fluids; alcohol, Lugol's solution, carbolic acid (1 to 40), etc. Of course, these are only to be used when castration is not performed.

A variety of hydrocele is seen where we have œdema of the spermatic cord. This appears as a fluctuating swelling which may be easily moved from one side to the other. It occupies the whole length of the spermatic cord, and, as a rule, is never interfered with. When the fluid of the hydrocele, which is discharged by puncture, consists of bloody serum, we call it hæmorrhagic hernia, or hæmatocele. Any other complications of the testicles and their membranes may be found on page 208.

Umbilical Hernia.
(*Hernia Umbiliculis*).

The hernia ring is formed by the umbilical ring. The contents may consist of the omentum, duodenum, and in rare cases of the large intestine. In the hereditary form the intestines are located in the umbilical cord, and are not covered by the abdominal membrane (hernia of the umbilical cord). In accidental hernia of the umbilicus, we always have a hernial pouch, originating from the peritoneum. As a rule, umbilical hernia occurs a few days after birth. It may increase gradually and become eventually strangulated, but it often disappears without any surgical interference. Hernia of the omentum we see occasionally, but generally it cures itself by an adhesion between the hernial pouch and the hernial ring. Umbilical hernia is easily recognized (Fig. 129). We find a swelling under the umbilical ring, which may vary in size from a hazelnut to a walnut.

Therapeutics.—Treatment consists, as a rule, in very young animals,

of the application of a bandage over the hernia and kept there for three or four weeks, thus holding the abdominal contents back and allowing the opening to close spontaneously. The bandage consists of a tampon of lint which is fixed to a piece of rubber adhesive plaster or, better still, the round top of a bicycle repair plug with the stem cut off, then adhesive rubber plaster is placed in strips in a circle, as per Fig. 130. Before applying the plaster it is well to clean off the skin on the region of the
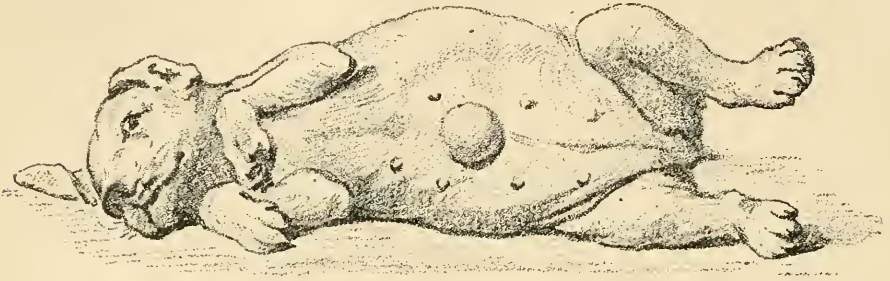
Fig. 129.—Umbilical hernia.

umbilicus with ether or benzine to get better adhesion. Shoemaker's wax is also used as an adhesive substance. It is best to put a strip bandage around the body to retain the bandage in position.

Another more certain method is to place the animal on his back, reduce the hernia; the hernial pouch is pulled away from the body, and a needle carried through the centre of the base of the sac, the thread is cut through at the needle and then each side of the ligature knotted, dividing the tumor. Almost immediately the tumor dries and mummifies, and in a week or ten days falls off with the stitches, leaving a raw
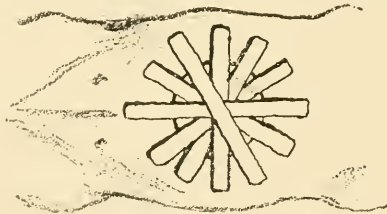
Fig. 130.—Plaster on umbilical hernia.

surface which is painted with compound tincture of benzoin daily and soon dries up. Care is to be taken to prevent the animal licking or chewing the part until it is healed.

Injections of corrosive substances, such as solution of chromic, nitric, or sulphuric acid, are not to be recommended, as likewise are salves of cantharides, collodion, subcutaneous injections of absolute alcohol, chloride of zinc or chloride of sodium.

Femoral Hernia.
(*Hernia Cruralis.*)

Femoral hernia is extremely rare in the dog. The ring is formed by the upper end of the so-called femoral canal, and is formed by the crural fascia, the external membrane forming the hernial covering. The femoral canal of the dog is a long, three-cornered cavity in the median surface of the upper part of the leg, which is surrounded front and back by the inverted muscles of the upper thigh—that is to say, in front by the sartorius muscle, and back by the long abductor, the large and short abductor, and on its upper surface by the ilio-psoas, while the floor of the cavity is formed by a portion of the muscles of the thighs and by the crural fascia. Below the borders of the sartorius the abductors run together at an acute angle (Fig. 131). This canal, as a rule, is filled with masses of fat, nerves, and blood vessels. In cases of fracture of the pelvis the intestines which leave the abdominal cavity, after having followed the direction of the large blood vessels, locate themselves in this
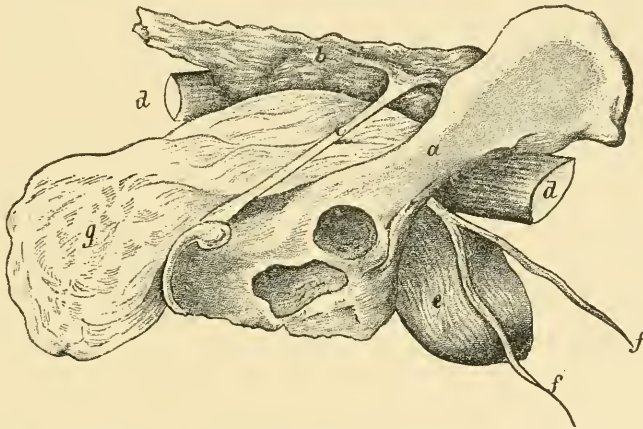
Fig. 131.—Middle section through the pelvis, showing the organs: *a*, Pelvis; *b*, coccygeal vertebra; *c*, broad pelvic ligament; *d*, anterior and, *d'*, posterior portions of the rectum; *e*, bladder; *f, f*, seminal vesicles; *g*, fold of the peritoneum.

cavity and are covered by the peritoneum, the crural fascia, and external membrane; but they may also under certain conditions penetrate directly under the skin through an opening of the crural fascia.

In the inner fascia of the thigh we find a soft swelling which has more or less pain when the condition is examined and the disease has been of recent origin, and in cases of strangulation. In the latter cases, however, we see also a peculiar dragging motion of the thighs, with lameness and symptoms of intestinal obstruction, such as vomiting, etc. Herniotomy has to be performed according to the rules mentioned

before, but must *only be attempted* in extreme cases. In making incisions into this region great care must be taken to avoid the large blood vessels which pass into and through the femoral canal.

Perineal Hernia.

Perineal hernia occurs in both dogs and bitches. In the former it is recognized by a peculiar bulging or lifting of the recto-vesicalis, and in
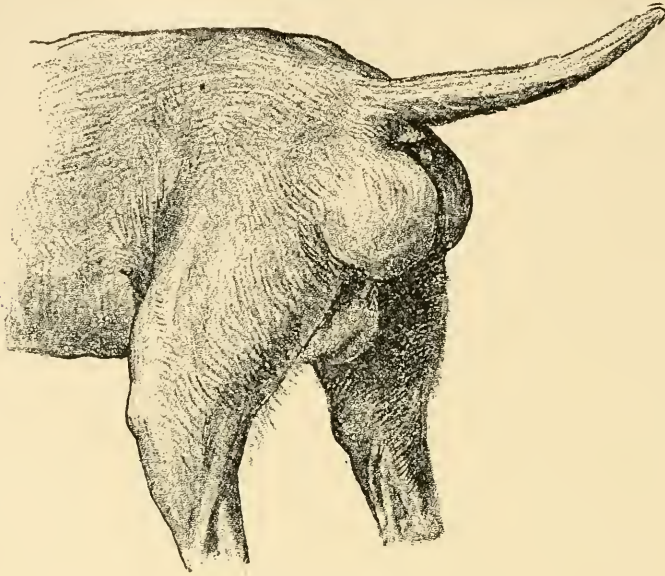
Fig. 132.—Double perineal hernia.

the latter by a bulging of the vesico-uterina. In both cases we observe prolapse of the duodenum or lower bowel, and sometimes in the dog we observe a prolapse of the bladder.

In the dog we recognize perineal hernia by a soft swelling the size of an egg or the size of the hand. This appears in the side and above the anus, between the root of the tail and the tuber ischii (Fig. 132). In the bitch this hernial swelling is seen under the vulva and on the peritoneum. This hernia can only be removed by means of an operation, and unless it is either very large or shows indications of strangulation, it had best be left alone. To operate the parts should be thoroughly cleaned with antiseptic washes, the skin shaved, the animal etherized, and an incision made in the skin, then the hernial sac is emptied of its contents and the sac pulled out as far as possible, and ligated and the free part of the sac cut off. In case there are adhesions between the contents of the sac and the sac itself, the pouch must be opened and the adhesions carefully torn away, and pushed back into the abdominal cavity, the pouch ligated as already described.

DISEASES OF THE EYES.

AFFECTIONS OF THE EYELIDS.

Adhesion of the Eyelids. Ankyloblepharon.

It is a well-known fact that puppies are born blind—that is to say, the palpebral fissure is closed at birth (atresia palpebrarum). This is not a simple agglutination of the eyelids, but a true adhesion of the membranes. This has been proven from the fact that if they are forcibly separated after birth, the cornea has an opaque look and the edges of the eyelids bleed. As a rule, the fissure opens in from seven to twelve days. It is very rare that we have an obstinate closure of the eyelids. If this should be the case, we try to produce separation by means of emollients, tepid water, and normal tension upon the eyelids. If these are not successful, the eyelids must be separated by means of a pair of scissors or a probe-pointed curved bistoury. Then we rub the edges of the wound with vaseline or, if they persist in uniting, with caustics, nitrate of s'lver pencil, in order to prevent an adhesion. In very rare instances, as a consequence of traumatisms, burns or excoriations, we may find more or less adhesion and narrowing of the lids (ankyloblepharon, blepharophimosis).

Entropion—Turning In (Inversion) of the Eyelid.

By this term we understand a turning or wrinkling of the eyelid in such a manner that the edge of the lid is directed toward the eyeball and the eyelashes come in contact with the conjunctival tissues and cornea. Entropion occurs quite frequently, especially in bulldogs, Newfoundlands, setters, Great Danes and spaniels, although it may be present in all breeds. In some cases it is present at birth, or it may be developed by constant convulsive closing of the fissure of the eye (blepharospasmus), due to some chronic irritating conditions of the cornea or conjunctiva (conjunctivitis chronica, conjunctivitis follicularis). It is occasionally caused by cicatricial contraction of the conjunctiva of the lid, after injuries, such as the result of caustic substances getting in the eyes, burns, or some chronic inflammatory condition, or to atrophy of the eyeball. The more relaxed the cutaneous tissue may be in the neighborhood of the eyelid, the more obstinate the diseased

condition is to treat. Haltanhoff considers that the tendency to entropion is hereditary.

Clinical Symptoms.—As a rule, the inversion of the lid occurs more frequently in the upper than the lower eyelid, but we may also see both affected at the same time. Sometimes we see a lateral inversion of the eyelid. This is extremely rare, however. A symptom observed is constant irritation, which is caused by the hair of the lashes being directed toward the cornea. We also see a marked increase in lachrymal secretion, a twitching and convulsive compressing of the eyelids, and a thick, gray, purulent mucus accumulates in the corners of the eyes. The hairs of the eyelashes become adherent, and the eyelids may become completely glued together. Besides this we see an intense inflammatory condition of the connective tissue, and in some cases inflammation of the cornea, and in extremely bad cases ulceration (ulcerative keratitis).

The prognosis may be favorable when we operate at the proper
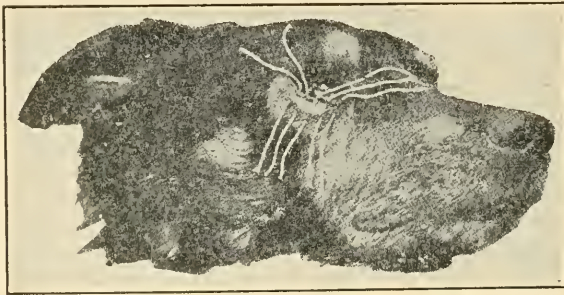
Fig. 133.—Entropion operation of lower eyelid.

time, but relapses are not rare, especially in dogs which show a peculiar wrinkled condition of the facial membrane. We may expect a relapse in such cases where we do not entirely remove the conjunctivitis (primary or secondary) at the same time as the entropion.

Therapeutics.—It is only in fresh and very mild forms of the disease that we may expect to obtain any favorable results by means of medicinal treatment, and this must be directed toward removing the conjunctivitis which exists in conjunction with entropion, otherwise an operation alone will answer.

The following methods of operation are suggested:

The best method is to carefully remove the hair and thoroughly disinfect the surrounding tissue, and a fold of tissue running parallel to the edge of the lid is picked up by means of a pair of entropion or ordinary artery forceps, the fold of skin lifted being sufficiently large to make the lid lie in its normal position, care being taken not to include the conjunctiva, and this fold is cut at the edge of the forceps; there

must be at least 0.5 cm. between the edge of the wound and the edge of the eyelid; the hemorrhage must be completely controlled before the wound is closed with several silk sutures (Fig. 133). Where there is extensive inversion of the lid, it is best not to attempt to remove too large a portion of the lid, but divide it into two portions and equalize the tension, as illustrated in the accompanying figure. The portion may be removed either on the upper or lower lid, and also at the lateral corner of the eye a portion in a vertical position can be removed, and in extreme cases of entropion, all three excisions can be performed (Fig. 134). Another method recommended by Schleich consists in removing a piece of skin in the form of an arrow-head (see Fig. 135) and uniting the edges with sutures.
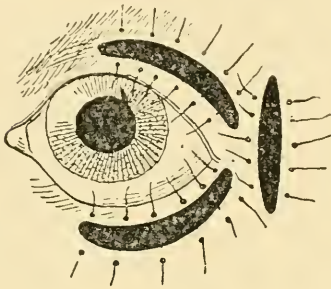
Fig. 134.   Fig. 135.

Fig. 134.—Diagrammatic position of sections and mode of stitching in the operation for entropion. (*G. Müller*.)
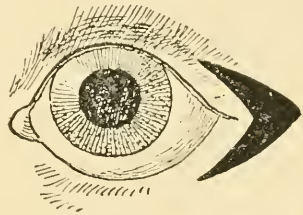
Fig. 135.—Diagrammatic position of section in operation of entropion. (*Schleich*.)

The simple removal of the inverted eyelid by means of scissors, is undoubtedly the simplest method, but it is very evident that not only is the appearance of the animal very much impaired by it, but that the eyeball may be constantly irritated and there is a constant flow of tears on account of the insufficient closure of the lid.

Tying up small portions of the lid, by means of needles, or the method recommended by Brennen of burning a series of lines on the lid by means of thermo-cautery, which afterward heal and by cicatricial contraction draw the lid back, are not as efficacious as the proceedings first described.

Ectropion—Turning Out (Eversion) of the Eyelid.

This condition is, as a rule, in the lower lid, the free edge of the lid being turned out from the eyeball toward the external side of the eyelid. This is generally noticed in bulldogs, St. Bernards, and setters, especially so in animals that have sunken eyeballs. It may be due to an alteration

or partial paralysis of the palpebral muscles. Sometimes it may occur from the shape of the cartilage, which does not consist of a firm disk, but of bunches or collections of connective tissue mixed with elastic fibres. In some cases it may be caused by a contraction of some of the tissues of the face, especially from cicatricial contraction, as a result of wounds or burns. It may also be due to a loosening or softening of the tarsal cartilage as a result of prolonged conjunctivitis.

Clinical Symptoms.—The affected eyelid is turned up and out, so as to show the conjunctiva. The latter is inflamed from the action of the air and is more or less reddened, and at the same time there is considerable secretion of mucus and tears along the cheeks (lachrymal eyes).

Therapeutic Treatment.—If it is due to conjunctivitis, we must first endeavor to reduce it by "touching" the connective tissue of the eyelid with a pencil of nitrate of silver or sulphate of copper, or by removing a portion of the mucous membrane of the lower eyelid. This, however
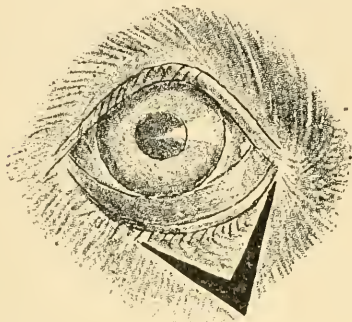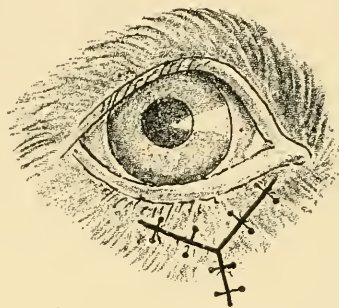
FIG. 136.　　　　　　　　　　　FIG. 137.

FIGS. 136 and 137.—Entropion operation and mode of stitching. (*Cadiot-Breton.*)

is extremely hard to do, and as a rule it is not advisable. If these measures are useless, or if they seem doubtful from the onset, Moller recommends to excise from the external half of the affected lid an arrow-shaped or nearly triangular piece of skin and unite it by means of sutures (Figs. 136, 137). Frick's method of excising two crescent-shaped pieces of skin whose concavities are toward the lid and meet at an angle, 2 to 3 cm. from the edge of the lid, and uniting the edges by means of button sutures, has not been found to be as satisfactory as the first-mentioned operation.

Inflammation of the Eyelids. Blepharitis.—This condition appears as an inflammation of the external covering of the lid (B. superficialis), inflammation of the cellular tissue of the lid (B. profunda), and inflammation of the edge of the lid (B. ciliaris). Superficial inflammation of the lid is generally caused by some irritation that involves the skin of the surrounding tissues, such as eczema or parasitic mange, particularly

sarcoptic or dermodectic mange (B. acarica). General inflammation of all the structures of the lid is caused by direct traumatisms, bites, tears from sharp objects, and is invariably accompanied with pronounced tumefaction and subsequent suppuration; sometimes it may even terminate in an abscess. Inflammation of the edge of the lid is generally confined to the affected edge and is covered by a tenacious purulent mucus that sticks the edges of the lid together; this secretion varies in color, at first grayish-yellow, then light brown and finally dark reddish-brown.

The treatment consists first, in frequent fomentations of boracic acid solution, or strong infusions of ordinary tea, with a pinch of borax in it, and the edges of the lid should be covered with ointment of red oxide of mercury. General inflammation of the lid (B. profunda) should be treated with warm fomentations and if an abscess forms it should be opened as soon as it points. B. acarica is taken up under parasitic skin diseases.

Hordeolum. Sty.—Sty is due to an inflammation of one of the glands of the hair follicles of the eyelash or of a Meibomian gland. It is indicated by a small bright red globular tumor on the edges of the lid, with more or less redness and tumefaction of the surrounding tissues. It may be chronic (chalazion), but that is extremely rare.

The treatment consists in warm application of boracic acid solution applied frequently, and if an abscess has formed it must be carefully opened by means of a fine needle; forcibly squeezing the lid to evacuate the contents does more harm than good. In chronic cases remove the tumor.

Diseases of the Lachrymal Organs and the Membrana Nictitans.—The lachrymal organs are very rarely affected in the dog. Inflammation of the lachrymal duct generally appears as a secondary complication of catarrh of the conjunctiva. It appears as a round circumscribed tumor, which is immovably fixed in the corner of the eye, and on pressure a quantity of mucus or muco-purulent fluid exudes from the lachrymal opening. In acute inflammation of the duct, if the end of the duct is closed by inflammatory processes, it is apt to break out through some portion of the duct, which may discharge a muco-purulent fluid for a time or else form a permanent fistula; this condition is extermely rare, and occasionally we may find that an abscess at the root of one of the molars has caused a fistulous opening near the canal; careful probing with a sound will generally enable one to make a correct differential diagnosis.

Stenosis and obstruction of the lachrymal canal is due to inflammation of the mucous membranes, traumatisms, foreign bodies, tumors. Closure of the opening of the canal is indicated by the constant flow of

tears from the internal angle of the eyes, irritation of the skin, and loss of hair below the opening.

Hypertrophy of the lachrymal canal is due to various inflammatory processes or neoformations.

The treatment of closure of the lachrymal canal is a very difficult and

FIG. 138—Protrusion of the membrana nictitans.

delicate operation to handle. It consists in trying to establish a new opening into the nasal cavity and direct the tears into it.

Diseases of the Membrana Nictitans.—Irritation of this organ may result from various pathological processes which affect the conjunctiva, the membrana nictitans being covered on both surfaces by that membrane.
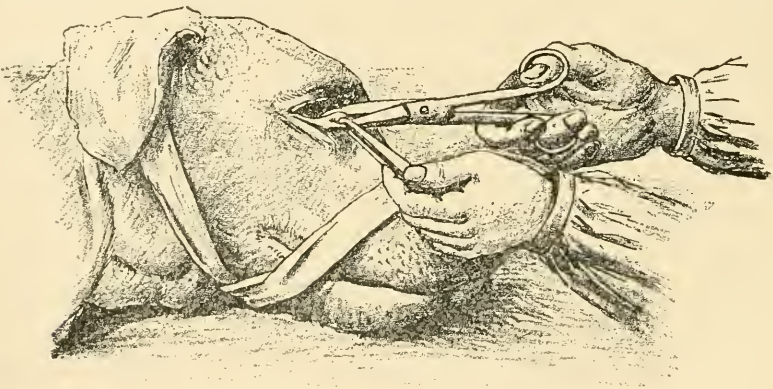
FIG, 139.—Removal of the membrana nictitans.

Follicular conjunctivitis frequently causes the formation of various sized nodules (hypertrophied follicles) round bodies about the size of a millet seed, deep red in color, and may sometimes produce a tumor which is visible in the internal canthus of the eye. When the membrane is picked up and examined by means of a pair of forceps, and enlargement of the membrane is indicated by a pink red tumor in the internal corner of the eye, which moves over the eyes on slight pressure on the eyeball;

this tumor not only originates from follicular conjunctivitis, but from traumatic causes and neoformations such as adenomas of Harder's gland, lipomas or papillomas. A prolapse of the membrane without any hypertrophy is seen frequently in St. Bernards, retrievers and mastiffs, when the enlarged membrane lying over the eye gives the animal a sleepy looking eye, or "dead eye" (see Fig. 138).

Treatment.—Astringent washes of boracic acid, zinc, lead, etc., may reduce this irritation, but, as a rule, if this hypertrophic condition of the membrana nictitans is once established, removal of it by surgical means is the only way to establish a permanent cure. The eye is first treated by a few drops of 4 per cent. solution of cocaine, and then the enlargement is seized by a pair of forceps and by means of curved scissors clipped off (Fig. 139). Putting a thread through the tumor by means of a curved needle enables the operator to make a much evener removal of the tumor and is preferred to holding it with forceps by some operators. The hemorrhage is insignificant and is controlled in a few minutes. If it should persist for some time, put a few drops of acetate of lead solution on the eye and keep the lid closed for a few moments by means of a pledget of cotton.

DISEASES OF THE CONJUNCTIVA.

Inflammation of the Conjunctiva—Conjunctivitis.
(*Conjunctivitis; Syndesmitis.*)

Inflammatory conditions of the conjunctiva are the most frequent affections of the eye in the dog, and appear in various ways according to their cause. Under ordinary circumstances we see the development of a simple catarrh of the conjunctiva, which, like all catarrhs of the mucous membrane, causes swelling, great redness, and formation of loose folds of tissue. The redness may vary from a slight injection to a dark or bluish-red coloration. This is, as a rule, regular and rarely spotted with blood extravasations. The secretion of the mucous membrane is sero-mucous in the beginning, but later on becomes muco-purulent, and in some cases there is a peculiar grayish secretion. This secretion becomes agglutinated to the interstices and corners of the eyelids, producing a gluing together of the lashes, and during the night, when the animal is asleep, it dries up, forming a grayish-yellow adhesive mass. The inflammation is usually restricted to the conjunctiva of the lid, the transition fold and the bulb of the conjunctiva being very rarely affected. The follicles of the connective tissue are generally swollen in all prolonged forms of catarrh of the eyes. Sometimes they protrude here and there

from the reddened connective tissue in the shape of a millet-seed or a sago granule.

In cases where the irritation is due to the influence of some infectious, pathological microorganism or bacteria, which are always present on the conjunctival membrane, we notice a marked cellular infiltration of the tissues of the mucous membrane, with proportional swelling of the connective tissue, and the production of a copious thick, yellowish-green secretion. Under the influence of chemical irritants we have the formation of grayish-white or transparent membranous accumulations upon the surface of the mucous membranes, and sometimes ulcers which may lead to *trichiasis* (turning in of the hair of the lashes toward the bulbs; the mildest form of entropion). In some cases it may cause a natural entropion or symblepharon adherence between the lid and bulbs of the conjunctiva. The cornea and the conjunctiva being in such close proximity to each other, an inflammatory process in one is very apt to produce a similar condition in the other.

The following forms of conjunctivitis are observed in the dog:

Catarrhal Conjunctivitis (*Conjunctivitis Simplex*).—By this we mean an acute catarrh with intense redness and loosening of the conjunctiva, also copious mucous or muco-purulent secretion. The local disturbances do not seem to be very marked, but we see in rare cases irritation with itching, the patients attempting to rub their eyes with their paws.

Etiology.—Catarrh of the eyes may occur at any period of the animal's life, and, as a rule, affects both eyes; in very rare instances only one. It is generally the result of exposure to cold or the influence of sharp, cold winds. It is, therefore, apparent why it appears at certain seasons of the year more than at others, that is, in the spring and fall. Mechanical and chemical influences also produce a certain effect, such as foreign bodies (dust, hair, etc.), turning in of the eyelashes (trichiasis), smoke of soft coal, etc.

Catarrh of the conjunctiva is intimately connected with catarrh of the respiratory organs, such as nasal catarrh, distemper, and all serious internal diseases which have a prolonged course.

Symptoms and Course.—Pain and twitching of the eyelids, which is more pronounced if foreign bodies are present in the conjunctival membrane. In the early stages there is a slight increase of the flow of tears, later it becomes mucous and finally we observe a muco-purulent discharge which is very tenacious and frequently the eyelids stick together, the discharge frequently flowing down the face, and the conjunctival membrane becomes greatly swollen and injected. This condition may become chronic, lasting in a modified form the whole course of the animal's life. Frequently there is intense itching, causing the animal to continually scratch the affected eyes with his paws, and rub them on the ground, pro-

ducing considerable increase of the irritation already present. When the affection extends to the cornea, it may become opaque, and in more severe cases cause ulceration of the cornea (see Keratitis).

Conjunctivitis follicularis of the membrana nictitans is a variety of this disease (catarrhal conjunctivitis) that is generally chronic. This is indicated by the appearance of large numbers of lymphatic follicles upon the internal surface of the membrana mictitans. These follicles stand out distinctly in the form of millet-seed bodies upon the surface of the membrane. They are dark red and transparent, consisting of ball-shaped accumulations of lymphoid cells. Soon they appear in numerous masses, giving the membrane the appearance of a granulating wound surface, and in such cases the membrana nictitans is pushed out from the bulbous and extended over the cornea. The question whether this condition is a form of follicular conjunctivitis or it is to be accepted as a disease *sui generis*, we have not been able to determine fully, but we know that the presence of numerous lymphatic follicles prolongs indefinitely the course of a case of conjunctivitis. We ought, therefore, to always expose the membrana nictitans by means of a pair of forceps; evert the membrane and examine it to see if there are any enlarged follicles, or a foreign body present, especially in catarrh of the conjunctival tissue. According to Frohner, 40 per cent. of all dogs are affected more or less by conjunctivitis follicularis.

Purulent Conjunctivitis; Conjunctival Blennorrhœa.

Etiology.—It is generally admitted that this disease is due to a specific infectious organism developed in the course of some epizootic disease, particularly distemper, and a specific form of this disease may occur as an epidemic, the cause of which up to the present time has not been definitely described. It is possible to produce the same form of the affection by inoculating the conjunctiva of a healthy dog with this purulent material. Guilmot observed that by placing dogs in a kennel which had been previously used by a dog affected with this disease that they soon became similarly affected, and it has been found to be carried by the benches where dogs are exhibited. Frohner has seen it in many cases of distemper, and thinks that the development of this form of conjunctivitis is due in all probability to the transmission of gonorrhœal secretion from a human being placed on the conjunctiva of the dog. Guilmot says that gonorrhœal secretion of the dog itself is the cause of this disease, but this assertion is combated by Moller whose experiments with secretions of preputial gonorrhœa in the dog have always given negative results.

This form of conjunctivitis is marked by considerable swelling of the membrane. The membrane is sometimes spotted red by hemorrhages;

there is sensitiveness to light, and photophobia, the animal constantly winking or convulsively closing the eye. The secretion of the eye is changed into a muco-purulent mass, becoming filled with a thick, yellowish-green fluid mixed with pus, which agglutinates the lids, particularly during the night, when the animal is asleep, and there is great itching and irritation causing the animal to rub the eyes continually with his paws, and in this condition complications of the cornea are generally present. The latter becomes dull in the centre, showing erosions in some cases. This capacity of the cornea gradually increases, becoming darker, more opaque, and then taking a yellowish-gray coloration. We may see in some cases, ulceration of the cornea (see Keratitis). A common occurrence is to find eczema of the eyelid and the skin around the eye.

This blennorrhœa of the conjunctiva is a rare and dangerous disease, causing extensive inflammation and ulceration of the cornea, the condition being prolonged in some cases from four to eight weeks, and in extremely bad cases the eye is apt to be destroyed.

Therapeutic Treatment of Conjunctivitis.—If the disease is produced by foreign bodies, an eruption, etc., or caused by trichiasis or entropion, we have to remove the cause first. If we have to deal with dirt, coal dust, or small bodies, it is sufficient to wash out the eye with a little soft-rubber syringe. If the bodies are adherent, such as iron fragments, sand, etc., accompanied by convulsive movements of the lids and intense secretion of tears, we must apply a certain amount 4 per cent. solution of cocaine to the eye, remove the foreign bodies, or wipe them off by means of a blunt probe or sound covered by a handkerchief or cotton. Then keep the animal away from strong light, smoke, etc.

First, foment the eye thoroughly with boracic acid solution, and to thoroughly clean the eye the membrana nictitans must be lifted, as that membrane is pulled down close on the eye as soon as the fomentation is started; the eye must, however, always be cocained previous to doing this, as the membrane is too sensitive to do it otherwise. The cocaine solution can be applied by means of an atomizer.

℞.	Cocaine muriate,	0.25
	Aqua distil,	5.0
	Sig.—A few drops in the eye.	

℞.	Acoin,	0.1
	Aqua distil,	10.0
	Sig.—A few drops in the eye.	

In **catarrhal conjunctivitis** we must use astringents, such as sulphate of zinc, sulphate of copper, or nitrate of silver. These solutions must be used mild, such as 0.2 to 0.75 per cent. They may be applied by means of a camel's hair pencil or atomizer put between the lids and

washed off in a short time with clean water; or we may apply nitrate of silver, following it up a few minutes afterward with a 2 per cent. solution of chloride of sodium. Alum solutions are also useful for washing or painting the inflamed membrane. In pronounced photophobia we may paint the conjunctiva with a solution of cocaine or tincture of opium and gum arabic. In chronic cases apply ointments of calomel, 10 to 20 per cent., oxide of mercury, 3 to 5 per cent. It is not well to keep up too long with one preparation, but substitute another drug after a certain period has elapsed.

In chronic catarrh of the eyes a very effective method of reducing the irritation is to blow small quantities of calomel directly on the membrane. Follicular conjunctivitis may be treated with astringents, but in the acute forms which occur on the surface of the membrana nictitans we can only remove them by surgically removing the membrane.

R.   Zinc sulphate,   1.0
        Acid boric,   3.0
        Aqua distil.,   150.0
   Sig.—Eye drops.

R.   Argenti nitras,   0.1
        Aqua distil.,   10.0
   Sig.—A few drops in the eye for several days.

R.   Hydrarg. sesquioxide,   1.0
        Ung. petrolati   4.0
  M. F. ung.
   Sig.—Apply to the edges of the lids twice daily.

The influence of cocaine upon the conjunctiva and cornea renders these parts insensitive and permits a number of small operations without producing any feeling of pain or convulsive irritation of the eyelid. We pour a little 5 per cent. solution of cocaine into the eye and obtain in this manner, in from two to three minutes, an absolute insensibility to pain, both in the cornea and conjunctiva. This does not, as a rule, last more than ten minutes and must therefore be renewed every five minutes if necessary. In order to reduce blepharospasm, as a consequence of conjunctivitis, we should apply solutions of cocaine every two or three hours. In the milder forms of follicular conjunctivitis that is seen on the inner surface of the membrana nictitans, the stronger solutions of sulphate of zinc, sulphate of copper, or nitrate of silver are used. It is best to apply a solution of cocaine to the eye and then lift up the membrana nictitans and apply the solution directly to the inside surface of the membrane by means of a camel's hair brush. These cases are generally very obstinate to treat and it is best, when after some time the condition does not improve, that the membrana nictitans be removed

by surgical means (see page 401). This operation invariably removes the irritation.

In **ophthalmic blennorrhœa** we must endeavor to prevent it before it goes too far, particularly if it appears as an epizootic. We must treat it with antiseptic agents, and it is especially important to keep the conjunctiva clean with water or some non-irritating antiseptic fluid, such as boric acid, 3 per cent.; corrosive sublimate, 0.02 per cent.; permanganate of potassium, 0.05 per cent.; creolin, 1 per cent.; salicylic acid, 1 per cent.; carbo-sapo-cresol or lysol, 1 to 100. These must be introduced under the lid by means of a syringe, brush, or sponge. When it is necessary we must irrigate the eye with strong solutions of nitrate of silver (1 to 3 per cent.), taking care to observe the rules already mentioned, that is, neutralizing the silver solution by means of salt solution. A solution of itrol 1 to 4000 has been found very useful in these cases. Covering the conjunctiva with calomel, dermatol, tannoform, is also useful. This is applied by means of an insufflator or blown through a cylinder of paper or a quill. Aniline (pyoktanin), advised by some authors, is of little benefit.

The treatment may also be materially altered by complications of the cornea, for which we would refer to Keratitis for further details.

Neoformations on the Conjunctiva.

Beside the inflammatory condition which has just been described, we may have tumors, fibromas, papillomas and lipomas of the conjunctiva, but, as a rule, these occur on the membrana nictitans. They are generally painless, sometimes extending over the eye and preventing the closure of the eyelids. A peculiar case of hair formation has been observed by the writer, situated in the conjunctiva of the upper lid, in which a tuft of long, white, silk-like hair grew out of it, and a few isolated hairs in the vicinity of the spot. On examination the hair spot was found to contain hair bulbs, sebaceous and sudoriferous glands. It was found that several animals of the same strain in that breed had similar anomalies.

DISEASES OF THE CORNEA.

Inflammation of the Cornea.
(*Keratitis*).

Notwithstanding the fact that the corneal coat does not contain any blood vessels, it is frequently the seat of inflammatory processes which become present through a pericorneal injection due to intense irritation of the blood vessels which surround the border of the cornea, and further by an opacity of the cornea forming an obstruction that prevents the admission of rays of light into the eye itself. This clouding or opacity may extend over the entire cornea, or it may only involve a

small portion. It varies in color from a grayish-blue to a pure gray. It is yellowish-gray in some cases (purulent inflammation), but never pure white in color. On careful examination it seems to be diffuse, forming spots or stripes. The lustre of the membrane is dull on its surface and a partial loss of the epithelium is noticed. The other symptoms are avoidance of light, convulsive movements of the eyelids, and discharge of a thin watery mucus from the corner of the eyelids, visual deficiencies, and in some cases the animal may be partially or even totally blind. This is especially seen when the opacity of the sclerotic membrane is in the region of the visual line that is opposite the pupil.

Pathological Anatomy.—We have in other cases of keratitis the appearance of large quantities of round cells in the corneal tissue. These come from the blood vessels of the neighboring membranes, the sclerotic membrane, and the conjunctiva. These are wandering cells which find their way into the cornea. As long as the round cells in the cornea are not crowded together it remains unaltered in its true structure (infiltration of the cornea), and complete recovery follows after the cells have disappeared. But as soon as the cells are packed too closely together the corneal tissue is partially destroyed by maceration and necrosis, followed by a loss of actual substance. If this is surrounded by intact tissue of the cornea, it forms an abscess; if it is open externally, it forms an ulcer. We consider as ulcers, small superficial openings in the cornea which are always round in the early stages, and are caused by infiltrations located closely under the epithelium, forming little blisters or sacs, and finally bursting through the epithelial covering. In the dog, as a rule, they heal without leaving any cicatrix. Still, many cases are seen where they finally close up, leaving a white cicatrix, or else they lead to perforation of the cornea or to a total destruction of the eye by extending into the anterior chamber.

We find the following forms of inflammation of the cornea:

(1) **Keratitis Superficialis.**—Etiology.—Superficial inflammation of the sclerotic membrane is caused by slight irritations of various kinds (superficial injuries, inversion of the eye-lashes (trichiasis) or entropion). It may also originate, secondarily, from acute conjunctivitis, the inflammation extending from the conjunctiva to the cornea, irritating eye washes or salves, or from foreign bodies. Keratitis superficialis may also appear as a secondary symptom of distemper, but generally in this case the entire parenchyma is involved.

The cornea is clouded, opaque and lustreless, having a diffuse grayish-blue or grayish-white coloration, with a slightly irregular surface, but under certain circumstances it may also be covered with small epithelial masses, easily distinguished with the naked eye. In this affection the eyes are watery, which may disappear in a few days

or last for weeks. In the latter case we observe the formation of blood vessels at the border of the cornea and the sclerotic membrane. These blood vessels increase in size and the edges become very vascular, and during vascularization of the cornea it is not rare to see hemorrhages in that tissue followed by a number of brownish-black pigment spots, and occasionally the cornea remains permanently opaque and even vascular. Froehner describes a superficial purulent affection of the cornea as an effect of purulent keratitis or as a secondary symptom of distemper; this is indicated by a roughened appearance of the cornea, and a yellowish opacity of the cornea due to pus corpuscles.

Therapeutics.—The treatment is the same as in inflammation of the conjunctiva—that is, washing and painting with a solution of sulphate of zinc, corrosive sublimate, alum, or sulphate of copper, boracic acid, or the oxide of mercury salve; where there is great pain and photophobia use solutions of cocaine or acoin. Avoid all use of lead solutions in such cases where there is any loss of substance of the cornea, as the lead is deposited in the ulcer and produces black-colored spots which are permanent. If there is any ulceration, we must apply the therapeutic treatment as indicated in ulcerative keratitis, and in cases where the spots on the cornea remain use the treatment given under the same heading.

Peritomy.—This operation is recommended in **pannus,** that condition where there is vascularization of the cornea, and after massage, stimulating salves and hot-water compresses have been tried and failed. The animal must have a few drops of a 4 per cent. solution of cocaine put into the eye, and the lids held back by an assistant; then the affected surface of the cornea is carefully scarified, or curetted by means of the edge of a sharp knife. Great care must be taken to hold the knife at right angles to the eye, as the slightest slip or struggle on the part of the animal misplacing the position of the knife will cut through the cornea. The surface must be carefully scraped until all of the vessels are removed from the surface of the cornea. Frick recommended making a direct incision in the cornea. He fixes the eye and by means of a very sharp knife, pares off the abnormal formation, even cutting down half through the body of the cornea, treats it with boric acid solution, and generally has a cure in a few days.

(2) **Keratitis Profunda or Keratitis Parenchymatosa. Deep Parenchymatous Inflammation of the Cornea.**—This affection may be circumscribed or diffuse. In the former it is due to some external traumatism directly on the corneal membrane; in the latter, the diffuse condition is due to some infectious disease such as distemper, or, in certain cases, fever is the only other symptom present. The surface of the cornea has an opaque, dull, slightly grooved condition, the color bluish-gray

or gray, rarely grayish-white, either covering the entire cornea or only certain portions, accompanied by watery eyes, sensitiveness to light (but only to a slight degree), and also the formation of new vessels which extend from the borders of the cornea toward the centre. In the keratitis of distemper the opacity covers the entire eye, and is blue-gray or even milky in color. Abscesses and ulcerations, as a rule, are rare. This form, however, must not be mistaken for ulcerative keratitis. In mild cases the opacity may disappear without leaving any trace; in more severe cases it may run a protracted course, with vascular infiltration from the border of the cornea. These cases are very difficult to treat, running on sometimes for months and at times resist all forms of treatment, in some cases terminating in ulceration (see Keratitis).

The course of this disease is generally favorable. After several weeks the dulness disappears and the new vessels become thinner, disappearing entirely in a short time.

Therapeutics.—We attempt to remove the irritation to a certain extent by applications of compresses. Also irrigate with warm water or boric acid, and drop atropia into the eyes. Bandages over the eyes. If the inflammatory symptoms are reduced, we then follow it up by stimulant irritants, such as calomel powder or ointments of red oxide of mercury. As to massage of the cornea and treatment of ulceration see Keratitis.

(3) **Abscesses of the Cornea.—Etiology.**—Abscesses of the cornea appear after some traumatism, especially contusions or bruises of the membrane, also after non-septic operations, in connection with blennorrhœa or conjunctivitis, or during distemper, and very frequently appear without any appreciable cause, which some ascribe to lymphatic infection.

When there is intense dread of light and great increase of tears, and when we see a pericorneal injection and the cornea colored a gray, yellow, or straw-yellow, and a certain spot on that part which is sharply defined from the tissue of the normal cornea, or it is surrounded by a more or less dull zone, we then can safely conclude that it is the commencing formation of an abscess. Its location varies; sometimes it is on the edge of the cornea, at other times in its centre; then, again, we may find it close to the surface of the membrane or deep in the centre of it. It may be very small in dimension, such as the size of a pin-head, or it may even include the whole sclerotic membrane.

The course varies also. In small abscesses it may disappear by simple absorption, while in large ones the acute inflammation subsides, frequently leaving an intensely white spot, or it may break out externally, forming an open ulcer. This latter conclusion, or termination, is the most common, and in rare instances it may break in a posterior direction

toward the anterior chamber of the eye, causing an accumulation of pus in it (hypopyon) and producing further inflammatory processes in the internal part of the eyeball.

Therapeutics.—This is closely related to that of ulcerations of the cornea—that is, to open, puncture, or cauterize the abscess after first using cocaine in the cornea. It is then dried with corrosive sublimate or iodoform gauze and washed out with a solution of corrosive sublimate, and afterwards dusted with calomel until it dries up; in certain cases touching the edges with the actual cautery seems to bring about prompter resolution.

(4) **Ulceration of the Cornea.—Ulcus Corneæ.**—This results from traumatisms, irritations, and an accompaniment of distemper; it also appears in diabetes mellitus and certain breeds, such as toy spaniels and Boston terriers, seem to be prone to it, with no appreciable cause; apparently it is due to a certain cachexia and after maceration or necrosis of the corneal epithelium, as a consequence of blennorrhœa of the cornea. In this condition we find a loss of substance in the cornea which varies in size and depth, showing a grayish-white or grayish-yellow ground, and, as a rule, has short, abrupt borders with a bluish-gray, gray, or grayish-yellow opacity in the immediate neighborhood of the ulceration and accompanied by great dread of light; the eyelids are practically closed and the membrana nictitans drawn over the eye. When the ulceration of the cornea begins to heal it is indicated by a lessening of the infiltration in the immediate neighborhood of the ulcer, the dull circle surrounding it becomes clearer, the pericorneal injection less, and the dread of light begins to disappear. In rare instances blood vessels will shoot from the edge of the cornea toward the ulcer, and the cornea in appearance very much resembles the normal tissue of the sclerotic membrane. If the ulceration has not been very deep, the dulness gradually disappears, leaving only a very thin white veil of opacity; or, if the ulceration is deep, we have as a result a distinct white spot which remains permanently (cicatrix of the sclerotic membrane, macula cornea). This cicatrix of the membrane may become clearer in the course of time, but, as a rule, it never disappears entirely. When the ulcer does not take a favorable termination we find the inflammation increases, the ulceration becomes deeper, reaches the membrane of Descemet, and we have a perforation of the membrane in a few days. The contents of the anterior chamber escape through the opening, and in rare instances the iris and the lens push forward and may also protrude if the opening is large enough. After perforation occurs the ulcer begins to heal, and we are very apt to have an adhesion of the iris and lens to the posterior wall of the corneal membrane, the pupil is drawn to the edge of the cicatrix and the sight greatly impaired. In other cases where the opening

of the ulcer is very small the anterior chamber fills up again, is forced forward, forming a clear bladder-like body, forming corneal prolapse or dropsy of the cornea (keratocele). If the ulcer is large, the membrane of Descemet pushes through the ulcer from internal pressure and the whole ground of the ulcer becomes embossed—that is, it stands out from the surrounding membrane. As a consequence of perforation of the cornea we may have a series of alterations to the iris. Externally the iris, which is drawn into the orifice, becomes covered with cicatricial tissue, and by its contraction forms a lobule of the iris. This finally contracts into a peculiar club-shaped body over the anterior surface of the membrane (iris staphyloma). We must not confound this condition with staphyloma pellucidum, by which we mean a change of form in the corneal membrane, due to a non-inflammatory condition, where it becomes more or less opaque and is forced outward in the shape of a grape-like body by the dropsical condition of the anterior chamber. When there is great irritation of the corneal membrane, in some cases we may have a prolapsus of the lens, and the whole eyeball subsequently collapses, forming an opening in the centre of the eye which finally becomes closed up by a whitish-gray cicatrix.

Besides the causes already mentioned in the formation of abscesses, the following also produce them: cauterization, foreign bodies which adhere to the membrane, wounds in some cases, etc. This disease may appear in the epizootic form with or without distemper, and generally in connection with blennorrhœa of the whole eyeball (purulent panophthalmitis).

Prognosis and Therapeutic Treatment.—The prognosis depends to a large extent on the irritation of the ulcer and the rapidity of its progress. Ulcers which are small and located on the borders are easier to treat than those which are larger and located in the centre of the cornea. In weak, badly fed young animals and in pugs the prognosis is more unfavorable than in healthy adult animals.

The treatment requires cleanliness and strict antiseptic remedies. The use of a dressing is of great advantage, but few dogs can be made to submit to one. In canine hospitals, as a rule, they use a specially constructed leather cap; it is not to be used except in extreme cases, where it is impossible to keep the animal from scratching or rubbing the eye. It is always well to leave the affected eye without covering, as all bandages or coverings are apt to press on the eye and cause intense pain, which irritation the animal generally increases by rubbing or pulling constantly at the covering. The various antiseptic agents which are used are corrosive sublimate, 1 to 2000, or chlorine water (either pure or mixed with two or three parts of water), to be applied with a brush and calomel powder blown from a quill directly on the eye. The writer has

obtained very satisfactory results with hot fomentations of boric acid (3 parts to 100). These should be applied three times daily, ten minutes at a time. They are far better than cauterizations with nitrate of silver or painting with pyoktanin.

Besides the antiseptic treatment we can use atropine or eserine solution, of which a few drops are put in the eye. The first-named agent should be applied when the ulcer is located centrally, as it dilates the iris, and consequently the pupil is enlarged, and the latter when the ulceration is located on the borders as it contracts the pupil and draws it away from the seat of irritation. There is an objection to atropine in that it increases the internal pressure by widely dilating the pupil. The iris is dilated or contracted by these drugs and removed from the neighborhood of the ulcer, so that if the perforation does not occur the iris will be drawn far enough out of the road to prevent any adhesion.

Good results have been obtained with cocaine, alternating with atropine:

R. Atropine sulphate, 0.1
Aqua distil., 10.0
M. S. In order to produce a dilatation of the pupil we must introduce five drops of this remedy into the conjunctiva, drop by drop, by means of a brush or a dropper.

R. Eserine salicylate, 0.05
Aqua distil., 10.0

When a keratocele is developed we may prevent rupture by puncturing the membrane with a needle and allowing the water in the chamber to escape. In prolapsus and adhesion of the iris we can do very little, as it is impossible to push back the iris into place. We must dust the protruded portion with calomel; at the same time we may reduce the enlargement by means of nitrate of silver or sulphate of copper solutions, or a powder of oxide of mercury blown on the eyeball. In iris staphyloma, where the tissue does not wedge and contain a portion of the contents of the anterior chamber, the eye may be cocained and by means of a very sharp pair of scissors the staphyloma may be carefully cut down; if, however, the protruded portion is filled with the fluid portion of the anterior chamber, a threaded needle is carried through the centre of the protruded portion and the thread cut at the needle and thus making two ligatures which are tied right and left dividing the enlargement into two portions, the ligated portion of the cornea will dry and pull off in a few days with the ligatures, leaving a surface which dries up very quickly with the ordinary antiseptic treatment.

We must try to remove any spots on the sclerotic membrane by means of irritants, such as the mild chloride or oxide of mercury or massage. According to Bayer, massage of the cornea has to be performed in the following manner: The points of the fingers are placed on the closed-up eyelids and by a constant circular or centrifugal friction move the eyelid for sometime. In some cases we may also apply the above-mentioned ointments and powders. The writer has obtained far the best results from calomel than anything else. He placed daily a small amount of powder composed of equal parts of calomel and sugar (grape sugar) on the cornea and massaged the eyelid for ten minutes. Very good results by painting the enlargement several times daily with a solution of pyoktanin (1 to 100).

The following alterations are also seen in the cornea of the dog:

Dermoid of the Cornea.—This condition has already been described under neoformation of the cornea. We find a peculiar abnormal collection of true epidermal tissue on the cornea which is covered with hair and interferes with the direct action of light, and also produces
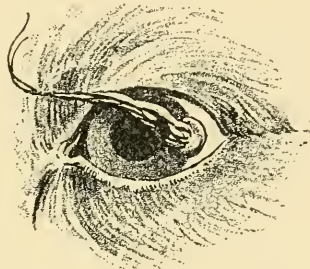
Fig. 140.—Dermoid of cornea.

irritation in the cornea and conjunctiva (Fig. 140). The hair should be cut off by means of scissors. Thierry observed the same abnormality on the sclerotic membrane of both eyes in a three months' old dog. There was a slight swelling and enlargement above the surface of the membrane which was covered with fine hair.

The treatment consists in the removal of the abnormality, the eye is cocained, the dermoid is lifted with a pair of fine curved forceps and removed by means of a pair of curved scissors. An opacity of the cornea follows as a result; no attempt should be made to remove this for at least two months, as any friction or manipulation shortly after the operation is apt to set up great irritation. In removing the dermoid great care must be exercised not to cut entirely through the cornea and allow the escape of the contents of the anterior chamber; if any part of the dermoid seems to involve the deep structure of the cornea, it had better be left alone. French advises that during the operation a stream

of warm water should run over the eye to carry off the blood and facilitate the operation.

Pterygium.—By this we mean a more or less triangular proliferation of the connective tissues containing numerous blood vessels and branching over the cornea toward the centre. This growth is very loosely connected with the corneal structure and can be removed by means of caustics or by an operation; the animal is narcotized or the eye cocained, the growth seized by means of a pair of curved forceps, raised from the surface of the globe, and carefully dissected out, and the hemorrhage controlled by astringents.

Injuries to the Cornea.—It is not uncommon to observe injuries to the cornea of dogs where the epithelium is slightly injuried or where there is a deep penetration of the membrane or it is entirely perforated, such as injuries from cats' claws or sticks mischievously pushed into the eye or from the lash of a whip. Immediately after the injury we observe a great fear of light, closing of the eye, and copious tears. Wounds which have not entirely perforated the cornea are rapidly followed by an opacity and swelling in the neighborhood of the injury. When the membrane is perforated the symptoms and results are very similar to ulceration. Superficial or very small wounds which penetrate deeply heal very quickly after a few days, leaving scarcely any opacity. This, of course, must be expected in wounds that have been caused by some object that was clean, while septic large wounds, caused by some unclean object, frequently produce great irritation, and penetrating ulceration results, ending in panophthalmia and destruction of the eye.

The therapeutic treatment of wounds of the cornea is identical with that of corneal ulceration.

Desiccative Keratitis.   Xerosis Corneæ.—This is a particularly rare condition described by Bayer that occurs as a result of acute distemper; it is seen particularly in pugs. The animal has a wide open staring look of the eye, the cornea is dull and lustreless, there being no reflection in it; the conjunctiva is tumefied, corrugated and deep purple-red in color and covered with a thick tenacious secretion. After a short time the cornea commences to slough small portions of its substance, and it finally becomes reddish-brown in color. The treatment consists in moist fomentations and compresses of boracic acid solution, followed by astringents such as acetate of lead or sulphate of zinc solutions. If the acute symptoms of distemper have not shown themselves they are apt to appear shortly after this condition is developed.

Corneal Spots or Opacities.   Maculæ Corneæ.   Leucoma.—By this is meant more or less turbidity or opacity of the cornea, due to injuries, ulcerative keratitis and certain opacities that are not accompanied by fever or other phenomena. These spots may vary from complete

opacity of the cornea to cloud-like spots, dull white, chalky white, or pigmented (Fig. 141). Calomel blown on the cornea by means of a small cylinder of paper or a quill, salves, such as calomel 1 part and petroleum salve 4 parts; a piece the size of a pea is put on the cornea and the lid gently massaged for several minutes. Calomel and sugar of milk, equal parts, is also used; a small portion is put on the eye by means of a camel's hair pencil, and the lid is gently massaged, moving the lid by a circular motion of the finger for ten or fifteen minutes. Red and yellow precipitate of mercury ointment or a few drops of iodide of potassium, 3 per cent. solution, are sometimes found useful as an absorbent. When there are elevations or encrustations on the cornea due to the deposit of chemicals from eye washes, they can be curetted (scraped) off by means of a sharp knife. The cornea is, as a result of this

Fig. 141.—Leucoma.

irritation, apt to be slightly denser in its structure. Certain permanent opacities of the cornea that disfigure the animal can be modified by means of tattooing; the eye is cocained and a tattooing needle used. The punctures are made in an oblique direction to avoid any possibility of puncturing the cornea; a great number of small punctures are made in the body of the opacity, covering its entire surface, and sepia or india ink rubbed into punctures. This is done by putting the color in solution on the eye and massaging the lid for ten or fifteen minutes at a time. This tattooing may have to be repeated several times.

DISEASES OF THE CRYSTALLINE LENS.

Cataract.

All diseases of the lens, either of its membranes or its capsule, as a rule cause a certain amount of opacity, and may form one or more star-like gray bodies in the centre of the lens itself (cataract). It is not possible to enter into a description of the various forms of cataract and its pathological alterations, but we will only take up one form (gray) of cataract that can be subdivided into two forms—soft, which may be congenital; or traumatic and hard or contracted cataract, which is senile. The softening process generally begins in the equator of the lens, and becoming diffused soon causes a total opacity of light gray color. This may be streaked with darker lines or it may have a mother-of-pearl discoloration, with enlargement or distortion of the lens and a contraction of the anterior chamber. This is very often seen in young animals. The contracting process, on the contrary, begins in the shape of a number of small whitish striæ, or dull opacities, in the peripheric layers of the lenticular nucleus, and extend gradually over the cortical, giving the lens a yellowish-white or yellow aspect after some time. This is generally observed in old dogs (hard nuclear cataract, senile cataract). The so-called capsular cataract does not, as a rule, depend on true opacity of the capsule, but on an accumulation of products of the same, which have been developed from disease processes which have gone on in its immediate neighborhood. For instance, the inflammation of the iris. In some cases they appear in small, star-like or streaked pigmented dull spots, which are distinctly marked.

Etiology.—Gray cataract, as a rule, is a senile or old-age affection, but it appears quite frequently in young dogs; in this case the opacity is deep-seated, and brilliantly white star-like opacities appear in the posterior part of the lens, and now and then it is congenital. The writer saw one case of hereditary star cataract in connection with microphthalmus. Meleval observed in the progeny of a pair of poodles, where the dog had a double cataract, that the pups had lenticular opacities. The development of cataract which occurs in advanced age—that is to say, after ten or twelve years—is what is known as senile cataract; this is slow in its development, while cases of opacity of the lens, which are observed in young animals, appear frequently without any marked cause, and run their course very rapidly, the opacity forming in a few weeks, and even in a few days the whole lens has been completely covered. Traces of sugar are found in the urine of dogs which become very thin and anæmic in a short time, cataract frequently developing in this condition. Frohner thinks that the lens becomes saturated with grape-sugar, which is present

in diabetes, and the lens undergoes a retrogressive metamorphosis due to disturbance of its nutrition.

There is no doubt that cataract is also caused by inflammatory processes of the eye, and the nutritive supply of the lens becomes disturbed and its normal condition impaired, such as ulcerations of the cornea with central perforation, inflammation of the membrane of the lens and iris, and also bleeding into the anterior chamber. Injuries of the lens and concussions of the eye also cause a number of cases of cataract.

Certain conditions are developed as the result of concussion of the eye and appear quite frequently; they may be thus briefly described: The lens either sinks downward with the capsule or becomes laterally displaced. It may lean against the iris or it may drop forward into the anterior chamber of the eye, and it may finally crowd into the

FIG. 142.—Gray cataract of both eyes.

vitreous humor. If the lens has undergone but slight displacement (subluxation), it may remain clear for some time, but the vision is much impaired. If it has fallen into the anterior chamber or has been forced into the vitreous humor, we see a rapid development of the cataract, and in the later stages considerable inflammation of the choroid membrane of the iris, or of the whole eyeball.

Clinical Symptoms.—In cases where the disease is somewhat advanced, and the cataract is fully developed into one of the following forms—punctiform, streaked, spotted, or complete opacity of a whitish-blue, brownish-blue, or mother-of-pearl color—it is easily recognized (Fig. 142); but, on the other hand, where there is a mere cloudy dimness and small spots of cataract, we must use candle-light or some illuminating power such as an ophthalmoscope and a strong light to see the

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action of the lens in the eye itself.   Before doing so, however, we must dilate the pupil with atropia.

Discoloration of the lens may be caused by violent concussion, contusion of the eyeball, and by various pathological conditions in the interior of the eye.   It may be congenital, the lens being in a variety of positions in the eye, sometimes it is necessary to dilate the pupil by means of atropine to ascertain the exact position of the lens.

The prognosis is rather difficult to make, and, as a rule, it should be an unfavorable one.   Hereditary cataract shows little inclination to enlargement, as is also the case in senile cataract.   In soft cortical cataracts seen in young animals, we may see a rapid opacity of the lens in a few days or weeks.   The sight is entirely lost and medical treatment is of little use.

Therapeutic Treatment.—In the early stages of senile cataract very good results have been obtained with iodide of potassium, 1 per cent.
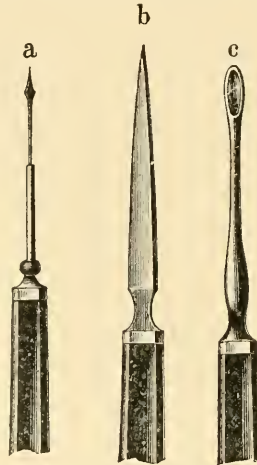
FIG. 143.—*a*, Stop discission needle; *b*, Graefe's cataract knife; *c*, Daviel's cataract spoon.

solution, few drops in the eye daily.   A gray cataract may be removed by an operation, and this is much more advisable in the dog because it is, as a rule, particularly in young dogs, attended with no great danger, and its results are generally beneficial, producing a partial restoration of the vision.   It is advisable to perform the operation of cataract after having first dilated the pupil by means of atropia, and then performing the operation under ether.   The writer has tried cocaine alone, but he finds it unsatisfactory.   The animal must be tied up, placed on a table, and ether or chloroform administered.   The operation is performed by one of the following methods:

Opening of the Capsule.—The anterior capsule of the lens has to be opened in a transverse way with what is known as a discission needle

(Fig. 143, *a*). The fluid in the anterior chamber causes a gradual break-ing up and reabsorption of the lens. An assistant holds the eyelids open and the operator seizes a fold of the conjunctiva with a small tenaculum, holding the eye firmly with the left hand, while holding the needle in the right hand, placed on the animal's head to steady it. The needle is then introduced into the cornea, in the middle of the lower external quadrant, in such a direction as to meet the ciliary insertion of the iris and as far as the upper internal quadrant. Before the point of the needle has reached this latter point, however, it is placed firmly on the capsule of the lens, and this is cut through in a transverse direction with a lever-like movement of the needle (Fig. 144). The instrument must then be removed in the same way that it was introduced in perforating the cornea. After the operation the animal must be placed for some time
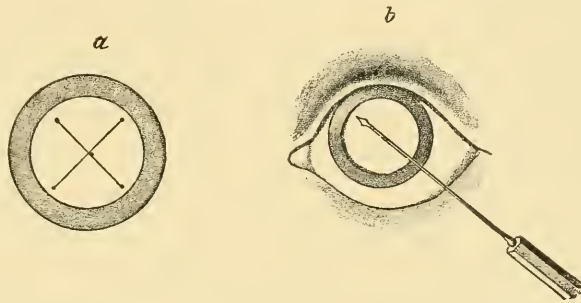
FIG. 144.—Discission of the lens: *a*, Form and size of the cross-incisions; *b*, method of insertion of the needle.

in a dark place and the eye treated twice a day with atropine. We must treat all irritating symptoms of the eye by means of cold compresses, and sometimes we must use mild laxatives. After six or eight weeks the reabsorption of the lens is complete. We generally perform dis-cission in young animals affected with soft cataract. The result of this operation, however, is not always satisfactory, as reabsorption is slow and in many cases requires a second operation. Several months may also elapse before the cataract is absorbed. Schlampp advises in such cases puncturing the cornea, and by this means slowly allowing the fluid of the anterior chamber to escape, leaving the lens untouched. Anterior displacement of the lens enlarges or ruptures the opening which has been made in the capsule. Reabsorption follows, as a rule, more quickly when this is performed, probably due to the fact that the fluid which contains the elements of the lens has been discharged and replaced by fresh fluid. The process is not dangerous, and may be repeated much oftener than discission.

Linear Extraction.—This operation is used where there is complete opacity of the lens and enlargement of the lens and contraction of the

anterior chamber. After having prepared the dog as in the operation for discission, an assistant holding the eyelids apart, with another forceps seize the conjunctiva of the eyeball in the neighborhood of the median line of the eyeball, at the same time everting the upper eyelid. We then make an incision by means of Graefe's cataract knife (Fig. 143, *b*), about 5 mm. broad, through the cornea, about 2 or 3 mm. from the border of the sclerotic membrane. We then pass a discission needle through the wound, split open the lenticular capsule, as in discission, and empty the soft parts of the cataract by means of Daviel's spoon (Fig. 143, *c*). Any remnants of the cut capsule which may not be removed at the time are left to be reabsorbed. If during the operation we observe prolapsus of the iris, we must try to restore it to its position
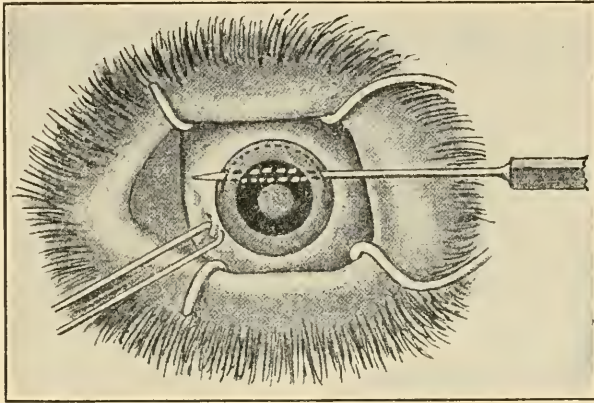
Fig. 145.—Lobular extraction of lens. (*Cadiot* and *Breton*.)

by means of Daviel's spoon (Fig. 143, *c*). If this is not possible, we may cut it off close to the wound of the cornea.

It is very evident that linear extraction is only to be performed in cases of complete softening of the lens. This may be recognized by total opacity of the lens and alteration of the iris, and also when the anterior capsule is pushed toward the cornea.

Lobular Extraction.—Lobular extraction is indicated in hard cataract, which is generally senile, where the lens may be prolapsed into the anterior chamber and where discission will only produce an imperfect result—that is to say, where reabsorption of the lens does not progress properly. It is performed in the following manner:

Make an incision into the cornea exactly as in linear extraction, by means of Graefe's cataract knife, but it must be enlarged to 8 or 10 mm. (Fig. 145). After that the capsule of the lens is split by the discission needle, the fluid of the anterior chamber is allowed to escape, and at the

same time the lens must be detached by means of an even, but not too energetic, pressure upon the other side of the eye from the wound, and then by means of the Daviel's spoon the lens is pushed out of the opening
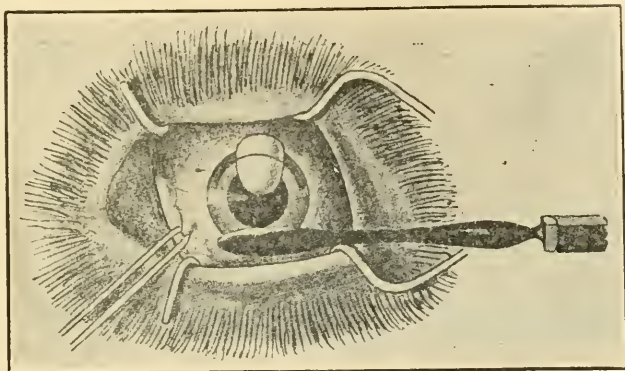
FIG. 146.—Lobular extraction of lens. (*Cadiot* and *Breton*.)

(Fig. 146). The subsequent treatment is the same as in linear extraction.

Dislocation of the Lens.—This operation is undertaken in hard cataract, and is performed in the following manner:

By means of a cataract needle pushed through the sclerotic mem-
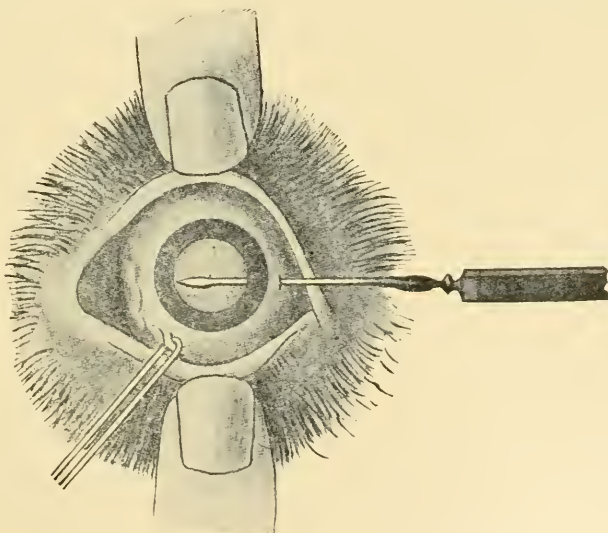
FIG. 147.—Dislocation of the lens. (*Cadiot and Breton*.)

brane, or the cornea, steady pressure was made on the upper part of the lens, and it was pushed down into the lower posterior part of the vitreous chamber of the eye. The needle is held like a penholder and is introduced into the sclerotic membrane at the side of the eye about 2 to 4 mm.

distant from the corneal border and is pushed underneath the iris, between it and the lens to the median line, until it is visible in the pupil. When the needle has reached the inner or nasal border of the pupil, the needle is pushed back against the lens and by steady pressure the lens is dislocated from its supports and pushed backwards into the vitreous humor. The lens must be held in position to endeavor to prevent its return. but it is very apt at times to partially re-enter the pupillary opening.

DISEASES OF THE SCLEROTIC MEMBRANE, OF THE NERVOUS PORTION OF THE EYE, AND ALSO OF THE VITREOUS HUMOR.

These diseases are generally not of any great importance compared with the diseases before described, and therefore we will not go into minute details.

Anomalies of the Iris.—Of this organ there are two kinds: Persistent papillary membrane and iris coloboma.

Persistent Papillary Membrane (*Membrana Papillaris Perservans*).— The fœtal papillary membrane extends in the shape of threads or strings from the anterior surface of the iris to the capsule or over the pupil, or their free ends may also float in the aqueous humor. Calvé saw a young dog, twelve months old, affected like this and saw a similar condition in the mother, and several of her offspring were blind from persistent papillary membrane Moeller has seen a number of young dogs affected in the same manner.

Iris Coloboma.—This is a congenital split or division of the iris, which is not at all rare. In the iris are found circular split-like openings and there appear to be two and sometimes three pupils (Fig. 148). There are also associated with this condition alterations in the ciliary body of the choroid membrane.

Inflammation of the Choroid.—This condition is very similar to iritis, and the symptoms are similar. Treatment consists in keeping the animal in a dark place and solutions of cocaine to the eye.

Inflammation of the Iris (*Iritis*).—This affection is very rare in the dog and is apt to be associated with keratitis, cyclitis, or choroiditis. It may also be due to extension of inflammatory processes and to traumatisms, and is also said to be associated with rheumatoid conditions and distemper. It may be recognized by contraction and difficulty of movement of the iris, change in the color of the iris, fibrous accumulations in the shape of a gray veil-like coating, and dulness of the fluid of the anterior chamber, and slight dimness of the cornea. The cure for this disease consists in complete rest, keeping the animal in a dark place,

and solutions of cocaine and atropine, and the administration of saline laxatives.

Purulent Inflammation of the Eye (*Panophthalmitis*).—This is produced by serious concussion of the eye itself. It may also be due to septic wounds of the cornea and sclerotic membrane, as well as to the large perforating ulcers of the cornea. We recognize the following acute symptoms:

The eyelids are constantly closed; great redness of the conjunctiva; total opacity of the cornea; purulent accumulations in the anterior chamber of the eye (hypopyon); great hardness and enlargement of the bulbus. After a short time we may have perforation through the cornea, and, in rare cases, through the sclerotic membrane. The lens and vitre-

FIG. 148.—Iris coloboma.

ous humor are ejected through the opening with the purulent mass; the eyeball collapses, becomes contracted, and forms a knob-shaped mass in the eye; the lids completely collapse and form a hollow in the face. The only thing to do in such a case is to perform enucleation, or removal of the eye. See Removal of Eyeball.

Glaucoma and Hydrophthalmus. Dropsy of the Anterior Chamber.— It is impossible to draw a distinct line between these two conditions. The anterior chamber is very much enlarged, hard and tense, so much so that the eyelids cannot be closed (goggle eye, exophthalmus). The blood vessels of the conjunctiva and the sclerotic membrane are injected, the cornea more or less opaque, the pupil much contracted and greenish in color, insensibility of the cornea, and dilatation of the pupil. The animal has partial or total loss of eyesight, congestion of the conjunctiva,

and greenish coloration of the pupil. Treatment consists of a few drops of physostigmin solution 1 to 100, which tends to reduce the intraocular pressure, and puncture of the cornea. In chronic hydrophthalmus the entire eyeball had best be removed. Iridectomy is performed in man for glaucoma and Græfe has recommended it for the dog.

Diseases of the Vitreous Humor.—These are generally congenital and are observed with the ophthalmoscope. The vitreous humor is found on examination to be filled by a filiform or striated opacity; in some cases the vitreous humor is found to be a mobile liquid. There are a number of other changes, but this condition is incurable, and merely for diagnostic purposes, consequently, works on the eye are to be consulted. Of these diseases there are a number of anomalies, but the most important are hemorrhage of the retina, inflammation of the papilla of the optic nerve, and detachment of the retina, total cataract and a partial luxation of the lens, liquefaction of the vitreous humor of the eye, swelling of the papilla, and injection of the vessels of the retina.

Hemorrhage of the Retina.—This may be caused by violent traumatism and from certain diseases such as scurvy, ptomaine poison and from poisoning from male fern extract given for tape-worm. Those which are only visible with the ophthalmoscope are round, irregular line-like bodies, brownish-yellow, which gradually become light yellow or white. Treatment is generally useless. Rest, moist, warm compresses, the application of a 1-per cent. solution of iodide of potassium, a few drops in the eye once or twice daily.

Inflammation of the Papilla of the Optic Nerve (*Papillitis, Neuritis Intraocularis*).—This is apt to be found associated with pathological conditions in the other structures of the eye from certain infectious diseases—distemper, septicæmia, ptomaine poisoning, and rarely traumatisms. The papilla when examined by the ophthalmoscope is found to be hyperæmic, with more or less projection of the papilla, and congestion of the surrounding vessels. When the active symptoms subside the papilla atrophies, becomes grayish-white and becomes oval or circular.

The treatment consists in keeping the animal in a dark room, administering strychnine and local applications of sedatives, and small doses of calomel.

Detachment of the Retina (*Amotio Retinæ*).—This is indicated by more or less separation of the choroid and opacity of the vitreous humor when there is complete separation of the retina; the whole body becomes converted into a funnel-like body. This condition has been observed quite frequently. Moeller has found numerous cases of detachment of the retina, and could find no predisposing cause. Subretinal cysts are occasionally found in the retinæ of old dogs, and present the same symptoms as this disease. Treatment is useless.

Amaurosis. Black Cataract.—Under this title we class all of those morbid states where there is partial (amblyopia) or complete loss of eyesight or blindness (amaurosis) without any change in the external portion of the eye. In the majority of cases it is due to pathological process in the retina or the optic nerve, namely retinal hemorrhage, separation of the retina, papillitis, retinitis, or atrophy of the optic nerve. In rare instances it is due to direct pressure of hemorrhages on the optic nerve, or to inflammations to neoformations in the orbit, or at the entrance of the optic nerve, or it may be due to certain lesions in the cranial cavity, such as inflammation, hemorrhage, tumors, parasites, which are located in the base of the brain near the optic centre. Certain poisons have a specific effect on the optic nerves and cause permanent or temporary blindness such as nicotine, salicylic acid, extract of male fern, santonin, carbon dioxide, or decayed meat toxines. The sight is sometimes affected by sporting dogs working in the field when it is covered with snow. Congenital amaurosis cannot be said to be extremely rare, it being rather common in toy terriers and particularly so in Boston terriers.

Symptoms.—When a dog is blind in both eyes it is not difficult to determine the condition, on observing the careful method of walking, the absence of fright when menaced with a stick or hand, and the very much increased use of the sense of smell, or of hitting obstacles or walking into them, and, in addition, the fixed, stary look, and the dilatation of the pupils which do not contract in the presence of strong light. Cases have been observed where there was pronounced amaurosis and while the pupil was ordinarily dilated, when the animal was brought into strong light the pupil contracted. Where there is partial or complete loss of sight in only one eye, it is more difficult to determine the condition. Blind one eye with some dark material and try to see whether the pupil dilates and contracts with the light. A peculiar form of blindness is hemeralopia (night blindness). In such animals the sight is perfectly good in the day, but at night the sight is partially lost and the animal has no confidence in walking about. This condition is found to be due to a peripheral opacity of the refractory mediums. The treatment consists in the attempt to remove the exciting cause, if possible.

Prolapse of the Eyeball.
(*Exophthalmus; Prolapsus Bulbi Oculi.*)

There are a number of causes that produce prolapse of the eyeball. It may be crowded out of the cavity of the eye, or exposed in its external circumference by the swollen and distended eyelids which are closely adherent to its posterior surface (Fig. 149). This condition occurs

especially in bulldogs, pugs and the toy spaniels, although it may occur in any breed. The dog does not possess a complete bony arch of the eye (zygomaticus), the space being filled up by a ligament, and the muscles are also very weak. Occasionally, from some mechanical force, such as blows in the region of the eye, or bites in its neighborhood causing hemorrhage and a large amount of blood to collect in the posterior part of the orbit, it is pushed out of position. Frequently the entire eyeball is crowded out, standing out on the face clear of the orbit, (tumors, etc.). Simple pressure of the fingers on the supraorbital cavity of pugs or spaniels is sufficient to make the eye protrude, opening the eyelids mechanically; luxation of the inferior maxillary also causes protrusion of the eyeball. It is also observed in that rare affection called Basedow's

Fig. 149.—Dislocation of the eyeball.

disease. This condition has been noticed in very rare instances to be due to inflammatory processes inside the eye, and by the formation of tumors in the orbits.

The prognosis of a prolapsed eyeball depends largely upon the circumstances and condition of the organ. If the prolapse is of recent origin, if the muscles of the eye and optic nerve are not torn, and if the eye itself has not been very much injured, we may expect complete recovery in a short time without any disturbance of sight. If the prolapse is recent and the muscles are not torn, or only partially so, but the eye is abnormally distended, we must expect there is some irritation of the optic nerve, and while the eye may be restored the animal may remain blind. If the muscles of the eye and optic nerve are lacerated and the eye proper is injured, or if any of the chambers of the eye are filled with blood, or if the prolapse has been sufficiently long that the irritating influence of the air is marked by an opacity and a dry look of

the cornea, which assumes a horny appearance, the eye must be considered as lost.

The therapeutic treatment consists in returning the eyeball as soon as possible, especially when the organ appears to be in such a condition as would encourage you to think it can be saved; but if otherwise, it must be removed as soon as possible.

We try to return the eye to its position as soon as possible.

First, clean it thoroughly by means of an antiseptic that is not irritating, such as a 2 per cent. solution of boric acid or a 1 to 2000 solution of corrosive sublimate. Place the flat of the hand or the points of the fingers on the eyeball, at the same time an assistant distending the eyelids as much as possible, and by gentle pressure endeavor to push the eye back into the orbital cavity.

If it is impossible to return it by this means, the fissure of the eye must be enlarged by making a small incision in the external corner, or the anterior chamber of the eye may be perforated by means of a cataract needle or sharp bistoury, so as to empty the eye to a certain extent and thus allow it to return to the chamber. After returning the eye we must try to prevent another prolapse by placing a bandage over the eye, taking care not to compress the eyeball too much. If the animal will not allow it to remain, we must join the eyelids with one or two stitches. After stitching the eye we generally see great inflammation of the lids and the eye itself, but the writer has found that these bad effects may be easily prevented by taking care not to carry the stitch through the entire lid, but only through the external membrane. At the same time it is advisable to keep the animal without food for at least twenty-four hours, for the use of the jaw, and especially the pressure of the prolongation of the crown of the inferior maxillary, may push the injured eye out of position. Cold applications are useful if the eyeball cannot be saved, or if reduction is impracticable for some reason or other, on account of tumors in the orbit, etc., there is nothing left to do but enucleate the eyeball.

Enucleation. Removal of the Eyeball.—Removal of the eyeball should be performed under a narcotic or ether, or continual applications of 4 per cent. solution of cocaine. We pull out the eyeball by means of a tenaculum or a thread is put in the body of the eye, cut through the conjunctiva with a pair of small curved scissors closely behind the cornea, snipping the scissors around the eye, keeping as close to the bulb of the eye as possible, and by this means separate the muscles and then cut through the optic nerve. The author thinks it is advisable to remove the membrana nictitans at the same time (Fig. 150).

After enucleation, the cavity of the eye is washed out with an antiseptic fluid and the bleeding is stopped by means of a tampon; and the

cavity should be powdered with boracic acid or sulphonal.   Pack the orbit
with absorbent cotton and put two stitches in the eyelids.   The stitches
and packing must be removed in twenty-four hours.   The further treat-
ment consists in cleaning out the cavity with corrosive sublimate solution
(1 to 3000) twice daily.   Dogs are not badly disfigured by the loss of
one eye, as the orbit becomes contracted and partially filled with granula-
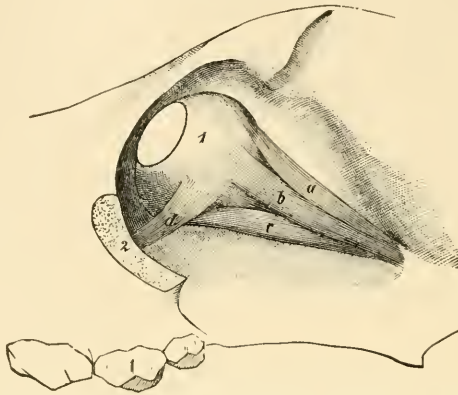
Fig. 150.—Muscles of the left eye: *a*, Superior; *b*, external; *c*, inferior straight muscles of the eye; 1
eyeball; 2, orbital arch cut through.

tions.   It is not advisable to use artificial eyes, as the animal generally
rubs them out, and such operations as tattooing the stump, only removing
the anterior portion of the eye, or cleaning out the contents of the eye-
ball and stitching up the sclerotic membrane are not only invariably
impracticable but very apt to act an as irritant and cause a constant
discharge from the cavity, and the empty orbit always presents a dis-
gusting appearance.

DISEASES OF THE EAR.

Serous Cyst.
(Othematoma; Hematoma.)

By this term we mean a blood or lymphatic excretion lying between the skin and cartilage of the ear, and forming a tumor in the external or internal part of the lobe. It generally occurs on the inside of the lobe. In rare cases it has been found in the external side, and in still rarer cases both inside and outside. This swelling is fluctuating, and when the skin of the animal is white it may have a bluish coloration.

Etiology.—This condition is probably due to some irritation or traumatic cause; for instance, by striking the ear against the collar or muzzle, pulling the ear, concussions, and injuries through biting; or from constant shaking the ear due to the continuous itching and irritation of disease of the middle ear and from irritation of parasites, or ulceration of the edges of the lobes. It is always seen in the lobe of the ear; it is general in dogs with long ears. If the sac is not emptied by surgical means, the secretion remains fluid and to a certain extent is reabsorbed, but rarely is the secretion entirely reabsorbed and it may leave quite a thickening and even malformation of the external ear, and when the sac is emptied by surgical means after the collection has been there some time we find that there is very little serous fluid left, but organized masses of filiform neoformations. In some cases when the fluid suppurates it may perforate the skin externally. This, however, is very rare, being generally associated with some later traumatisms.

Clinical Symptoms and Prognosis.—The swelling, as a rule, is on the internal part of the ear. This enlargement varies in size from a pigeon to a chicken egg, spherical or oval in shape. The lobe, which generally hangs downward, is pushed upward in a peculiar manner (Fig. 151). The swelling is hard, and in white animals it has a blue color. It is very sensitive to pressure and shows a distinct fluctuation. The animal carries its head in an oblique manner, the affected ear being held downward, and when the collection is of some size the ear stands out from the head, and the fact that it gives the dog more or less pain is indicated by the careful way that the animal shakes its head or scratches its ear.

The prognosis is favorable provided proper treatment (incision, etc.) is applied, although it may take some time before they are entirely cured. Compression of the ear by means of bandages has been found to induce the course of healing very materially.

In many cases where no dressing is applied, we may have as a sequence a slight thickening of the lobe of the ear. This, however, is of very little importance.
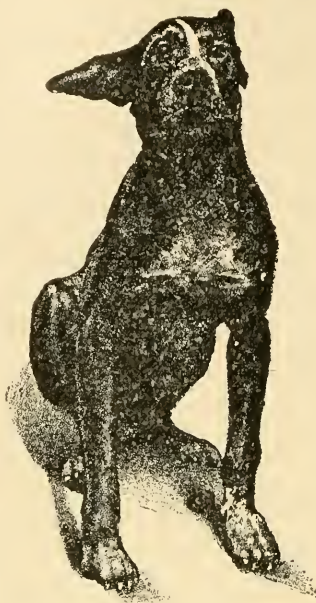
Fig. 151.—Hematoma of the ear.

Therapeutic Treatment.—The methods of treatment which the writer considers advisable are as follows:

We perforate the swelling with a large-sized hypodermic syringe or aspirator. The secretion is then removed and a solution of iodine 1,
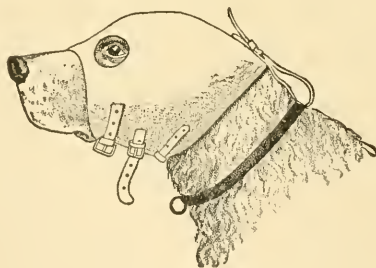
Fig. 152.—Ear-cap.

iodide of potassium 6 and alcohol 16 is injected into the cavity. We then apply a compressing dressing in the following manner:

The ear is covered with antiseptic wadding on both surfaces. It is

then held in position by means of an ear-cap (Figs. 152, 153). This dressing must not be displaced, but allowed to remain for days. This method has been an element of uncertainty; in some cases it acts perfectly and in others, beyond setting up considerable irritation, it does not destroy the secreting surface and the abnormal condition returns.

McQueen's method is very simple and produces good results. He carefully removes the hair from the ear and renders it antiseptic, and either paints the ear with cocaine or administers chloroform, empties the sac by means of an aspirator syringe, and makes sure that it is completely emptied. Sutures are then inserted radiating from the centre of the sac, about one-third of an inch apart, directly through the ear and
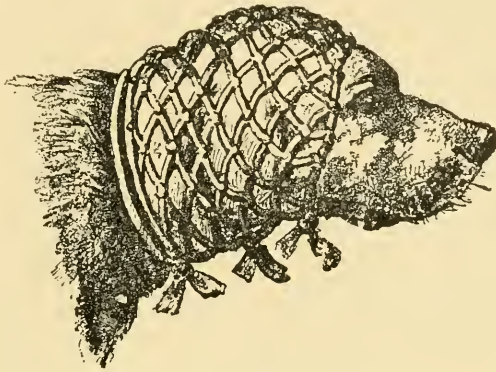
Fig. 153—Ear hood or net.

tied on the outer or hairy side, thus producing a firm pressure between the two surfaces of the sac and by that means get prompt union. The ear must then be irrigated with an antiseptic solution, carefully removing all blood, etc., and dressed with antiseptic wadding, and further covered with an ear-cap. It should be dressed every day, and the sutures removed at the end of a week.

Another method consists in taking a scalpel and making a free incision from one end of the sac to the other, then filling it in with tincture of iodine, and then keeping it clean and using an ear-cap.

Simple emptying by means of a trocar or making a small incision never produces any good results, as the opening closes immediately and it soon fills up again. Sutures are not advisable, causing great irritation. In order to prevent the too rapid closing of the incision, the removal of a small crescent-shaped piece of flesh from the edge of the opening has been recommended.

Ulceration of the External Concha.—External Canker.

By this we mean a purulent or ulcerative process on the edge of the external ear. This, however, is not confined to the edge, but may spread over different parts of the lobe.

Etiology.—The chief causes of this trouble are injuries and lacerations of the skin. Dogs are liable to scratch or shake the ears violently against the muzzle or collar, producing an inflammation. It may also be developed from the ear itself, as in cutaneous inflammations of the external
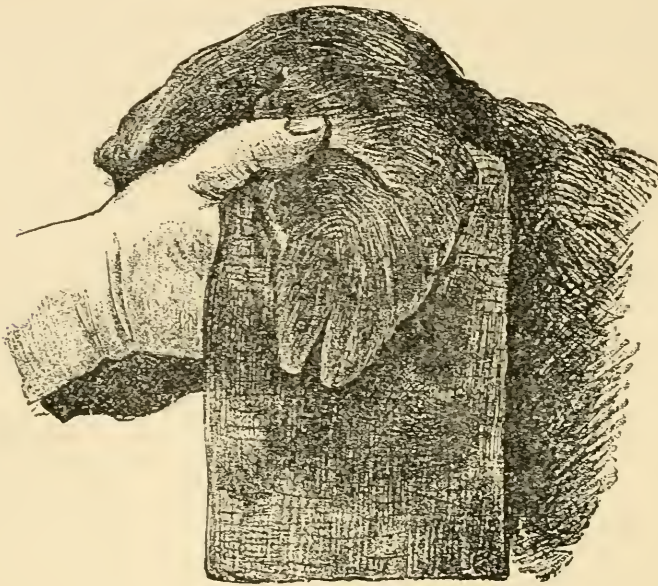
Fig. 154.—Mode of bandaging the ear.

auditory passages. We may also see this as a result of wounds or lacerations of the ear caused by bites of other dogs, which from neglect or improper treatment become ulcerated and do not heal readily on account of constant shaking of the ear. This affection is almost entirely confined to animals with long ears and short hair.

Clinical Symptoms.—The animals hold their heads to one side, shaking the ear frequently, sometimes keeping it up so long that the ulcerated surface bleeds and the blood is thrown in all directions. They attempt to scratch the affected ear with their paws, and are very sensitive about having them touched. On making an examination we find at the

edge of the external ear, generally at its extreme end, an ulcer or a number of them which are covered with a blackish loose scab with turned-up edges, and the tissues of the immediate neighborhood are œdematous.

Therapeutic Treatment.—The first procedure is to ascertain if there are any evidences of internal otitis; if so, heal that and lessen the irritation and itching. Next prepare an ear-cap (Fig. 152), which is so very essential in this affection. Dress the inflamed edges first with an antiseptic solution and get all the scab-dirt, broken down tissue and hair away, then paint the edges with compound tincture of benzoin and apply this daily, keeping on the ear-cap. Other ointments, such as airol, benzoin and lanolin, or stimulant counter-irritants, such as iodine or
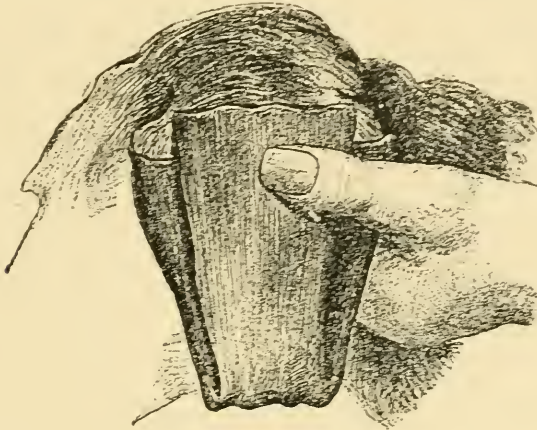
FIG. 155.

nitrate of silver may be employed. The writer has found the following method very efficacious: Clean the ear thoroughly, then apply freely some drying powder, such as dermatol or boric acid, on both sides and the edges of the ear. Have prepared an oblong piece of linen or muslin as in the accompanying illustrations (Figs. 154, 155), cover this with liquid glue and apply it as seen in the Fig. 155; this is held in position until dry. When it is to be removed the ear can be steeped in warm water and it is easily removed. It is best, however, to let it remain until it falls off, as by that time the ulcers have healed and the scabs and hair come off with the bandages. In very small animals silicate of soda solution or rubber adhesive plaster can be substituted for glue, but in ordinary sized dogs the glue is the most efficacious. When there are a series of deep tears or chronic separations of the ears, and the edges of the ears are in a chronic state of inflammation, with more or less induration of the tissue,

there is no doubt that the quickest results may be obtained by cutting off a portion of the diseased lobe of the ear; this, however, disfigures the animal very much. This operation is generally performed on animals under the influence of ether. First remove the hair and thoroughly disinfect the parts and cut off a circular piece from the ear that will include the torn portion, being careful not to remove any more of the lobe than is actually necessary. Another method is to cut off the edges of the slit ear a thin section about one-eighth of an inch in thickness, so as to insure two raw fresh surfaces. The two edges of the wound must then be drawn together by means of sutures. These should not be inserted too close to the edge of the wound, as they are apt to tear through. The stitched line is then powdered with sulphonal. The external ear is covered with wadding, turned over the top of the head, and held in position by means of a bandage, as indicated in Fig. 152 and 153.

The writer has been able to obtain satisfactory results in slight cases of external otitis and canker by covering the ulcer with oxide of mercury and tying the ear in a cap.

Inflammation of the External Auditory Canal—Internal Canker.

(*Otitis Externa.*)

This consists of an inflammatory irritation of the external canal of the ear. It occurs most frequently in dogs with long ears. It is generally of an eczematous nature and appears in a diffuse form, extending over a larger part of the lining of the ear. It is accompanied by redness, swelling of the membrane, and an exudation of a serous, and, later in the chronic course, a purulent secretion. It involves the papillary body and the wax secreting glands of the ear. The skin is tumefied, red and warm; there is abundant epithelial desquamation; the ceruminous glands secrete a very much increased amount of abnormal wax, which collects with the secretion of the ear. In some cases the discharge becomes purulent and is found lying in the ear in the form of a viscous fluid, varying in color from yellowish-brown, gray-brown, yellow-brown, or dark brown. This discharge may irritate the skin of the lower part of the ear, causing an erythema. We may also have the formation of abscesses and contraction of the meatus (caused by thickening of the cutis, by granulations, and by polypus malformations). We may have acute inflammation of the canal extending deep into the lining, and perforations of the tympanum and irritation of the Eustachian canal and discharge of pus into the pharynx. Abscesses of the parietal bone have been observed.

Etiology.—The causes are similar to those mentioned under eczema. It is due to an accumulation of cerumen, dirt, cutaneous scabs, and

foreign bodies; also too frequent bathing with soap is a common cause of irritation. Sporting dogs, such as spaniels, setters and retrievers and Chesapeake Bay dogs, from going into icy cold water. It may accompany or follow distemper, or by extension of inflammatory processes from the surrounding tissues, such as injuries, bites, etc. It is also recognized that otitis is produced by acari. (See Parasitic Otitis, page 439). Hoffmann states that he has observed serious suppuration in cases where dogs' ears have been clipped too close to the head.

Clinical Symptoms and Prognosis.—Great care must be used in making the first examination of the ear to distinguish between superficial and deep external otitis. In the former form it may rapidly become chronic. The animals shake their heads, and, as the disease is almost invariably located in one ear only, they hold their head in an oblique position, trying to scratch the head about the base of the ear or to rub it against some object. They carefully avoid any attempt which is made to touch the ear, and show great pain when the base of the concha is touched. Milder cases rather encourage manipulation of the ear and if the ear is gently rubbed they show every sign of pleasure. In examining the external ear we use a forceps-shaped speculum or ear-mirror (Fig. 156). If we distend the canal we generally find it filled with a fœtid, grayish-green, or reddish liquid consisting of glandular secretions, fungi, cutaneous scabs, pus, acari, etc. After the organ is cleaned out we find an intensely red, swollen, sometimes ulcerating surface of the skin. In the deep-seated cases the meatus is almost entirely closed by thickening of the cutis and an abundant purulent discharge from the ear (otorrhœa). Numerous granulations appear quickly and in some cases where both ears are affected we may have symptoms of impaired hearing or deafness. A characteristic smacking or sucking liquid sound is produced by side pressure or rapid compression on the base of the ear.

Fig. 156. Kramer's ear speculum.

The general condition of the animal is very seldom affected. Vomiting is only observed in exceptional cases; this is said by Froehner to be due to pressure on the auditory branch of the vagus. Vertigo, spasms, and epileptiform convulsions sometimes follow where acari are present in enormous numbers.

Therapeutic Treatment.—The treatment which corresponds with that of eczema is generally followed. We must thoroughly clean the external ear. This can be done by tying a piece of absorbent cotton or a piece of sponge on the end of one of the ordinary orange sticks used in manicuring (Fig. 157), dipped in alcohol or ether; warm water, made

slightly alkaline, can also be used—the two former, however, are to be preferred. When the condition is chronic a syringe must be used to get into the deep parts of the ear and the best for this purpose is one made entirely of soft rubber with a long flexible point that can be pushed into the meatus without any great danger of injuring the canal; the flexible point adapts itself to the turns of the external ear canal, and by using applications of warm water injected into the meatus the latter can be thoroughly cleansed of accumulated cerumen, crusts, etc. The canal is then dried with absorbent cotton introduced into the ear on the end of a small pair of forceps. In some chronic cases great benefit is to be had from injecting peroxide of hydrogen into the ear, as it cleans it out thor-
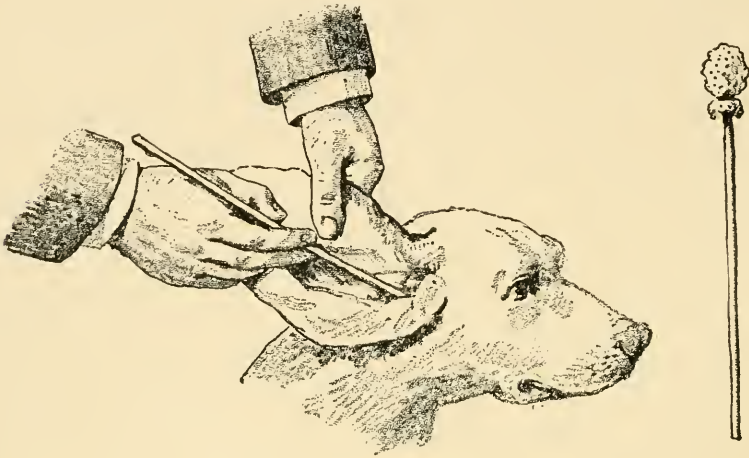
Fig. 157.—Ear swab and mode of using it.

oughly, but under no circumstances must this be repeated frequently as the peroxide solution, while it has great cleansing properties, if repeated frequently, attacks the normal structure of the ear and frequently the writer has had brought to him cases where the whole inside of the ear and concha was a mass of granulations, in what was originally a very mild case, caused by the action of the peroxide solution.

Syringings with water and fluids of any kind must not be used for any length of time, as they are apt to carry the débris of the condition, such as wax, pus, mucus, scab, etc., down into the middle ear. On the other hand, it is well to clean out the ear thoroughly once or twice with a syringe with a flexible point. As the meatus is elongated, narrow, and slightly curved, there is not much danger of injuring the tympanic membrane. In very slight affections of this character, which may be recognized by a slight redness of the membrane, itching, and the presence

of a certain amount of fluid, it is only necessary to clean the meatus once or twice, using solutions of lead-water. The writer has found that simply powdering with lycopodium, amylum, talcum, or boracic acid and filling up the ear, and then massaging the base of the concha to work the powder well down into the ear, is much preferable to any of the above-mentioned liquids.

A mode of procedure suitable to most cases is to clean the ear with wood alcohol, filling in the cavity and working the alcohol into the canal by manipulation of the base of the ear. It is then to be dried thoroughly with absorbent cotton until all trace of brown coloration, characteristic of this condition, is removed. Then fill up the ear with powdered boric acid, working it thoroughly into the canal, and covering all the inflamed portions. This should be repeated every third day until the irritation is lessened, and then after that, once a week. With this treatment also prescribe a laxative, such as a tablespoonful of saturated solution of sulphate of soda (glauber salts) or some of the saline laxative waters. If there is eczema present, add to the treatment two drops of Fowler's solution, morning and evening.

In serious diseased conditions where there is much ulceration, we may treat them in two different ways:

By syringing the ear with solutions of disinfecting and astringent agents, such as salol in alcohol (1 to 10), tannin in glycerin (1 to 10). This must be repeated several times, and we may also dry up the secretion by means of oxide of zinc or boric acid; the latter is to be preferred. Hoffmann advises us to use subnitrate of bismuth or sulphate of copper in starch. As a rule, the general treatment with powders is preferable to that with liquids, but the latter must be used when the meatus is much contracted and the ulcers located deeply—dermatol in starch powder, 1 to 10; salicylic acid and talcum powder, 1 to 15; tannoform, thioform, dymal, itrol, etc. An ear-cap is only necessary when the animal is constantly shaking its head and the organ is very sensitive. Where there is great pain a few drops of 4 per cent. solution of cocaine is useful. We remove the numerous granular accumulations by means of nitrate of silver. If there are polypus enlargements they may be touched with a thermocautery or cut off with a wire écraseur. When the auditory canal is narrowed by extreme tumefaction of the tissues, frequent syringing with warm salicylic acid solution, 1 to 35, is very useful.

Ŗ.	Zinc oxide,	3.0
	Talc,	12.0
	M. F. Pulv. No. I.	

Sig.—Ear powder twice daily.

℞.   Bismuth subgallate,   3.0
         Amyl nitrite,
         Talc,   āā 6.0
      Sig.—Twice daily.

℞.   Phenyl salicylate,   2.0
M. F. Spts. vini rect.,   80.0
      Sig.—Put a small portion in the ear once daily.

Hoffmann states that in a very obstinate case he excised the entire lower region of the meatus, introduced a drainage-tube, and treated the wound with disinfecting powder.

Deafness, Partial or Complete.

External otitis may sometimes produce either partial or entire deafness. Both of these conditions are due to the entire closure of the external auditory canal either by swelling and filling up with granulations or by polypus formations, collections of wax, etc., and more rarely by extension of the inflammatory process in the middle ear, destroying the tympanic membrane, or up the Eustachian tube from the pharynx or inflammation of the labyrinth, or paralysis of the auditory nerve, as well as certain pathological processes in the cranium, and as a result of certain infectious diseases, particularly distemper. Of course, any disturbance of the sense of hearing or entire deafness which comes from old age or is hereditary will not show any of the symptoms already described. Breeding a pure white-coated dog may produce a congenital deafness. This is particularly seen in bull terrier puppies; in certain strains of this breed it is a common occurrence. The examination generally showed atrophy of the auditory nerve. When a dog is getting deaf he changes his manner very much. He seems strange, does not answer to the call of his master. In certain cases, when an animal is deaf, the loudest call has no effect on him, but a slight blow on the floor immediately attracts his attention. This should be carefully noticed, as certain kennel men, when a dog is protested at a bench show, know this and when they call on their dog at the same time they give a sharp tap on the floor with their heel, which immediately attracts the dog's attention.

When dogs are born deaf they either do not attempt to bark or, if they do, it is a peculiar cry more like a howl.

As a general rule there is very little result from treatment. Where deafness is due to paralysis of the auditory nerve, the administration of strychnine or the faradic current should be tried. Treatment in congenital deafness is hopeless. Where there is a contraction of the external meatus, we may try to dilate it by means of the introduction into the canal of cylindrical compressed tampon sponges.

Parasitic Canker of the Ear.
(*Parasitic Otitis.*)

Dermatophagus Canis.

The symbiotes auricularis (canis) is a parasite that inhabits the ear of the dog, causing an aggravated form of canker (Nocard and Sewell). The parasite which is common to the dog and cat is said to produce a peculiar form of vertigo.

The parasite differs from the common symbiot by the absence of abdominal lobes in the male, which are represented by a notch which has three bristles. The pubescent female has four pairs of legs which are simple knobs. The male is 30 mm. long and 23 mm. wide, and the female is 42 mm. long and 29 mm. wide (Neumann) (Fig. 158).

Hering found moths (dermatophagus canis) in an ulcer of the ear which was accompanied by a deep-seated otitis. Nocard describes minutely certain epileptiform fits in which the dog had a peculiar husky cry and rushed about violently, running into various obstacles, and finally fell insensible, and after a number of such attacks became totally deaf. Sewell describes the condition as finding a collection of brown or sooty-colored cerumen in the ear. If the inside of the ear is examined closely a number of tiny white specks, the size of the eye of a needle, are seen to be rapidly moving about the ear, and he believes that the tickling sensation caused by these movements and the biting of the parasite are what produce the irritation of the lining membranes of the ear. Boden examined every case brought to the Dresden canine clinic, but failed to find a case due to parasites. Frick after numerous examinations had the same result. Cadiot and Newmann describe a parasite which causes parasitic otitis (acariasis auricularis, otacariasis).

Symptoms.—The ear is hot and slightly swollen, and on examination it is hard to distinguish it from ordinary otitis. There is, however, less discharge in this condition. The head is carried to one side, and the animal will scratch the base of the ear very gently with its paw and whine in a plaintive way. After having observed a number of animals infected with the parasite, the writer is inclined to think that the carrying of the head on one side and the gentle scratching of the ear are characteristic of the disease, although it is quite as frequently seen in non-parasitic otitis. The epileptiform symptoms described by Nocard have never been observed.

Treatment.—Nocard recommends naphthol 1 part, ether sulphuric 3 parts, and olive oil 10 parts. This should be injected into the external auditory canal once daily, and the ear plugged up with cotton to prevent the escape of the ether. The latter procedure is not advisable, for if the

ether is confined in the ear it causes great irritation, and the author has found from experience where he has followed this procedure that while he may not have observed epileptiform fits before the treatment, he has had symptoms simulating them very much after the ear was injected with ether and the cotton plug put into it.

Sewell advises the application of the following liniment:

R.   Ung. hydrarg. nit.,   4.0
      Oleum amygd.,   32.0
      M. S. Apply a small amount to the inner surface of the
           ear with a camel's hair pencil.

The ear should be first cleaned out with wood alcohol, and then apply the above.

DISEASES OF THE SKIN.

INFLAMMATORY CONDITIONS OF THE CUTANEOUS MEMBRANE.

Inflammatory symptoms of the skin vary according to their intensity, character, or location. The slightest irritation may produce redness, either with or without swelling—this is defined as erythematous inflammation; or we may have a formation of circumscribed, solid, firm protuberances, papillæ, pustules, boils, or granulations. These are ascribed to exudations originating partially in the papillary body, in the Malpighian membrane, and also in the neighborhood of the follicles.

The inflammatory exudation may become reabsorbed in certain cases, so that after the acute period of the disease has passed, the epidermis, which has become loosened, is gradually desquamated in the form of scabs or crusts. We also occasionally see a dark pigmentation after the disease has run its course. This originates from the hæmoglobin of the extravasated red blood corpuscles. If the inflammatory processes and exudations increase gradually in the cutaneous tissue, we may observe two different results. The inflamed location may become covered with a moist, liquid exudation, or the horny layer of the epidermis is raised up by the fluid, and we may have vesicles which raise the granular layer of the mucous strata, and also the deeper layer of the membrane becomes destroyed in the affected region. In the first case it is covered by the deep layers of the membrane; in the latter case the upper surface of the corium is exposed, having lost its vesicular covering.

The liquid which fills the small or large vesicles is deficient in cells in the early stages of its formation, and the liquid is clear or slightly yellow. Later it becomes turbid by the addition of leukocytes, and a number of whitish-yellow cells fill the fluid. In some cases it has this appearance from the very onset. When the liquid contained in the vesicle is yellow and filled with cells it is called a pustule. Sooner or later the covering of the pustules becomes ruptured, and the fluid dries up in a yellow, gray, or brown crust, under which the regeneration of the lost epidermic layer goes on rapidly.

Now and then the inflammatory process shows it is in the neighborhood of a follicle and its sebaceous glands, and we have the formation of a dark red, very sensitive nodule, and finally suppuration of the same membrane and its adjacent tissues. As a consequence of this we find

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that the glands and canal of exit are filled with purulent or bloody matter. Soon the internal follicles become involved; the masses of matter can be easily pressed out of the orifice of the follicle, and we may have an elasticity of the purulent cavity surrounded by infiltrated cutis in which we find the hair has become entirely detached from the follicle and falls out. This condition is generally a rather serious affection in the dog, as in this animal there are always several follicles which are accumulated into one group with a common orifice, and in every case of cutaneous disease we find a group of affected sebaceous glands.

In very bad cases peri-glandular and peri-follicular inflammation may become so acute that we see the formation of an extended nodule-shaped, dark red swelling, forming a so-called "boil." This is marked after a certain period by a yellowish-green, necrotic thrombus, which becomes detached by purulent disintegration of the surrounding tissue, and is sloughed after the pus has been discharged. In such cases we find that not only is the external surface of the skin impaired, but the corium is affected, and as the follicles are destroyed the hair does not return. The formation of abscesses and ulcerations, also inflammations of the skin, will be discussed further on.

In chronic cutaneous inflammation we may see the formation of hypertrophic as well as atrophic conditions. In the former case we find as a consequence of the constant increase and congestion of blood in the part the formation of superfluous connective tissue, whereby the skin may be thickened several times its normal size and may form large folds or collosities, and in rare cases club-shaped or warty elevations. In the latter case the corium becomes thinner. This is also the case with the epidermis. Its tissue is either greatly reduced or greatly increased in size, and in the latter case the epidermic cells which proceed from the deep part of the tissues do not undergo any horny degeneration, but rather a drying, mummifying process, covering the membrane in the shape of numerous whitish or white-gray scabs.

NON-PARASITIC DISEASES OF THE SKIN.

Erythema.
(*Redness of the Skin.*)

Erythema, due to disorders of the circulation, is the mildest form of inflammation of the cutaneous membrane and consists either of normal hyperæmia of the corium in its upper layers (erythema simplex, erythema congestivum), or it may be due to a slight sero-cellular infiltration of the membrane of Malpighi—erythema exudativa (dermatitis erythematosa).

Etiology.—Erythema is a local irritation of the skin and originates as the result of various external cutaneous irritations which may be mechanical, chemical, or thermic—for instance, animals with thick, wooly coats, having their coats cut short or shaved to the skin; from irritation of the skin between the toes, caused by running through sand; by friction of the collar upon the skin of the neck; bathing in strong creolin mixtures—coal oil, benzine—lying on rough boards; bites of insects; on the abdomen from ammoniacal urine (in catarrh of the bladder); in catarrh of the prepuce, and by slight burning or freezing. Erythema may also appear in connection with various cutaneous diseases, such as eczema, scab, and canine varioloid, and the presence of an enormous number of fleas.

Clinical Symptoms and Course.—The symptoms consist of a bright arterial redness of the cutaneous membrane, which disappears under pressure of the finger, but reappears immediately after, and may be complicated in some cases by slight swelling of the epidermis. As a rule, the affected portion is reddened, but not irritable, although, as a rule, the animal evinces pleasure on gentle rubbing of the skin. The course is usually short, depending to a large extent on the cause. When this is suppressed or removed, especially after the itching and rubbing have discontinued, erythema disappears, and in certain conditions it is followed by desquamation of the upper membrane. There is, however, a more or less dark red spot left after the acute symptoms of the disease have lessened. These finally disappear, but very slowly. This is particularly noticeable when the irritation is due to preputial secretion or ammoniacal urine.

Therapeutic Treatment.—There is not, as a rule, any great irritation. It will be sufficient to remove the cause in order to remove the erythema. If there is a certain amount of irritation, we must lessen it by bathing the animal with lime water and sponging the affected parts with any of the following solutions: lead-water; solutions of alum; bay rum; cologne; benzoin 1 part, alcohol 30 parts; ichthyol or salicylic acid soap; rubbing with salicylic oil (1 part of salicylic acid dissolved in 35 to 40 parts of olive oil and heated slightly); or a mixture of 1 part of glycerine and 5 parts of water; or 1 part of carbolic acid, 10 of alcohol, 10 of water; or 4 parts of creolin, 100 of water; or 1 part of ichthyol, 10 of glycerine, 30 of water; or 10 parts of nitrate of silver, 100 of water (Friedberger). Frequent dustings of talcum powder is one of the most efficient remedies.

In very obstinate cases we may also use laxatives or purgatives (aloe, jalap, salines, etc.), also the internal administration of arsenic in the form of Fowler's or Donovan's solution.

Urticaria.
(*Nettle-rash.*)

This disease is an acute irritation of the skin, indicated by the formation of circumspect elevations from one to one and a half inches in diameter, and due to a vasomotor neurosis (angioneurosis) of the skin.

Etiology.—This disease is comparatively rare, and except where we can trace it as being due to some known external irritation, such as stings of insects—leptus autumnalis—or turpentine. The real cause of the majority of cases of urticaria is not understood, being due to some internal irritation, the cause of which is unknown. This is classed under the general head of idiopathic urticaria. In the majority of cases it certainly is due to some disorder of the intestines (catarrh of the intestines, constipation, etc.), and it is supposed that faulty assimilation caused the admission into the circulation of certain toxic substances which get into the circulation and are eliminated by the skin, causing local irritation. Schindelka saw a mastiff bitch which was affected with vaginal catarrh and condylomas of the vagina and accompanied by general urticaria, and also saw the same condition in a poodle bitch, during her period of heat. Urticaria may also follow rapid cooling after the animal has been in a great state of excitement. It has also been seen during dentition of the permanent molars.

Clinical Symptoms and Course.—The manifestations of nettle-rash generally show themselves without any previous fever or other phenomena, such as want of appetite, depression. There appear over the entire body circumspect flat hemispherical elevations, varying in size from a pea to a large bean, on which the hair is ruffled and staring. When two of these elevations become confluent the elevations are much larger; the skin may be itchy, but this is rare. The course is rapid, frequently twenty-four hours after the eruption appears the rash has entirely disappeared, but occasionally a new crop of elevations appears or the disease may take a chronic course (urticaria chronica), but this is only in very rare instances. The eruption may last for a number of days, and when it disappears it leaves a peculiar pigmentation of the skin. Schindelka has called this urticaria pigmentosa.

Treatment.—In the acute cases, the condition disappears before treatment can be of use. In slower cases, as a rule, saline laxatives, saturated solution of sulphate of soda, Hunyadi Janos, Apenta; and when there is itching use some of the local preparations recommended in erythema.

Eczema.
(*Red Mange.*)

By this we mean fat mange, summer mange, phagedenic scab, scale scab. It is a cutaneous disease which appears in all breeds; it is non-contagious and is an inflammatory condition of the cutaneous membrane indicated by redness, swelling, nodules, pustules, fissures, scabs, and crusts, which are generally accompanied with more or less itching. In the first stages development of a hyperæmia is seen, thus reddening the skin superficially, and accompanied by a serous exudation. If the inflammatory irritation stops, or if proper therapeutic measures are taken, recovery may occur at once, and we have a more or less prolonged desquamation of the epidermis. In the majority of cases, however, the irritation increases and we find the formation of numerous pale red, tough, itching nodules, accompanied by serous swellings and slight cellular infiltration of the papillæ, but generally it is connected with the cutaneous follicles. This condition may become retrogressive; the nodules become depressed, forming scabs. In other cases the serous exudation increases constantly inside the papule, and, as a consequence, we have a rising of the external cutis in these locations; or, in other words, numerous vesicles are formed (eczema vesiculosum). If the external cutis is strong enough to resist the accumulated exudation for some time, the contents of the vesicles gradually become milky and pus-like, on account of the entrance of colorless blood-cells into the tissues (eczema pustulosum).

In other cases the vesicles burst or are scratched open; the skin is dark red in large blotches, and is marked by fine furrows which correspond with the location of the ruptured vesicles. The eczematous exudation oozes freely out of the upper surface (eczema rubrum). It is a common occurrence to see the detachment of small portions of tissue which are located between the numerous furrows in the epidermis. Thus the whole surface of the skin is stripped of its ornyh layer and may become filled with pus. The oozing liquid dries rapidly and becomes a scab or crust (eczema impetiginosum), which is pushed away gradually by the consecutive exudation, and finally becomes hard, dry, and firm. Inflammation and swelling become gradually lessened under the crust, and we have the formation of a firm epidermic cover, from which the crusts gradually become detached. The diseased membrane, which is now exposed, is not swollen to any great extent, but very red (sometimes marked with dark, livid pigmentations) and covered with numerous loose scabs which constantly fall off and are renewed from time to time (eczema squamosum).

Etiology.—The etiology of eczema is of great importance for es-

tablishing the correct prognosis, as no cure can be obtained until after the cause of the trouble is removed. The first thing we must do is to lessen the mechanical irritations, such as appear under the collar and on the testicles. But the lesions which the patient inflicts upon himself are of very much more importance, for we see it in all forms of itching eruptions of the skin, in erythema, in cases of parasites of the cutaneous membrane—flies, lice, acari—in great accumulations of dirt, scabs, and falling out of the hair. We also find attacks of eczema which extend very fast, and in some cases may go all over the body.

As regards the second group of agents which cause eczema, they are chemical irritants, especially those which have an influence upon the tissues, such as acids, alkalies, mixtures of mercury, also tar and carbolic salves, combinations of ether and oil of turpentine, of mustard, and also tar-soap.

The third group is formed by a number of thermic irritations, namely, excessive high temperature, but not high enough to produce vesicles.

Eczema appears more frequently in summer than in winter, and we have a great deal more difficulty in healing it during the summer weather. We also have a number of eczematous formations for which we can find no cause. In such cases the disease has been ascribed to acids in the blood or diseases of the nervous apparatus, and also to vegetable parasites, and as the sensible perspiration in the dog is so slight, it is very apt to cause irritation when the skin becomes congested, checks the secretion of the glands and retains the natural excretions. There is no doubt that various fermentative and toxic processes occurring in the intestinal tract are factors in the production of eczema rubrum, and that dogs have the disease annually, and associated with constipation. Eppinger contends that too much meat is not the actual cause as he has cases where the animal has had moist itching eczema and treated the animal with various drugs without result, and finally gave the animal a meat diet, and in two weeks the animal was entirely recovered. This, however, must have been an individual case as experience is that a strong meat diet is invariably one of the causes of this disease.

Clinical Symptoms and Course.—Eczema may appear in any breed of dogs and in any region of the body without regard to age, sex, etc. It is usually seen on certain regions of the body (back, head, neck, and external surface of the extremities).

There are three general forms of eczema without taking into consideration the changes which may be produced by irritation, scratching, or rubbing.

(1) **Acute Moist Eczema.**—This may develop year after year and in dogs of all breeds. The longer haired dogs seem, however, to be more

liable to it. It affects certain localities of the body more than others—
the neck, jaws, elbow, on the back anterior to the tail, and the outside
of the thigh. The first type is restricted to small, irregularly circum-
scribed regions, but has a tendency to extend to the neighboring tissues.
The eruption begins as eczema papulosum with close nodules. The skin
becomes red in irregularly circular patches varying in size from a
quarter (shilling) to the palm of the hand (Fig. 158); there is increased
heat and the skin thickens, the hair stands up, and soon a number of
small vesicles are seen, which burst and discharge a pale yellow viscid fluid,
and in from twelve to twenty-four hours there is partial or complete
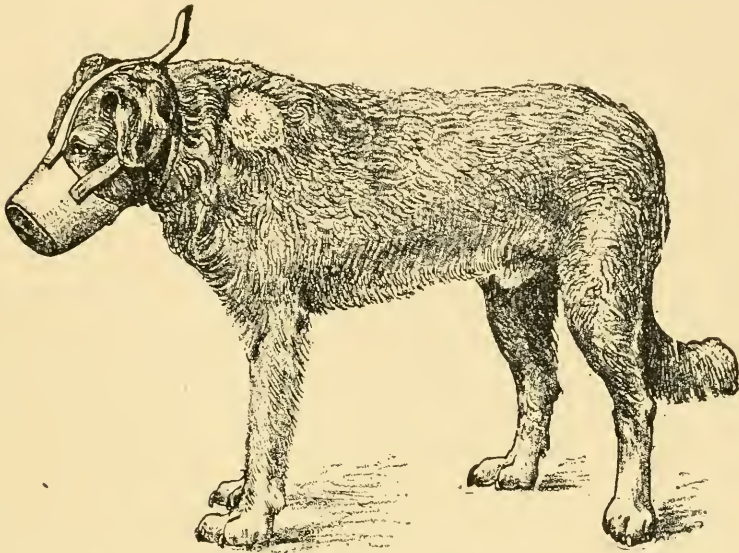
Fig. 158.—Moist eczema of the shoulder, and muzzle to prevent the animal biting it.

loss of hair. This rapidly changes into the vesicular layer by alteration of
the nodule, and finally we see the appearance of the median stage.
This has a more or less extended surface without skin or hair, and shows
a bright red, serous, sero-fibrinous or purulent exudate, very painful
to the touch, and having a great tendency to extend to the adjacent
tissues (phagedenic scab). The stage of crustation follows very slowly;
the exudate dries, forming a yellow-green to brownish crust which is
firmly fixed to the skin and if not rubbed by the animal forms a thick
scab that may fall off in a few days, but generally it is two or sometimes
three weeks before it finally comes off, leaving a glossy, hairless, deep
red or pigmented surface, with more or less gray scales. The surface
soon becomes covered with fine hair, which soon grows very rapidly,
covering the spot very quickly. This termination is frequently altered

by the animal scratching, biting or gnawing the itchy surface, particularly when the sore is on the side where the animal can scratch it with the hind legs, or on the thighs or back where he can bite it. In rare instances the animal may so lacerate the affected portion as to cause permanent loss of hair. The course of this disease depends on whether it is treated early, for if neglected its course is apt to be slow or it is apt to degenerate into the chronic form, particularly in older animals.

Chronic Eczema. Dry Eczema. Scab Mange.—The second type shows from the beginning an inclination to extend. In is generally
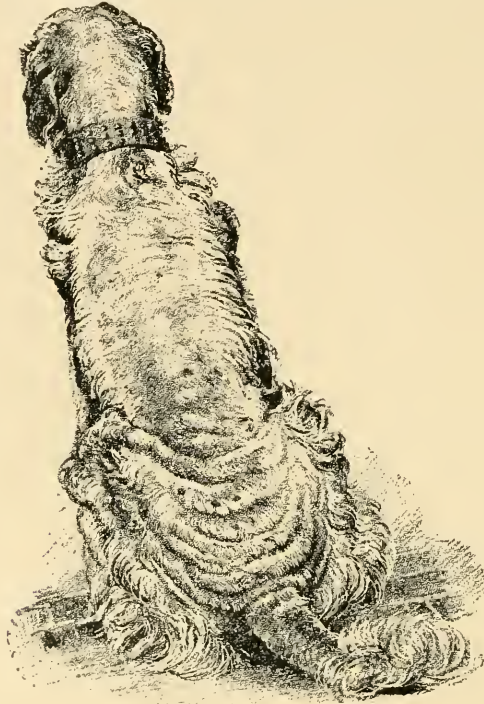
Fig. 159.—Chronic eczema of the back.

observed in sluggish, well nourished dogs, and while it may occur in all breeds of dogs, it is more apt to be seen in short-haired dogs. It commences on the back at the root of the tail and extends gradually up the centre of the back, each succeeding attack going a little further forward until it finally reaches the neck. It is sometimes observed at the base of the ear, around the anus and the extremities; the scrotum is also a seat of the disease, and in exceptional cases the entire body is attacked (general eczema).

In the early stages we see it as eczema erythematosum with formation of scattered papules. These are scratched open on account of the

great itching they cause, or they become altered into pustules. Later
we see the appearance of small scabs under which regeneration of the
epidermis occurs, the hair falls off or frequently long solitary hairs are
found, the skin is thickened, developing wrinkles, crevices which fre-
quently are raw, and the surface dull, lead colored, "elephant hide"
in appearance (Fig. 159). In the other regions desquamation of the
epidermis follows, particularly in summer; the animal, from the intense
itching, scratches and tears the skin, converting the entire surface into a
raw bleeding space with spots of pigmentation. There is more or less
itching, but the irritation is not nearly so great as in sarcoptic mange,
and is limited to the affected skin.

In chronic eczema the condition gradually creeps up the back,
becoming broader and assumes a dull dark lead colored "elephant hide"
look, with long unhealthy hairs here and there, or else this condition
may prevail during the summer months, defying all forms of treatment,
and when the cool autumn months come the irritation gradually sub-
sides, the hair begins to return, becomes thick and normal by January
or February and remains so until July or August comes, and the con-
dition returns.

The following is a list of remedies useful in eczematous eruptions:

Ichthyol ointment, 2 to 5 per cent., with equal parts of lanolin and
cosmoline.

Ichthyol tar-soap moistened and rubbed on the itching parts and
allowed to dry.

Permanganate of potash solution of the strength of 1 to 3 per cent.
where the skin is peculiarly irritable.

Where the surfaces are widespread and moist, dust with equal parts
of talcum, lycopodium, and boric acid.

For use in the house on pet-dogs that have the range of the parlor
and lounge on the rugs and furniture, try a 15 per cent. solution of
hyposulphite of soda.

Creolin baths of the strength of 5 per cent. will give very great relief
for many hours.

In the finer toy varieties, try a 1 per cent. solution of trikresol; ten
grains of boric acid to the ounce of this solution adds to its efficacy in
some cases.

Chloro-naphtholeum, two ounces to the gallon of water, is a useful
medicated bath for the large varieties of dogs, and is destructive to
parasitic forms of life.

Trikresol soap is far safer and better than carbolic acid soap for
bath purposes when washing dogs frequently.

Do not use bichloride of mercury solutions in moist eczema.

Starch and oxide of zinc may be used separately or in combination
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as a dusting-powder alone, or after any of the watery solutions and tend to hasten healing of broken or denuded parts.

In chronic and long-standing cases, where fissures of the skin have formed and the animal tends to bite the affected parts, causing bleeding, touch them a few times with Monsel's solution of iron, and then use one of the powders.

For softening the parts, equal portions of lanolin and pure cosmoline, with ten per cent of boric acid, will be found useful and cleansing.

Itching of the Skin Without Presence of a Rash.—This condition may extend over the entire body or it may be limited to the back or abdomen, or the internal surface of the thigh. Frequently there is intense itching, with little or no evidence of change in the skin. The skin appears red in some cases with only the slightest evidence of papules. In some cases the animal will scratch constantly, and at night the itching is apt to be particularly violent (this is seen generally in animals that are particularly well fed, house pets that are bathed often). They scratch their sides with the paws, bite different portions of their anatomy with the teeth, and rub under or against furniture until there is great irritation of the skin. A similar condition is also seen in dogs that have been clipped, and the short stubby hairs sticking in the folds of the skin cause great irritation, but in this condition, while the itching is intense just after the animal is clipped, in a short time the hair grows and, becoming more flexible, does not cause irritation and the itching soon disappears.

Seborrhœic Eczema. Eczema Seborrhœicum.—This generally originates from a seborrhœa sicca; it may be local or general, and is distinguished by a number of eczematous calculæ or oval disks which are either solitary or in groups, each elevation being clearly outlined from the other. There is no itching, as a rule, and if there is, it is insignificant.

Eczema of the Toes. Interdigital Eczema.—Eczema between the toes is quite common. It is apt to occur in well-fed, well-taken-care-of house pets, and also a certain number of cases originate from actual external influences, such as sporting dogs in the field working through stubble, short grass and weeds; generally, however, it is due to good feeding and want of exercise, and may occur in any of the various forms—eczema vasculosum, eczema medidans, or eczema pustulosum.

Therapeutic Treatment.—In the treatment of eczema we must consider the following facts:

(*a*) That in many cases the tar preparations which have been used almost exclusively are very harmful, as is also the method of systematically washing the animal with strong alkaline or carbolic soaps. The first thing to do is to give attention to the causes and find out from what cause the itching really occurs, as many cases of eczema disappear as soon as the irritation has been suppressed.

We must first remove any cause of irritation that would tend to aggravate the condition—such as dust, scales off dandruff, parasites—or anything that would tend to prolong the condition. Filthiness of the skin and hair must be removed by bathing the animal thoroughly, taking care to use a clean superfatted soap that does not contain too much alkali, and particularly avoid various soaps that contain crude carbolic acid or the irritating coal-tar products, so frequently seen in the "dog soaps" sold. It must be borne in mind, however, that too frequent bathing is apt to act as an irritant in eczema and while it should be used to remove dirt, it must not be used frequently, but as an actual necessity. In acute squamous eczema, the irritated spots can be dried up by pressing absorbent cotton on the sore, which has been saturated with carbolized oil, lime water, boracic acid solution, creolin solution, acetate of alum, or thiol mixed with corn starch. In the acute form of eczema the hair should be clipped not only over the affected parts, but also cut a clear space in the tissues surrounding the sore. Excessive scratching must be avoided by putting on muzzles, bandages or covers over the body, or chamois boots on the hind legs, etc. Finally, care must be taken to prevent the animal licking off the medicine, which may either act as an intestinal irritant, or actually poison the animal; with the addition of muzzles, the means already mentioned should be employed. We dust the affected parts with oxide of zinc, cerussa, sulphur, or thiol, talcum powder, corn starch, magnesia containing bismuth subnitrate, dermatol; salicylic acid in talcum powder is particularly useful. If the affected parts are very moist, they may be dusted with lycopodium or smeared with vaseline.

In cases of extensive redness of the skin we must apply compresses of lead-water or thymol (1 per cent.), creolin (1 to 2 per cent.), carbolic-acid water, thiol water (20 per cent. thiol liquid, 30 per cent. glycerine, and 50 per cent. water); and where the skin is dry, an ointment of sulphate of lime, or sugar of lead in lanolin, dermatol (1 to 5) or tannin (1 to 10); but powdering is preferable as every skin is not benefited by liquid or oily preparations in the early stages. As soon as the marked symptoms of the disease have decreased we may replace the use of powder by ointments of zinc or lead, white precipitate ointment, or cold cream, lanolin, benzoin and glycerine, and benzoin and lanolin, 1 to 30, or use mild ichthyol soaps.

(b) In very moist eczema with an acute course the use of powder is not always successful. In those cases we must apply drying fluids, such as corrosive sublimate solution (1 to 1000), nitrate of silver solution (2 per cent.), 1 per cent. solution of picric acid twice daily by means of a brush or cotton tampon, and at the same time use the powders already mentioned in conjunction with these liquids. Great care must be taken

when using the sublimate to avoid poisoning, also the application of both nitrate of silver and picric acid are apt to leave more or less black or yellow stain on the skin. Oxide of zinc and sugar are recommended by Bissauge, to be dusted on several times daily. Sublimate ointments (1 per cent.) or subiodide of mercury (2 per cent.) are beneficial, but strong solutions of blue-stone or crude sulphate of iron and tormentilla root are not to be recommended.

R. Hydrarg. bichlorid.,   1.0
Glycerinum,   10.0
Spts. vini rect.,   90.0
F. M.
Sig.—To apply upon eczematous surfaces.

R. Zinc oxide,   5.0
Amyl. pulv.,
Talc,   āā 10.0
F. M.
Sig.—Dusting powder.

R. Bismuth subgallate,   3.0
Talc,   20.0
F. M.
Sig.—Dusting powder for moist eczema.

(c) In cases of pustula we may use the same treatment as is indicated in *b*, after having pressed out and emptied the pustules. The writer has also obtained good results with ichthyol liniment and salicylic ointment (see Acne).

(d) In chronic eczema, when it has reached the scaly stage, we must first clean the skin thoroughly with some mild, non-irritating soap, but not carbolic or tar soap. The best kind to use is Castile, ivory, green German soap, or the pure potash soap of the Pharmacopœia. The writer has had good results from "Hebra's" alcoholic potash soap:

R. Saponis kalin. venal.,   200.0
Alcohol,   100.0

Hebra's soap is poured or rubbed upon the surface which is thickly covered with crusts, and on the following day they are removed easily without subjecting the animal to much pain. After careful cleansing we use the same agents as are used in the moist forms of eczema—zinc powder, corrosive sublimate, or nitrate of silver.

(e) In chronic eczema, we use tar and ichthyol and resorcin. The first is used either in the form of solutions of tar or combinations with oils. These preparations are used with good results in the chronic forms of eczema where there is considerable cutaneous thickening, with cracks,

fissures, etc. Ichthyol is especially useful, and when used in concentrated form in ointments or liniments, it is much more valuable than tar preparations, because it relieves the itching or irritation in a very short time. Its high price bars its use to a certain extent when it is to be used in a kennel of dogs. Resorcin is also used in spiritous solutions. It has the disadvantage of staining the hair of light colored animals yellowish- or brownish-green, which takes a long time to wear off. In chronic cases, alcoholic preparations of benzoin, 1 to 30, are very useful, to be well rubbed into the skin daily.

R. Oleum picis, 3.0
Spts. vini rect., 2.0
Ether sulphuric, 1.0
F. M. S.—Rub into the parts every third day.

R. Picis liquidæ,
Saponis kalin. venal,
Spirit dilut., āā 50.0
Sig.—Apply once daily.

R. Creolin,
Sapo kalin venal, āā 100.0
Spts. vini rect., 50.0
F. M.
Sig.—Rubbed in daily. (Frohner.)

R. Ammon. sulfo-ichthyolic, 12.0
Aqua calcariæ,
Oleum olivarum, āā 60.0
Sig.—Apply upon the thickened membrane once daily. (Frohner.)

R. Resorcin, 3.0
Spts. vini rect. dil., 120.0
F. M.
Sig.—Rub into skin daily.

R. Acid salicylic, 5.0
Ol. Fusci, 25.0
Sapo. viridi. 150.0
Sig.—Soap for chronic seborrhœic eczema.

R. Acid salicylic, 3.0
Ol. olivæ, 100.0
F. M.
Sig.—Rubbed into the skin daily.

That form of eczema described under the head of itching of the skin without the presence of papules generally resists treatment. Frequent bathing with the various strong soaps, sold as "dog soaps" con-

taining active irritants, such as tar, crude carbolic acid, and various other chemicals supposed to destroy fleas, tends to irritate the skin and increase the itching. First, the blood which is generally too rich from overfeeding, or too little exercised, must be purified by the internal administration of salines, such as a tablespoonful of saturated solution of sulphate of soda (glauber salts), once daily, or the same amount of Hunyadi or Apenta water, and when the animal is bathed it must be with the mild superfatted soap, containing little alkali and some soothing preparation, such as benzoin or ichthyol. Frequently bathing has been found to aggravate the condition. The animal should be rubbed daily with bay rum, spirits of camphor, or benzoin, 3 parts, lanolin 1, and alcohol 2 parts, or salicylic acid and alcohol (1 to 30), or resorcin and lanolin (1 to 50), and internally the regular adminstration of some of the arsenical combinations—sulphuret of arsenic, 1–200, Fowler's or Donovan's solution, in 1-, 2-, or 3-drop doses. These arsenical preparations must be always given in the food, for when given on an empty stomach are very apt to cause vomiting; at the same time the animal must be exercised, the amount of meat must be lessened to a minimum, and the diet be soups containing vegetables and stale hard bread or toast.

(*f*) If there is considerable thickening of the skin, and if the latter is covered at the same time with scabs, we can obtain good results by rubbing salicylic oil (1 part salicylic acid in 35 parts of warm olive oil) over it daily for a week. If this does not succeed, which, however, is very rare, we must first use tar or ichthyol preparations and follow it up by the other. Some authors advise friction with soft soap, chrysarobin ointment, or naphthalin, and washing with potash.

For internal treatment, use saline laxatives, and where there is general disorder of the digestive tract, such as gastro-intestinal catarrh, constipation, or fœtid black stools, regulate the diet, put the animal on a mixed vegetable and meat diet, and two meals daily. The amount should be just as small as possible until the animal regains his appetite; in fact wait until he is ready to eat every meal when it is offered, before putting him back on his regular food. Yeast preparations, such as brewer's or baker's yeast, are recommended on account of their properties for stimulating the intestines.

Administer arsenic in the form of red sulphuret, 1–200 grain, or Fowler's or Donovan's solution, 1, 2 or 3 drops *in the food* twice daily. The theory that the gradual increase of the dose of arsenic until you have reached the point where the physiological effects were beginning to show on the teeth, vomiting, etc., is an error. Small regular doses continued over some time is the best mode of treatment. Care must be taken, however, not to start on too large a dose.

Acne. Furunculosis.

Under the name of "acne" we mean an inflammation of the hair-follicles and sebaceous glands resulting in suppuration. This form of skin disease is not produced, however, by follicular acari. This condition is classed as folliculitis or perifolliculitis, and in the dog is regarded as a rather grave condition, as the various follicles in the dog are frequently connected by one common follicular duct, particularly in the hair bulbs where they have a very complex arrangement with the sebaceous glands, and the irritation of one duct involves the whole hair bulb and sebaceous gland, causing extensive elevations, painful nodules, or dark bluish-red tumefactions (furuncle, dermatitis furunculosa).

This condition generally appears on the nose, cheek, side of the face, external fasciæ of the extremities, between the toes, and in some cases over the entire body.

Etiology.—Very little is known of the actual cause of this disease. Local irritations have been thought to be the cause, such as constant pressure of the muzzle, licking or rubbing the affected parts, and in certain cases to some hereditary predisposition due to alteration in the character of the sebaceous glands, to waste products or pus that breaks down and
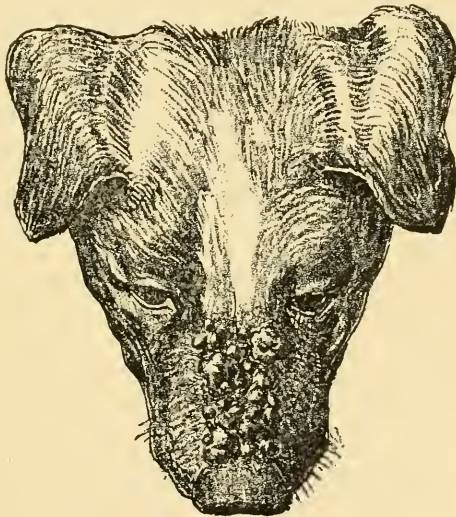
Fig. 160.—Acne of the nose.

tends to encourage the growth of bacteria which invade the hair-follicles and sebaceous glands. Dogs affected with chronic constipation are more liable to have acne.

Clinical Symptoms and Prognosis.—This disease which seems to

attack certain portions of the body more than others, particularly on the skin of the snout between the stop to the nostril (Fig. 160), cheeks, side of the skull, and between the toes; more rarely on the outside of the legs, and in exceptionally rare instances it extends all over the body, develops very slowly, beginning with redness and loss of the skin and hair. It is indicated by a series of red spots which are painful, irregular, swollen, and extend over the surface the size of a dollar to the palm of the hand. These spots are caused by the formation of a large number of pea-like nodules which are hard and firm. In some cases we find the whole surface of the skin red, hard, and very painful to the touch. After a short time the nodules become soft, discharge spontaneously a more
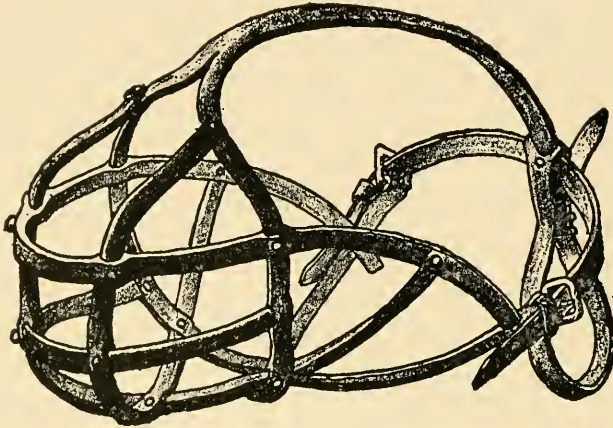
Fig. 161.—Acne muzzle.

or lesser amount of bloody pus, and contain in some cases cores of necrotic tissue.

Occasionally we see the coalescence of a number of these acne nodules, so that the skin presents a bluish-red discoloration and becomes purulent or sometimes necrosed, as if the skin was undermined by purulent collections. This may appear all over the body.

The "non-acarian" acne often presents symptoms similar to the parasitic acne (dermodectic mange) and in every instance it is always well to make a careful microscopical examination of some of the pus squeezed out of nodules to see if any of the acari are present. It has a great tendency to extend in almost all directions, and the cicatrices which appear after healing of the disease leave bare spots in different parts of the body, pink in color, streaked with lines of black pigment deposits.

Therapeutic Treatment.—The treatment consists in the removal of any known cause of the disorder—when the disease is located on the nose,

which is one of the commonest locations of the disorder, due to pressure of the muzzle, the accompanying figure shows a muzzle recently put on the market (Fig. 161), which obviates the pressure on the nose, the ordinary nose strap being replaced by a snooth metallic arch. The ordinary muzzle can be covered by rawhide, leather or wadding or, better still, the portion toward the nose faced with patent leather. The treatment consists in the energetic local application of various external preparations. If the acneous nodules are in the early part of their development, we must puncture them or open the follicles by some strong antiseptic, such as salicylic or balsam of peru ointment. In cases where purulent disintegration has gone on it is advisable to open the pustules. This is best performed by means of a small bistoury or short strong needle, and then fill in the opening with iodine or paint it with disinfecting solutions, such as pyroktanin solution (1 to 10 of alcohol), or a 1 to 1000 solution of corrosive sublimate, compound tincture of benzoin, or dusted with boracic acid, or bismuth-formic-iodide. This should be used once a day when the acne is developing.

> ℞. Acid. salicylic, 20.0
> Oleum olivæ, 40.0
> Lanolin, 80.0
> Sig.—Put a small portion on the parts once daily.

> ℞. Naphthol, 10.0
> Sulphur sub., 50.0
> Ung. petrolati,
> Sapo. viridis, āā 25.0
> F. M.
> Sig.—Apply daily.

The following should be used when the pustules have been emptied:

> ℞. Creolin, 1.0
> Acid. boraci, 30.0
> F. M.
> Sig.—Dusting powder.

Frohner advises curetting the cavities and the use of the creolin ointment just mentioned, and in some cases cauterization with nitrate of silver, or powdering with sulphonal and tannic acid. In cases of circumscribed acne it is advisable sometimes to cut out the diseased portion of the skin.

The scales or scurf must be removed daily, until the pus is cleared out and granulation has commenced, then encourage the formation of a scab by using one of the various antiseptic dusting powders or the daily

painting of the part with compound tincture of benzoin, until a thick scab is formed which protects the sores while healing goes on.

Alopecia.   Falling Out of the Hair.

By this term we mean a falling out of the hair which is not caused by actual disease of the hair.   We make a distinction, however, between general alopecia and alopecia areata.   The former is an extensive falling out of the hair, often recognized after serious disease and during the period of convalescence, as in the latter stages of gestation and during and after nursing a large litter.   The latter is a symptom of bad nutritive condition (alopecia symptomatica), and is characterized in some cases by a circumscribed or rounded herpes; this may become confluent and is especially developed on the back, tail, and external fasciæ of the thighs. In both forms it is not rare to find the skin pigmented.   Siedamgrotsky has proved that alopecia of the dog if circumscribed or diffuse, depends on the atrophic condition of the hair and infiltration of the upper cutaneous layers, and it is especially seen in dogs with silky, white or grayish hair.   Black-tipped hair, if the body of the hair is gray, is also noticeable.   This condition is very apt to be confounded with herpes, in the form of a trophoneurosis, either from a disturbance of the circulation, or the irritation of parasites.

It has been thought that certain forms of this disorder might be due to some specific microorganism, but it has not been as yet isolated and described.   There is seen in two breeds, Pomeranians and Yorkshires, a peculiar condition due to atrophy of the hair bulbs, in which young dogs, rarely over six to eight months, changing from the puppy hair to the first coat, loose the hair gradually or it falls out in spots or large areas become bare, invariably one side of the body being in perfect symmetry with the other, leaving the animal permanently bald in the affected portions.   It rarely covers over the entire body, but is seen in the hind quarters and body as far up as the anterior limbs.   The skin is bluish-black, perfectly smooth, soft and pliable, with no signs of eruption.   That it is due to some pathological change in the central spinal system is very evident as there is a perfect symmetry of the affected sides.   It is evidently due to too close breeding, when the object is to get miniature animals, as it is only seen in these toy breeds.

Therapeutic Treatment.—Find the cause; if any, remove it by treatment.   The treatment consists of washing with alcoholic soap, bay rum, benzoin and alcohol (1 to 30), and a diluted tincture of cantharides or balsam of Peru with alcohol, 1 to 10, or some of the various hair tonics recommended for man.   In alopecia areata when it is possibly due to

vegetable parasites, we should use the treatment recommended for favus and herpes.

R.   Tincture of cantharides,   5.0
      Balsam of Peru,   10.0
      Spts. vini rect.,   100.0
M. D. T.
Sig.—Hair tonic.

It is advisable in alopecia areata to use antiparasitic agents, such as diluted tincture of iodine (Friedberger and Frohner), or an alcoholic salicylic acid (10 per cent.). The principal therapeutic agents, however, are rubbing with a strong brush, increasing the nutrition of the skin, plenty of exercise, and, above all, patience.

Pruritus (*Pruritus Cutaneous*).—This is an anomaly of the skin in which there is intense itching without any apparent cause, either from parasites or visible anatomical alterations of the skin. In man a similar condition is observed in icterus, diabetes mellitus, chronic affection of the kidneys and intestinal tract; also from the administration of some medicinal substances or certain kinds of food. It is also seen in old age. Intense itching has been observed in rabies, from the presence of large numbers of intestinal parasites shown by anal itching (pruritus ani), in certain affections of the spinal cord, distemper, neuritis, disorders of nutrition, and in some instances no true cause can be found. Frequently old dogs that have been extremely healthy, suddenly begin to age rapidly and show intense itching of the skin. The treatment of these nervous conditions depends on finding the true cause of their origin, and treating these causes. Where it is due to unknown causes, consult the chapter under the head of itchiness of the skin without the formation of papules.

Prurigo (*itching vesicles*) is a disease of the skin which appears at an early age. It is generally incurable. There is the formation of a rash which is intensely itchy. Sometimes we may find a prurigo exanthema which is indicated by the formation of numerous nodules, followed later on with pigmentation of the skin and tumefaction of the lymphatic glands (prurigo bubo). This disease, as a rule, appears only in young dogs, commencing with an eruption similar to urticaria. The treatment consists in thorough cleaning with mild sulphur soaps and sulphur, tar, and ichthyol ointments.

Seborrhœa (*Greasy Skin*).—This disease is characterized by an extraordinary secretion of the sebaceous glands. We find two forms, seborrhœa oleosa and seborrhœa sicca et pityroidis. These two forms may both be present in fat, overfed dogs. The seborrhœa sicca is especially found in long-haired dogs, like poodles, as an accompaniment

of eczema. More rarely it is found following distemper. It appears behind the ears, on the neck, and at the root of the tail, from which locations it may gradually extend. The animals give off a slightly rancid or fœtid odor and are slightly itchy in the early stages. There may be a bran-like dandruff which increases in amount, later accompanied by desquamation of the external epithelium. The hair feels oily and unhealthy, imparting to the hand a peculiar, fœtid, unpleasant odor, characteristic of this disease. The hair gradually falls out, and the animal becomes bald. The treatment consists in bathing with strong sulphur soap, or soaps containing benzoin, and the application of salicylic and sulphur ointments.

Seborrhœa Oleosa.—This appears, as a rule, in the parts having the most hair, yet it may also be observed in the crural surface and folds. It frequently develops after distemper and is sometimes observed as a result of the irritation caused by acari. The skin feels as if it were oiled, and leaves the hand oily after having stroked the animal. Want of cleanliness may occasionally produce a modification of this condition.

Seborrhœa præputi has been described by Schindelka as appearing in dogs with very narrow contracted foreskins, and has no similarity or connection with phimosis. The preputial orifice continually discharges a fœtid, oily-like fluid, greenish in color, and has much more consistency than the discharge in blenorrhœa of the prepuce. The treatment consists in cleansing of the penis with an antiseptic soap and followed by dusting the affected parts with dermatol powder. If phimosis is present, the opening must be enlarged by an incision.

Pemphigus.—This appears in man as a result of a number of diseases, and is indicated by the appearance of a series of vesicles which reappear from time to time and are apt to become chronic. In one case observed by Frohner, a male poodle dog not yet a year old gradually lost flesh and became anæmic. His back and both sides of the body up to the scapula, as well as the upper part of the legs, were denuded of hair, and certain raw spots on the skin about 2 mm. deep, varying in size. They were light rose-red on the border, shiny red in the centre, smooth, glossy and slightly moist on the surface. On the neck and upper sections of the anterior limbs were a number of vesicles the size of a hazelnut covered with dirty brownish-green crusts. These vesicles gave out, when pressed, a yellowish-white pus. The head, tail and posterior parts of the legs were free from vesicles or spots. The appetite was very good, but the animal grew weaker and weaker, and finally was destroyed.

Impetigo.—This is a condition understood as an eruption of pus vesicles. It is noticed frequently in distemper, and has been observed in old bitches in an advanced state of gestation. Some of them are also afflicted with endometritis.

On the external portions of the anal organs, on the skin of the internal surface of the legs, and the mammary glands were a number of pustules the size of hemp-seed, filled with thick yellowish pus which dried, leaving a brown scab, followed by a gradual succession of new pustules at the periphery of the affected regions. There was also more or less general disturbance and fever. These cases, as a rule, make a favorable termination.

Canina Bubo.—Frohner describes a purulent follicular inflammation of the lips, with lymphangitis and lymphadenitis on the head. This he observed in young dogs. There was swelling of the skin on the face; the lips became covered with bluish elevations which upon pressure yielded a bloody purulent fluid.

The lymphatic glands of the larynx and the region of the larynx and the parotids became tumefied, swelling to the size of a pigeon's egg. One dog died of pyemia. Frick has seen a similar disease in an old dog, which he does not think was a specific condition, but due to an extensive eruption of acne pustules.

Noma.—Moeller compares this with the noma (water cancer) of children. It is a spontaneous gangrenous formation of the jaw, which is extremely rare in the dog. The affection is situated in the corner of the jaw. The gangrenous condition developed very rapidly, reaching the size of a dollar in a very few days. The skin is grayish-brown in color, exfoliates and can easily be lifted from the healthy tissue. The submaxillary lymphatic glands were tumefied; there was also fever and salivation. The condition finally healed, but only after the greater portion of the jaw had been lost, the wound healing from the periphery. The treatment consisted in the application of a thermo-cautery, followed by corrosive sublimate solutions, 1 to 3000, and the animal was fed by means of liquid nourishment, being unable, on account of the jaw, to pick up the food and chew it.

Cutaneous Affections Which are Caused by Animal Parasites.

The changes produced in the skin from disease caused by animal parasites are divided into two conditions—primary and secondary.

The primary appears as a superficial inflammatory process, produced directly by irritations of the parasites upon the skin, and this condition depends to a large extent upon the amount of irritation and the depth that the parasites have penetrated in the skin.

The secondary symptoms are the result of this penetration into the cutis, causing more or less itching and irritation, and, as a rule, scratching and rubbing on the part of the animal, producing heat, redness, papules, vesicles, pustules, hemorrhages, or excoriations. These irritated spots

may not be restricted entirely to the affected region in which the parasites are located, but may spread to other localities. This form, which is nothing more or less than eczema, possesses two peculiarities which may distinguish it at once from the common form of eczema which is not produced by a parasite:
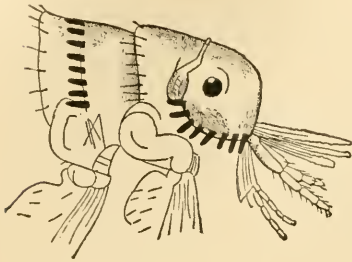
Fig. 162.—Head of dog flea (Pulex canis). (*Mégnin*.)

1. It invariably appears in single, isolated eruptive spots, and it is only after the disease has been present for some time, or where there is extensive irritation, that we may find the surface connected together.

2. We see the appearance of these eczematous eruptions in certain locations which are especially preferred by the parasites, and showing their greatest development of the eruption in those regions, even when the whole body is affected.

A microscopical examination of the scales of the skin will furnish definite information as to the character of the cause of the eruption. We distinguish two groups of cutaneous parasites: First, those which live upon the external surface of the skin, and, second, those which enter the tissues of the membranes, penetrating deeply into the tissues. In the first group we have the following:

Ceratopsyllus Canis, Pulex Canis, the Dog Flea.

The true dog flea, as well as the human flea (pulex irritans), is found in the dog. The former is distinguished from the latter by its size, by the different length of its tentacles, and by the presence of a number of sharp hairs arranged in a comb-like layer along the side of the head (Fig. 162). Coarse breeds of dogs are not particularly affected by the bites of fleas, but pet dogs and delicately bred animals scratch and rub to such an extent as to cause irritated splotches and redness over the entire body, and lead the owner to believe that the animal is affected with mange. The skin is also filled with the small brownish-black excrement of the flea. If the fleas are removed from the skin by a bath or in some other manner, we may relieve the itching and irritation by the application of some soothing solution.

Therapeutic Treatment.—Fleas are best removed by means of Persian insect powder (Flores pyrethri). This must be moistened with alcohol and rubbed into the hair. The animal must stand on a sheet of paper while this is being done, as the flea is not killed, but is only temporarily stupefied by the action of the drug, and falls on the paper. The

paper with its contents must be burned. Another method is to take the dog out in a field away from the kennel and rub him thoroughly with spirits of camphor, and the fleas fall on the ground and soon die. The placing of cedar shavings, walnut leaves or pine shavings, in dogs' kennels tends to keep away the parasites. Parsely seed and absinthe powder are also useful. In fine pet animals the daily rubbing into the skin of spirits of camphor drives away the fleas and the camphor left on the skin after the alcohol evaporates has a tendency to keep the fleas away. Rubbing with laurel oil, or a mild solution of creolin (2 per cent.) may be tried, the latter, however, being apt to roughen the hair in soft-haired dogs. The blankets or cushions where the dog sleeps should occasionally be subjected to heat. The best plan is to put the blankets or cushions in an oven that is moderately warm, and leave them there for ten or fifteen minutes. This destroys the parasites and kills the germ in the eggs. In a kennel the washing of the floor with corrosive sublimate solution 1 to 300, or creolin 1 to 100, and allowing the solution to go down between the cracks where the eggs lie is particularly useful.

Pulex Penetrans, Sarcopsylla Penetrans (*Sand Flea*).—This is somewhat smaller than the dog flea and is found in America and since 1872 in certain parts of Africa. It lives in sand and on weeds. It lives on man as well as the dog, and while the mature male and virgin female cause little or no inconvenience, the pregnant female burrows into the skin, burrowing until the head is in the skin, leaving the body protruding. In a few days the body, in consequence of the development of numerous eggs, grows to an enormous size in proportion to its normal size, sometimes getting as large as a pea (Fig. 163). It causes more or less itching while it is in the skin, and if the dog should gnaw and kill the insect, it is apt to act as an irritant, causing suppuration and in some cases necrosis of the skin. Great care must be used in removing these ticks, as careless removal, as has just been said, causes irritation and abscess. Saturate a pad of

FIG. 163.—Female pulex penetrans greatly enlarged.

cotton with chloroform or ether and lay it over the parasite which immediately liberates its holding hooks in the skin and falls off.

Hæmatopinus Piliferus (Dog Louse) and Trichodectes Latus.
(*Dog Parasites.*)

Description of Hæmatopinus Piliferus.—This parasite is distinguished by an egg-shaped head fitted with fine, short hairs and fleshy sheath-trunk with hooks at the edge. This when lifted shows a sucking tube and two

movable knife-shaped stilettos. The thorax is wrinkled and possesses three pairs of scissor-like claws. The posterior portion of the body is large and possesses nine rudimentary legs. The length of the body is about 2 mm. (see Fig. 164 *a*).

Description of the Trichodectes.—In this parasite the head is broad, quarter-shaped, with three manacle feelers and a tooth-shaped mouth. The thorax is contracted, the posterior part of the body has nine distinct members, and the length of the body is from 1 to 2 mm. (see Fig. 164 *b*).

The former parasites are the most disagreeable, as they suck the blood from the body, live particularly on those parts of the skin where the hair is thick and which are not exposed to the cold, such as the neck, flanks, and around the base of the tail. The trichodectes feed, as a rule, upon the hair and epidermis, and are found particularly on the head and

FIG. 164*a*.
Hæmatopinus piliferus.
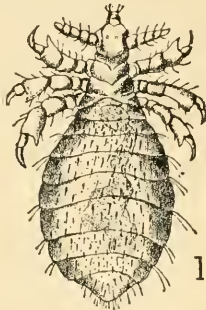
FIG. 164*b*.
Trichodectes latus.

The accompanying small lines give the natural size of the parasite.

neck. Both skin parasites produce intense irritation and rubbing, causing inflammatory efflorescences which look very much like squamous eczema, with partial loss of hair and formation of scabs. The diagnosis is usually easy, as we can see the parasites and their eggs by separating the hair.

Therapeutic Treatment.—This consists of destroying the parasites and their eggs. For that purpose it is often requisite to clip the animals. The safest and least harmful agents are decoctions of tobacco (5 to 10 per cent.), solutions of creolin (3 to 6 per cent.), petroleum (crude, or mixed with benzine, lysol or sapo-cresol), and in small dogs anise-seed oil (1 to 10 per cent. of olive oil). Mercurial ointment may be rubbed in the neck around the collar, but we must not apply more than a piece the size of a bean, as it is apt to cause salivation. Washing with corrosive sublimate solution has been tried, but it must be carefully done, as the same precaution has to be taken as with mercury ointment, the animal not being allowed to lick the body, as it is very apt to produce mercurial

symptoms of salivation. Insect powder (pyrethrum), mixed with alcohol, can also be rubbed into the body.

Ixodes Ricinus.—This parasite, which is about 2 mm. in length, and sometimes when full grown almost 3 mm., looks very much like an acarus. It penetrates into the skin and sucks the blood, and is generally seen in setters or pointers, and dogs when working through the woods and underbrush become filled with them. Turpentine and petroleum will destroy them instantly, or, better still, a small quantity of chloroform or ether sprayed on the skin makes them loosen their hold immediately. They should never be forcibly pulled away from the skin as they leave the mandibles in the skin and cause great irritation and frequently an abscess.
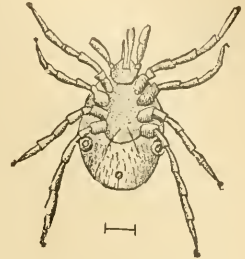
Fig. 165.—Ixodes ricinus. The accompanying line is the natural size of the parasite.

Leptus Autumnalis.—This is what is known as a "harvest bug" or acarus. It is about 4 mm. in length, and is the red larva of thrombidium holosericeum. While human beings are quite frequently affected with this parasite, it is only rarely found in the dog. Pustular inflammations of the skin of the dog are sometimes produced by this parasite. The rash was very prominent on the abdomen and the inner fascia of the legs, and was healed quickly by an application of carbolic acid and glycerine, or carbolated cosmoline.

Dermatophagus Canis.—This is very rarely found in the dog, and is a parasite which affects the ear, producing otitis externa. For further details refer to Parasitic Otitis (page 439).

CUTANEOUS DISEASES DUE TO ANIMAL PARASITES.

Sarcoptes Scabiei.
(*Sarcoptic Mange; Scabies Sarcoptica.*)

Sarcoptic mange (common mange, scab) is a disease of the skin which is very common, particularly where a large number of animals are together. It is accompanied by violent itching, and is due to the presence in the integument of the sarcoptes scabiei squamiferis.

Description of Sarcoptes Scabiei.—This parasite is about 0.2 to 0.3 mm. broad and from 0.2 to 0.5 mm. long. It has a rounded, turtle-like shape and a horseshoe-shaped head, with well-developed club-shaped scissor-like jaws. It has short rudimentary feet, and tulip-shaped suction cups which are attached to the first, second, and fourth pairs of feet in the male, while in the female they are found in the first and second pairs only. In the back we see six elongated acorn-shaped scales or thorns, and four

30

rows of lance-shaped scales on the upper surface of the back. The skin shows transverse folds and we find four elongated hairs on the posterior end of the body (Fig. 166).

The male acari and the young parasites generally inhabit cavities in the skin which they have made for themselves (Fig. 167). These cavities are connected externally by short ducts, the entrances of which may be marked by small vesicles or pustules, while the female may move to different parts of the body when sexually ripe, burrowing ducts through the upper layers of the epidermis down as far as the membrana Malpighii, which contains a great deal of fluid. At the end of the duct, that is, the place of entrance of the acari—we see the development of a small, somewhat moist nodule, or a vesicle, which dries up ultimately, leaving a scar. This digging of the parasite may produce more or less separation of the epidermis. We generally find that the parasite has a preference for certain parts of the body, such as the head, neck, abdomen, and chest, at the root of the tail, and the paws. It is very hard

Fig. 166.—Female s a r - coptes of the dog, magnified 75 times, giving the abdominal view. (*Siedamgrotzky.*)
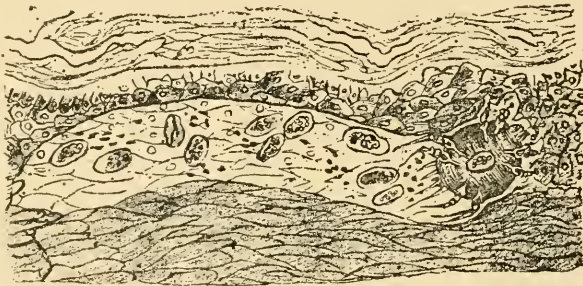
Fig. 167.—Female sarcoptes burrowing in the skin; also eggs and excrement.

to detect it with the microscope. The best may is to remove some of the membrane with a scissors or scrape the upper portion of the skin to the corium. If parasites have been present for some time, a secondary eczema is soon developed, which is produced by scratching and rubbing, also by itching of the scabs and scales. This "mange eczema" appears in various forms, according to the sensitiveness of the skin, and is either papular, vesicular, or pustular, and sooner or later produces decided thickness of the skin and leads to the formation of a number of folds, wrinkles, and ulcerated points between the clefts of the wrinkles. There is always a certain characteristic appearance about these affected localities which makes it easy to distinguish between the parasitic and simple

eczema. The surface finally becomes confluent, forming large eczematous areas. It is very improbable that a mistake will be made in diagnosis, except in the early stages, when there is only a very small spot affected, because the parasitic eczema produces rapid characteristic changes, accompanied by scratching, twitching, rubbing, and licking, which are very much aggravated as soon as the animal is placed near any warm object, for instance in the neighborhood of a stove or if covered up with a blanket, and also the evident pleasure which the animal gets if the affected part is rubbed or scratched, and finally, if the animal is kept with other dogs, the disease is carried to them and developed very quickly.

In making a differential diagnosis between sarcoptic and follicular mange we may frequently find that in follicular mange the eruption may be very similar to sarcoptic, but the itching is very slight in follicular mange; in fact, in some cases of follicular mange scratching or rubbing an affected animal very frequently causes the animal pain, and there is rarely any pus in the pustules of sarcoptic mange, whereas in follicular mange the pustules contain pus and when squeezed out and examined under the microscope, the matter is filled with acari. Of course it is not impossible to have both sarcoptic and follicular mange present in the same animal.

The prognosis is not unfavorable, as vigorous treatment usually cures an animal in a short time, provided the disease has not covered the whole body. If it has extended over the body in young animals, it may cause great emaciation, and in some cases great alteration of the skin, and if the animal is greatly run down, it is a question whether they can stand energetic treatment. When the parasites are destroyed, frequently we find an eczema follows that is very obstinate and it takes some time before the skin returns to its normal condition.

Therapeutic Treatment.—In order to produce good results in mange we must kill or remove the parasites, their larva and eggs, as the itching and scratching ceases as soon as they are destroyed, and naturally the artificial eczema also disappears rapidly. A large number of anti-parasitic agents are used—creolin, carbolic acid, coal-tar, anthracol perugen, ichthyol, sulphur, petro-sulphol, septoform, formaline. The preparations generally used are creosote, wood-tar, creolin, sulphol-cresol, styrax, and epicarin, lysol, salicylic acid, and Peruvian balsam. They are all useful, and may be applied according to the following directions:

It is always necessary to make a general application of the agent, even in such cases where the disease seems to be restricted to one region of the body. The dog must have the hair shaved off, if necessary; be covered all over with a layer of soft soap or with Hebra's alcoholic potash soap, which is to be shampooed into the skin with the hands or a

stiff brush, and cleansed thoroughly in clear tepid water. The agent which is to be used is then applied with the hand or with a brush, covering only one-third of the body at a time, repeating the operation in two or three days. If the whole body is affected in spots, cover the whole body. A good general plan is to give one thorough application to the body, three days later another, then three days after that a third application, and three days after that the application may be removed by soft soap and water, then if the animal is at all suspicious repeat the whole cycle a second time. The best ointments for mange are:

1. Picis liquida, sapo potassii viridis, spiritus vini rect., equal parts, q. s. Ft. linimentum.

2. Creolin, sapo potassii viridis, of each 1 part; spiritus vini rect., 10 parts.

3. Creosoti, 1 part; picis liquida, sapo viridis, spiritus vini rect., aqua, of each 7 parts.

4. Creolini (lysol bacillol, liq. cresolis saponat); petrolatum 12.

5. Two to 5 per cent. solution of creosote or carbolic acid in olive oil.

6. Peruvian balsam 1 part, spiritus vini rect. 3 parts.

7. Peruvian balsam 1, sapo viridis 1 part, spiritus vini rect. 5.

8. Styrax 2, alcohol 1, olive oil 2.

9. Sulphur sublimed, pix carolina each 3, creta preparata 2, sapo viridis, adeps, of each 6.

10. Epicarin, oleum ricini, ether sulph. 1, alcohol 9.

The first five agents which are mentioned are very energetic, but more or less dangerous, so it is advisable to use them in healthy or not too young or delicate animals, and if the animal is greatly depressed, no appetite, and has either slight convulsions or dark-colored urine, or both, the preparation must be washed off immediately, and at the same time administer small quantities of sulphate of sodium in their drinking-water in order to prevent carbolic poisoning. Peruvian balsam is harmless and very useful, but, unfortunately, it is expensive, and is only adapted to very fine pet dogs. At the same time if it can be procured and it is not adulterated, it is by far the cheapest in the end, as it is not dangerous and it can be applied liberally. The coal-tar products are always more of less dangerous on account of the ready absorption of such preparations. Styrax renders the hair very sticky. The solution of epicarin is used for very delicate house dogs in the early stages of the disease; the hair need not be shaved off when using this combination, and should be rubbed in thoroughly every third day. It is apt to sting and smart the animal and they may become greatly excited. During the treatment it is well to give strong nourishing food, and as the animals are either shaved or the body covered with an oily preparation, to keep them in warm houses or kennels.

Prevention Methods.—The owner of the dog must have his attention called to the fact that the sarcoptes are highly contagious, and may produce similar complications in other dogs and in man; and while this in man may be of a very mild character, it has been observed in the acute form in several cases.

The contact of many dogs with healthy animals must be prevented and covers, blankets, bedding, etc., which have been used by the affected animals must be subjected to a thorough cleansing by washing with hot solutions of soda and a high degree of heat. The straw, of course, must be burned.

FOLLICULAR MANGE. ACARUS MANGE. ACARIASIS.

Acarus Demodex Folliculorum.

Follicular mange is a very serious affection due to the presence of the acarus demodex folliculorum in the skin and particularly the hair-
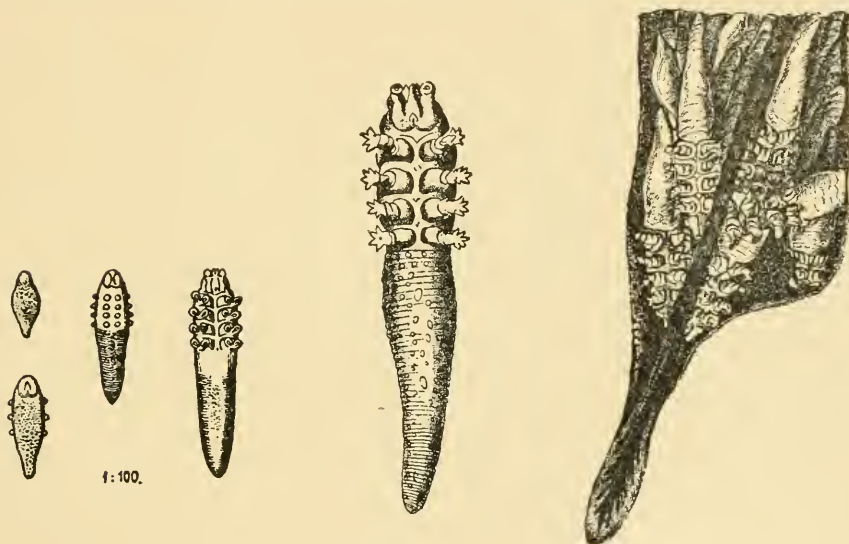
FIG. 168.   FIG. 169.   FIG. 170.

FIG. 168.—Development of the acarus folliculorum: Egg; six-legged larva; eight-legged larva, and developed larva.

FIG. 169.—Acarus folliculorum greatly magnified.

FIG. 170.—Hair-follicle invaded by demodectes folliculorum.

follicles. It differs from sarcoptic mange in that it is rarely itchy, and if so, only very slightly.

Description of the Acarus.—This parasite is about 0.3 mm. in length and about 0.045 mm. in breadth, elongated, lanceolate, with a

lyre or horseshoe head, provided with a broad, scissors-like masticatory apparatus, a mobile anterior trunk, and three articulated tentacles (Fig. 169). It has an oblong or worm-shaped, wrinkled abdomen, with eight triple-jointed, clawy, thick, short feet attached to the thorax. The elongated oval larvæ have only six legs (Fig. 168). The eggs are spindle-shaped, and the larvæ escape from the eggs, almost fully developed. The exception is that the newly born larvæ have only six feet (Fig. 168).

These parasites are found in the hair-follicles and sebaceous glands, their head toward the bottom of the sac, and the caudal end toward the external opening (Fig. 170). Their number may be large in a sebaceous gland, even as many as 200 have been found there. They generally average from twenty to thirty. The larvæ and eggs lie beside the parasite. The irritation of the parasite, causes the follicles and sebaceous glands to become dilated and the subsequent atrophy of the hair papilla causes falling out and permanent loss of hair and where there is a great number of parasites present, pus is produced and a purulent inflammation of the perifollicular and periglandular tissue ensues, with the formation of pustules. The relapses, after the disease appears cured, may be due to temporarily encysted units. It may be that these parasites may have been in some inaccessible place, such as the eye, ear, or prepuce. In very severe cases with numerous pustules of the sebaceous glands, death may occur from general septic infection. The sebaceous glands are also destroyed, causing acneous pustules. The demodex acne shows itself in certain preferred parts of the body, especially the head, throat, neck, and paws, but it may extend over the entire body. It is not very easily transmitted from one animal to another, as has been proven by the attempts made by Weiss, Martemucci, and others, who were unsuccessful. The writer had four dogs, two adults and two pups, and kept them for months with a bitch that was badly affected with acari, but failed to get any signs of transmission. When the animals have been experimentally inoculated Haubner reported a case in which twenty-four hours after inoculation there were all the marks of the disease and the sac contained eggs and larvæ. A second inoculation cured itself spontaneously. Other observers have had similar experiences. It seems that to propagate the disease the animal must have a certain predisposition, the nature of which has not been satisfactorily explained. Young dogs when exposed to infection seem to take it more readily than older dogs, but whether it is congenital is a question. The natural method of contagion is the contact of healthy dogs with diseased ones, but there is no doubt that some individuals are immune.

Clinical Symptoms and Course.—These are distinguished by a pustular and squamous form of eruption, but both forms are apt to be united

DERMODECTES FOLLICULORUM (*dermodectic mange.*)

in the same animal. The pustular form is the most common, and may be recognized by the hair falling out, by hyperæmic and swollen skin, which becomes thickened and in folds, and red from lack of pigment, forming nodules often the size of a millet seed, which change from bluish-red to yellow pustules, and finally the purulent bloody contents escape, and in it and under the membrane we find hundreds of acari.

The itching, as a rule, is never very great, as in sarcoptic mange, and in some cases not even present. When the affected cutaneous regions are scratched or rubbed, the patients, as a rule, resent it and do not derive the pleasure that scratching gives in sarcoptic mange. The disease spreads very slowly, the eruption starting at the head and between the toes, and in only very rare instances does it cover the whole body (see Plate). The parts that are affected finally heal, but the skin remains thick, denuded of hair, marked in some places by scars or cicatrices, and also by cracks and wrinkles. In some cases we may have a dark pigmentation marked with warty projections. When there is any itching present the appearance of the cutis may be changed materially by secondary eczema. The appetite is very rarely affected, the animal eating well, although some cases, in spite of good food, have shown the animal to have an impoverished, unhealthy look.

The squamous form is seen in the neighborhood of the eyes, the bridge of the nose, forehead and the anterior surface of the neck (Fig. 171) and breast, but it may show itself in other parts of the body. It is a normal cutaneous inflammation accompanied by falling out of the hair and great accumulation of scabs, and isolated bare spots resembling alopecia areata. The hair drops from the affected places. The skin is only slightly reddened, but covered with thick scabs. If these places are squeezed, the parasites can be pushed out of the skin very rapidly. The easiest way to obtain the parasites is to rub the blunt end of a knife, previously dipped in oil, over the affected parts, and the microscope will aid you in distinguishing this disease from simple scaly eczema. In any suspicious bald spots on an animal, it is always well to scrape off a portion of the affected part and give it a close examination under the microscope. The pustular form seems to be more frequently observed in the last few years. This form of the disease appears as a series of hard nodules in the skin, ranging in size from a millet seed to that of a pea, and when they appear in numbers they are apt to become confluent and merge into one nodular mass, and the tissue in the affected region assumes a reddish-blue color. On pressure of one of these nodular masses there exudes from it a purulent sanguineous fluid which, when examined under the microscope, is found to contain numerous dermodectic acari. After the nodules empty or are evacuated, the skin becomes covered with scales or crusts. The animal is not itchy in this condition, or if so it is in very

slight degree, and not in any sense at all like the intense itchiness of sarcoptic mange; generally the animals when scratched or rubbed in the affected region evince pain and endeavor to get away. In case the animal should show a certain amount of itchiness it is not at all impossible that the animal may have sarcoptic mange as well as dermodectic even if all the symptoms of follicular disease are present. The pustular form of the disease seems to attack the head and neck more frequently than any other part of the body; that is, it commences there, as a rule, and grad-
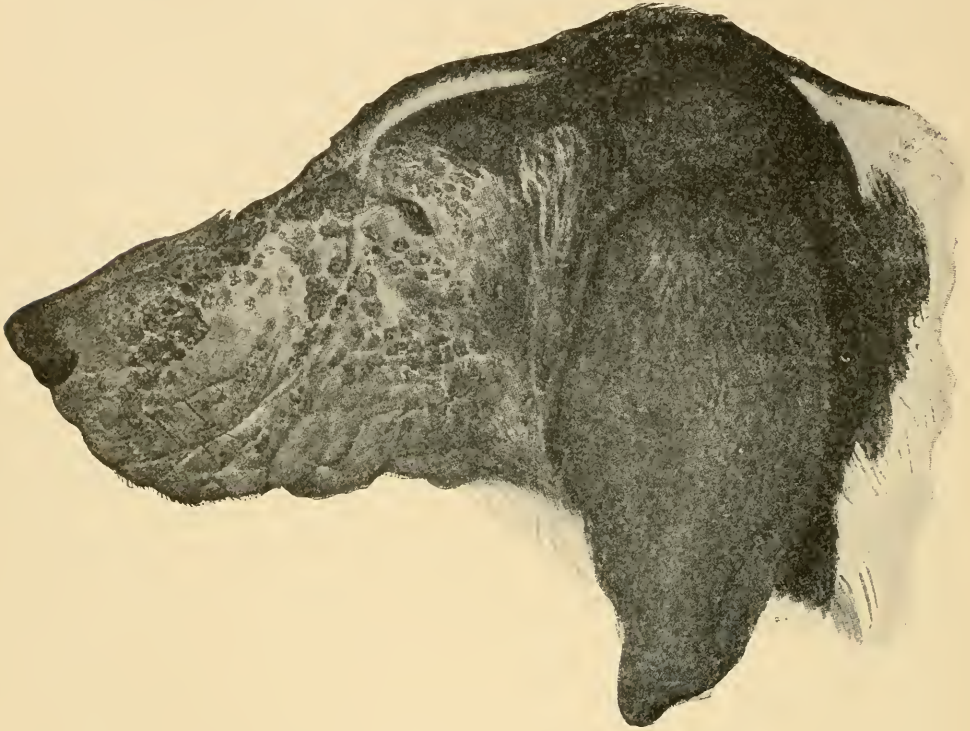
Fig. 171.—Head of dog affected with demodectes folliculorum.

ually spreads from that point to other parts of the body. The disease goes through the phenomena of developing the nodules, accompanied by acute local inflammation of the skin. This is followed by purulent inflammation of the nodules and the discharge of a serous purulent or sanguineous fluid. The abscess gradually dries up and the skin as a consequence of the local thickening of the cuticle becomes traversed by grooves and fissures and is covered with crusts and scales, assuming a gray-blue color in some places and copper-red in others (see Plate), and looks like elephant hide. As the nodules dry, there is apt to be a secondary eczema, causing the animal to scratch more or less.

The prognosis is generally unfavorable, as it is almost impossible to reach the parasites, and it is necessary to continue vigorous treatment for months, and then, when apparently the animal seems to have gotten entirely well and remains so for a certain interval, invariably it suddenly bursts out and the disease appears with increased violence. The cases which are successfully treated are those that are limited to a very much restricted area, but it must be borne in mind that every recovered case must be closely watched for months after the active symptoms disappear. This is especially the case with the squamous form, which is always considered the worst form of follicular parasitic mange.

Therapeutics.—The hair must be shaved off in the diseased portion and to include a good portion of the surrounding tissues, or if the animal is affected generally, the whole body should be clipped. This can be done by means of a scissors, clippers, or even lathered and shaved with a razor, and the hair removed should be burned and the instruments thoroughly disinfected. The animal is then bathed in warm water and soft soap, to which is added in the proportion of 1 to 10, creolin, pix liquida, or styrax. Sulphuretted baths are then to be repeated twice a week. Fill a large tub or barrel and add from 50.0 to 200.0 of sulphuret of potash, and to prevent the too free liberation of sulphuretted hydrogen 5.0 of sulphuric acid should be added. The toxic properties of the hydrogen gas makes it necessary to keep the tub in an open shed or out in the air.

(*a*) **Treatment of the Pustular Form.**—When pustules are present they must be squeezed and emptied every day. In some instances it is necessary to open the hard nodules by means of a sharp scalpel, and at the same time apply the antiparasitic agents already mentioned with a brush twice daily. The animals, as a rule, show great pain and object to it, but to obtain any good results this must be followed up patiently. Any of the solutions may be used, as one is as good as another, but we must remember that where we have an opening directly into the deep portions of the skin that reabsorption of poisons through the membrane is much easier, consequently it is better to select a non-poisonous remedy, such as Peruvian balsam or warm preparations of salicylic acid (1 part of salicylic acid to 40 parts of olive oil). Both agents may be replaced by styrax (in oil solution). Solutions such as tincture of iodine, Lugol's solution, corrosive sublimate are all more or less dangerous and never can be used with the same freedom as the balsam.

(*b*) **Treatment of the Squamous Form.**—In this condition we must first try to reach the parasites, and this we do by systematic rubbing with acid ointments or strong concentrated salicylic ointments (1 to 5), and also with soft soap or lye. When we have removed the scabs and scales with this form of treatment we must apply the same treatment

as prescribed in the pustular form. The prophylactic measures must be the same as in sarcoptic mange. No transmission of this disease has ever been observed in man. The following are some of the remedies with their formulas: Cerate of cantharides and lard, 1 to 6; tincture of iodine and chloroform; oil of turpentine and chloroform; styrax, oleum petræ and alcohol; endermol, 1 per cent. solution; zymoidin in the form of ointment; naphthol 10.0, sulphur 50.0, green soap and lard; ung. sulphur comp. with creolin baths or decoction of tobacco; silver nitrate, 5 per cent. solution; ichthargen, 10 per cent. solution alternated with iodine 10 per cent., and tar 25 per cent., each well rubbed in; styrax salve and bathing with liver of sulphur; formaline in 2 per cent. solution; dermaform, oleoformaldehyde; creolin and alcohol, equal parts; liquor creositi saponis; creosote diluted with alcohol or sweet oil; creolin, balsam of Peru and alcohol, equal parts; ichthyol, soft soap and alcohol, equal parts; oil of juniper; scraping the affected parts with a blunt knife and applying balsam of Peru; xeroform; endermal injections of iodine, or 2 per cent. solutions of carbolic acid; superficial cauterization of the skin with the thermo-cautery; carbonate of sulphur as a bath and then frequent applications with the powder and followed by an ointment, formaline 3.0, vaseline 50.0, oxide of zinc and almond powder, each 24.0. Where the skin is greatly thickened carbonate of sulphur should be used in conjunction with sulphur or neutral soaps.

And to sum up the treatment, when you find an animal that is slightly affected with the disease, clean the skin thoroughly with a strong soap and then apply the balsam of Peru liberally as directed and keep up the treatment for some time, and if you find an animal that is very badly affected then you had better destroy him, as he is not only a menace to every other dog he comes in contact with, but the chances of a permanent cure are extremely slight.

Skin Diseases Caused By Worms.

Rivolta has described having seen in the neck of a dog a herpetical eruption which he found to be due to the presence of certain embryos which he thought were the embryos of the *Filaria medinensis.* Seidamgrotzky also found in a large hound dog, a pustulous eruption on the external surface of the shank of the leg which was accompanied by violent itching and in every pustule he found from 1 to 3 small embryos 0.04 to 0.07 mm. long and having a peculiar awl-shaped caudal appendix. The embryos newly born and solitary, the females were found in the bedding of the animal. Schneider found a similar condition in a pointer, but there was little or no itching. The case observed by Seidamgrotzky

was cured spontaneously in three weeks; in the case described by Schneider it was necessary to use a 50 per cent. solution of balsam of Peru in alcohol, to destroy the parasites.

The **Filaria immitis** and **Filaria medinensis** are found encysted in the subcutis. The embryos of the former are found in the blood and also in the connective tissues in the encysted form, and it may also be found free. The latter, Filaria medinensis or guinea worm, is found on the west coast of Africa and Arabia, and produces abscesses and tumefactions in the man and the dog.

The treatment is simply cleanliness.

Cutaneous Affections which are Caused by Vegetable Parasites.

We know at the present day of two skin diseases in the dog which are ascribed to the presence of vegetable parasites. These are favus and herpes. These ectophytes belong to the filiform fungi class (hyphomycetes) and may be simple or ramified, membranous or non-membranous, double contoured, cellular threads (hyphae), which become mixed in their growth and form a real fungous bed or fungous turf (mycelium). These fungous growths produce at their ends and at the point of their
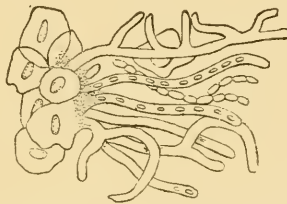
FIG. 172.—Favus spores, magnified 450 times. (*von Düben.*)

short side branches bead- or string-like spores, uniting and ligating each other, which are considered as sexual or multiplying organs. We cannot make a strong distinction between the fungi of favus and those of herpes, but there is a difference, as is seen in the disease in its local form, and we have given a description of both.

1. **Favus.**—This fungus is called achorion Schönleinii, and is developed upon the skin, between the epidermic layers in the hair-follicles, and also in the hair itself, and the secreting tissues of the claws. It is very rare and generally affects young animals. The determination of the fungus is the same method followed in trichophyton. It may be transmitted to the cat, horse, rabbit, mouse, and human beings, causing a characteristic skin affection.

Clinical Symptoms.—Favus is found in special regions of the body,

namely, upon the forehead, back of the nose, abdomen, and external surface of the hind legs, as gray, gray-yellow or even saffron-yellow, dry, brittle crusts or eschars. These are about the size of the head of a pin in the beginning, but gradually by their growth cover the entire surface, and may finally become from 2 to 5 mm. in thickness. They appear in the shape of round or elliptical scutula, depressed in a saucer-like manner, generally perforated with a dull, lustreless hair, which drops out later on. If the escharous mass is removed we find a corresponding depression with exposed, very red epidermis. As a rule, this is followed by bleeding and more or less itching, and where the disease is extensive, the animal has an odor likened to the urine of cats or old cheese. The claws, when affected, become thickened, loosened, reddened, brittle and are shed.

Therapeutic Treatment.—The treatment of this disease is easy, consisting of removal of the scutula and a daily application of anti-
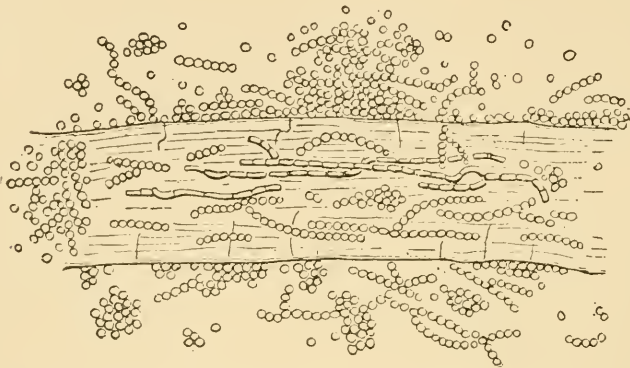
FIG. 173.—Trichophyton tonsurans, after treatment with potassium solutions. Enlarged 300 times.

parasitic agents, especially tincture of iodine, carbolic acid and creosote solution, sublimate or salicylic acid (10 per cent. solution with alcohol), and tar soap. Chloride of sodium (common salt) has recently been advocated in the treatment of ring-worm. It is either to be applied in saturated solution or else made into an ointment with vaseline.

Concerning the prophylaxis, we refer you to the indications which are given later in herpes.

2. **Herpes Tonsurans.**—Debilitating herpes, herpetic ring, herpetic eschar, bare herpes. This fungus, which is said to be the cause of herpes, is called trichophyton tonsurans, and is found in large masses lying on the upper portion of the epidermis, and especially in the hair and its follicle.

Trichophyton has a much more rapid growth than achorion. It

not only grows from one centre, as in the other form, but it may make its appearance in a number of new centres scattered all over the body, until finally the whole is strewn with numerous, isolated, round-shaped bare spots. The parasite may be transmitted to dogs, man, cattle, goats, cats, pigs, and rabbits. This mushroom, which attacks the skin, spreads to the hair follicle. When the hair and scales are put in a caustic potash solution, and examined under the microscope with a low power, large masses of spores are found massed like strings of beads (Fig. 173). In isolated cases sometimes, where all the appearances point to Tricho-phyton, it is not found to be present. Boden and Almy describe an eruption resembling herpes, which resembled round or oval gray-white stains, covered with scales, seen on the back, flanks and the lower parts of the extremities caused by the micro-spores audouini, the cause of head fungus in children. This condition heals very rapidly. The French authors claim that all herpes is due to various forms of fungi. Schindelka claims that the majority of cases of herpes that originate in man are due to contact with diseased dogs.

Clinical Symptoms.—The eruptions which start generally in the head, region of the lips and eyes, and more rarely on the neck and legs, are marked by small, round, or elongated herpes, which vary in shape and size between a lentil and a large bean. The spots are hairless and distinctly circumscribed. The blotches are arranged at intervals and are generally very regular. They become confluent in some cases, and extend over the entire body. Affected regions show peculiar grayish-white or dirty gray asbestos-like scabs and in old cases yellowish-brown crusts about 2 mm. in thickness. These crusts may have some hair adhering to them. The skin under the crust is copper-red in color and covered with numerous millet-like nodules (swollen hair-follicles). After a certain time, if the disease ceases to spread, the scab drops off gradually, and we see a bare, scaly herpes upon which the hair slowly returns; it is very similar and might easily be mistaken at this stage for alopecia areata. In other cases we find the formation of nodular eleva-tions, semiglobular in shape, very sensitive to the touch, rough on the surface and brown in color. They generally appear on the head, par-ticularly on the cheeks, and are generally very difficult to treat, follow-ing a protracted course covering over one or two months. Itching is constantly present, but mild in character. After the acute symptoms have subsided the scales fall off, leaving a bare space, smooth or with a few scales on it, and the hair returns gradually.

R.	Ac. salicylic,	3.0
	Alcohol,	30.0
Sig.—Salicylic ointment.		

℞. Ac. salicylic,
    Sulphur sublim.,
    Sapo virid.,
    Ol. rusci,,   āā 10.0
    Adeps.   40.0
    Sig.—Salicylic sulphur salve.

℞. Picis carolina,
    Sulphur sublim.,
    Sapo kali,   ˙   āā 10.0
    Adeps,   50.0
    Sig.—Tar and sulphur salve.

The afflicted animals are often affected with secondary eczema. This, however, is produced by constant scratching, due to the irritation of the disease.

Therapeutic Treatment.—The treatment of herpes depends on the removal of the favus. We must, therefore, clean the affected part, lift and remove all scabs and eschars by means of a thin knife, or shampoo with soft soap, following it up by a dressing of some of the agents mentioned under the head of Mange.

Prophylaxis.—The animals must be separated, as the danger of infection to both dog and man is very great. The kennels are to be cleaned, and all straw, etc., burned, and the animals kept away from children.

Trypanosomiasis.

Under this term we class numerous infectious diseases peculiar to tropical countries. These various conditions are, generally speaking, due to a flagellate protozoon present in the blood (protozoa flagellata). Some of the diseases, such as the nagana of Africa and the surra of India, are easily transmitted to the dog by inoculation. The parasite of the nagana and the surra (trypanosoma brucei) is transmitted by the sting of certain insects (tsetse fly of Africa and the tropical horse fly of India). Under the microscope it is easily recognized by the low power. It is worm-like in form, having a blunt posterior extremity, its length depending on the animal it inhabits. In the dog it is extremely short.

The symptoms of the disease are elevation of the temperature, which may be intermittent, œdematous swellings, especially of the posterior extremities and of the thigh, scrotum, and face; pustular eruptions of the skin which may heal up and leave the animal bald; opacity of the cornea, and finally paralysis of the posterior extremities. Death generally occurs in three to four weeks. Blin states that when dogs imported into India and China, contract the disease it is almost invariably fatal, but native dogs generally make good recoveries.

African Horse Sickness.—Dr. Arnold Theiler finds as a result of his observations that dogs are susceptible to African horse sickness and further that the canine species constitutes a very important medium through which horses can be infected with the disease. This statement is combated by McFadyean who after a series of observations has reached the conclusion that dogs positively resist inoculation and that it is highly improbable that dogs act as a reservoir in propagating the disease to the horse.

TUMORS, PARTICULARLY THOSE OF THE SKIN.

A thorough description of tumors, with the different varieties and forms, cannot be discussed here as explicitly as the writer would like, and he therefore will confine himself to such tumors as are met with in general practice, and for further details would direct the reader to books on general pathology and morbid anatomy.

Tumors are rather common in the dog. Of the various neoformations carcinoma seems to be the most frequently seen. Next is the fibroma, then the papilloma and the sarcoma, and the lipoma, the latter being comparatively rare. Regarding the frequency of cancer, out of over twelve hundred dogs only about 5 1/2 per cent. were affected with cancer, and of the organs attacked they were in the following order: Respiratory apparatus, 26 per cent.; urino-generative apparatus, 26 per cent. digestive apparatus, 25 per cent., and the skin, 20 per cent. As regards age, Frohner found that 15 per cent. were in animals under five years of age, 25 per cent. between the ages of five and six, 34 per cent.; between seven and eight years, and 18 per cent. between nine and ten years, while 4 per cent. were between eleven and thirteen years. No animal under two years was found to be affected with cancer.

The following tumors are found in the dog:

1. The Fibroma.—This neoformation occurs rather frequently in the dog, the most frequent location being in the skin and subcutis of the head, neck, abdomen and spine. Fibromata are also found on the chest and extremities. They may occur singly or in large numbers. They may be hard or soft according to the amount of intercellular tissue they contain. They are usually clearly outlined, rounded with a smooth surface (fibroma durum), more rarely soft in consistence, and not so well circumscribed (fibroma molle, fibroma molluscum). The latter is frequently bluish-red with a network of veins on its surface. The fibroma frequently hangs down, particularly when it is in an inferior portion of the body, like the abdomen (fibroma pendulum) (Fig. 174). In parts where there is slight movement of the skin, and the cutis is firmly fixed, such as the ear or metatarsus, the fibroma assumes a flat, circular, coin-like appearance, and has a rough or granular surface. In some cases there is tumefaction of the skin, as on the edge of the nose, elbow, tuberosity of the ischium, the outer part of the forearm, knee and legs. These callosities are usually called recumbent, bed or kennel tumors. They are generally bluish-gray or grayish-red in color, rough-

ened externally, and irregularly circular. They vary in size from a small pea to the palm of the hand, are generally devoid of hair, their flat surface being smooth, furrowed, or irregularly elevated. The skin occasionally develops acne from pressure or alteration of the tissue. Fibromata, both hard and soft, are not malignant.

Many pathologists are not inclined to regard the callosities known as bed or kennel tumors as fibromata. Most definitions of the term tumor include the clause that they are without demonstrable cause.
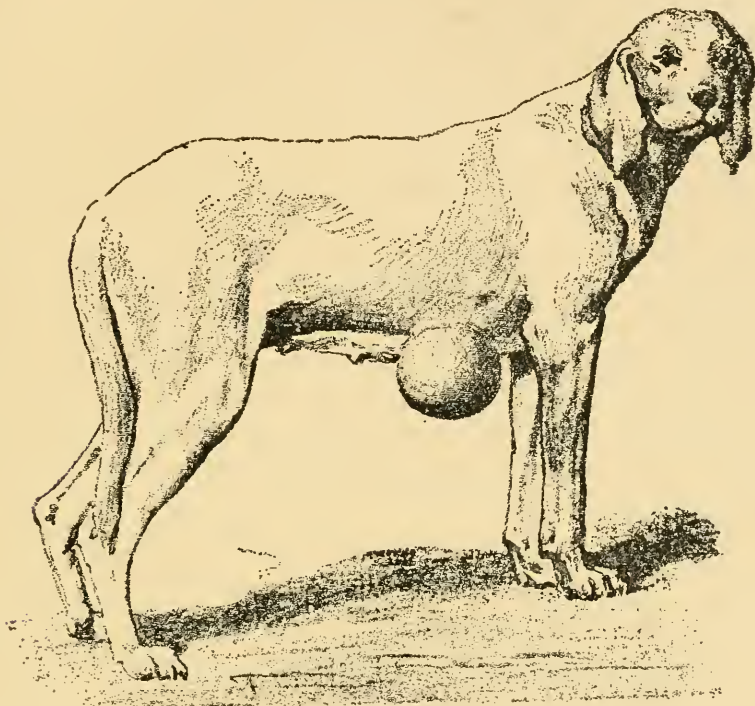
Fig. 174.—Dependent fibroma.

This would exclude these callosities, as their cause is obvious, usually growing on prominent parts, exposed to friction and pressure whenever the animal assumes the recumbent position.

2. **The Lipoma.**—These fatty tumors of the subcutis are rarer than fibromata. They are generally round or oblong in shape, very distinctly circumscribed, being separated from the surrounding structures by a layer of connective tissue. Sometimes they are of considerable size, but as a rule they are of very slow growth, and often pedunculated or lobular in outline and diffused in different directions. The mixed forms of lipoma and fibroma (fibrolipoma) sometimes grow to an enormous

31

size, and are seen as nodular collections under smooth skin. As a rule lipomata are found on the tendons and their sheaths, the chest, shoulders, and tail. Frohner found a lipoma that surrounded the anus in a half-circle. Lipomata may be multiple but are not malignant.

3. **The Sarcoma.**—A tumor made up of embryonic connective tissue, originating in various parts of the body, such as cartilages, bones, periosteum, adipose tissue, and in fact any of the connective tissues of the body. Depending upon the size, shape and disposition of the component cells, sarcomas are classified as small and large round cell, small and large spindle cell, giant cell, melanotic and lympho-sarcomas. Sarcomas are generally considered as malignant tumors (1) because they usually show a tendency to become large, (2) because they are apt to reappear after removal, and (3) because under certain conditions they are apt to form in other parts of the body by metastasis. Their malignant character is generally much greater in proportion to the size of their cells and the softer their intercellular substance.

The external anatomical appearance of a sarcoma does not always present characteristic symptoms. In most cases these tumors are round, distinctly circumscribed, and sometimes they form encysted knots, which vary in color and consistency. Their color depends, as a rule, on their blood vascular supply, and any blood extravasations which may have occurred also produce certain alterations, so that on section a sarcoma may appear white, yellow, brown, gray, dark red, and even entirely black, as the melanotic variety. This pigment sarcoma, or melanoma, is extremely rare in the dog, although Gray asserts that it is very common in Yorkshires, where it is seen in the form of small black excrescences the size of a pea. Troutman describes an interesting melanosis of the toe of a three-year-old setter.

The metamorphoses which occur in the sarcoma are of some diagnostic value, especially the mucous softening, which leads to the formation of cysts and sometimes to bony deposits. This is frequently noticed in sarcomas, and the ulceration of the adjacent skin and mucous membranes occurs without producing any active disintegration of the tumor. Notwithstanding the malignant character of the sarcoma, it may remain in the same condition for years, and never inconvenience the animal, or after lying quiescent for years it may suddenly begin to grow with incredible rapidity.

The myeloid or medullary sarcoma is a rare form of tumor which grows in the marrow cavity of the bones. They have been noticed in the forearm, shoulder-blade, arm, femur, maxilla and penis. Circumscribed nodules are developed in the medullary cavity which generally crowd out the bone by their growth, and when new bone is formed from the periosteum, fill up the entire cavity. In this manner we find enormous

lumps, or masses, possessing the firmness and hardness of bone, and in the centre is found a soft tumor surrounded by a bony cyst. Sooner or later the soft parts penetrate the bony envelope and certain of the fluid escapes.

4. The Papilloma.—A benign tumor originating from a hyperplasia of the fibrous stroma of the cutaneous and mucous membrane, with a proportionate formation of connective tissue. Papillomata are divided into the hard and soft varieties.

The hard papilloma or wart is a neoformation of the papillæ of the skin and of the epidermis. Warts differ very much in size, from a lentil to the size of a large pea. The external covering of a wart is very often hard and firmer than that of the connective tissue, so that the surface is surrounded by a firm, hard, horny covering (horny warts). The reverse
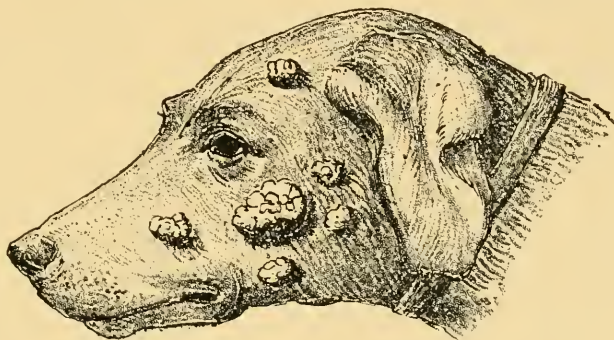
FIG. 175.—Multiple formation of warts.

is found in the case of the soft, fleshy warts. These little growths are found on the skin of dogs of all ages; as a rule on the head and back, but also in other regions, and they frequently disappear without any treatment (Fig. 175). Now and then the horny warts grow to a very large size and form what are called "cutaneous horns." Such are found on the forehead, the ear, and the flanks. They are generally seen in old dogs, and at times have a tendency to be malignant. Enormous numbers of warts are sometimes seen in the mouth, on the buccal mucous membrane and tongue, and that they can be reproduced by inoculation has been proved by McFadyean and Holding.

A variety of the papillomata is the flat condyloma. These are certain marked malformations which have the shape of a papilla, but as a rule are ramified and divided, forming coxcomb-like or cauliflower collections. In some cases they appear as true papillomata, particularly as a sarcomatous formation. As a rule they appear on regions other than the skin, such as the lips, cheeks, and prepuce, and also upon the buccal mucous membrane. They are generally salient and bleed easily,

due to the large number of blood vessels they contain, their softness, and very thin epithelial covering. The writer has noticed that dogs affected with condyloma of the vulva or penis also show these formations quite frequently on the edges of the lips. Gratin has often seen the obscure transmission of condylomata from one dog to another. This would tend to establish the fact that this variety of tumor is contagious. (See Infectious Genital Tumors.)

5. **The Carcinoma.**—By the term carcinoma we designate that neo-formation the essential feature of which is the overgrowth or accumulation of epithelial cells, some of which have penetrated the basement membrane, by root-like projections, into the underlying or neighboring structures. It is the commonest of all neoplasms. These cells possess the peculiar property of forming metastases, by way of the lymph channels, producing a general cancerous infection of the body (carcinomatosis), and are, therefore, considered malignant. Any organ or structure in the body having epithelium in its make-up may be the seat of carcinoma. Most cancerous forms are distinguished by their tendency to regressive metamorphoses. These include mucoid, colloid and fatty degeneration, with cystic formation, calcification, cicatricial contraction, and in superficial carcinoma of the skin and mucous membranes, ulcerative processes, with the formation of purulent foci. Those showing a strong tendency to spread over the surface are termed "phagedenic." Necrotic changes are frequent, the ulcerating portions discharging a foul, sometimes bloody, material. In cases of some standing the dog may show the effect of this process, losing flesh and showing a general condition of cachexia. Carcinomata are generally divided into:

(a) Squamous epithelioma, squamous cancer, or cellular epithelioma.

This variety occurs in the cutaneous membrane, and in all mucous membranes containing squamous epithelium, as the mouth, throat, larynx, eyelids, ears, cheeks, external genitalia, bladder and urethra, rectum, vagina and uterus. This form of cancer is frequently seen in old animals. It is a peculiar fact that this cancerous growth may accumulate rapidly for a short time, and then remain stationary without increasing further in size. Squamous epitheliomata appearing in the mucous membranes, especially the vagina, which deserves special mention, have a great tendency to extend superficially, followed by a cancerous disintegration, also by a constant, bloody, purulent discharge. Ulceration usually takes place in these cancers, sooner or later. Some parts may be covered with a scab-like crust, while other parts may be raw and bleeding. Fistulæ frequently form.

(b) Adeno-carcinoma, or malignant adenoma.

This variety may originate in any organ containing glandular epithelium. It is probably most often seen in the mammary glands of

old bitches. This cancer of the mammaries is marked by the following characteristics: It is of slow growth, particularly hard and firm, and has a tendency to remain stationary for a long time. In some regions of the glands we may see a small, hard knot developed, which is not sensitive to pressure and shows no signs of inflammatory action. This enlargement gains slowly and may be accompanied by other knots in the immediate neighborhood, which finally unite and form one mass. The carcinoma at this stage is found to be a hard, irregular, circumscribed tumor, and united, as a rule, with smaller masses by a thin cord-like enlargement that lies in the integument. When this enlargement is located very near the skin it shows a peculiar cicatricial contraction, and especially if it is near the teat this may be drawn entirely into the skin. This is quite common. We also observe great distention of the cutaneous veins, which may even be varicosed. As a rule, the enlargement is rarely confined to one, but we may find scattered through the gland numerous lumps or knots of various sizes. We also see in the mammaries of the dog fibromas, chondromas, adenomas, sarcomas, and cysts, but these are much rarer than carcinoma.

It is hardly possible to confound these tumors of the mammaries with inflammation of the lacteal gland. True acute mammitis occurs very rarely in the bitch, and is indicated by a circumscribed, painful, very sensitive reddened swelling of a definite glandular section. The section may undergo complete disintegration, forming an abscess and sloughing, or we see chronic inflammation with a formation of knotty lumps, and a peculiar cicatricial contraction. True mammitis must not be confounded with inflammation of the lacteal glands, which may appear in bitches that are nursing and deprived of their young. The swelling disappears in a few days by itself, but it may be hastened by a light diet and saline purgatives. In very rare instances there is a peculiar condition of the lacteal glands that is seen in bitches that have had several litters of pups. About forty-five days after they have been in "heat" we may find a general enlargement and filling up of the entire glands, also the appearance of a thin milk or colostrum in the glands, and every appearance of active lactation. This might lead the practitioner to believe that the bitch was in whelp.

The tendency of carcinoma to become malignant and cause a general infection of the whole body is especially marked in the soft forms of cancer, particularly those having a tendency to ulceration and degeneration, while the hard forms, such as above described in cancer of the mammaries, may remain months and even years after producing no other effect than a gradual enlargement. The process is generally developed in the lymphatic glands, but we may see the appearance of secondary tumor centres which swell up without being accompanied by any pain or

inflammation. A large part of the body may become affected in this manner, that is to say, there is a gradual development of the process through the entire body, these various tumors being supplied from the primary tumor or carried into the circulation and scattered in all directions, forming new centres of development. We may see this occur in cancerous masses in the liver, kidneys, and lungs, producing very little irritation of the surrounding tissues beyond the central tumor, but we find that the animal falls away quickly, becomes emaciated, has weak heart-action, and presents all the symptoms of what is known as cancerous cachexia.

The prognosis is always unfavorable. Removal of a cancerous tumor may only be made when the neighboring lymphatic glands have not become affected, and where the animal is in good nutritive condition. Cases of ulcerated carcinoma must always be considered unfavorable, except in the form of cancroid, which has been already described. The treatment of cancer consists of speedy removal and keeping the animal in as healthy condition as possible.

6. **The Myxoma.**—A tumor made up of mucous or gelatinous connective tissue. They are apt to appear on the head and back, more than any other place. They are frequently multiple primarily, and sometimes attain great size. The myxoma is a benign tumor, but it may recur after incomplete extirpation. Usually these tumors are round or oblong, clearly outlined in the tissue, are elastic on pressure, and they stand out in the skin in semi-hemispherical elevations. The cut surface is pale, moist, and exudes a thin, stringy mucous material when squeezed. They are frequently found combined with fibroma and sarcoma. A very characteristic example of myxoma is described by Velmalage, in which he found from the neck to the root of the tail, as well as on both sides of the thorax, the outer surface of the hind legs, and the anterior region of the sternum, great numbers of nodules varying in size from a pea to a hazel nut, or even as large as a walnut.

7. **The Adenoma.**—One of the parenchymatous group of tumors, composed of glandular epithelium, which may assume either the type of a tubular or an acinous adenoma. They always originate in some gland, are either single or multiple, and can be distinguished from simple glandular hypertrophy by the fact that they stand out prominently from their surroundings, are knotty or scirrhous, or sometimes quite soft. Their growth is slow and they are seen most frequently in the breast, rectum, thyroid and ovary. Adenomata are not malignant, primarily, but just as soon as the basement membrane is penetrated by the tumor, it then becomes a carcinoma, malignant in character. Cystic degeneration is probably the most common of the retrograde processes. When they are superficial, we may have ulceration taking place.

8. **The Angioma.**—A tumor composed of blood vessels and their

contents. According to the kind of vessel present, angiomata are designated either capillary, cavernous or aneurysmal. The capillary type is the most common. In the dog these tumors may frequently escape notice, on account of the color of the skin and the hair obscuring them. They may occur in any part of the skin, and some attain the size of a hen's egg. They are non-encapsulated, but usually only involve the corium. They are flat, but slightly elevated, and the color varies from a light to a dark red. Shindelka observed a nævus vasculosum (birth-mark) on the right side of the head of a white poodle, the formation being irregularly outlined, bluish-red in color, and involving the forehead, temporal region, and a portion of the eyelids. The author saw a similar condition on the chest of a Russian wolf-hound. Simple enlargement of the veins has been observed on the scrotum.

9. **The Myoma.**—A tumor made up of muscular tissue. According to the variety of muscle making up the tumor they are designated leiomyoma (smooth or involuntary), or rhabdomyoma (striated or voluntary. Myomata are rare, but may originate in any structure containing muscular fibres, voluntary or involuntary. However, these tumors may exist in structures normally having no mucsular fibres in them, but these cases are rare. When a myoma exists in normal muscle, it sometimes so closely resembles the normal muscle as to be distinguishable with difficulty.

10. **The Osteoma.**—A bone tumor, either compact or spongy, and usually developed on the body of a bone. As a rule it occurs on the periosteum, but more rarely in the muscles, fasciæ, tendons, and still more rarely in the thyroid glands. (This last condition was described by Siedamgrotsky.) They are usually recognizable by their location and consistency. They frequently occur in combination with sarcomata and chondromata. The size varies, the author having seen an old dog in which he found osteomata nearly as large as a hen's egg. These were remarkable for their extremely regular surface, and were attached by distended tendinous tissue to the left of the transverse prolongation of the fifth cervical vertebra, but were removed without any bad results. As a rule osteomata are removed only when they are closely connected with the bone, and when they are likely to cause a great deal of trouble.

11. **The Chondroma.**—A tumor made up of cartilage cells, usually of the hyaline variety, but sometimes they are observed to be of the fibrous or yellow elastic type. They may arise from any structure containing cartilage, such as the trachea, nasal septum, ribs and the ends of bones. They are frequently met with in the shafts of long bones (enchondroma). Usually they do not grow to a very large size, and are non-malignant, although they may be multiple primarily.

Infectious Genital Tumors.

This condition seems to be almost entirely confined to the higher bred animals. Particularly since careful selection in breeding has been made, and the best bred dogs are apt to be infected. It was first observed on the continent and later in Great Britain, and then from the large number of dogs that have been imported into the United States, it made its appearance in America. Its peculiar character of reaching its highest development in three months or about that time and then commencing a retrograde degeneration and healing up, has to a certain extent checked its development and has a tendency to keep it within bounds, and also that it is rarely seen in common bred dogs. Its chief mode of dissemination seems to be from the male, for when a particularly good stud-dog is affected numbers of bitches become inoculated, thus the disease is carried in all directions.

The disease commences by a circumscribed tumefaction, deep red in color and by a gradual elevation of the tissue and develops into round nodular tumors, these become lobular masses, are grayish-pink, varying to purplish red; they bleed easily on the slightest manipulation. There is more or less discharge of bloody muco-purulent fluid from the prepuce, and that organ is swollen and deepened in color at the free portion (see Plate). If there is a chance to observe the disease from the onset, it is found to commence with a slight tumefaction of the tissues and formation of small firm nodules, which increase slowly and finally develop into rounded masses; then these masses become softened, break down and leave a deep ulcer with raised edges from which a thin tenacious discharge flows.

In the bitch the tumors are rarely noticed until a discharge is seen at the vagina, or she shows great pain during copulation and will generally refuse to take the male. A digital examination shows a number of tumors in the form of elevations either sessile or pedunculated, in severe cases the walls of the vagina are covered with them. The sessile seems to be commonest in the bitch; they lie, as a rule, well up in the anterior portion of the vagina.

The tumors will break down and disappear, but in the bitch they invariably leave a cicatricial contraction so that while the bitch may become pregnant she has great difficulty in parturition, the vaginal walls in that particular portion becoming inelastic. In other cases if the bitch becomes inoculated by the dog the tumors grow so rapidly that they practically close the vagina so as to produce dystocia.

That this disease is contagious there is not the slightest doubt, and that it is easily transmitted experimentally has been shown by Washburn and Smith, who state that, "For the first few days after inoculation

INFECTIVE TUMOR OF DOGS (*natural size.*)

Circle 1 includes area shown below.   Circle 2 shows fully developed stage.

INFECTIVE TUMOR OF DOGS (*the initial stage.*)

Camera drawings, low power.   Clarke, Protozoa and Diseases.   Baillière, Tindall & Cox, London.

a swelling can be felt, partly due to the fragments of the tumor introduced and partly to inflammatory exudation. In some cases this swelling completely subsides, so that nothing can be felt until the appearance of a small nodule indicates that inoculation has been successful. In other cases the swelling persists, and it is difficult to decide whether the inoculation has been successful until a definite increase in the size of the swelling has taken place. The usual time at which there is distinct evidence of the first appearance of the growth after inoculation is about three weeks, but it varies between twelve days and a month. * * * The small firm nodules which first appear gradually increase in size, and form rounded lobulated masses. At the commencement they are freely movable beneath the skin, but at a later period the latter become thinned out, of a bluish-red color, and firmly adherent to the growths. * * * The maximum growth is attained in about three months. A curious regularity obtains in this respect. * * * Having reached this stage, retrograde stages are not long in appearing; the growth becomes soft and flabby, and slowly dwindles until nothing is left to indicate its former presence. * * * In nearly half the cases the subsidence of the tumor was accompanied by ulceration; the thinned-out reddened skin giving way over the growth, which has previously undergone softening, and there results a deep ulcer, from which a thin grumous discharge flows. Even when these retrograde changes are occurring, fresh growths occasionally take place at the periphery of the tumor."

Clake, who has carefully examined the tumors, likens them to the alveolar sarcoma of the human breast and classes them as granulomata. He describes three stages and shows marked changes in each. And concludes that they may be divided into three stages:

1. "The early granulation-tissue stage—*i.e.*, a filling out of the shrunken connective-tissue cells.

2. "A stage in which the granulation-tissue cells have assumed the character of sarcoma-cells. Some of these cells exhibit a mitotic activity comparable to that seen in the earlier stages of invasion of the cells of the cornea by the protozoa of vaccinia in their hyaline or chromidial phase. Among the tumor-cells in this stage are bodies of typical protozoon characters; and—

3. "A final stage in which chromidial parasites escape from the nuclei of the tumor-cells, rapidly enlarge, become nucleated, and subdivide; this process terminates in the formation of minute bodies, most of which are in the chromidial condition."

Treatment.—In the male it is comparatively easy. If the tumor has not broken down it should be removed by filling the prepuce with cocaine solution, then have an assistant retract the prepuce and expose the free portion of the penis. The tumors must be freely cut away with

a pair of curved scissors; then to the excised portion of tissue apply the thermo-cautery, or with a camel's hair brush apply pure carbolic acid which should be neutralized immediately with an alkaline solution. There is always considerable hemorrhage, but this is easily controlled. French advises, if there should be great hemorrhage, to take one or two stitches in the mucosa. This is to be done only where the hemorrhage is extreme and the stitches to be removed not later than twenty-four hours afterwards as the sutures cause great irritation. The non-irritating substitutes for nitrate of silver such as the silver proteids and albuminates are particularly useful in this condition and should be applied locally in the male and injected freely in solution in the bitch.
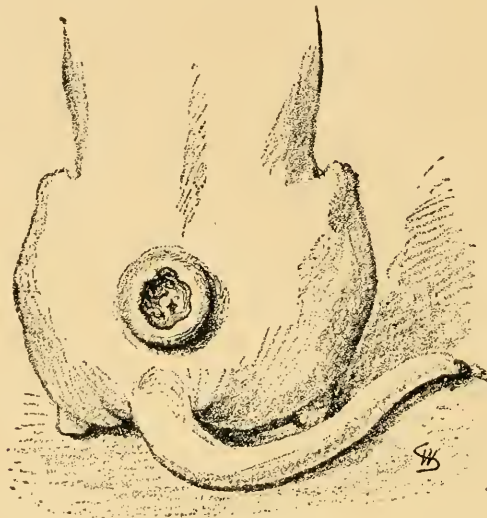
Fig. 176.——Chronic ulcer.

The male, if treated early, generally recovers in three or four months, in the bitch if the vagina is involved to any great extent it is not wise to breed her. If asked to give an opinion as to her purchase as a brood bitch it would be well to advise against it.

General Therapeutics of Tumors.—The treatment of tumors of the mouth, anus and mammary glands has already been taken up and the reader is referred to those conditions under their respective titles. The internal medicinal treatment of tumors by preparations of iodine may be used in cases of goitre. In carcinoma and sarcoma we may give arsenic in the form of a solution of mercury, iodine, and arsenic (Fowler's or Donovan's solution).

Surgical Treatment.—This is generally palliative in cases where the tumor is difficult to reach, being restricted to the prevention of hemorrhage, suppuration, and a fetid odor.

INFECTIVE TUMOR OF DOGS (*the fully developed stage.*)

*1. Cells distended by cell-inclusions. 2 and 3. Cells with active nuclei. 4. Cells with amœboid bodies
close to empty nuclei. Camera drawing, low power. Clarke, Protozoa and Diseases.
Baillière, Tindall & Cox, London.*

Tampons of tow which have been saturated in a solution of chloride of iron and injections (where there is an opening) of subsulphate of iron, 1 to 90.

This palliative method is only indicated where a radical operation cannot be performed from some cause or location of the tumor and where the owner wishes to keep the animal alive as long as possible without surgical interference.

The methods of radical removal of a tumor are as follows (these do not include torsion or twisting):

Ligation.—This method may be applied in all cases where the base of the tumor is not too broad and if it has not penetrated deeply into the tissues. It is useful in many forms of warts, fibromas, and sarcomas; but, as a rule, it is objectionable because it acts slowly, is extremely painful, produces great inflammation with suppuration, and the tumor has a tendency to return. The general mode of procedure in this operation is to ligate the base of the tumor with a strong silk thread or rubber band wound several times. These growths can also be subdivided by means of the ecraseur, using either the chain or wire. The chain of the ecraseur is put around the base of the tumor and greatly tightened by

FIG. 177.—Wire ecraseur.

means of the instrument, when the tissues are gradually crushed. The writer has used the wire-loop shown in its simplest form in Fig. 177 for the removal of epulides. The bleeding, as a rule, is very slight if the crushing is done slowly, but there is always danger of a recurrence of this condition. We must, therefore, touch the open space left after the removal of the tumor with a thermo-cautery.

Cauterization.—We may destroy tumors of the cutaneous or mucous membrane, flat warts, etc., by means of the thermo-cautery, or we may use some of the various cauterizing substances. The thermo-cautery has the advantage of being kept at an even heat for a long time, and on account of this steadiness is especially valuable in controlling hemorrhages

The caustic chemical substances, such as burnt alum, caustic potash, sulphate of copper, chromic acid, chloride of zinc, and nitric acid, are not especially valuable in the therapeutic treatment of tumors.

Removal—Extirpation.—This method is the best one to follow in all large tumors which are easily reduced. Various modifications are possible, according to the form and location of the tumor, but the following is the general mode of procedure:

In making the incision the cut should be made by an ordinary scalpel between the tumor and soft parts, making the incision, if possible,

in the direction of the hair and of the large blood vessels. After the extirpation of the tumor, the cavity should be cleared of all loose tissue by means of a pair of scissors or scraped with a curette. Ligate all the blood vessels. Clean the wound of blood clots, and touch the whole freshly cut surface with pure carbolic acid, as it frequently facilitates healing by first intention. Then bring together the edges of the
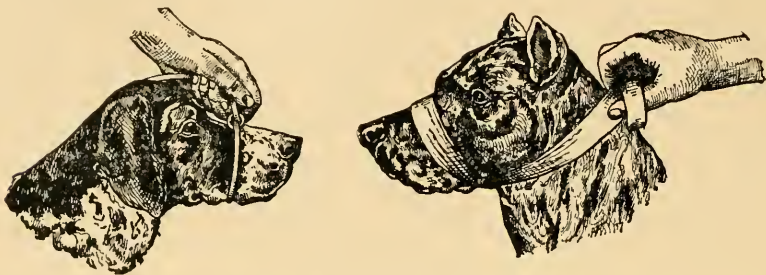
Fig. 178.—Manner of tying the mouth.

wound by means of sutures. Place over the wound an antiseptic dressing.

Anæsthesia.—We have already given information as regards the last three points of the operation. We must confine the animal, in all operations, in such a way as to prevent him from biting or moving that part of the body which is operated upon. It is best to place a leather strap or broad cotton tape bandage around the mouth (see Fig. 178) and have an assistant to hold it. This method is preferable to strapping with cord, etc. Hobday, Gray and Berdez have constructed special hobbles and operating-tables which are to be used in hospitals.

In very serious operations, accompanied by great pain, it is advisable to place the animal under the influence of some anæsthetic (except in slight operations of the eye, in which local anæsthesia with cocaine is sufficient). For general anæsthesia we use ether or chloroform, or in cases where small tumors or warts, etc., are to be removed. In that case for local anæsthesia we use the spray of ether or ethyl chloride or local subcutaneous injections of solutions of cocaine hydrochlorate. The inhalers used in anæsthesia consist of modifications of cones or cylinders. the commonest being a cylinder of tin with open perforated tin or wire at one end and containing a sponge to hold the anæsthetic. This is placed over the nose of the animal. A large number of modifications of this simple apparatus are used, varying from a wire muzzle or an ordinary tumbler or a flower pot to the elaborate apparatus advised by Hobday and described in the "Surgical Diseases of the Dog and Cat." This apparatus consists of a mask that has the form of an elongated blunt cone, having a stopcock at one end where the tube enters that carries

the anæsthetic into the apparatus. This is fixed on the head by means of a collar, and a circular continuation of the cone made of soft cloth, which is adjustable, is fitted over the face. A container with a broad base to prevent any chance of it being overturned contains the anæsthetic. This container has two openings—one to connect the tube and the other to allow the admission of air to mix with the vapor of the anæsthetic. Connecting the container and the mask is a bulb apparatus usually seen on the thermo-cautery.

The muzzle apparatus is fixed on the animal's head, and by means of the bulb the mixed vapor is blown into the muzzle and directly on the animal's nose, thus preventing the irritation of the direct contact of the ether or chloroform. By means of the stop-cock the supply of vapor can be stopped instantly, or, if need be, the whole apparatus can be slipped over the animal's head or the rubber tube can be pulled from the container and a supply or pure air blown directly on the animal's nostrils.

In the administration of the anæsthetic we must take care that a certain amount of air is inhaled with the vapor of the anæsthetic. The pulse, respiration, and reaction of the eyelids must be watched at the same time. After a few inhalations we notice a period of excitement which is marked by great restlessness, howling, groaning, and, in rare cases, delirium. This is followed in a short time by a period of depression, and after that the narcotic condition is completely established. The cornea has now become insensible—that is to say, there is no reflex action or closing of the eyelids when touched. The muscles are now entirely relaxed, fæces and urine are discharged involuntarily. This result is not always even or regular, but depends to a large extent on which of the above-mentioned remedies is used. For instance, in using ether the stage of excitement is usually prolonged (twenty to forty minutes) and in the stage of depression reflex excitement does not disappear immediately. Chloroform produces much quicker results, and, as a rule, answers fairly well, but it has one disadvantage—the attendant or administrator must be very careful not to push it too far, or it is apt to produce paralysis of the lungs or stop the action of the heart, causing death. We prefer to use a combined narcotic in the form of a subcutaneous injection. This injection consists of 0.01 to 0.5 of morphia muriate dissolved in water, and in order to prevent the possibility of too large a dose causing paralysis of the heart 0.002 to 0.005 of atropia sulphate should be added one-quarter to one-half an hour before the operation. Afterward the writer has found it necessary to carefully administer chloroform until the animal is completely anæsthetized, then follow up the operation with ether alone or alternating with the inhalation of ether and then chloroform. The narcotic stage is mild, the period of excitement

short. Some prefer Billroth's mixture (chloroform 3 parts, ether and alcohol 1 part of each); there is also Wachsmuth's mixture (chloroform 5 parts, oleum terebinthinæ recti 1 part). In England the A. C. E. mixture (ethyl alcohol 1 part, chloroform 2 parts, and ether 3 parts) is largely used In America the morphia-ether procedure, that of giving from one-half to one grain of morphia twenty-five minutes before the operation and then giving ether during the operation is largely used. It is safe, its chief objection being that it induces more of less preliminary excitement and salivation. Cocaine for local application as in the eye is harmless as a rule, but subcutaneous injections of a large amount of concentrated solutions for local anæsthesia should be avoided as they are liable to cause grave symptoms of intoxication or even death. This may also occur in the administration of cocaine in suppositories in tenesmus and prolapsus of the rectum in young dogs, and in very small dogs a dose of cocaine ranging from 0.025 to 0.05 may produce indications of cocaine poisoning; consequently in weak young animals of the smaller breeds it should be used with great care. Milder local anæsthetics, such as acoin, eucaine, stovaine, novocaine, are recommended. As to the so-called lumbar anæsthesia of the spinal cord, it has been recommended for painless operations of the abdomen. The operation consists in putting the hyperdermic needle in the lumbo-sacral fossa, which is between the median iliac angles. Pfeiffer uses a 2 to 3 per cent. solution of stovaine; the weight of the dog determines the dose (0.007 to each kilo.).

The use of various animal sera, such as the anti-streptococcic and polyvalent sera, have been offered as a possible means of preventing wound infection. These sera undoubtedly are valuable and will ultimately, when better understood, be of great benefit therapeutically. At present, however, they are still in a state of evolution.

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