

"Tips" on Camels

FOR
VETERINARY SURGEONS
ON ACTIVE SERVICE

BY
A. S. LEESE, M.R.C.V.S.

Temporary Captain, Army Veterinary Corps
Camel Specialist to Government of India, 1907 to 1913
and to Government of East Africa Protectorate, 1913-1914

Reprinted from
"THE VETERINARY JOURNAL"

SVVU 3800 ✓
(9)



616.0599736

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1918

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PREFACE.

These articles on Camels were written originally for the *Veterinary Journal*, in which they have been published; they were intended for the professional man, the idea being to supply such information on the diseases of camels as has not hitherto been easily accessible to veterinarians in a concise form, and to avoid long descriptions, both of well-known diseases like Sarcoptic mange, and of matters already quite familiar to the general veterinary practitioner; the subject is dealt with throughout on comparative lines.

A. S. LEESE.

8th October, 1917,
British Expeditionary Force.

"TIPS" ON CAMELS FOR VETERINARY SURGEONS ON ACTIVE SERVICE,

AN apology is necessary for placing these notes before professional readers in a somewhat random form. The war has prevented me from finishing a book on the one-humped camel; my notes and records are waiting in England, and I am writing now from memory. Camels are to the fore in several theatres of war, and it has struck me that there are not many veterinary surgeons who have lived along with camels in the only place where they can be really studied in health as well as in sickness—that is, their grazing country, the bush and the desert; and that possibly some service may be rendered by jotting down some of the conclusions formed and experiences gained in eight years of life under those conditions on three continents.

I shall attempt only an outline of what is known about camel-disease in the hope that it may be of assistance to veterinary men whose experience has, hitherto, been with animals other than the camel, and who find themselves in veterinary charge of camel-units in this war; only points referring to male working camels will be touched upon. Camels are splendid patients, because they rest well, make little of pain (within reason), and are easily handled. One veterinary surgeon who is keen can do more to alleviate the sufferings of camels than all the societies that ever existed for befriending animals.

Rutting.—In the Northern Hemisphere, rutting in camels occurs in the latter half of the cold weather, except in Somaliland. If grazing has been good the previous hot weather, a camel may rut from December to March. Usually it is in January and February that male camels are most violently "musth." There is no need to describe the symptoms; they are obvious enough. The pink or piebald "bladder" which is periodically belched out of the mouth of a musth camel is

simply the expansion of the soft palate which is normally lodged in the pharynx. Among a number of male camels running together in the jungle, the biggest and strongest only becomes musth; if another camel begins to get musth there is a fight between the two; the winner continues to be musth and the loser ceases rutting.

Veterinary advice may be sought as to how to combat the injury done by musth camels; because musth camels are more vicious than usual and may inflict severe injuries on men or other camels (thereby greatly increasing the number of casualties in camels); moreover musth camels do not thrive, and they are noisy, and dirty to handle.

The difficulty may be got over entirely by a general policy of castration of all working males, but this has serious disadvantages. Castration before six years of age leads to great deterioration in bone, muscle, and stamina, the gelding becoming, in fact, rather like the cow-camel in general appearance; castration over the age of six is liable to be followed by a fair percentage of loss due to the operation, and this loss, it must be remembered, is of camels in their prime, and is therefore no trivial one. The minimum of loss is sustained by using a "castrator"; the best are of colonial patterns. The cord should be severed as high up as can be reached. Adult camels should be chloroformed for the operation. Unfavorable sequels are much as in the horse; enlargement of the stump is one, but it is more amenable to removal than true "scirrhus cord."

In India and Egypt it is not the custom to castrate camels. In Somaliland, about 65 per cent. of camels are castrated; of these, a few are destined for eating, but the majority are done simply to obtain peace in the herds; for the Somali camel does not normally do much work except during short periods, and is not required for heavy loading. In Australia, only the camels used in teams (in harness) are gelded; this is done to prevent fights in the team. Throughout the camel world, the entire is easily recognised to be larger, stronger and a bigger weight carrier than the gelding, unless the latter was operated on as an adult.

When castration is not adopted, the best treatment for a musth camel is hard work. He should be given all the odd jobs, and will lose less condition by hard work than by being left alone with his thoughts. The damage he does is chiefly by his tusks; these may have the points cut off by a saw not more than $\frac{1}{4}$ in. from the point, and rounded off afterwards with an equine tooth-rasp; he will not then be able to inflict very serious injuries. Musth camels may inflict fatal injuries by biting other camels in the throat, jugular vein, testicle, or flexor tendon-sheaths.

NORMAL AND ABNORMAL TEMPERATURE, PULSE AND RESPIRATION.

The Temperature is as useful in camel practice as a guide to diagnosis as it is in horse-practice, but the normal fluctuations, which are great, must be known by the veterinarian. In the camel, the temperature is at its lowest at dawn and gradually increases until sunset, after which it gradually sinks again during the night. In addition to this, there is a great variation in temperature as between one day and another. The normal temperature may be described as follows :—At 6 a.m., average 97.5° F., extremes 94° to 98.6° F. At 6 p.m., average 100.6° F., extremes 99 to 101.7° F.; at noon, the temperature is halfway between these figures. The highest normal limits are reached on days or nights of stifling heat; and a cold rain-storm may reduce the temperature of the animal to the lower limit. When camels are much worried by flies, the temperature is useless as a guide.

Fever is present if under ordinary conditions the temperature is :—

At 6 a.m., over 98.6° F.; at 6 p.m., over 101.7° F.

Pulse varies a good deal in frequency, generally 45 to 50. It is most palpable in the posterior tibial artery in the sitting position with hind feet flat on the ground and hocks raised.

Respirations.—Five to seven a minute during rest, but are most frequent at midday. Anything over twelve a minute is abnormal. Camels readily show the clinical alterations in the character of the respirations associated with the painful febrile diseases, such as pleurisy and peritonitis. Respiration is greatly increased in frequency by pain.

SYMPTOMS OF ILL-HEALTH.

Fever.—Besides the abnormal temperature already described, the common symptoms shown by feverish camels are loss of appetite, cessation of cud-chewing, increased respirations, drooping forward of head and neck, and a slight discharge of tears over the face. Fevered camels often prefer to face the sun; the tail is motionless and the wrinkles over the upper eyelids smooth out. A warning must be given here against judging a camel's appetite by the way he tackles his rations; many camels will be quite "off feed" on the grazing-ground, and yet will come in and clean up their rations as usual. Grazing requires a certain amount of effort, and the fevered camel will not make it. Consequently, it is necessary to ascertain how the patient behaved when out grazing, if one is to judge "loss of appetite." A camel which will not eat his grain ration is generally more than a little sick.

Pain.—Abdominal pain is shown by rolling about, as in the horse, or by sitting with the hind feet tucked to one side, and the belly pressing on the ground. The number of respirations is greatly increased. Pleurisy is shown by the classical changes in the respiration. Peritonitis (which occurs without warning in the camel) is

accompanied by a marked interval between inspiration and expiration. Intense pain elicits lugubrious moaning and lachrymation. Grinding the teeth occurs sometimes in "lung abscess"; but is normal in musth camels or in camels which have just eaten salt. Grunting is in the same circumstances as with cattle, but generally on rising from the sitting position. Another warning is, perhaps, advisable here; that is not to assume hastily that a sitting camel which is frequently fidgeting from one side to the other is suffering from colic; it is more likely suffering from an injury either to the "pedestal," or another pad.

Cough.—Natives are very unobservant as regards the cough in broncho-pneumonia in camels. This is a soft, sigh-like cough, and is most often observed in the early morning, and soon after a camel rises from the sitting position. Violent fits of coughing occur sometimes in pharyngitis, laryngitis, and bronchitis; they may often be stopped by seizing the camel's head and holding it down with the lips touching the ground (the camel being in the standing position) for a minute. The common cause of chronic cough in camels is abscess in the lung; this is a sequel to pneumonia, and is not usually pyæmic from wounds, as I have seen suggested.

Nasal discharge is seen in catarrh. In frontal sinus trouble pus generally comes from *both* nostrils and does not smell; it is unlike equine cases in these respects.

Diarrhœa occurs readily with certain changes of grazing. Salvadoras, seaside salsolaceous plants, mangrove, wild jujube and many other good grazing bushes will cause it when camels first come on to them, as also will various fodder crops fed green. A nervous camel will have diarrhœa if he is frightened or hurt.

Constipation.—Normally the dung pellets are soft, convex on one side and concave on the other. With constipation they become cylindrical, hard and dry, and this is particularly the change one looks for daily as an indication of over-dosing when treating trypanosomiasis by methods involving the use of Soamin (Atoxyl).

Debility.—The common causes of debility in military operations are overwork, under-feeding, working at unsuitable hours, exposure to cold, working hard before the second pair of incisors is cut, mange and its curative dressings, want of time to acclimatise in imported camels, unfamiliar nature of grazing in imported camels, advancing age, and trypanosomiasis. Trypanosomiasis is, excepting in Australia and in the Somaliland Protectorate, by far the most important disease of camels; it is widespread, difficult for the inexperienced to deal with, often difficult to diagnose, and few Camel Corps are entirely free from it. When every precaution is taken against it as a routine measure, and when the C.O. can be convinced of its

overwhelming importance, it can be kept under control ; not otherwise. During peace time, the efficiency of the camels in Camel Corps chiefly depends on the thoroughness with which this disease is provided against. No one but an experienced veterinary surgeon is competent to supervise the routine measures which have to be taken to prevent trypanosomiasis getting hold in a Camel Corps. Much of the heavy mortality from trypanosomiasis in military and civil transport and riding camels is due to the want of competent veterinary control, and to practices based on the extraordinary theories which C.O.'s are apt to indulge in with regard to the disease if allowed to do so.

Among the less common causes of "debility" are tuberculosis, very heavy invasion of lungs and liver by hydatids, filariasis (if very heavily infected), internal abscesses, and overgrown molars. If a "debility" case fails to improve at all after five weeks' good feeding and attention, and is not suffering from either trypanosomiasis or filariasis, it is best to destroy the animal. Camels which get very low often suffer from a severe anæmia with atrophy of the heart-walls, which nothing will cure. Such cases entirely lose their "back-muscle" and that of the quarters.

There is a certain conformation often met with in camels which should be avoided when purchasing, as the animal so built never does well. A fair-sized hump may be present in the conformation referred to, yet there is a deep concavity just below the withers, and there is a sort of trench along the back on each side of the hump ; the quarters are flat or concave, and the ribs are very obvious. The function of the hump, as a storehouse of fat to be drawn upon according to the needs of the animal, appears to be in abeyance in these camels.

A peculiar feature in "debility" cases is the enormous variation between the morning and evening temperature, without any fever being present. The difference may be as much as 7° F. (94° to 101°).

TRYPANOSOMIASIS.

It is unnecessary to remind professional readers that this disease is a recurring fever due to trypanosomes in the blood, and that, in the intervals between the febrile attacks, trypanosomes are generally absent from the blood. I propose only to sketch very briefly the characteristics of the disease as it affects camels.

Firstly, as to its course and symptoms :—

(i) It may be acute, with almost continuous fever with trypanosomes present in the blood nearly all the time, and a fatal termination within a few weeks.

(ii) It is *more often* sub-acute or chronic ; in the latter form the intervals between the febrile attacks are longer than in the sub-acute

form and the febrile paroxysms are of shorter duration. Characteristically the febrile periods in these forms may at first be from two to five days and the intervals from three to nine days. In recovering cases, the intervals get longer and the febrile periods shorter.

(iii) After a number of febrile paroxysms the camel begins to lose condition. This is far more marked if the camel is at work than if he is at rest, but happens in any case.

(iv) Clinically, strong suspicion of trypanosomiasis is aroused by the following symptoms (in male camels) :—Irregular appetite, as shown on the grazing ground ; on some days he grazes well, on others (when the fever is on him) he stands listlessly about. The same camel may have a perfectly good appetite for rations at any time. The flank is always somewhat hollow, as the belly is rarely filled. The camel gradually shows a loss of muscular tone and does not carry his head as he should do ; it droops so that the bridge of the nose is below the level of the poll. The symptoms of fever, particularly the discharge of tears, may be noticed, but are not very marked in typical cases. Eventually he becomes thin and hidebound. The long hair near the ends of the tail easily comes out when pulled ; this is an excellent test as to whether a camel is going “ downhill ” or not ; when the hair-root brings with it a white speck of tissue, the camel is generally picking up ; if it appears naked (black, like the rest of the hair) the camel is nearly always on the downward track. The urine in trypanosomiasis frequently has an aromatic smell which may be noticeable towards the end of the tail. From the above description, it will be seen that there is nothing very pronounced in the symptoms of a typical case, and that is why it is so important to remember that :—

The symptoms often go unnoticed by the camelman himself for long periods.

(v) The duration, followed by death, may be any time up to three or even four years ; but the average for sub-acute cases is about one year. Recovery takes place in about 20 per cent. of camels if they receive good food and are rested most of the time throughout the disease ; but this recovery follows three years of sickness and is therefore of not much account from the practical standpoint, although these recovered cases are immune afterwards. Recovery may be expected if the affected camel improves in condition, and if the febrile periods gradually become more rare.

(vi) Death may take place in various forms, it may be sudden, and if the symptoms of trypanosomiasis have not been noticed previously it may be put down in error to anthrax, snake-bite, “ cussedness,” and so on. Frequently a broncho-pneumonia finishes up the affected

camel. He may die of anæmia and cardiac atrophy after slowly declining for months or years.

(vii) If a fresh blood preparation be taken from the tip of the ear during a fever paroxysm, the trypanosomes are easily seen moving about under a one-sixth objective. This is the definite means of diagnosis and can be done easily in the field. As a rule, it is not possible to find trypanosomes during the intervals between fever periods. As the disease is so common and the symptoms are not very marked it will now be recognised that a small microscope furnished with a one-sixth objective is a necessity, and not a luxury, for every camel doctor.

(viii) Although it is easy to confirm a diagnosis of trypanosomiasis by microscopic examination, it is not so easy to say that a camel is *not* suffering from this disease; to do that one would have to take the temperature daily for at least ten days, and examine the blood when any fever is found; that would, for ordinary purposes if the examination proved negative, be enough to exclude a diagnosis of trypanosomiasis in its acute or sub-acute forms, but a much longer period of observation would have to be undertaken to exclude the possibility of "chronic" trypanosomiasis, especially if it has a tendency towards recovery, because then the intervals between the fever paroxysms may run into months, and no trypanosomes will, as a rule, be found by examining the blood in these intervals. Inoculation of blood into small animals may give positive results in some of these cases; but a negative result does not justify any decision as to diagnosis.

(ix) In addition to diagnosing the disease, a veterinary surgeon must determine, if he can, by observations on the frequency and severity of the fever paroxysms, and by the other symptoms shown by the patient, whether the camel is going "downhill" (*i.e.*, whether he is suffering severely from the disease), or whether he has a tendency to recover. Without this knowledge, it is difficult to decide what to do with the patient.

As regards etiology, I have attempted below a summary of the main facts; the difficulty is to do it justice without writing a volume:—

(x) Trypanosomiasis is chiefly spread in camels by biting-flies. Excluding the tse-tse flies of Central Africa, in the bodies of which various trypanosomes undergo part of a definite life-cycle, it is the tabanus fly which acts as the chief agent in the spread of trypanosomiasis in the camel. All clinical experience is opposed to the view that the trypanosome undergoes any part of its life-cycle in this biting-fly; the tabanus seems to act as a mechanical carrier direct from a diseased camel with trypanosomes in his blood to a healthy camel. It is the habit of the fly to bite several camels before he fills his belly with blood; and the reason that he has to fly from one camel to the

other is that his bite is painful and, as a rule, leads to attempts by the camel to dislodge him. Experimentally, this direct inoculation by the means of large tabanus flies is very easy to demonstrate, and any observer who has spent time with camels grazing in a heavily-infested tabanus "zone" can see for himself the flies doing the same experiment "on their own."

Camels with acute or subacute trypanosomiasis have the parasites in the blood very frequently, and, indeed, on some days the blood is simply a mass of them, to such an extent do they swarm in it.

The extent of the spread of the disease in a herd of camels obviously, therefore, depends on the number of tabanus flies in the locality and on the number of "reservoirs" of infection, *i.e.*, the proportion of camels already affected with the disease. If the number of tabanus flies is small, and the veterinary control over the camels is such as to keep the herd free of all but the most "latent" cases (that is, chronic cases well on the way towards recovery), the disease has not much chance to spread. Where tabanus flies are plentiful, and where veterinary efforts against the disease are regarded as a "fad," and therefore a large proportion of unrecognised cases are left in the herd, nearly all the camels will get the disease, excepting the few that have gained immunity by passing through the three years of disease in their younger days.

The disease will always be serious, even when the herd is under frequent examination for affected camels, if they live where tabanus flies are numerous, because a few cases which escape the keenest detection can infect so many flies. Similarly, where no attempt is made to detect affected camels in a herd, and where tabanus flies are present, though not numerous, the disease spreads pretty widely, because the flies, though few, are so frequently sucking infected blood.

Other biting-flies may act as transmitters of the disease, provided they are very numerous and can operate on a herd already pretty full of "reservoirs" (undiscovered cases). *Lyperosia*, *Stomoxys* and *Hæmatopota* have evidence against them; *Hippoboscidae* and mosquitos have none. If proper precautions are taken against "reservoirs," there is no need to take into practical account any biting-fly but tabanus (in any camel-country other than that adjoining equatorial Africa).

(xi) Tabanus flies are seasonal in most countries, and are found in largest number during and after rains, chiefly those falling in hot or warm weather. In very cold or dry weather, they are either scantily present, or absent. It follows that there is generally a definite "trypanosomiasis season" (there may be two) and the spread of the disease is, generally speaking, confined to these rainy seasons.

Another complication to this complicated problem is that in some places tabanus flies never breed, and these places remain havens of refuge for camels in the trypanosomiasis season. The "desert," with its vegetation refreshed by the rain, makes camel-keeping possible in many countries where otherwise the animals would be wiped out by trypanosomiasis. Every hot-weather-rains, the tabanus-free desert is the refuge of camelmen, who have learnt, by the tribal experience of centuries, that their camels cannot be maintained in well-watered localities in the rainy season. A sandy soil is almost a guarantee of a tabanus-free "zone"; but the character of the vegetation is another good guide to experienced men, because the amount of moisture suitable for breeding tabanus is sufficient for the presence of certain kinds of trees and bushes; nothing but jungle-experience will teach these things. As a rough guide, it may be said that in or after the rains herds of camels are liable to be severely affected by trypanosomiasis if grazed or kept in the following zones:—(a) Rice-country; (b) low-lying country liable to flooding; (c) jungle chiefly composed either of the largest sized acacia trees, or of low tamarisk bush. Canal-irrigated country varies a good deal as regards the number of tabanus flies. The Himalayan foothills with their heavy rainfall, and any low-lying heavily grassed country, are infested by tabanus in the rainy seasons.

Preventive measures are all-important; success in camel-keeping in India and most camel countries, excepting Australia and the Somaliland Protectorate, depends on them. They are:—

(i) Provision of grazing throughout the tabanus seasons in country containing few or no tabanus flies.

(ii) Early diagnosis of affected camels; this is done by establishing, as a routine of stable management, the taking of the temperature of all camels at least twice a week; it is easily and quickly done by employing about ten thermometers ($\frac{1}{2}$ minute) with ten camelmen to insert and retain them. Any camel with a fever temperature should have a drop of blood taken from the tip of the ear and be examined under one-sixth objective for trypanosomes. A portable microscope suitable for this work costs only five pounds.

(iii) Segregation, into veterinary hands, of all cases discovered.

(iv) When purchasing camels into a unit, the same precautions as in (ii) are necessary; and, since a one-day examination is all that can usually be obtained, the purchasing officer should have as great experience of camels, and of trypanosomiasis, as possible.

(v) When it is inevitable that camels should be sent into country heavily infested with tabanus, keep them in small groups; and it may be useful to remember that in very hot weather, tabanus is chiefly active from dawn to 10 a.m. and from 4 p.m. to dusk, whilst in cool

weather he prefers to bite at midday. Carcasses of camels dead of trypanosomiasis are not long infective in hot climates, and biting-flies do not suck their blood. There is no need to burn the carcass, but it will wipe out the local population of pariah dogs and jackals which eat it.

Treatment of camels with trypanosomiasis.—Keeping in mind that these notes are intended for veterinary surgeons on active service, it is quite clear that segregation of affected camels with a view to the natural recovery of a minority (about 20 per cent.) after three years is quite an impracticable idea. Camels discovered with trypanosomiasis will come under two classes:—The first (the majority) will be on the downward grade and actively diseased, the second (the minority) will be on the road to natural recovery if given the necessary chance. It is only by observation that one can tell which category a patient belongs to; this observation will, in the first class of patients, show oft-recurring and serious febrile paroxysms and falling away in condition; in the second class, it will show slight paroxysms of fever lasting only a day or two, and long intervals between the paroxysms. The first class may be dealt with in various ways, viz.:—

(a) They may be destroyed, so as to prevent them acting as reservoirs of infection to healthy camels. Some may be used by the butcher.

(b) They may be worked in segregation as long as possible and then destroyed. They will not last long under this treatment. Under certain circumstances this procedure can be adopted for dangerous and unavoidable “*tabanus*” stages on a route.

(c) They may be put under curative treatment. This treatment cures between 50 and 65 per cent., generally nearer the former figure. Emaciated animals are unsuitable for this treatment. The treatment is by the use of various compounds of arsenic and antimony. The simplest is the injection of Salvarsan (tried in Egypt by F. E. Mason), but it costs nearly as much as a new camel. The other methods have grave disadvantages—all are clumsy, involving ten or twelve intravenous injections; great accuracy in dosage and keen observation of camels under treatment is essential, and it is very hard work to treat, say, fifty at a time; for these reasons it can seldom be placed in the hands of any “native” veterinary graduate. The drugs cost from three to six shillings per camel, and treatment is a matter of twenty to twenty-three days. A few camels will die of over-dosing, and the ones which are not cured will relapse any time up to ninety days after treatment, but generally within a month. Camels cured by drugs are not immune. These methods of treatment have all been fully described in veterinary literature, and it is likely that some day they will be improved upon. In the present war, I had the hardest work to treat about eighty camels out of a strength of 103 by these methods under

camp conditions and single-handed; the camels had to live during treatment in a tse-tse fly zone where no stock can survive, and were undoubtedly re-infected just as soon as they were cured; nevertheless, only three died in two months out of 103, although doubtless many have died since. The trypanosome in this case was of the *T. congolense* type not the usual *T. evansi*. The best of grazing and of good rations are required during treatment.

The second class (camels with a marked tendency to natural recovery) should receive rest and good food and grazing, in segregation. This may be continued until no fever periods have been observable for, say, two months, by which time, if condition has been regained, the camel will be capable of a fair amount of work, and is unlikely to go wrong; at the same time, trypanosomes will be so rarely found in his blood that, as long as the camels are kept away from bad tabanus "zones," he will be negligible as a "reservoir."

In spite of everything that has been said, "tryp" camels are so difficult to deal with that no efforts in prevention should be spared.

Prevention on the march into new country.—It is to be hoped that this will become necessary on several fronts. There are just three facts to impress:—

(a) If nothing is known of the fly-zones in the country ahead, a competent man should be with the first line transport to survey for tabanus and report. Immense loss could be saved in this manner.

(b) Tabanus sleeps at night. Unavoidable "bad" places can be negotiated at night without loss. (N.B. The tse-tse, *Glossina pallidipes* of East Africa, is more active at night than in the day.)

(c) Before the war, there were indications in East Africa that dosing with arsenic against trypanosomiasis might have preventive value. It is to be hoped that some one will get to work with tests in the field on this most important point and get results, one way or the other, to satisfy scientific critics.

One last word with regard to camel trypanosomiasis. It is frequently stated by those of superficial experience that trypanosomiasis does no harm to a camel if he is not worked. This is utterly and disastrously wrong.

The infective diseases of the camel, other than trypanosomiasis, are collectively of far less importance than the disease named.

The camel is subject, under natural conditions, to anthrax, variola, tuberculosis, rabies, tetanus, botriomycosis, contagious necrosis of the skin, and to a pleurisy and pericarditis caused apparently by an organism of the fowl-cholera type. "Influenza" is said to be a disease of camels by some observers; I must say that I know nothing about it, but I think the pneumonia of camels from

four to six years of age is possibly a contagious one. There is also an unimportant catarrh in camels, which may be contagious. The anthrax-like disease seen in Indian camels and characterised by swelling about the throat is, I think, anthrax itself, but the blood does not always contain bacilli to be demonstrated; this is true of pig anthrax, too. Anthrax is found in camels in Somaliland and in Jubaland under the name of "Kud," and some forms of it precisely resemble these throat cases of India.

Camels do not suffer from either rinderpest or foot-and-mouth disease under natural conditions. Lingard claims to have caused a mild form of rinderpest in camels by inoculation; and I have tried to infect camels in various ways with foot-and-mouth, but with no success. The fact is that, in countries reeking with these diseases in cattle, the camels do not get them. Laboratory experiments mean little in the face of these facts. On several occasions outbreaks have been mentioned in reports, but they do not bear investigation. Glanders and strangles are not met with in camels. I believe it has been proved that the Bactrian camel can carry the bacterium of plague.

Anthrax in camels takes a somewhat similar form as in horse and pig, with painful swellings about throat, base of neck, or body. Some of the throat cases, I feel sure, are local inoculated anthrax, probably *via* the punctures made by bots in the naso-pharynx; the swelling is sometimes enormous when the palatal expansion becomes involved. Certainly death may occur without septicæmia, and I have seen, and possess a photograph of, a case exactly resembling clinically that form of the disease which no one seems to see in Europe nowadays, described in text-books as "gloss-anthrax"; the camel was unable to close his mouth or eat owing to the size of his tongue; only one camel out of the three involved in the outbreak had this form, and he recovered from the "gloss-anthrax" but never regained his condition, and his tongue atrophied. As a good many cases do recover, a camel with anthrax should be given the chance.

It is interesting to note that the Somalis, by sheer tribal experience handed down from one generation to another, deal with anthrax as follows: The camel is kept in a small zariba by himself until he is dead, and then a huge thorn-bush defence is built over his body so that hyaenas and vultures cannot get at him until he is putrid.

Variola, or *Camel-pox*, is ordinarily a disease of young camels, usually very benign; in fact, most of them go through it like children and the measles. Adults sometimes get it, and I have seen in working camels outbreaks involving over twenty head in every case; but as a rule only a small percentage of a herd of adults exposed to contagion get the disease. In benign cases, lesions are confined to the lips. A malignant

form, however, is sometimes met with, the lesions spreading over the head and, indeed, anywhere on the body, particularly where the skin is thin. Sometimes an eye is lost; and camel-pox is occasionally fatal. The course is about three weeks, and the treatment of benign cases is handfeeding, or grazing only on plants free from thorns, and a daily application of boric vaseline to the lips. If the lips in this disease are allowed to get torn by thorns they swell enormously. A fact of practical importance in this disease is that it is liable to lose its benign character in the rainy season. Young camels are sometimes inoculated by their owners so as to get them through it before the rains. The malignant form seen in the rains sometimes finishes up in pyæmia.

Tuberculosis.—This disease is comparatively rare in India, but not uncommon in old camels at Cairo (Mason). It is not likely to be diagnosed very early, as trypanosomiasis will usually be suspected at first. Emaciation, irregular temperature and appetite are the chief indications. Cross has noticed persistent hæmaturia in one case. Tuberculosis of the camel is usually pulmonary, occasionally generalised. It is chiefly a disease of old camels.

Rabies.—Not infrequently met with in Asia in camels. Camels are peculiarly exposed to attack by rabid wild animals. Sometimes the affected camel is violently aggressive, and a rabid camel is then so dangerous that it is extremely important to see that any camel bitten by a rabid animal is *secured* during the necessary observation period. Some rabid camels are not aggressive, but noisy and terror-stricken, and I have seen a paralysis of the tongue in one case. The chief things for the veterinarian to do is (i) to see that any suspected camel is *secured* so that he can do no damage before a diagnosis is made; (ii) to distinguish it from "mad staggers," a disease caused by indigestion, and in which all the movements are without purpose.

Tetanus is not common, but does occur occasionally as a result of infection through bites or sores; no doubt, also, through shell-wounds. Only a minority recover. The disease sometimes prevents the camel from folding himself up in a sitting attitude.

Contagious Necrosis of the Skin.—This is met with in all camel-countries. It is inoculable; and, indeed, many of the lesions in affected camels are due to auto-inoculation—viz., rubbing a diseased surface of skin against a healthy one; thus, a camel with a lesion on his withers may inoculate himself on the poll by rubbing his withers with his poll; and a lesion behind the thigh frequently inoculates the skin over the gastrocnemius region, where they come in contact when sitting. Again, new lesions are apt to form wherever the discharge from current lesions runs down. The new pus from a lesion often appears to be an almost pure culture of streptococci; one may strongly suspect the

presence of the bacillus of necrosis, but that remains to be proved. The skin only is involved in the necrosis. The lesions may be of any size, from that of a threepenny bit to that of the palm of the hand. At first there is a diffuse swelling, hot and painful; then the centre gets hard, dry, and black, the hair falling out. Gradually a line of demarcation forms around this hard, black centre, and then pressure on the latter will cause pus to break through in some part of the line. Later, the centre sloughs out like a "sitfast." In favourable cases the wound left heals without trouble; but sometimes there is a great tendency for the edge of the ulcer to become involved in the necrotic process, becoming, in its turn, hard, dry, and black; when this happens, the case is apt to prove rather troublesome. The lesions may occur on any part of the body; but they are rare where the skin is thin, and are seldom seen below knee or hock. Some camels have only one or two lesions, and then the constitutional disturbance is almost *nil*. Others have many lesions, and I have seen deaths from exhaustion, and also from pyæmia, due to them. On the whole it is not a severe disease, however, if the camel is in good condition to start with. Some camels when in poor condition seem to be unable to put up any resistance against the spread of the necrotic process. The disease when it occurs is a great nuisance; and sometimes a sore back becomes infected, and a huge slough results, which may lay the camel up for months.

In the treatment, when possible, affected camels should not only be segregated from the healthy, but also be isolated from one another at a distance of at least six yards. Dressers must have it impressed upon them that the pus in these cases can be inoculated, by the mere rubbing process they often so delight in, into the skin, and that the disease is spread this way. The discharge must be washed off the skin with carbolic soap, without any scrubbing; and all bits of tow used should be burnt or disposed of in a special bucket of disinfectant carried round by the dresser, and used for nothing else but their reception. The dresser should frequently wash and disinfect his hands and instruments, especially when going from one case to another.

The treatment may usefully begin with the administration of $1\frac{1}{2}$ or 2 lb. mag. sulph. if there are more than, say, four lesions.

Local treatment depends on the stage at which the veterinary surgeon first sees his case. If no line of demarcation and separation can be made out, the best treatment I have found to be the painting on of pure carbolic acid around and over the lesion; this may be done on three days running, but generally not more. It has undoubtedly the effect of stopping the outward (centrifugal) spread of the necrotic process, and attains the chief object of local treatment—*i.e.*, to cause the necrotic centre to be sloughed more quickly and neatly than if

left alone. As soon as pus can be squeezed through the line of demarcation, one of the branches of a pair of strong dressing-forceps should be passed through the ruptured spot and under the black centre of the lesion; the latter can then be grasped by closing the forceps, and can often be separated quite easily; very often the necrotic piece of skin is removed in this way like a button. Experience has taught me that tearing makes a far better job than cutting; because the knife itself is apt to reinoculate the living tissues. If the dead piece cannot at once be completely separated, the best thing to do is to make drainage for the pus underneath it, and then carefully remove the pus; smear boric vaseline over the healthy skin below it, so as to prevent new lesions being formed there by the discharge; and paint carbolic acid (pure) over the part of the edge of the living tissue where the separation has not been completed. Usually, discharge of pus practically ceases when the necrosed piece is removed; up to that time the veterinary surgeon himself should superintend or do the dressing; afterwards, all that is necessary is a little dry dressing. When the edge of the ulcer shows signs of necrosis (becoming dry, hard, and black), the edge must, in its turn, be treated on the same principles as with the original lesion.

Hæmorrhagic Septicæmia (?).—Under this provisional heading I place a (practically) unimportant condition that I have met with twice, viz., an inflammation of the serous membranes of the thorax, in which the clear exudate was found to be an almost pure culture of bacteria of the fowl-cholera type. Both camels were suffering from trypanosomiasis (Indian surra) as well, and were living with other camels which remained free of hæmorrhagic septicæmia. The cases were in separate herds. Hæmorrhagic septicæmia, chiefly, in India, affects water-buffaloes and cattle, and occurs in country subject to flooding, and at about the same season as Indian surra. Gaiger, in the course of an investigation of hæmorrhagic septicæmia, found that a camel could be inoculated with the bacterium and show no symptoms of disease; yet the bacterium could be isolated from his tissues if the camel is killed a long time afterwards. It seems that the occurrence of my two cases may be explained in this way, that the camels each became infected at about the same time both by the trypanosome of surra and by the hæmorrhagic septicæmia bacterium; and that the latter had no effect upon the camels until they were sufficiently debilitated from the surra. There is no reason to suspect that hæmorrhagic septicæmia can ever occur as an outbreak in a number of camels.

Pneumonia.—I have found by experience that it is best to segregate cases of pneumonia, especially those occurring in camels of 4, 5 and 6 years old, and I suspect that it is contagious to camels about that age.

Infectious Catarrh.—Usually quite benign, and veterinary surgeons require no hints as to treatment. The clear discharge which is sometimes associated with the exit of camel-bots from the naso-pharynx in spring and autumn must not be mistaken for it.

Botriomycosis is occasionally seen in camels in the form of a complication of sore-back. I have seen it in India, and it has been reported from the Sudan. When complicating sore-backs, removal of the tumour is necessary; otherwise treatment is as for horses.

GROSS PARASITES OF THE CAMEL.

I regret that, as all my notes are in England, I cannot give in full the modern names of all the camels' parasites; helminthologists, please excuse. The object of these notes being to assist clinicians, the subject can be briefly dealt with in the form of a list:—

INTERNAL PARASITES.

The larva of Œstrus cameli, the camel-bot, lives in the naso-pharynx, and is sneezed out in spring and autumn. Quite harmless in themselves, but I suspect them of admitting anthrax occasionally by the punctures they make.

Hæmonchus longistipes, found in abomasum and closely resembling the well-known *H. contortus* of sheep. Very common in India, and seems harmless.

Nematodirus spathiger, round worm of duodenum.

Ostertagia mentulata, small worm, gastro-intestinal.

Other round worms, also without clinical significance as far as one can judge.

Trichocephalus echinophyllus, of large intestine. Have been unable to find appreciable clinical damage.

Distoma hepaticum and *Distoma lanceolatum*.—Never seen in quantities able to cause "rot."

Tænia expansa, *Tænia centripunctata*, and *Tænia globipunctata*.—These tapeworms are met with in camels.

Echinococcus cysts are extremely common, and generally do no damage to health. I have, however, noted one case of death from suffocation due to the whole lungs (liver also) being crammed with cysts. The symptoms were:—Dyspnoea and emaciation; there was no cough; appetite and temperature normal.

Cænurus cyst.—I believe a case is on record.

Linguatula larvæ (and cystic forms) are found frequently in the mesenteric glands of camels in India. The dog (and probably, also, the jackal) is, of course, the host of the adult, which lives in his nostrils. In camels, the larvæ make galleries between the medulla of the gland and the peritoneal cavity, and I have evidence which indicates that it is

by this channel that the occasional passage of bacteria from the intestine to the peritoneal cavity is made possible, and I regard linguatula larvæ as the indirect cause of the frightful disease of the camel which I described under the name of "Specific Peritonitis" some years ago.

Strongylus filaria is sometimes found in the bronchi. In the Nile delta the disease "husk" is a recognised camel-ailment, and was described by Piot many years ago. He stated that intratracheal injection of the usual character proved a good treatment. The symptoms were very much as with sheep; some camels get pure bronchitis, others broncho-pneumonia. Elsewhere than in Egypt, "husk" is rare as a camel-disease. I have met with one camel in India which had a mild cough, which got better without treatment; he was, subsequently (on being killed because of surra), found to harbour a few of these worms. I have had a description given to me by an old camel-breeder in the Indus delta region of a disease suggestive of "husk."

A. bilharzia was found in the mesenteric veins of the camel by me in India, but was unassociated with disease as a rule, and only with "debility" when in enormous numbers. I cannot recall its scientific name, having no notes here. It has not yet been found affecting the urinary tract.

Filaria evansi lives in the arteries of the body, more particularly in the spermatic artery. The adult female pours its embryos into the circulating blood, where they are easily seen in a fresh preparation taken from the tip of the ear. In searching for them, a two-thirds or "A" objective is a convenient magnification, and they are most numerous, generally, along the edge of the preparation. There is a great discrepancy in the accounts of camel filariasis in different countries. I have studied the condition in India, and have also made observations on the Arabian parasite, and the affected camels, as a rule, are not the worse for the fact that they carry the parasite; the only damage I have ever been able to note is a debility when enormous numbers of embryos are present in the blood; and it is only in a very small percentage of hosts that such large numbers of embryos are found. I have no hesitation in asserting that the Indian camel-filaria is not a parasite of economic importance. In Egypt, however, Mason has come to the conclusion that the disease causes a recurring fever, especially in camels at work, and seriously affects the efficiency of camels. A possible explanation of the discrepancy may be that the two filariæ are perhaps not identical; if so, it is curious how alike they are anatomically and in habitat. Many drugs have been tried against filariasis in camels, but without any effect on the parasites.

Thelazia Leesei is found in the conjunctival secretion, and is very

common. I consider that it is only very exceptionally capable of causing eye-trouble.

Onchocerca mentulata is the worm found coiled up in the subcutaneous "worm-nodules" of camels. The nodules are very conspicuous in Sudanese camels. They are harmless.

EXTERNAL PARASITES.

Lice.—A *hæmatopinus* of large size is found on camels. It is sometimes the cause of irritation in long coats in cold weather, and may be treated as for lice in other animals, or left alone until warmer weather. Kerosene emulsion is a very efficacious remedy.

Ticks sometimes cause thickening of the skin in groin and axilla; in the latter case they may cause a fold of skin to form, which gets sore when squeezed between foreleg and body during locomotion, and so sets up a form of "brushing." In either situation the skin-thickening may be mistaken for mange. In rainy seasons, African camels infested with ticks and neglected may get a "fly-blown" ulceration below the anus which is intensely disagreeable to deal with, and dangerous to life if not vigorously treated. Ticks on the eyelids of camels may irritate the animal until by rubbing against trees, etc., he sets up conjunctivitis. There is no true "tick-borne" disease suspected in camels. Riding-camels should be de-ticked as a routine of stable management.

Sarcoptis cameli is the cause of mange, of which camels have only one form. I do not propose to describe camel-mange in this article, for various reasons. I shall only say that it is the second camel-disease in importance, and that the secret of dealing with it is in early diagnosis. The Army has had much experience of it.

Hippobosca cameli is the "forest-fly" of camels. It is met with in Africa, Australia, Baluchistan, Sind, and Dera Ghazi Khan, but I have never seen it east of the Indus in the Punjab. The flies live chiefly about the groin. Experience shows that, although they are blood-sucking flies, they stick to their host too closely to be of any practical importance in spreading trypanosomiasis. They are common in certain countries free from trypanosomiasis, and absent from huge tracts full of the disease.

NURSING SICK CAMELS.

Generally one's first care is to get the camel into the shade if possible. If not very ill, he may be allowed to potter about grazing a little close at hand in the cool hours of the day. If green meat is obtainable, well and good. If branches of trees are brought in to give to a sick camel, it must be remembered that he can get no purchase on them lying loose on the ground, and so cannot strip the leaves off;

either a man should hold them for him, or the branches should be roped down at their thick ends. Such branches should be of trees without thorns, if obtainable. A camel has to be pretty bad not to eat a grain ration offered to him (if he is used to grain). Feverish or thin camels require jhools, or protection by sacks sewn together, on cold nights. In pneumonia and other fevers, in lameness of shoulder, hip, or hock, and in injuries to pads, it is very detrimental to tie the camel down in the sitting position at night, as the poor beast will get no rest. The best way of tying camels in sick lines is by a loop around the neck to a picketing rope along the ground, with sufficient length for the camel to stand if he likes; this enables him to turn round with the sun during the day. Draughts are given by pouring into the side of the mouth whilst a man grasps the lips of the camel and opens the mouth skywards. Time should be given to swallow. When a long case is frequently being dosed, a tap on the head immediately before pouring in the draught is quickly recognised as a signal that it is coming, and the end of an expiration is the time to pour. The vessel should have an open mouth, and be narrow enough at the top to get easily into the commissure of the lips; a cylindrical tin with its opening squashed in a little from side to side is as good as anything. Camels are frequently choked by camelmen who grasp the upper lip so high up as effectually to close the nostrils; all camelmen about a sick line should be taught to catch the lip nearer the end, so as to leave the nostrils free. In India, in several *post-mortems* done for camelmen, I found death due to taramira oil having "gone the wrong way."

A bolus for a camel is made the size and shape of a cricket-ball, and thrown down into the pharynx at the end of an expiration. All the gruels used for sick horses are useful for sick camels (linseed, oatmeal, wheaten flour, rice, etc.). A good nutritive is 1 lb. flour, $\frac{1}{2}$ lb. ghee, and $\frac{1}{2}$ lb. gur, made into boluses. Soup of a fat sheep's leg is a favourite Somali remedy, and there are many worse ones. Bran mash is liked by some camels, not by others; plenty of salt makes it more palatable.

There is no large animal so easily tempted to eat, when inclined to be "off his feed," than a camel. One man's duty in sick lines would be simply to go along offering food, and even placing it into the mouth of camels refusing to eat of their own accord. Camels are often started back on to their feed in this way. When holding branches for a sick camel to strip leaves from, it should be turned after every mouthful, so as to present the best bunch of leaves towards the animal.

Water should be offered twice daily to sick camels, although they will generally refuse it.

Drugs used in camel-practice and their doses.—I exclude the treatment of trypanosomiasis, as it is outside ordinary practice. It is not

necessary to have a lot of drugs for use on camels. *Internally*, I find the following drugs of great use for general work, and most of them are cheap :—

Mag. Sulph.—Dose, 1 lb. as laxative; 1½ to 2 lb. as saline purgative, for ordinary purposes; 3 lb. as a purgative, for suddenly-occurring brain and spinal troubles. I prefer not to use salt with it, because of the thirst that results from giving big doses of salt.

Ammon. Carb. is regarded by camelmen who have seen it used much for broncho-pneumonia as a specific for that disease. It is a very effective remedy, probably because it assists expectoration—no small matter if you have a neck as long as a camel's. Dose, 4 to 6 drachms, in bolus.

Iron tonics are of decided value in what is usually called "debility" but is more often in the camel, anæmia. Dose as for cattle.

Linseed Oil.—Dose to purge: 2 quarts. On active service it is rather too bulky, and linseed tea can sometimes take its place as a vehicle.

Oil of Turpentine, used with ammon. carb. and linseed oil, cures most cases of tympanitis. Dose: 1½ ozs. or 2 ozs.

Kamala, as a purgative. Dose: 7 ozs. in linseed tea.

Chlorodyne is a good anodyne for camels in pain, and gives good results in practice in doses of 6 drachms to 1 oz.

Strychnine salts are valuable for putting new life into camels that sit down on the march owing to fatigue or sickness; and is a good stimulant in many diseases, the effect of small doses being very perceptible on the pulse. Hypodermically given, dose should be 1 to 1½ grains; never more than this, owing to the varying degrees of tolerance to this drug which camels possess.

Eserine and Pilocarpine, 2 grains of each hypodermically act well; but eserine alone is useless.

Arecoline acts well in doses of 2 or 3 grains subcutaneously.

Rum is a good general stimulant in collapsed animals which have been exposed to cold rains or cold winds and have difficulty in rising. Dose: 4 ozs., and repeat in 1 hour. I think great benefit results by giving rum or whisky frequently to camels suffering from "stroke," the spinal trouble which sometimes suddenly afflicts camels, and is known as "Hawa," "Shimber," etc., by camelmen.

Potassium bromide, Chloral hydrate, Chloroform, Cocaine, Sodium Bicarbonate, Chiretta, and Catechu are handy drugs.

Externally I prefer the following remedies :—

Taramira oil (called Jambu in Sindh), made from *Brassica eruca* in India. This is the best remedy for mange. Failing it, sarson ("sim-sim") oil and sulphur may be used. Lime and sulphur sheep-dip has its use in delaying the spread of mange.

Hydrarg. perchlor. and *Potassium permanganate*, because they are easily carried.

Boric acid, for dry dressings ; *Fuller's earth*, for same.

Cresol, as it keeps flies away from wounds.

Carbolic acid ; *Carbolic soap* ; *Carbolised oil*.

Kerosene, used in emulsion.

Boric Vaseline ; *Vaseline*.

Turpentine.—A little mixed in vaseline is the best protective application for wounds against flies, and as a stimulant to slow-healing, sore backs.

Hydrarg. Biniod. should be available for use as a blister ; *Mustard* ; a little *Tincture of Iodine*, for use in operations ; and *Stockholm Tar*. I have hardly any use for cotton-wool and bandages in camel-practice ; but *tow* and *gauze* are both necessary ; *brushes* for applying pure carbolic, etc., are useful. I doubt if that excellent dressing, Hypochlorous acid, would be much use in hot climates in the open, but have never tried it outside Europe.

Useful Instruments.—In the field most of the ordinary instruments in the veterinary wallet are useful, but a strong pair of dressing-forceps is absolutely essential. The camel veterinary surgeon should also have a large allowance of half-minute thermometers—at least ten or twelve. No Symes' knife will last long in camel work, and a second strong scalpel should be substituted. Besides these, the field-man should have a mouth-gag (the £1 is. equine one is suitable, which works with a thumbscrew) ; an equine tooth-rasp ; a small saw to use, with one hand, on tushes ; bullet-forceps ; necrosis forceps ; curette ; bistoury ; an equine trocar and canula ; and two pairs of curved scissors. An enema pump is not necessary unless there is sand-colic to deal with.

A small microscope, with two-thirds and one-sixth objectives and No. 4 eye-piece, but no condenser, is essential if any good work is to be done with camels in the field or elsewhere. Messrs. Baird and Tatlock make a very light instrument for £5 complete, and suitable in every way. I have used it in the field under every conceivable condition. Slides and cover glasses, but no stains, are required.

Camel-hospitals ought to have a respectable equipment for microscopic examination of blood ; possibly, also, for cure of trypanosomiasis. Every shape of curette, necrosis forceps, and bone-forceps is useful ; a small trephine ; a "castrator" ; an ecraseur ; tooth-shears ; and some line firing-irons.

Edema in camel-practice.—I purposely omitted the fact that oedema about the belly and pedestal is occasionally met with in trypanosomiasis ; the reason I did so was to impress the fact that it is

irregular appetite on the grazing ground which is the characteristic symptom of that disease in camels, and not oedema, which is less seen in this species than in other animals affected with trypanosomiasis. Nevertheless, oedemas do occur in camels with trypanosomiasis, and the most common form is an oedema about the base of the pedestal, the skin pitting on pressure although there is hardly any visible swelling. Oedema in male camels may be found about the lower part of the belly and chest in pneumonia, pericarditis, and pleurisy, or any febrile disease where the heart's action is weak; sometimes in trypanosomiasis; sometimes after dressings for mange; and in Indian camels is generally of pathogenic origin. In Somali camels and others accustomed to live for long periods without water, oedema of these parts is sometimes physiological, and is seen for several days after a big drink following a long period of abstinence from water; the Somali camel can temporarily store water in the form of visible oedema.

DISEASES OF RESPIRATORY SYSTEM.

Torn nostrils are almost confined to camels in which nose-pegs have been inserted; the condition occurs from repeated strain on the nose-rope, which is attached to the peg by string. It is therefore found to occur chiefly in sick or lame camels which have been made to work with others; in overloaded camels; and in badly driven strings of camels in hilly country. A septic condition of the nose-peg hole, which sometimes gets "fly-blown," predisposes to "torn nostril" and even a fatal phlebitis; this is common in Scinde, where blow-flies are active for a great part of the year, as there is no real cold weather. A campaign against the use of the nose-peg in riding-camels in Scinde might save a good many lives and certainly great suffering. It is doubtful whether the entire pack-camel of India could be managed without the nose-peg.

There is nothing special to note concerning treatment; but septic wounds about the nostrils should be thoroughly freed from necrosis and maggots and carefully dressed; the fatal phlebitis above referred to will be described under "Surgical Conditions of Head," and ends in meningitis.

Catarrh and *Bots* have already been referred to.

Fractures and *Otitis of turbinated bones* cause nasal wheezing from narrowing of the meatus, and are sometimes curable by bold operation. Pus generally works out on to the face and guides one as to the seat of injury. The cause is a blow over the nose.

Laryngitis is a rare disease in camels; the veterinary surgeon should know that the common febrile diseases causing swelling in the region of the throat are pharyngitis from irritant plant-poisons, traumatic inflammation of the palatal expansion, and anthrax.

BRONCHITIS, BRONCHO-PNEUMONIA, CROUPOUS PNEUMONIA, LUNG-ABSCESS, AND PLEURISY.

The course and treatment of all these diseases in camels resemble those of other large animals. Exposure to cold and wet predisposes to broncho-pneumonia, as also does debility from any cause; indeed, broncho-pneumonia finishes off many camels weakened by trypanosomiasis. Croupous pneumonia is met with as an apparently contagious disease in 4, 5, and 6 year olds. Pleurisy may accompany pneumonia; or it may be specific, caused by a bacterium of the fowl cholera type, in weakened subjects. The specific lung diseases already described, such as verminous bronchitis, tuberculosis and pyæmia, must not be forgotten in diagnosis. Pneumonia sometimes arises from choking by medicinal draughts carelessly given, particularly oily ones.

The common sequels of pneumonia in camels are (i) lung-abscess and (ii) œdema of lungs. Lung-abscess is by far the most common cause of *chronic cough* in camels; the cough is most often noticed early in the morning, and also after rising from the sitting position. Camels with lung-abscess often have indifferent appetites and temperatures above normal; they gradually waste away, although death may not take place for months. It is a matter worthy of note that all known causes of chronic cough in camels are incurable (lung-abscess, chronic "dry" pleurisy, and tuberculosis); an emaciated camel that has had a chronic cough for two months can safely be destroyed. Grinding of the teeth, and grunting on rising, are sometimes indulged in by camels with lung-abscess; nasal discharge is generally absent. Many camels recover from pneumonia and pleuro-pneumonia. Œdema of the lungs is chiefly met with in camels which are the subjects of the acute form of trypanosomiasis. A chronic "dry" pleurisy with extensive adhesions, causing emaciation, occasional cough and irregular temperature, may supervene on an acute pleurisy.

Fractured ribs are common in camel-practice and may produce localised pleurisy; or may penetrate the lung.

As regards the symptoms of the acute diseases of the chest, the camel shows the classical abnormalities in the respiratory movements extremely well; in health, the "thoracic" respiration is less marked than in the horse, the ribs of the camel being weight-bearing bones and less capable of movement; the "abdominal" respiration is more pronounced than in the horse. A soft sigh-like, cough; sitting inclined towards one side; absence of nasal discharge; are rather characteristic of pneumonia in camels. The painful stages of pleurisy are marked by frequent changes of attitude and grunting. Œdema about the lower part of the chest and belly occurs when the heart is hard-pressed.

Treatment of the acute diseases of the chest follows the usual lines, the special points applying to camels being :—

- (i) Examine the blood for co-incident trypanosomiasis.
- (ii) Examine the ribs for fractures.
- (iii) Never tie the sick camel down in the sitting position, as he prefers to stand most of the time and to change his position frequently.
- (iv) Ammonium Carbonate, $\frac{3}{4}$ to $\frac{1}{2}$ in bolus, is a particularly effective drug in camels with pneumonia, probably, as I have said before, because of the great length of their trachea. Strychnine (up to $1\frac{1}{2}$ grains hypodermically) is also very useful.
- (v) Carefully attend to all the items mentioned in the section "Nursing of Sick Camels."

Hydatid cysts are present in the lungs of many camels, and a large number can be harboured without any inconvenience whatever. I have met with one case, however, slowly suffocated by having its lungs crammed with cysts; the symptoms were emaciation and dyspnoea, unaccompanied by loss of appetite, abnormal temperature or cough; and I have never met with this clinical "picture" in any other camel-disease.

Nodular disease of lungs is met with in *post-mortems*, and resembles the same condition in horses. It has no clinical importance.

DISEASES OF CIRCULATORY SYSTEM.

An irregularly intermittent pulse is sometimes met with in healthy camels. The only diseases which need be mentioned here are pericarditis, atrophy of heart, and anæmia (parasites of the blood have been dealt with). I believe that the sudden death so often noted in trypanosomiasis is due to thrombosis with embolism. A case of *Traumatic pericarditis* has recently been reported in the *Veterinary Record*; it is very rare in camels, in spite of their prickly diet, and I have never seen a case.

Pericarditis, due evidently to a bacterium of the Hæmorrhagic Septicæmia type and accompanied by pleurisy, has been seen in a camel weakened by trypanosomiasis. The symptoms were the classical ones, and the pulse-beats were increased in number out of all proportion to the increase in respirations.

Atrophy of the heart. This, associated with extreme *anæmia*, is the common condition which makes it impossible to bring extremely emaciated camels back to health. The heart-wall is sometimes only $\frac{1}{4}$ inch thick, even in the left ventricle. The blood looks like claret and the muscles are all œdematous. Anæmia in a less severe form can often be cured, and the magic word "debility" should, in the case of camels, generally be dropped in favour of "anæmia." Treatment with iron compounds is beneficial in practice.

DISEASES OF DIGESTIVE SYSTEM

Abnormalities of teeth. Among conditions affecting incisors and tushes, one may see "overshot," "undershot," and irregular direction of growth of incisors; the two former are only serious if very marked, and in grass-grazing breeds; the latter is corrected by shearing those teeth which inconvenience the animal. Badly healed fractured lower jaw may necessitate the rounding-off of tushes to prevent injury to the palate, especially when the jaw heals with a "twist" to one side. Molar teeth are practically never affected with caries; alveolar periostitis is very rare too, and the superior maxillary sinus, which is extremely small is not, in my experience, liable to suffer from disease. Overgrown grinders are treated as in the horse, but are much less common. The disease of molars in camels most often met with is an abnormal space between the first molar of the upper jaw and the premolar in front of it; in this space, twigs become lodged, and, by sticking out on either side, cause ulceration of palate, tongue or cheek, as the case may be. I have seen cases fired externally by camelmen under the impression that the swelling of the cheek was a "boil." Treatment consists in daily removal of twigs and food from the space. I have succeeded in preventing this accumulation of food for six months by packing the space with gutta-percha, but the gutta-percha must be at exactly the right consistency when applied, and the camel's mouth kept shut with a rope for at least half an hour after, so as to prevent him chewing the cud until the "stopping" has hardened.

INFLAMMATION OF PALATAL EXPANSION.

This is a condition peculiar to camels, and is generally traumatic, the palatal expansion of camels being exposed to bites of other camels when it is extruded from the mouth during fights between rutting males. There is complete inability to swallow food, with a large painful swelling in the region of the pharynx; sometimes there is a hard paroxysmal cough, and generally there are frequent swallowing movements. The head is extended on the neck (*i.e.*, nose is "poked out"). The condition must not be mistaken for anthrax or for irritant plant-poisoning; in anthrax, the swelling is largely subcutaneous and in injury to the palatal expansion it is palpably deep; in plant-poisoning, there is generally some vomiting. One generally has a history of "rutting" to help in diagnosis; and an examination of the back of the mouth will enable it to be made; if the organ cannot be seen, it may often smell putrid, and a manual examination of the palatal expansion, made by means of a mouth-gag, reveals a large, hard, painful swelling in it. The best gag for this purpose is one made by wiring together four strong wooden bars thus

The palatal expansion, when wounded, shows a great tendency to chronic inflammation and indolent ulceration. Treatment consists in surgical removal of the greater part of the organ, including the diseased portion. This is done by extracting the organ as far as possible by hand and cutting it across at about the level of the first grinders. There is practically no hæmorrhage and little pain is involved in this amputation, and the camel is relieved instantaneously, requiring no further doctoring. It is possible that this operation may reduce the thirst-enduring power of the camel, but the disease will eventually prove fatal if this operation is not performed.

Pharyngitis is chiefly seen in irritant plant poisoning, and is usually accompanied by vomiting. It must not be mistaken for anthrax.

Choking is frequent in greedy camels which bolt their grain ration. I have never seen a case which did not soon recover by either leaving it alone or administering, carefully, small draughts of water.

Parotiditis. I have met with one or two cases due to plugging of Stenson's duct at the buccal opening, which is easily located on a very large papilla inside the cheek. Treatment is as in other animals.

Vomiting. True vomiting is seen in camels which are suffering either from impaction of third and fourth stomachs or from plant poisoning (oleander, datura, irgin, and many others), but it remains to find a drug which can produce it. In sick camels liable to vomit, the tissues of the under surface of the neck have a peculiar sagging appearance.

Tympanitis occurs in camels under similar circumstances as in cattle, and is treated in the same way. I have seldom found it necessary to use the trocar, because the camel can generally be cured by drugs, viz., linseed oil 1 quart, turpentine $1\frac{1}{2}$ or 2 ozs., and ammon. carb. $\frac{1}{2}$ to 1 oz. If poisoning is suspected, the amount of linseed oil should be 2 quarts. Tympanitis in camels sometimes supervenes on diaphragmatic pleurisy. If trocar and canula are used, they should be fine ones, not the clumsy cattle pattern. If left untreated, tympanitis finishes up in true apoplexy, and, once a camel has got thus far, I have not found that removal of the gas from the paunch will cure him. Impaction of the first stomach with food does not appear to be a disease of camels.

IMPACTION OF THIRD AND FOURTH STOMACHS.

In camels, there is but little constriction between these two organs, and they practically form one long chamber; but the character of the mucous membrane clearly maps out their actual areas in the chamber. Camels differ from cattle in that the normal contents of the third stomach are semi-liquid or soft, and that that organ can be acted upon by mag. sulph. I think that impaction of the fourth

stomach always precedes an impaction of the third stomach in camels ; it could hardly be otherwise. The condition may be brought about by extreme thirst, and possibly also from dietetic causes. It is also characteristic of soamin or atoxyl poisoning, when camels are accidentally overdosed during treatment for trypanosomiasis. There is constipation, with small, hard, dark, dry cylindrical pellets of dung at first, and later no dung is passed at all. There is little or no appetite, and rumination soon ceases and may give place to vomiting. There are frequent spasms of pain, not violent as a rule ; and a good deal of fidgetiness and moaning. Sometimes the impacted fourth stomach is perceptible by palpation behind the last rib on right side. If unrelieved, nervous symptoms follow ; the camel is unable to co-ordinate his movements, and often falls when he tries to rise ; and, later, he may be unable to rise. He may be three weeks in this condition before death takes place.

Treatment :—A dose of $2\frac{1}{2}$ or 3 lb. mag. sulph. in plenty of water, and followed by frequent administrations of water, cures most cases if given in time. Food should be withheld until the bowels have begun to act. Failing this, linseed oil 2 quarts, or eserine and pilocarpine (2 grains each subcutaneously) may be tried. Relapse must be guarded against by observing the state of the dung during the six days following relief ; if the pellets again tend to become hard and cylindrical, another purge must be given ; and if mag. sulph. is used $1\frac{1}{2}$ lb. will be enough, and the camel should receive rum, ammon. carb., or strychnine.

Diarrhœa and Gastro-enteritis may be set up by sudden changes of diet or grazing, mouldy fodder, or poisonous plants. Full justice cannot here be given to the consideration of the effects of grazing imported camels on certain plants which they have not been accustomed to ; it is a common cause of indigestion and diarrhœa. Camels used to fresh water, and made to water from brackish wells, generally scour at first. Male camels when violently " musth " often have diarrhœa. Diarrhœa finishes off many camels exhausted by trypanosomiasis or by war conditions. The treatment for diarrhœa in camels is the same in principle and practice as in cattle. In all cases of diarrhœa, the tail should be tied to one side, for reasons which the novice will not take long to appreciate. Coccidiosis is supposed to have been seen in camels in East Africa, but this requires confirmation.

Abdominal Pain.—Colic is very rare in camels excepting when they are ration-fed. It is generally due to sudden changes of diet, or to sand. These cases are treated by purges and anodynes ; mag. sulph. acts well in dietetic cases, but linseed oil and linseed tea are more suitable for " sand-colic." Chlorodyne, in $\frac{3}{4}$ to $1\frac{1}{2}$ oz. doses, relieves pain ; chloral hydrate, if used, should be given in solution, because if a bolus

of it is broken in the mouth, the palatal expansion may become violently inflamed. In sand-colic, an enema-pump is useful. I have seen several cases of recurring abdominal pain in camels; some had had daily attacks for weeks before I saw them; the peculiar fact remains that mag. sulph. cured all these cases at once and permanently. I do not know what this disease is. In camel-practice, peritonitis must be looked for in every case of abdominal pain.

Peritonitis.—This disease, in the camel, is one that arises apart from traumatism, and unexpectedly, a fact which the camel veterinary surgeon should know. I have already given my views on its causation, viz.:—the penetration to the peritoneal cavity of bacteria from the intestine via the mesenteric glands damaged and perforated by linguatula larvæ, which glands, in health, would otherwise act as safety valves against the bacteria. The disease chiefly occurs in the rainy season, at which time camels seem to have least resistance to bacterial invasions. The disease occurs quite independently from trypanosomiasis and is in no way connected with that condition. The peritonitis may be acute or chronic. Acute cases die in three or four days; violent continuous abdominal pain, high fever, tenesmus, and a characteristic respiratory movement, are the chief symptoms, generally enabling a correct diagnosis to be made at an early stage. The respiratory movement, which is diagnostic of this disease in camels, consists in a quick inspiration, a pause, and a quick expiration; the pause is made to try and delay the pain caused by the contraction of the abdominal muscles in expiration; respiration is as "thoracic" as is possible in this animal, and the belly is pendulous and not "tucked up."

Chronic peritonitis is one of the most horrible diseases imaginable; for it results in the formation of new tissue about the spirally arranged colon in the left flank, which gradually presses on this gut and eventually closes it completely, and the animal dies of gangrene and rupture of the intestine immediately anterior to the stricture. The symptoms shown are similar to those of acute peritonitis, but fever is not so high, and there is a complete stoppage of the bowels except for the passage of a little dung of the appearance and consistency of vaseline. In this form of peritonitis the camel lives in perpetual agony for as long as fifteen days. If any doubt as to diagnosis exists, a rectal examination will reveal the tumefied mass formed by the new tissue around the colon in the left flank; no one who has witnessed a camel suffering from this disease would refuse to take his coat off and make sure of the matter, so that the camel could be destroyed. There is no treatment for either form which does any good; diagnosis is easy, and affected camels should be destroyed as early as possible. Of course, peritonitis may also occur from traumatism, as in other animals, particularly

after castration ; I have seen it produced by pressure in a camel which died from enormous distention of the paunch with water taken after a long thirst ; and on *post mortem*s it will sometimes be found to have arisen from a pleurisy via the diaphragm. But the two chief things to remember about peritonitis in camels are :—

1. It occurs in these animals without warning.
2. The respiratory action is diagnostic.

Hernia.—Small ventral herniæ are not uncommon in camels, but I have never seen one interfere either with work or with health.

"*Staggers*" is most suitably dealt with under diseases of the nervous system ; and *rheumatism* will be described when discussing lameness. Both these diseases of camels are of dietetic origin.

Liver-disease includes cirrhosis, hydatid disease and nodular disease ; none of these are important enough to worry a veterinary surgeon on active service.

DISEASES OF NERVOUS SYSTEM.

There are three characteristic camel-diseases which it is necessary to describe in detail under this heading, and they may be called "Mad Staggers," "Cold-struck" and "Shivering," for the purposes of this article. But, of course, the camel suffers from certain other diseases involving marked disturbance of the nervous functions and which may be briefly dealt with first :—

Rabies and Tetanus have already been described.

Trypanosomiasis.—In this disease I have seen, more than once, an affected camel suddenly rise to his feet and rush out into the bush and fall dead. The blood swarmed with trypanosomes. This manifestation, however, is quite an uncommon one.

Cænurus cereбрalis.—A case is on record, but I have no information on it.

Locomotor ataxia.—This is seen as a symptom in impaction of third and fourth stomachs and in Soamin poisoning.

Concussion of brain.—I have seen this as a result of a camel falling against a tree. Symptoms as in other animals ; a purge was given and was followed by gradual recovery.

Apoplexy is the cause of death in most fatal cases of tympanitis in camels.

Satyriasis.—Occasionally camels may be met with which remain "musth" all the year round and are extremely vicious to man and beast. The excessive "rutting" amounts to mania in such cases. If they cannot be made tractable by castration, they are too dangerous to retain in military service.

Amaurosis will be dealt with under "Diseases of the Eye."

The three characteristic nervous diseases of the camel will now be described :—

"Mad Staggers."—This is a dietetic disease and the pathological condition appears to be an acute congestion of the meninges. I have only seen it in grain-fed camels. It is rarely met with when actually travelling with camels, but generally on a day's halt. The best conditioned camels are the chief sufferers; and the circumstance which is most liable to bring the disease on is a big feed of grain on an empty stomach (*i.e.*, after an enforced fast). Greedy camels which bolt their grain-ration and then start on their neighbours', are particularly prone to this disease. At first, the camel is unusually alert, restless, and noisy; in a short time, he will appear to go "mad," will break away from his picket and dash about aimlessly all over the place. In this state, a camel may rush right through a thorn zariba, or collide with trees, other camels, etc. The eyes are amaurotic, and all the animal's actions are plainly purposeless (differing from violent rabies). Some cases may break away into the bush at top speed and get lost; they may be found dead owing to falls or collisions, or may be discovered next day quietly grazing and recovered. Some camels which fall to the ground early in the attack will struggle on the ground as though in an epileptic fit

Treatment consists in early purgation whilst the camel is in the alert, bellowing stage; afterwards it is difficult to administer a purge without danger of choking; indeed, you have to catch your camel first. Hypodermic purges are not very suitable, but may be tried at a pinch. The best purge, when it can be given, is mag. sulph., and the dose must be large to act on the bowels in this disease; 3 lb. is necessary. The camel may also be bled from the jugular to the extent of 1 gallon. The vein is easily raised by pressing the fingers upwards on the under surface of the neck to one side and about 4 inches below the larynx. Further treatment consists in preventing the animal from injuring himself and in applying cold water over the cranium. With early treatment most cases recover and are subsequently little the worse; but if the purge cannot be given quickly, many die, first becoming comatose.

Potassium bromide, 1 oz., or chloral hydrate, 1 oz., may be used in this disease, but the difficulty is to administer the drugs, owing to the state of the patient. Chloral hydrate should always be given in solution to camels and never in bolus.

"Cold-struck."—I do not pretend that this is a good name for the disease about to be described, except that it indicates the sudden onset, and the popular opinion as to its cause, *viz.*, exposure to cold winds. I have had a lot of these cases in my time, and have made

it a rule to investigate the history of the camel in every case ; and have come to certain conclusions, which, however, are very far from being a solution of the precise cause. These conclusions are :—

(i) Although the disease occurs in all sorts of camels, it is more common in riding-camels.

(ii) Cases occur at work, at rest, going down to water, after watering, in grain-fed camels and in those only living by grazing, in hot weather, in cold weather, in windy weather, and in the stifling calm of the hold of a ship at anchor near the Equator, in fat camels, and in thin camels.

(iii) Cases occur in camels quite free from trypanosomiasis as well as in camels with that disease.

(iv) The symptoms, sudden onset and course, seem to me to point to some local circulatory disturbance in the spinal cord not far from the medulla, and I suggest embolism.

(v) The disease is met with in all countries to which the one-humped camel is native.

The disease has a sudden onset. The first symptoms may be nervous twitchings or jerky swayings of the neck, and partial paralysis of either a fore-limb or sometimes of both hind-limbs. But the paralysis quickly tends to become more general, and a typical advanced case will be found sitting and unable to rise, and with a curious bulge of the neck towards one side. This bulge is seen in any disease in which there is great loss of power in the neck-muscles (thus, in approaching death, from any cause) ; but is particularly noticeable in " cold-struck," and people love to call it " wry-neck." The reason there is a bulge of the cervical vertebræ to one side is simply that the ligamentum nuchæ, which, in these cases, is practically the sole support of the head, is shorter than the column of bones, so that the latter sags to one side. Fatal cases die in coma. There is, in some cases, fever ; in others, none. The camel does not look bad " about the head," and may take an interest in food until the muscular paralysis is advanced. Treatment is very efficacious if begun early. It consists in a preliminary large dose of Epsom salts (3 lb.) ; subsequently, administration of 4 oz. whisky or rum every 2 hours ; keeping the body warm with blankets or jhools, and wrapping blankets around the neck for the same purpose ; and preventing the camel from rolling over on to his side, in which position he sometimes gets his neck twisted under him and may suffocate. When the paralysis is complete except in the facial muscles, there is little chance of recovery ; if the camel is to get the chance, his head must be supported on sandbags, or it will fall to one side. With early purging, camels often recover completely ; the recovery is gradual and averages twelve days. There is, however, a good deal of loss of flesh to make up.

"*Shivering*."—This disease closely resembles equine "Shivering" in some respects; it is more common in Indian camels than others, and here again I have noted a special tendency for riding-camels to suffer from it. It is of slow onset, and the chief symptom is a violent tremor of the muscles of quarters and buttocks when in the act of "barracking" or sitting. After a time, the hind-quarters show a definite weakness in addition to the "trembling," and, at a still later stage, the quarters and buttocks atrophy. There is no difficulty in progression; but the camel becomes unable either to rise or to barrack properly under a load, and towards the end cannot rise at all. This is a gradual disease which takes months, and even years, to develop itself. As in horses, "shivers" improve temporarily with rest and good feeding, but there is no real treatment. The disease occurs in camels free of trypanosomiasis; but that disease seems to predispose to it. Its cause is wrapped in mystery. The trembling in the muscles of young camels not fully trained must not be mistaken for "shivering."

DISEASES OF URINO-GENITAL SYSTEM IN MALE CAMELS.

I have no information to impart on kidney-disease, bladder trouble, or calculi; excepting that I can assert with confidence that they are of rare occurrence in camels.

Hæmaturia.—I have seen this from ecchymoses in camels far gone in trypanosomiasis; and have notes at home of several other cases, of which some recovered and some died, but few opportunities occurred for real investigation. I have suspected oxaluria as one cause. *Hæmaturia* has been noted by Cross in a camel with a tuberculous kidney.

Pigmented Urine.—Is of no consequence and is sometimes seen in camels eating mango leaves, or after receiving turmeric. The inside of the hind-legs is then found covered with yellow pigment from the urine.

Paraphymosis.—Treatment as for other animals.

Orchitis.—Camels which "do the splits" on slippery ground may come right down on their testicles without dislocating their hips, and orchitis results, also sometimes sprain of the adductors of the thighs. Recovery is the rule from both these injuries. Sometimes the skin of the scrotum sloughs and exposes the tunica vaginalis; castration may then be necessary, of one or both testicles. The scrotum is a common object of attack by musth camels. Here again, if the teeth puncture the tunica vaginalis, the testicle should be removed as soon as possible. The cord may be found so swollen and division of it has to be done so high, that an ecraseur or ligature is necessary before one can get on to healthy cord. A suspensory bandage is useful in all forms of orchitis in camels.

Chronic enlargement of testicle has been noted in Egypt by Mason, associated with *Filariasis*.

"*Scirrhus cord*" in camels has not the appearance of a botriomycosis infection. Veterinary surgeons should know that the *camel's penis* has an S-curve, as in the ox; that the glans has a peculiar structure nearer that of the ram than of any other species; and that the urethral opening is too small to admit anything larger in calibre than a knitting-needle.

POISONS.

Snake-bite.—Camels are liable to be bitten on lips, feet or belly by snakes. Being a large animal, the camel is better able to withstand the dose of venom than are most other species of domesticated animals. Nevertheless, camels are often lost from snake bite of the more deadly snakes. The symptoms and treatment do not differ from those in other species, generally speaking; but, with camels, there is a tendency to bellow loudly and continuously until coma sets in. It is useful to remember this fact, because, when the snake has not actually been noticed, this symptom may be the means of attracting attention and suitable treatment, which may save life. In my experience, if a camel survives 45 minutes after the bite, he recovers.

POISONOUS PLANTS.

There are some general considerations applying to most plant-poisonings to which camels are liable :—

(i) Camels reared in a district containing a particular poisonous plant are rarely poisoned by it; somehow or other, they learn to avoid it.

(ii) Camels imported into a district containing a particular species of poisonous plant are liable to eat it and poison themselves, particularly in the dry season, when the poisonous plant is often the greenest in the jungle.

(iii) Grass-eating camels are liable to pick up a fatal dose of a poisonous plant by accident when their mouths are full of grass. Otherwise, most poisonous plants are disagreeable and not voluntarily taken and swallowed, except by camels which do not know them. In this connection, it may be noted that although Indian camels do not usually eat grass, they do so in the rains, when it is green and succulent.

(iv) Speaking rather generally, it is in nullahs and damp places where most poisonous plants which affect camels are found. The moral of all this is, when camels are advancing in unknown country, to see what plants the nullahs contain, and take measures to prevent camels from grazing where these plants are dangerous.

Leaving out of all consideration the camel-poisons of the Australian bush, the subject may be conveniently dealt with by classifying

the usual poisons found in typical camel-country as follows, but the list is, of course, only an outline :—

1. *Poisonous Plants Liable to be Eaten when Grazing.*—These are oleander, datura, irgin, sorghum, and others. Oleander grows in nullahs in stony or hilly country, and is also grown in gardens ; it is very bitter, and generally taken by accident in a mouthful of grass ; a small quantity will kill, the chief poisonous principle being a glucoside, and the action being depressing and irritant. Dulness, vomition, coma, these are the symptoms ; and diarrhœa may occur if the camel is not dead in twelve hours. Datura has a leaf shaped like that of a fig, and the fruit has a prickly capsule ; datura is found chiefly in the beds of dry watercourses. It is sudden in its effects, and contains alkaloid nerve-poisons ; I have never arrived in time to see the symptoms. "Irgin" is confined to the northern part of the British Somaliland Protectorate ; it looks like a lot of green candlesticks curving up from a common stem, and contains a white irritant milky fluid. Irgin is an irritant poison producing pharyngitis, vomition and diarrhœa, but many camels recover from it under proper treatment. Sorghum poisoning, from browsing on a stunted crop of jowari in a rainless season, is a well-known subject and only requires mention here. The Muttur pea is eaten by camels without harm in the form of green forage.

2. *Poisonous Plants Liable to be Fed to Camels among Refuse thrown away by Gardeners.*—This form of plant-poisoning is common in Indian cantonments, oleander, datura and narcissus being amongst the known culprits. Camels should never be given gardeners' refuse.

3. *Poisonous Plants which Camels do not Eat.*—Various kinds of cactus and euphorbia come under this head, as also does the Sodom apple (*Calotropis procera*). These contain an irritant milky fluid in their stems, especially the last-mentioned, which is found in most camel countries. This juice sometimes blinds camels, which get some of it into their eyes when grazing.

The castor oil plant is found in many camel-countries but the leaves when eaten appear to have no poisonous effect, and I have no record of any authentic case of poisoning by it in camels.

4. *Plants which afford good grazing to camels which are used to them but which cause indigestion when eaten by imported camels not used to them.*—Among them are salvadoras, salsolaceous plants growing along the coast, garra, mangrove, wild jujube, and many green fodder crops, such as mote, mung, taramira and trefoil. All these should be fed sparingly, at first, to strange camels.

Notes on Treatment of Poisoned Camels.—An oily purge gives the best results, particularly linseed oil, 2 quarts, with turpentine oil, 1½ ozs. Soup from a fat sheep's leg is a good demulcent for the irritant poisons,

as also is linseed tea. Hypodermically-given purges may be tried. In Western Australia, potassium permanganate, thoroughly dissolved, is used to decompose alkaloids ingested in poisonous plants; 1 or 2 drachms might be given. Suitable stimulants are found in strychnine (not exceeding $1\frac{1}{2}$ grains hypodermically), ammon. carb., $\frac{1}{2}$ to $\frac{3}{4}$ ozs., or rum, 4 to 6 ozs.

Diseases of the Eye.—The camel is very subject to conjunctivitis, keratitis and opacities of cornea, the common causes being injury by thorns, contact of the milky irritant sap of the euphorbias and of the Sodom apple, injury self-inflicted when trying to rub ticks from the eyelids, blows, and so on. Very exceptionally, ocular symptoms are met with in trypanosomiasis in camels, as is the rule with dogs suffering from that disease; in this case, the keratitis is of both eyes. The worm *Thelazia leesei*, which is found in the conjunctival secretion, has not yet been found to have produced conjunctivitis, although one of the worms in an abnormal position is thought to have caused ophthalmia in one case.

Congenital absence of pupil has been seen in a camel. The normal black curtain over the pupil which has the same function as the less-developed corpora nigra of the horse, is sometimes absent in one or both eyes; such eyes are very prone to cataract. Cataract is very common in camels; all sizes, shapes and colours of cataract are met with, and in camels of any age. One-eyed camels are useful for work excepting in mountainous country, where they are liable to fall down ravines. Dislocation of the eyeball is seen in "Kapáli," a disease to be described under "Surgical diseases of the head."

Amaurosis is one of the symptoms of "Mad Stagers"; it also occurs from the ingestion of the pods of acacia arabica in large quantities when invaded by a certain red fungus; both forms are curable, the latter often only after some weeks. An incurable amaurosis is sometimes found following suppuration of the frontal sinus; it generally affects one eye only.

SURGICAL DISEASES OF THE CAMEL.

In the general surgery of wounds and abscesses there are a few practical matters which may be mentioned:—

1. Owing to the comparative inelasticity of the skin, accumulations of pus may form under it without much swelling.
2. Camel pus is often so thick in its consistency that it cannot readily escape through small openings. Long incisions are indicated when opening abscesses or making drainage for wounds.
3. There is a strong tendency in camels' tissues to encapsule an irritant agent, *i.e.*, to form inflammatory fibrous tissue around it.
4. In many countries, "fly-blow" has to be guarded against.

(Turpentine and vaseline, mixed, is the agent against fly-blow that I favour most.)

The treatment of wounds, etc., in other respects does not differ much from that accorded to other veterinary patients. If crows are a nuisance, a crow's feather tied to the hair close to the wound will prevent them coming to peck at it.

SURGICAL DISEASES OF THE HEAD.

Torn nostrils, tooth troubles and inflammation of the palatal expansion, have been described already. The characteristic diseases of the camel which remain to be dealt with in this region are :—

1. "Kapali."
2. Suppuration in frontal sinus.
3. Fracture of lower jaw.
4. Suppuration in external auditory meatus.

1. *Kapali*.—This is an Indian word and is used for several distinct diseases of the head, but is particularly applied to the extraordinary condition about to be described.

This consists in a phlebitis of the nasal branch of the submaxillary vein, arising from a septic wound about the nose or muzzle; generally the nose-peg wound is the starting-point, but I have seen it follow an injury to the anterior part of the hard palate between the two upper incisors; and sometimes a rope gall over the nose is the starting-point. This phlebitis spreads until it reaches the other branch of the submaxillary vein, the one which runs into the supra-orbital foramen in the camel. The inflammation spreads along this vein until it reaches the back of the orbit, and there causes a swelling which pushes the wretched animal's eyeball out until it is "dislocated" and ruptured. By infection through the foramina at the back of the orbit, the camel soon dies of meningitis.

The first symptom is a diffuse swelling of one side of the face, associated with a septic wound about the nose or palate. The camel goes off his feed early in the attack; in twenty-four hours the eyeball begins to bulge and is pushed out of its socket; sometimes both eyes are pushed out (because the two veins are joined by a small branch running over the bridge of the nose). Convulsions, coma and death close the scene within three days.

One wonders how Christian scientists would explain away this horrible disease. Treatment is generally useless, and the poor brute should be shot to save suffering. Under certain circumstances, it might be possible to save life by early removal of the eyeball, but if the camel subsequently died, the veterinary surgeon would certainly get the blame for it.

2. *Suppuration in Frontal Sinus.*—In two important respects, the frontal sinus of the camel differs from that of the horse, although it occupies a similar position :—

(1) It communicates by a curved slit with the nose (and not with the superior maxillary sinus, which is very small).

(2) The supra-orbital foramen pierces the frontal bone near the middle line, so that there is a fairly long bony canal containing the supra-orbital vessels before they reach the orbit. This canal lies in the frontal sinus and forms an "elbow" turn inside it.

The only cause I recognise for this disease in camels is a blow over the head. I have never known it follow catarrh, and it could not possibly arise from suppurative alveolar periostitis. It is often the result of fractured frontal bone.

The symptoms differ in detail from those shown by horses. In camels—

(1) Nasal discharge is not invariably present.

(2) When present, it rarely smells.

(3) When present, the discharge generally runs from both nostrils, but most comes from the affected side. (The condition was unilateral in every case I have had.)

(4) As often as not there are marked swelling and tenderness of the frontal bone over the diseased sinus.

(5) Pus has a great tendency to work through the bone and come out on to the face. The favourite places for it to burst out are (a) above the nasal canthus of the eyelids, (b) behind the supra-orbital process of frontal bone, and (c) near the middle line. In the latter case, probing settles which side is involved.

(6) Nasal discharge is not through the curved natural slit of the frontal sinus but through an adventitious opening (the bone being perforated by the suppurative process). There is usually a curious carriage of the head, the nose being tilted higher than usual.

Treatment: Considerable judgment is necessary as to the best thing to do for every case. When the camel does not appear to be incommoded, and has a free nasal discharge, and the state of the frontal sinuses can only be indicated by percussion or by exploratory perforation, I find that some camels recover spontaneously, the adventitious orifice through which the pus gains the nasal chamber allowing of sufficient drainage in these cases.

If the camel is in pain, or when swelling of the bone or perforations are seen on the face, the sinus should be trephined. The sinus occupies a very similar position to that of the horse, but to make a neat job so as not to damage the supra-orbital canal and its vessels, and to obtain the best drainage, I prefer to use a small trephine and to let its circum-

ference touch two imaginary lines, viz., one joining the nasal canthi, and one parallel with the long axis of the head and $\frac{1}{2}$ inch from the edge of the orbit. After-treatment consists in flushing twice daily with solution of pot. permang.; when doing this, the nose must be depressed and the head tilted sideways until the solution runs out of the nostrils. Sometimes it is necessary to break down the secondary partitions which subdivide the frontal sinus, to get at the diseased part. It is not uncommon to find the eye on the affected side amaurotic; and my experience is that the camel never regains the sight of the affected eye in such cases.

3. *Fracture of the Lower Jaw.*—This occurs when fighting, and the fracture is nearly always transverse, and through one or both tush sockets (the weakest part of the lower jaw). Treatment for this fracture gives good results if adopted early. When suppuration has already begun, the case is apt to be tedious. The best treatment is to notch two teeth on each side of the jaw, one in front of and one behind the fracture, with a sharp file and near the gum, just sufficiently to allow a string to grip on the notch, and then, having the broken part of the jaw supported in its proper position, bind the notched teeth of each side with string in such a way as to maintain it there. The camel can pick up his own food if placed in front of him, but of course must not be sent out to graze until the bone has "set," say for four weeks. The string should be examined twice daily, and changed and tightened whenever the fractured piece is in the least inclined to sag. Care should be taken that, when the bone is "setting," in the second week particularly, the jaw is trained into its place perfectly straight in both planes to prevent subsequent trouble with the teeth. In East Africa I managed to get a camel fit for active service within five weeks after this fracture and another veterinary surgeon could find no trace of the fracture. If the camel is sent out to graze too soon, the strain on his jaw will undo the work of three weeks. String is preferred for supporting the jaw because it is more easily altered and manipulated than wire. As to the teeth around which the supporting strings are adjusted, the one in front of the fracture is always an incisor, but the one behind the fracture may be tush or wolf's tooth. Sometimes one tush is so loosened by the original injury as to need extraction. The chief thing is to prevent the camel from stripping leaves from trees and branches until the jaw is firmly set by bony union.

4. *Suppuration in External Auditory Meatus.*—Although I have frequently met with this disease, I am ignorant of its cause. The pus comes from a depth which makes exploration impossible. I generally have these cases syringed with Pot. permang. until the pus becomes thin and scanty, after which I stuff the meatus with

boric acid. My own experience is that this disease results in recovery in the long run, but may take months. Probably a small foreign body is the causal factor in many cases, but this is a guess.

SURGICAL DISEASES OF NECK AND TRUNK.

Camels sometimes *fracture* their *vertebræ* by falls. The "*wry-neck*" which is seen in certain diseases is only a symptom, the cause of which was explained under "*Cold-struck*." *Enlarged thyroid glands* are met with sometimes, but, in adults, are of no clinical importance. *Saddle galls* are treated as in other animals, but are often over-dressed by dressers. Sore withers sometimes need the sawing off of the tops of the superior spinal processes; sore loins may require a similar removal of the ends of lumbar transverse processes. There is plenty of room for good surgery in treating sore withers; but necrosed soft tissues are often better torn out than cut out. The cartilage of prolongation of the scapula is more easily underrun than in the horse, owing to its position, and when that happens the case is generally incurable. In some districts, sore withers have to be protected by a leather shield to prevent them being torn open by the branches of thorny trees on the grazing ground; and, in some parts, a crow's feather must be tied to the hair near the sore. Vaseline with a little turpentine mixed in it is my favourite application against flies and for encouraging the skin to grow from the edges of saddle-sores.

Fractured ribs.—The normal number of pairs of ribs in camels is twelve; but I have several times found a thirteenth pair, very rudimentary, and never attached at their upper ends to the first lumbar vertebra.

Fractured rib is common in camels from blows and may be multiple, and of any degree of severity up to penetration of the lung. The treatment is the same as in ordinary veterinary practice; but as, when the camel is sitting, the rib is a weight-bearing bone, it is very important never to tie camels down which have this fracture.

Sublumbar abscess has been met with, causing emaciation, low fever, and difficulty in barracking and in rising. I do not know the cause.

DISEASES OF THE PEDESTAL.

The pedestal is composed of the following structures:—

- (a) the Horny pedestal, or outer layer of horn.
- (b) the Sensitive pedestal, or secreting membrane.
- (c) the Fibro-cartilaginous pedestal, or Base.
- (d) the Sternal Boss, the part of the Sternum which is the "*foundation*" of the Pedestal, and which is, of course, bone.

Cracks in the horny pedestal, which is only about $\frac{1}{4}$ inch thick, are caused by sitting in pools of water in rainy weather. Sometimes there

is some irritation of the sensitive pedestal beneath it, due to the entry of sand or gravel into the cracks. Treatment consists in the removal of grit, the application of Stockholm tar to the cracks, and protecting the organ by sacking slung from the back. Bruises of the pedestal are due to sitting down on sharp stones, particularly in camels imported into stony country from a sandy desert, and which have soft horn; or to barracking when heavily loaded and weakened by disease or privation, and so coming down "hard." If the bruise is near the edge of the pedestal, any suppuration arising in the sensitive pedestal will find its way out between hair and horn before much damage is done. But if the bruise is central, and suppuration under the horny pedestal occurs there, the pus cannot easily escape; it may burrow between the sensitive and horny layers, and, when it does, the burrowing is always towards the posterior edge, where it eventually finds exit; but sometimes, before the pressure is thus relieved, the fibro-cartilaginous base may become infected, and then the case becomes serious. Abscesses may then form in the base and break out at the sides of the pedestal through the skin; or enormous enlargement of the posterior half of the base may occur from the formation of a mass of new fibrous tissue around a small abscess; or the sternum itself may become involved, with suppurative osteitis. In all degrees of injury of the pedestal from bruising, the principles of treatment are the same—to rest the part (*i.e.* relieve it from its function of weight-bearing), to give exit to pus, to get drainage, and to remove necrosed tissue. Suppuration of the sensitive pedestal near the edge can generally be dealt with by evacuating it between hair and horn. Pus forming under the centre of the horny pedestal must be removed by cutting through the latter. Abscesses in the deeper layers of the pedestal require a bold and thorough operation for removal of all diseased fibro-cartilage or bone, but it is only worth undertaking when the patient is in good condition. I prefer to trephine from below in the centre of the pad (and again, from one side, in some cases), so as to get freely at the parts with a curette. The enormous enlargement by new fibrous tissue which sometimes occurs is treated by operation; the posterior enlarged part is sawn off obliquely, preserving as much of the anterior part as is normal and not involved. The hæmorrhage is great and can be controlled best by sawing a little at a time; arteries must be tied, and the capillary bleeding is stopped with a flat firing-iron. The great wound which remains should be covered with a thick layer of tow, and over that an old cushion should be secured, the whole application being supported by bands over the back. It is surprising how little discomfort the camel shows; indeed he is undoubtedly relieved, since the operation

exposes and evacuates the causal abscesses. All serious operations on the pedestal call for chloroform ; niggling surgery is quite useless. In all degrees of pedestal injury, the camel must never be tied down in the sitting position. I have tried several kinds of appliances for taking the weight off the diseased pad when sitting, but they are not very satisfactory. There is, however, nothing to prevent camels with this disease being put into slings if the latter and a suitable tree are available ; the object of the slings is to prevent barracking.

LAMENESS AND SURGICAL DISEASES OF THE LIMBS.

In the camel, lameness is a much more simple subject than in equine practice, provided one knows the diseases he is liable to. In addition to the ordinary means of diagnosis, one can obtain further information on a case by carefully watching him whilst he is in the act of barracking and of rising, when any painful joint will be strongly "favoured." Foot-lameness in the camel is generally made obvious by swelling ; there are practically no internal diseases of the foot except penetration by thorns. Shoulder and hip lameness are extremely common in camels. It is very seldom that one need handle the limb below knee or hock. If one desires to lift a forefoot, say the near fore-foot, the left hand is placed over the triceps region, and then, by bending down and catching the cannon with the right hand and simultaneously throwing one's weight on the left hand, the foot will come up. The hind-feet are not easily handled unless the camel is roped fore and aft and rolled on to his side.

Veterinary surgeons ought to know that the upper parts of the camel's limbs are covered by a layer of yellow elastic fibrous tissue so arranged subcutaneously as to take much of the strain off the muscles during progression. The action of this elastic tissue is easily demonstrated when, in a camel lying prostrate with a fore-leg extended, one bends the fetlock joint : the foot will fly up and strike the chest. It is the possession of this layer of tissue which makes the camel so tireless, although he has comparatively poor muscular development.

Two other anatomical characters, at least, must be noticed by clinicians. One is the "double-jointed" hock, in which the joint formed between the astragalus and calcis on the one hand, and the cuboid and scaphoid on the other is ginglymoid, and not a gliding joint, this arrangement making it possible for the camel to flex his hock until the tibia and metatarsus come into line. The other point is the existence of an elastic pad of yellow fibrous tissue below each digit in the foot, which prevents "jar," and so saves the camel from most of the lamenesses due to concussion.

Injuries to the limb-pads, which exist at the elbow, knee, stifle,

and outside of hock, are dealt with in a similar way to injuries of the pedestal, and need not again be mentioned.

SURGICAL DISEASES OF THE FORE-LIMB.

The characteristic camel-lamenesses of the fore-limb are as follows :—

1. Fracture of acromion process of scapula.
2. Fracture of rim of glenoid cavity of scapula.
3. Rheumatism of the shoulder.
4. Sprain of the tendons binding the shoulder-joint.
5. Dislocation of the shoulder-joint.
6. Abscess of prepectoral lymph-glands.
7. Fractured humerus.
8. Brushing between foreleg and body (three varieties.)
9. Fracture of radius.
10. Chronic strain of knee and fetlock joints in young camels, resulting in permanent knock-knees and "bandy" fetlocks.
11. Fractured metacarpus.
12. Exostoses of metacarpus (rare).
13. Sprain of flexor tendons (tendinitis and synovitis)
14. Rheumatism of flexor tendons (rare).
15. Brushing (fetlock or foot).
16. Open sesamoideal sheath (from bites).
17. Fractured os suffraginis.
18. Foot-soreness and bruised sole.
19. Punctured wounds of foot.
20. Whitlow.

1. *Fracture of Acromion Process of Scapula.*—In camels, the acromion process is a finger-like projection, pointing, as it were, to the shoulder-joint. It is sometimes broken off by a camel colliding against a tree or falling. The fracture causes dead lameness, although a little weight can be placed on the limb, and a swelling over the shoulder region above the joint. The swelling is not half that noted in dislocation of the joint. The treatment is removal of all loose and necrosed bone by operation; and this results in complete cure, provided the operation is thorough and not "niggling"; chloroform should be used to ensure thorough searching. The loose pieces are generally drawn a little downwards and backwards by the muscles.

2. *Fracture of rim of Glenoid Cavity of Scapula.*—This sometimes happens in loaded camels which have done "the splits" on slippery ground. The fractured pieces are on the external side and may be quite small, but the condition causes incurable shoulder-lameness and muscular atrophy, and after the acute symptoms have passed, one can hear a "crack" in the joint when the camel is walked.

3. *Rheumatism of the Shoulder*.—This is an important disease of camels, about which there is much yet to be learned; yet the cause is almost certainly rheumatic. There are three circumstances which predispose to it, viz.: grazing on certain species of plants or trees, working plains camels in hilly country, and changes of seasons. In India the almost universal opinion of camelmen is that the disease is brought on by grazing on the fresh young shoots and leaves of the Shisham tree in the spring; and my own observations tend to confirm that this is a predisposing influence. Yet in Somaliland the disease occurs and there are no Shisham trees. I believe also that camels used to drinking briny water, or used to grazing on the alkaline salsolaceous plants found in certain deserts, are liable to this disease when they come on to fresh water and acid grazing.

The disease occurs suddenly and is characterised by great stiffness of both shoulder-joints without any external swelling. The camel, if made to barrack, will resist strongly, and on touching the ground with his knee, may probably fall right over, to avoid the pain of bending the shoulder-joint. As the acute stage passes off, the animal becomes able to barrack, but he does so slowly, sliding his knees forward on the ground so as to avoid flexion of the shoulder, and settling down to the ground slowly. Novices might easily think his pain was in the loins. The lameness tends to wear off with exercise; the stride is shortened, and, in riding camels, the head is carried low. The rheumatism sometimes permanently lames the camel, but I think this is due to camelmen not resting the animal until he is sound, because they are inclined to think that, because the lameness wears off with exercise, exercise must be good for the disease. When complete rest is given from the first onset until freedom from stiffness or lameness is obtained, many camels recover. The prognosis is the difficult part, and must be based on the length of time the camel has suffered, and the degree of stiffness or lameness. Old cases, when met with on active service, are best worked on, if slight. In treatment, complete rest from work, and access to salsolaceous plants are the chief things; sodium bicarbonate may be given daily, followed by a spell of arsenic treatment. Firing does no good. In this, as in many other lamenesses, "complete rest" is not obtained if the camel has to cover many miles daily on the grazing ground to pick up a living. On the first onset, 2 lb. Epsom salts may be given with advantage. The lame camel should not be tied down in the sitting position, and should be rugged up at night.

4. *Sprain of the Tendons about the Shoulder-joint*.—Causes: False steps in rough country, or slipping on a muddy surface. Symptoms: lameness with a short step and a tied-in gait, and an endeavour to prevent flexing the shoulder when barracking. Treatment, as in

horses. This is, perhaps, the common camel lameness, and its cure chiefly depends on the animal getting, from the first onset, complete rest until he can run without any suspicion of stiffness. The recovery will take place quicker, therefore, if the country can produce some sort of forage which can be substituted for grazing, thus preventing the necessity of the animal walking about all day.

5. *Dislocation of the Shoulder-joint*.—The camel is the only domesticated animal in which this injury is not an unusual one. It occurs from the same causes as "sprain." The huge bulging made by the head of the humerus cannot be mistaken. I have met with several cases, but always under circumstances in which reduction under chloroform could not be attempted.

6. *Abscess of Prepectoral Lymph-glands*.—The prepectoral glands of the camel form two groups, one easily palpable at the base of the neck, the other just inside the first rib. Abscess in the prepectoral gland is quite a common disease, and its exact cause is unknown; it may be botriomycotic in many cases. There is considerable fever and lameness until the pus is evacuated, but the local treatment is on the usual lines; I wish to deny absolutely the statement which has been made that you must never foment a camel's skin or something dreadful will happen. It is not true. A dose of 2 lb. Epsom salts may be given in this disease with advantage.

7. *Fractured Humerus*.—Sometimes occurs in riding-camels suddenly from (apparently) a false step. Incurable.

8. *Brushing between Foreleg and Body*.—This is a common disease, and there are three distinct varieties.

The first variety is due to friction of the inside of the forearm against the side of the pedestal. Pathologically, the two lesions exactly resemble the human "corn"; although sometimes friction is so severe that the epidermis is worn through before it has time to hypertrophy, and then there is hæmorrhage at every step. I have seen the epidermis so thickened in this disease as to resemble wood in its consistency. The lesions make the camel take a short quick step, and he will take on a sort of sidelong gait to shift his body away from the tender side. The larger the lesion grows, the worse the friction is, and eventually the camel actually goes lame. The chief cause of this form of brushing is in the conformation, particularly turned-out toes and a narrow chest; it is also brought on by overloading young camels, by working plains camels in hilly country, by steep descents under a load, and by favouring a lame limb and so shifting the weight of the body too much to one side. It is impossible to cure advanced cases; in slight cases the swellings can sometimes be reduced by complete rest on full

rations (so that the camel has not to go out grazing) and by the use of blue ointment ; but one is rather helpless against this disease.

The second variety is caused by the squeezing in the axilla, at every step, of a fold of thickened skin. This fold is caused by working the camel when he has the skin of the axilla thickened by ticks, mange or mange-dressings. It is a bad form of brushing, and causes much pain, and often hæmorrhage in the axilla. Treatment involves complete rest and surgical removal of the fold of skin by a careful operation, and that throws the camel out of work for a long time.

The third variety of brushing consists in friction between the elbow-pad and the skin over the chest, some distance above the pedestal. It is less serious than the other forms because the skin over the chest is loose and "gives" under pressure of the elbow-pad, and so does not readily become sore. If the camel is rested before soreness occurs, the skin may thicken sufficiently to protect him in this form of brushing.

9. *Fracture of Radius*.—I have seen deferred fracture of this bone in camels.

10. *Chronic Sprain of Knee and Fetlock-joints* in young camels. The damage is done during the first year of life, and is caused by the young camel having to follow his dam over stony, hilly country whilst his joints are immature and unfit for it. The veterinary surgeon on active service will only meet with the resulting deformities in the adult : they are excessive knock-knees and inward-bending fetlocks, sometimes with compensatory exostoses. Many camels so deformed can do packwork without any lameness.

11. *Fracture of Metacarpus*.—I have had very good results in treating simple fractures of the metacarpus with the help of plaster of paris and of iron splints. The natural sitting position of the camel enables him to rest this bone completely. It takes about seven weeks before he can bear his weight on the leg, and three months before he can work at the walk.

12. *Exostoses of Metacarpus*.—These are from camel-bites and blows. If lameness is present, treat as in equine practice.

13. *Sprain of Flexor Tendons*.—This is only common in fast riding-camels and is treated as in equine practice.

14. *Rheumatism of Flexor Tendons* takes the form of synovitis of sesamoideal sheath ; treat by bandaging with dry flannel puttees, and medicinally as for shoulder rheumatism.

15. *Brushing (Fetlock or Foot)*.—This is only serious in riding camels. Either from excessively large feet or from the forelegs being too close together, brushing may occur on the fetlock or on the foot about $1\frac{1}{2}$ inches from the ground. Riding camels which develop this habit are unsafe to ride.

16. *Open Sesamoideal Sheath*.—The sheath of the flexor tendons is sometimes opened by bites of musth camels. The condition is too serious to be worth treating on active service.

17. *Fracture of Os Suffraginis*.—The camel has, of course, two digits in the foot, and it was only one bone which was fractured in the cases I have seen. The baggage camel is a good subject for the treatment of such a fracture, although sometimes an exostosis forms which interferes with the flexor tendons and causes permanent lameness.

18. *Foot Soreness and Bruised Sole*.—The structure of the sole from below upwards is made up of :—

1. Horny sole, varying in thickness in different breeds, from $\frac{1}{4}$ to $\frac{1}{2}$ inch.
2. Sensitive sole, or secreting membrane.
3. Two yellow elastic pads, one for each digit.
4. The tendons and small sesamoideal sheath.

The horny sole may wear thin, particularly in camels brought from sandy deserts and put to work in stony country ; the feet of the desert camel are usually softer than those of the hill camel. The sensitive sole becomes inflamed and there is some swelling of the foot. A similar condition may arise from cracking of the horny sole after a march over wet and unsuitable going. Treatment is rest, application of Stockholm tar, and a leather boot to protect the foot until the horn has grown again. Bruised sole is caused by treading on stones when loaded, especially in camels not used to stony country. The foot swells, there is lameness, and on testing the foot a tender place will be found in the sole. Very often there is an exudation from the sensitive sole and it becomes palpable by bulging and fluctuation. A knife should then be passed, at the bulging point, through the horny sole and no deeper, and the fluid and any necrosed soft tissues can be pressed out. The elasticity of the foot prevents the re-accumulation of fluid and the only after treatment necessary is to dab on Stockholm tar.

19. *Punctured Wounds of the Foot*.—In the camel, such punctures are generally made by thorns. In India, the Garinda thorn is the chief culprit ; in Somaliland, it is generally one of the long Acacia thorns. I have nothing particular to say about treatment, which is on general lines. The puncture is troublesome when one of the elastic cushions is punctured ; and often incurable if the tendon-sheath is reached by the thorn, the camel being rather subject to septicæmia when the sesamoideal sheath becomes septic.

20. *Whitlow*.—Each digit of the foot is capped in front by a small claw, under which is a small area of sensitive laminae. Whitlow is suppurative inflammation of this tissue under the claw. In camels,

if there is any difficulty in draining or evacuating pus, it is best to remove the claw and treat the parts below directly.

SURGICAL DISEASES OF HIND LIMB.

These include :—

1. Fractured pelvis (very rare).
2. Dislocation of hip joint with fracture of articular head of femur.
3. Sprain of hip-joint.
4. Abscess of superficial inguinal glands.
5. Luxation of patella.
6. Sprain of stifle-joint (?)
7. Fractured tibia.
8. Sprain of flexor metatarsi.
9. Hyæna bites.
10. Sprain of gastrocnemius at its insertion.
11. Brushing at point of hock.
12. Luxation of tendon of Achilles.
13. Arthritis of hock-joint.
14. " False spavin."

The diseases of the parts below the hock closely resemble those in the fore-limb.

1. *Fracture of Pelvis.*—I have seen two cases. One was a fracture of the ilium and suppurating, and the owner was just starting from Nushki, in Baluchistan, to Meshed (Persia), taking the camel with him unloaded ; this gives some idea of the endurance of pain that camels possess. The other case was a fractured ischium ; the tuber ischii had disappeared from its usual position, and a large bony swelling developed near the hip-joint ; this case recovered completely, becoming quite free from lameness or stiffness in all its movements in spite of the shortened quarter. The camel should be a good subject for treatment of pelvic fractures.

2. *Dislocation of Hip-joint with Fracture of Articular Head of Femur.*—Not an uncommon occurrence and happens when the hind-legs slip apart on muddy ground. In my experience, it has always been in camels under six years old, in which the articular head of the femur is not yet firmly united, having a separate centre of ossification. The articular head breaks off, the ligamentum teres ruptures, and the articular head is carried outside the cotyloid cavity ; the fractured surface on the femur is then brought into contact with the cotyloid cavity. Diagnosis is easy if one knows what happens in these cases ; the immobility, the inability to bear weight, and the great swelling over the region of the joint are characteristic. The condition is

incurable, but nature makes great efforts in these cases, and I have seen camels working which were subsequently found to have the articular head joined to the ischium by a huge exostosis, and a sort of improvised hip-joint, the femur having worn smooth in the cotyloid cavity. Needless to say, the camels were in pain, especially when barracked, and no European would use a camel so affected.

3. *Sprain of Hip-joint*.—This is a sprain of the ligamentum teres. Symptoms: Lameness; a shortened stride of the lame limb, which is brought forward with difficulty; a sidelong gait, the quarters being inclined away from the lame side; no swelling; a great unwillingness to lower the hindquarters when being barracked, particularly during the stage when the hip-joint is being flexed, the weight of the body being thrown on to the sound side. The only treatment, practically, is rest from the first onset until quite free from lameness; if possible, the forage should be brought to the camel so that he will not have to go out and graze; and the camel must never be tied down. Cases rested from the onset generally recover unless the sprain is very severe; but by working them before they are fit, very many are lamed permanently, and show atrophy of the quarter.

4. *Abscess of Superficial Inguinal Glands*.—Not uncommon, and is curable by treatment on the usual lines.

5. *Luxation of the Patella*.—None of the chronic cases I have met with proved curable; the extreme flexion of the stifle in the natural sitting position makes permanent recovery almost impossible.

6. *Sprain of the Stifle-joint (?)*.—Camelmen are fond of diagnosing stifle-lameness, but, in my opinion, it is very rare, and most of the cases fired by them over the stifle were lame from sprain of the hip-joint.

7. *Fractured Tibia*.—Transverse fractures are not worth treatment on active service. Deferred longitudinal fractures, however, have been met with, as are so often seen in equine practice, without displacement, and when this is diagnosed, the camel should be fed and watered where he stands and, if possible, not moved from the spot for three weeks; I have had one or two good recoveries, and found that the patient would not attempt to sit down until about fourteen days after the injury, when the fissures have begun to unite.

8. *Sprain of Flexor Metatarsi*.—This lameness is more common in camels than in horses, but the symptoms are identical. It is done by slipping on muddy surfaces, the foot sliding out behind the animal. Treatment: Complete rest and blistering, but they are very obstinate cases.

9. *Hyæna bites*.—The hyæna often attacks the hind parts of camels tied down in the sitting-position and so unable to defend themselves.

The favourite points of attack are the crural muscles above the stifle, and the gastrocnemius. It is marvellous how good the recoveries are from these bites, even when the camel is nearly hamstrung by them.

10. *Sprain of Gastrocnemius Tendon at its Insertion.*—There is a slight painful enlargement at the point of the hock ; lameness may be absent, but the camel cannot rest when barracked, because of the stretching of the inflamed fibres in that position. He remains workable under light loads but if complete cure is desired, nothing but a long rest (and never tied down at night) will do it.

11. *Brushing at the Point of the Hock.*—Sometimes seen in riding-camels. The point of one hock rubs against the point of the other, and a painful swelling, often "callous" like a human corn, is formed on each leg. Like so many of the diseases of the hind-leg of camels, the condition is not permanently curable.

12. *Luxation of Tendon of Achilles.*—This common disease is known in India as "Ragl," and in Somaliland as "Sivr." It never causes lameness, and is only perceptible when the camel is sitting. It is brought on by the habit some camels have of sitting on their hocks and not on their feet ; and by want of tone in the muscles after some sickness, particularly when the animal is made to lift heavy loads before he is fit. The normal sitting position obliterates the angle between tibia and metatarsus ; and, as a result of this extreme flexion of the hock-joint, the tendon of Achilles has to pass over a pulley formed by the lower end of the tibia ; and at this weak point nature has not provided any great support to the tendon, and it is liable to slip outwards off the convexity ; this is the condition I have called "luxation."

There are all degrees of this "luxation" ; some camels have tendons which are easily pushed out of place, but never slip out of their own accord, and these cases are practically sound. When, however, the tendon slips outward off the end of the tibia when the camel is sitting, it is a serious unsoundness. The camel may be able to rise under a load with an effort which brings the tendon back into its place with a snap, but every such effort aggravates the luxation. Eventually, if only one hock is affected, the leg becomes devoid of lifting power and the camel can only rise under a very light load ; whilst, if both hocks are involved, he may at last be unable to rise off the ground at all.

Treatment : Slight cases due to want of tone of the muscles in debilitated animals sometimes recover by rest and a proper full diet, which remove the cause. Old-standing or severe cases often prove incurable ; but a deep firing along the inside edge of the tendon where it normally lies over the end of the tibia (and taking care not to damage

the posterior tibial artery) may occasionally succeed in forming adhesions which give the tendon support.

13. *Arthritis of Hock-joint*.—Sometimes a camel develops acute arthritis of a hock joint without any obvious cause. Most of the cases I have seen developed during the night, nothing being noticed wrong the previous evening; and generally in wet weather. I think there is good reason for suspecting the disease to be a form of rheumatism, although, of course, it would be easy for a careless camelman to damage the hock-joint by a blow with a stick when the animal is barracked, because, in that position, the joint is decidedly exposed owing to its extreme flexion. The affected camel, if made to sit, endeavours to straighten his hock by rolling on to his side; and a tender swelling on each side of the Achilles tendon just above the point of the hock is found when the joint is flexed. The camel takes a longer stride with the lame leg than with the sound one. If the camel receives complete rest (involving feeding him where he stands) from the first onset, and is not tied down, the disease may not progress beyond the stage of synovitis, and a slow but sure recovery can be expected. He must not be worked until he has been able to run sound for several days at least. If worked or exercised too soon, the disease develops into an ulcerative arthritis in which the articular cartilage gets eaten away and exostoses form about the joint. This chronic arthritis is incurable and is easily recognised by the diffuse bony enlargement of the joint and the obvious hock-lameness.

During the synovitis stage, the camel should be rugged up, and given 1 lb. of Mag : Sulph. I have not yet met with this disease outside India.

14. *False Spavin*.—Enlargement of the inner and upper end of the metatarsus results from blows—sometimes from sprains of ligaments. Lameness is only temporary, but the enlargement may be permanent. There is no disease of the camel that I have yet seen bearing any real resemblance to the true "spavin" of horses.

Conclusion.—The foregoing paper is admittedly only a superficial account of the camel's diseases, and has been written from memory only. Veterinary surgeons must therefore deal gently with any inaccuracies which may have crept in; the paper has been written in the back-country of Somaliland, and all my notes and records are at home. I hope that those whose experience with camels brings new facts to light will ventilate them in the VETERINARY JOURNAL, thereby increasing our knowledge of camel diseases. No attempt has been made in this paper to deal with anything but the male working camel from the point of view of the veterinary officer on active service; nor have I thought it necessary to mention certain diseases of purely local importance.