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DELIVERED BEFORE THE

New York State Agricultural Society,

AT ALBANY,

On Wednesday Evening, February 9th, 1870,

BY

PROFESSOR JAMES LAW,

OF CORNELL UNIVERSITY, ITHACA, N. Y.

RATIONAL AND IRRATIONAL TREATMENT OF ANIMALS.

ALBANY :

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ADDRESS.

MR. PRESIDENT AND GENTLEMEN:

The present age is essentially a utilitarian one. It discards many barren speculative pursuits of former times for those which directly contribute to the triumphs of human intellect over the forces of nature, and seeks to inaugurate an era of universal civilization and happiness. We have not yet, however, arrived at the goal of our aspirations. It is true we have girdled the world with railroads, steamboats and telegraphs, bringing the contributions of all nations to minister to our physical and intellectual wants; and we have lessened the fatigue of toiling millions by substituting for worn fingers and wearied muscles the machine of admirable conception and design, and the all conquering power of steam. But as yet we come far short of the possible, in annihilating the sad list of human ills. Our Union Pacific Railroad, that greatest engineering work of modern times, reached not its completion without the immolation of its martyrs on the altar of human progress. No railroad track of any moment passes a year without offering up its human sacrifices as the price of the immeasurable advantages it grants to the traveling public. No large building, no great seat of learning is erected, but the remorseless demon of destruction exacts from his sworn enemies his human victims as the purchase of material and intellectual advancement. But if we have not yet acquired the power to avoid the lesser evils in the attainment of the greater good, we have at least reached this point of advancement—that we no longer seek to attain the desired object by inadequate and irrational means. We now demand of science that, while inaugurating great reforms, she shall also devote her best energies and her higher powers to the protection of the humble toilers in her grand reformations.

In darker ages men sought for personal safety, as well as the protection of their flocks and herds, in charms, amulets and invocations, remnants of which are to be found, even in civilized communities, to the present day. But the reliance on the charmed

blade has given place to the perfect finish and accurate bore of the rifle; the belief in the efficacy of human sacrifices to appease the angry gods in time of pestilence, has been replaced to better purpose by a confidence in the draining of marshes, the better cleansing of towns and hamlets, and the destruction, by disinfectants, of morbid contagia; the written charm or sign, and the treasured amulet, have resigned their sway to the study and control of those natural laws which a gracious Providence has placed at our hands, and by which we are empowered to ward off myriad ills whose causes were at once mysterious and terrible to our forefathers.

But as man is constituted a religious animal, so with imperfect knowledge he must remain more or less a superstitious one. And as if the lower animals were doomed to be the last victims of such delusions, we see them still cropping up, at frequent intervals, in the management of live stock. The Irish or French peasant whose herd has been attacked by an epizootic, threatening their destruction, reverently calls in the parish priest and has him say mass over the victims. And while he may seek to excuse himself on the strength of his religious feelings, we cannot but pity the delusion which appeals to the Almighty for protection while neglecting those certain measures of prevention which God has placed in his own power.

On many stable doors in Great Britain we see nailed up a horse shoe, and though in many cases this is only done as the result of habit, and with no conception on the part of the doer of its primary significance, it was confidently relied on in former times to debar evil spirits and diseases from the premises. One of the most extraordinary superstitions was that which attached to the *bezoar* or *egagropile*. Here a stone or calculus, formed by deposit from the animal fluids in some internal organ, and which had in many cases caused the death of its host, was eagerly sought after and purchased, at ten times its weight in gold, as a prophylactic against contagion.

Nor is this highly favored country, with its admirable provisions for securing an education to all its citizens—its advanced Christianity, and its ingenious and progressive people—entirely free from such delusions. I have repeatedly postponed surgical operations until the proprietor of the animal has assured himself that the astronomical signs were favorable, and have been seriously consulted about the propriety of putting away in a dry place the

object removed with the knife, that a satisfactory recovery might be ensured.

In themselves, these superstitions and delusions are harmless enough, and might be treasured as mementoes of a credulous and imaginative past, but as they all tend to distract attention from the real dangers of each particular case, and the precautions necessary, they ought to be forever discarded. It is not among the members of this old and intelligent Society that such delusions can find a resting place, yet it is no less the duty of every member to disabuse the mind of any neighbor less favored in an educational point of view. The mass or *bezoar* will not harm the plague-stricken animals, but they divert attention from the all important separation of healthy and diseased, and from the cleansing and disinfection so essential to the checking of the malady. The waiting for a favorable influence of the stars, and the particular disposal of the excised fleshy mass, may be a matter of indifference as regards the result, but the postponement of a surgical operation from favorable weather to a tempestuous season, and the preservation of a mass of putrifying animal matter in the same stable in which the wounded animal stands, are among the best possible means to secure unhealthy action, or even gangrene, in the sore.

There are certain other delusions, entertained by many stock owners, which cannot claim even the poor excuse of superstition. These refer mainly to *hollow-horn*, *horn-ail*, *tail-ail* and *black-tooth*. I would not venture to mention these redoubtable ailments, but for the unaccountable prevalence of the inhuman practices resorted to for their cure, and while I indulge the hope that no member of the New York State Agricultural Society may have been guilty of the barbarities alluded to, I trust that my words may come under the notice of others who have unwittingly and against their better natures been led astray by the prevailing errors.

Some one has said that *horn-ail* is a truly national disorder, and such it may justly be held, inasmuch as in no other country do cattle require to have their horns perforated with gimlet holes, and stuffed and rubbed with heating agents, to restore them to soundness. But what is the true state of the case? In all countries alike, the horn is hollow in the healthy, full-grown animal. But instead of this hollow condition proving a source of trouble, it adds to the comfort of the animal, and, indeed, is almost essential to its existence. In the young and growing calf, the frame-

work of the skull is to a large extent membranous, and hence lighter than a bony structure of the same size would be. But as earthy salts are deposited in these membranes, and as they are transformed into true bone, the weight of the head is correspondingly increased, and without some compensating device would become an unwieldy burden. To obviate this, the Divine Architect establishes a process of excavation in the bony mass, which separates the inner layer from the outer, and leaves between a hollow cavity which communicates freely with the nostrils. As development proceeds, as the head increases in bulk, and as the framework of the skull becomes more exclusively bony, there advances in equal ratio the process of excavation, until over the entire forehead the inner and outer plates of bone become reduced to, comparatively, mere shells, with a wide and open intervening cavity. This scooping-out process extends for some distance over the ridge forming the summit of the head, and into the conical bony supports of the horns, as well as downward in front of each eye and deeply into the center of the skull beneath the cranium, so that all the otherwise heavy parts are attenuated and lightened, and while the head maintains its massiveness and symmetry, the animal can use it with ease, and even with gracefulness. Nor is it lightness and symmetry alone that are secured by this arrangement. As the outer plate is connected with the inner by delicate pillars of bone, possessing, as all bone does, a certain amount of elasticity, we have here interposed, between this outer plate of bone and the brain, a most admirable means of warding off from this vital organ those concussions to which the forehead and horns are of necessity subjected when used as weapons, offensive or defensive. The forehead, moreover, by this peculiarity in structure, similar in some respects to the plates of iron ships bent over at right angles at their borders, to increase their power of resistance, acquires a strength altogether disproportionate to the amount of bony matter employed in its construction. The whole condition, then, of hollow face and hollow horn, in place of demanding to be combated by cruel surgical operations, presents to him who will view it aright one of the most beautiful examples of creative wisdom in the adaptation of means to ends, at once so varied and so vital.

In the young calf and growing animal, then, a hollow horn is not a natural condition, but as it increases in size its bony support becomes scooped out internally, and the older the animal the

larger becomes this internal cavity and the thinner the investing plate of bone. In cases of inflammation of the lining membrane of this cavity, from severe catarrh or from direct injury when the yoke is attached to the horns, the cavity alike of the horn and the forehead may be filled up with matter, which finds only a slow and imperfect exit by the nose. But this is manifestly a condition diametrically opposed to *hollow-horn*, and is moreover a very rare affection. A disease of this kind is recognized by the discharge from the nose of whitish or yellowish matter, and sometimes of pure blood, by the heat and tenderness of the root of the horns and forehead, by the hanging head, the partially closed eyes, the great dullness and listlessness, and by the absence of a hollow sound when the forehead is gently tapped with the tip of the middle finger. It demands as treatment absolute rest, a dose of opening medicine, a semi-liquid, non-stimulating diet, the application of cold water, or even hot fomentations, steadily maintained, to the forehead, steaming of the nostrils by hot water vapor, and in obstinate cases the opening of the cavity in the interval between the eyes, and the syringing of it out daily with a mild astringent lotion until a healthy action has been established. But this disorder will never warrant the boring of the horns with a gimlet. If the horn were cut off by the root, as is done by a certain French author, the act *might* be defended on the ground of utility, but the boring of the horns entails great suffering without the slightest advantage, and if indefensibly cruel and hurtful in the diseased state of the parts, how much more so in the healthy?

But let me draw attention for a moment to the utter cruelty, uselessness and injury of this practice. First note the structures involved in the gimlet wound. Beneath the horn which is insensible to pain, there are first the highly sensitive and unyielding fibrous layer and its vascular folds, by which the horn is so firmly bound to the supporting bony process. Next there is the spongy, vascular and sensitive bone, with its outer and inner nutrient, fibrous membranes. And lastly, the delicately sensitive mucous membrane which lines the cavity of the bony process and the forehead. All of these vascular structures, with the exception of the mucous membrane, have a very close and resistant texture, and do not readily yield to exudation and swelling, so that inflammation seated in them is associated with exquisite pain. This suffering is increased by the compression of the inflamed parts by the investing and unyielding horn. The rude tearing of these tender and

susceptible structures by the gimlet can scarcely fail to set up inflammation, and an amount of attendant pain and suffering which may be partially appreciated by those who have had a *whitlow* under the finger nail. To those who have suffered from this, I need not appeal against the cruelties practiced for the imaginary *horn-ail*. But the ox suffers more than the human being because of the close proximity of the disease to more vital parts, and because the structures are of a closer texture and yield less readily to exudation than in the case of the human finger. The exudations and matter pent up between the unyielding bone below, the resistant horn above, and the dense fibrous structures around, are only too well calculated to produce excruciating agony. The tearing of these sensitive structures, and the rubbing in of pepper and other irritants, might be truthfully branded as fiendish but that the act is the offspring of ignorance, and practiced, however mistakenly, as a means of cure.

But after all, what is the condition known as *horn-ail*? In seeking to answer that question I have gone into the history of the disease, and find that it first occurred in 1771, as an epizootic, in the neighborhood of Boston. Mr. Cotton Tafts thus describes it in the first volume of "Memoirs of the American Academy of Science," page 529: "In 1771, a mortal distemper prevailed among foxes, and greatly reduced their numbers. About this time, or not long after, a distemper appeared among neat cattle, which destroyed many and has continued to this day. The distempers that befell these various kinds of animals were said not to have been known in the country before, more especially that which has effected neat cattle, and which has generally been considered as a new disease. It is commonly called the *horn distemper*. Cows are more especially subject to it; oxen but seldom; bulls are said to be exempt from it, also steers and heifers under three years of age. It is a disease which affects the internal substance of the horn, commonly called the pith, insensibly wastes it, and leaves the horn hollow. The pith is a spongy bone, whose cells are filled with an unctuous matter; it is furnished with a great number of small blood-vessels, is overspread with a thin membrane, and appears to be united by suture to the bones of the head, and is projected to a point. This spongy bone, in the *horn-distemper*, is sometimes partly and sometimes entirely wasted. The horn loses its natural heat, and a degree of coldness is evident upon handling it. When it is only in one horn (which is often the case), a mani-

fest difference between the one and the other will be perceived, and in all cases a want of natural heat will be apparent. Wherever this is found, there is no room to doubt of the disorder being present, yet it is seldom suspected without a particular acquaintance with other symptoms that commonly attend this distemper, and for want of knowing these the farmer has often lost his cattle, not even suspecting the evil. The symptoms are: a dullness in the countenance of the beast, a sluggishness in moving, a heaviness of the eyes, a failure of app \grave{e} tite, an inclination to lay down, an aversion to rise, and when accompanied with an inflammation of the brain, a giddiness and frequent tossing of the head; besides, the limbs are sometimes affected with stiffness like a rheumatism, and in cows the milk often fails, the udder is hard, and in almost all cases there is a sudden wasting of the flesh." He adds: "(Neat cattle are subject to a disorder commonly called the *tail-sickness*, which is a wasting of the bony substance of the tail, and if not cut off, or dilated as far as the defect reaches, often proves fatal. It frequently accompanies the horn-distemper.) From the number of cows siezed by this distemper in the space of a fortnight, a suspicion arose that the distemper was infectious. Time, however, has shown that it is not so, at least in any great degree, for it frequently happens that among many cattle herding together, one of them shall have the distemper and the others shall remain in perfect health." He goes on to describe the cure of the disease by the now time-honored *gimlet* surgery.

Our knowledge of the disease has not advanced since the days of Cotton Taffits. From all available descriptions of the malady, and from the numerous cases that have been shown me, I can learn of no specific symptom, in addition to those of general ill health, but extreme coldness or warmth of the horns. To enable us to appreciate the importance of these symptoms, let us note the following facts: The vascular structures beneath the horn, like those of the skin generally, wherever an abundance of epidermic productions are secreted, are very abundantly supplied with blood. This applies alike to the human scalp, the heels of the heavy breeds of horses, or the structures secreting the nails of man, the claws of carnivora, the hoof of the horse, or the horns of cattle. From this abundance of blood, the horns participate in all the changes of temperature experienced by the blood and body at large, and their excessive heat affords conclusive evidence of the

existence of fever. But as they are superficial structures, they equally participate in the chill or shivering fit by which the fever is ushered in, and when the blood is repelled from the contracted vessels in the integument to accumulate around internal organs. The coldness of the horn, then, is merely a concomitant of that of the skin when fever is being manifested by its first outward symptom—a chill or staring coat. Unnatural heat of the horn is equally an exponent of a morbid rise of temperature in the blood and body at large—a constant and essential condition of fever. Alternations from heat to cold, and the reverse, on the part of the horns, like corresponding changes in the skin generally, will take place at frequent intervals during the progress of many diseases.

Having thus arrived at the general morbid condition betokened by the coldness or heat of the horns, it remains to note other specific symptoms which will denote the precise nature of the disease. But these symptoms are as varied as the febrile and inflammatory disorders of the animal, so that it were vain to attempt to enumerate them here. And yet it is upon the observation and recognition of these specific symptoms alone that a rational treatment can be based. To note a few by way of illustration, in themselves generic and pointing to disease of special organs rather than to particular diseases, I mention the following: There may be dullness, stupor, or somnolence, or extreme excitability, restlessness, or wildness of look; there may be slight twitching of the muscles, there may be cramps or convulsions, or more or less complete loss of sensation or voluntary movement—all pointing to diseases of the brain or nervous centres. There may be disturbed breathing, red injected nostrils, hot expired air, swelling of the throat, dryness of the nose or watery discharge from it, cough, grunting with each expiration or when some particular part of the chest is struck, together with modifications of the natural sounds and resonance of the chest—pointing to disease of the respiratory organs. There may be an absence of these symptoms, but a suspension of rumination, impaired appetite, swelling on the left side of the belly, uneasy movements of the hind limbs and tail, and an unnatural state of the dung as regards liquidity or dryness, frequency of escape or infrequency, or a chopped up, undigested appearance—all indicating some disorder of the digestive organs. The epizootic of Tafts was probably a digestive disorder, with symptomatic brain disease, as manifested in the stiffness and loss of control over the limbs, the great dullness, and the violent movements of the

head. Color is lent to this supposition by the facts that the year 1771 was unusually wet and stormy, and marked by the prevalence of many diseases among men and animals in different parts of the world. Thus, ergotism was general throughout Europe; in Germany, bilious fever was very fatal in man, an abdominal disorder in the horse, and large numbers of geese, pheasants and wild animals died; in Holland, Belgium and France, an epizootic of gangrenous sore throat devastated the cattle; in Spain, they suffered from a fatal dysentery; in Russia, from the cattle plague; and in the West Indian Islands, man and beast alike suffered from a malignant blood disease. The deteriorated fodder of such a year was very likely, indeed, to induce disorders of the digestive organs and of the brain. To return to the general symptoms: there may be yellowness of the eyes and nose, lying on the right side, grunting when struck on the last ribs on that side, and perhaps lameness in the right fore leg in an overfed and inactive animal—bespeaking disease of the liver. There may be arching and tenderness of the loins, an unsteady or straddling gait with the hind extremities, uneasy movements of the hind limbs and tail, frequent attempts to urinate, the passage of water in small quantities, high colored, or even bloody—showing disease of the urinary organs. I might proceed, but I will only seek to advise a treatment to be adopted during the shivering and the coldness of the horn, that will be at once more rational and more successful than the boring and peppering process.

If the animal is chill, shivering, or has a rough, staring coat, and if the horn is unnaturally cold, a dangerous inflammation may often be warded off by bringing about a free circulation and warmth in the skin. Give an injection of three quarts of warm water, repeating it if it is thrown off. Administer by the mouth several quarts of warm gruel, containing six or eight ounces of whisky, brandy or gin, or if obtainable, four ounces of sweet spirits of nitre, or five drachms of carbonate of ammonia. Blanket the patient warmly from head to tail, and actively hand-rub the limbs. A good plan is to heat dry bran, salt or sand in a stove, put it in a broad, lengthy bag, and lay it along the beast's spine from shoulder to rump. Or wring a thick rag out of very hot water, lay it over the animal's back from head to tail, cover it up with several dry rags or buffalo skins, and bind them closely to the skin with surcingles, that the heat may be retained. The limbs may meanwhile be actively rubbed, and then tied up in warm

flannel bandages, loosely applied, so as not to impede the circulation. In half an hour the patient will usually be in a glow of warmth and covered with perspiration, and the covering must be removed gradually, one by one, and the damp one quickly replaced by an ample dry one, after one and a half to two hours. Dangerous inflammations in the chest, abdomen, &c., may often be warded off by these measures, when taken in the initial stage, and though a little more troublesome than the gimlet surgery, it has the compensating claims of being at once rational and successful. Such measures are of course only applicable at the commencement of the disease, when as yet no important change of structure has taken place, but when there is an impaired vitality of some internal organ, and when the blood is being repelled from the surface to accumulate injuriously or fatally around this and other deep seated structures. The same success must not be looked for from such measures applied during the slight and frequently alternating chills and flushes of the surface, which so often manifest themselves during the course of a severe inflammation, or after the diseased organ has become the seat of important structural changes. When the first chill or shiver has passed off, and when inflammation of an important organ has been fully established, other remedies must be employed, in the shape of counter-irritants and medicinal agents, as varied as the diseases, or even as the different types, phases or stages in individual cases of illness. To treat of these would require a volume, rather than a short address.

Tail-ail is closely allied to *horn-ail* in attacking the stock of ignorant and credulous owners and in the measures to be adopted for its cure. Like that disease, it is further the peculiar prerogative of horned cattle. The caudal appendages of horses, dogs, pigs, and even of sheep, are exempt from this formidable malady. It is not, however, confined to the New World, but lays claim to all the respect with which the hoary antiquity of European prejudices and practice may invest it. It would appear as if, the world over, the useful cow is doomed to have her tail slit and the sore rubbed with salt, soot, pepper, &c. The supposed softening of the end of the tail is due to a piece of pliable gristle by which the bones are prolonged, and if, in some weak states of the system, it may be further a little puffy and dropsical, this is due to the state of the body, and is not likely to be improved by the ruthless mutilation of this useful and ornamental appendage. It is true that the tail may slough off from dry gan-

grene in cattle feeding on ergoted grasses, or from moist gangrene after inoculation for pleuro-pneumonia ; it may drop off gangrenous in young pigs with a weak circulation, or it may suffer from mechanical injuries of various kinds ; but these conditions are all patent enough to the external senses, and do not require a wayward imagination to recognize them.

The destructive *black-tooth*, like *horn-ail*, is a disorder exclusively American, and its existence as a fatal disease rests on about equal authority. A pig is ill of indigestion, deranged biliary or urinary secretion, or other malady inappreciable by those about him, and forthwith, at the expense of much muscular effort and hog music, his mouth must be torn open by a couple of nooses placed on the respective jaws, and one or more blackened teeth being discovered they are hammered off level with the jaw. The hog sometimes recovers, as he would probably have done had he been let alone, and as he would much more certainly and speedily, in the majority of cases, had he had a good soapy wash and three or four ounces of castor oil. But, seriously, if a tooth dyed by the imbibition of coloring agents, but otherwise sound, can be conceived of as injurious to the hog, how much more hurtful the broken and decaying stumps left as permanent irritants in the gums? If a tooth must be got quit of let it be extracted entire, otherwise much harm may result, but certainly no good.

But to leave these imaginary diseases, I shall glance at a few of the real ones that attack our farm stock, and offer some suggestions as to their prevention and treatment.

In the case of the horse, it is notorious how many of his diseases are connected with errors in diet. Colics, blind staggers, founder, excessive secretion of urine and heaves are especially deserving of mention in this connection. *Colics* arise mainly from over feeding, irregularities in feeding and watering, or from putting to work too soon after having swallowed a meal. Unsuitable food, such as that which is too watery, food that is still partially green, fermentescible and irritating, as in the case of newly harvested hay or grain, or food which tends to clog the digestive organs, like wheat and fine wheaten flour, are also common causes. A horse crouching, kicking at his belly, rolling and casting agonized glances at his flanks, in an attack of colic, may often be relieved by frequent injections of three or four quarts of warm water. This measure is especially applicable to the horse because of the extraordinary development of his large or terminal guts, in which

obstructions and irritations are usually seated, and which may be, to a great extent, unloaded by the direct solvent action of the injection, as well as by the contraction of the anterior portion sympathetically with the more posterior and terminal part. To those who are in the habit of employing injections in diseases of the digestive organs in the horse, nothing need be said in their favor; but for those who have not, a statement of the capacity of the intestines and the nature of their contents may not be superfluous. The large or terminal intestines of the horse, then, are capable of holding from twenty-eight to thirty gallons, or within a fraction of two-thirds of the entire intestinal contents in the animal. Add to this that the contents of the anterior or small bowels are invariably semi-fluid, while those of the large intestines become increasingly firm and dry, and we find a reason not only for the greater prevalence of disease in the latter, but also for the highly beneficial effects of copious injections. These remedial measures, moreover, may be applied by any person, and in all kinds of maladies, without risk of injury. The only precautions are to avoid using the water at an unpleasant heat, to oil the nozzle of the injecting instrument and to introduce it with a requisite degree of caution. The common barrel syringe, holding about a quart, is an excellent instrument for the purpose, though, perhaps, a still better may be made from block tin, in the shape of a funnel, eight inches high, communicating below with a tube joining it at right angles, projecting six inches and rounded at its fore-end, after the manner of the nozzle of the syringe. This has the advantage that it draws off any gas which may have lodged in the last gut, while the barrel syringe is very liable to introduce air.

But colics are not always to be overcome by simple injections. In bad cases two or three ounces of sweet spirits of nitre and twenty drops of tincture of aconite may be given in a few ounces of water. If a repetition of this dose does not relieve the patient in the course of one and a half hours, a laxative consisting of five drachms of aloes should be at once given, to rid the bowels of their irritating contents. The nauseating and anti-spasmodic action of this agent will often relieve suffering within half an hour, and nearly always within four hours after it has been given, though the dung is not seen to be materially affected until next day. But I would add a caution as to the form in which the aloes are given. If given in the form of liquid as a drink, a half and upwards is usually lost, a fact which accounts for the absence of all effect

after a quarter or half a pound of aloes are supposed to have been administered. The powdered aloes mixed with a drachm of ginger, and, if it is at hand, two drachms of extract of hyoscyamus should be made up into a bolus, in the form of a cylinder, about two and a half inches long and not more than three-fourths of an inch in diameter, rolled in thin paper, and the tongue having been seized with the left hand and turned up between the jaws so as to compel gaping, the bolus held in the right is carried over the tongue and lodged just over its root, in the median line. The tongue is immediately released, and the bolus is inevitably swallowed.

Blind-staggers, so prevalent in some parts of the States, and to some extent in New York, results directly from partial or complete paralysis of the stomach, whether as the result of overloading, or of some agent which directly impairs nervous function. The brain disease is a secondary or sympathetic affection, and hence, if we attack the primary seat of the malady, all such heroic measures as bleeding, blistering the head, &c., may be profitably dispensed with. An over-feed of grain is a common cause of this disease; another is the feeding on grain, legumes and other fodders which have approached the period of ripening but have not been fully dried. Chief among these last agents are over-ripe rye grass, vetches, tares or millet, cut and fed green to the animals. Whole stables fall victims at once from this cause. Besides a complete change of diet, an appropriate treatment consists in large doses of aloes, a half more or double those given for colic, combined with four drachms of carbonate of ammonia, and frequent and copious injections. Food should be semi-liquid bran mashes until complete recovery is insured.

From sympathy of the integument with an overloaded stomach, *founder* frequently results. It must be met in the same way, by a purgative to clear away the primary source of irritation, and if caught in the outset will often demand nothing further than soothing poultices applied to the feet, the shoes having been removed, a roomy, well littered place, where the patient can lie in comfort, and an ounce dose of nitre daily, for six days after the physic has ceased acting. A restricted diet of bran mashes and roots must be kept up during convalescence.

Profuse staling, insatiable thirst, and rapid emaciation are frequent results of feeding on heated or musty hay or oats. As in most other cases, to know the cause is virtually to check the dis-

ease, though in some instances it may be necessary to give a course of tonics to restore the prostrate vital powers.

Broken wind, or heaves, is perhaps the most universally diffused evil result of improper feeding. Our splendid crops of clover and timothy, cut at the period of ripening, invariably dusty, and too often imperfectly cured, cannot be fed as they usually are to our agricultural horses with impunity. These horses, confined to the stable for days and weeks in succession, are habitually gorged with this hay, which injuriously affects the stomach by its dry, musty properties, in addition to the torpidity of the organ superinduced by a constant over-repletion. The common nerve of the stomach and lungs is functionally deranged, by which, as well as by the mechanical pressure of the loaded abdominal organs, breathing is impaired, and over-distention and rupture of the air cells ensue. Conjoin with these a full feed of grain, and, without any breathing interval, a hard and lengthy trot by the unprepared animal, and it is a miracle if the ill-used beast escapes. Musty hay should be altogether withheld from horses. Dry clover or timothy should be given in small quantities only, not exceeding fifteen pounds daily—should be slightly damped, and in case of a horse showing the slightest premonitory symptoms of *heaves*, the allowance should be reduced to one-half, and the grain correspondingly increased.

These considerations further explain the good effects of a laxative diet in cases of heaves—how mild cases, turned out on the prairies, sometimes recover—how the same result occasionally attends a diet of corn stalks, roots, cooked food and the like. The stomach, no longer loaded with a dry, debilitating aliment, by degrees regains its lost vigor, and in this restoration the lungs participate, provided the changes of structure are not too extensive to permit of a complete reparatory process. Certain agents having a special action on the nervous system will also assist in the process of recovery.

Respecting inflammatory diseases of the chest and elsewhere, I will add nothing new to the suggestions I have already offered for a rational treatment to be adopted in their initial or shivering stage, and which may be held to apply equally to all our larger domestic quadrupeds. Some remarks, however, on the varying types of disease, and on one or two common specific maladies, will not be altogether out of place. It cannot be denied that in the treatment of inflammatory complaints at the present time, the

severe bleedings, purgings, and other depleting measures formerly in vogue, cannot boast a respectable percentage of recoveries. Some of the most remarkable illustrations of this fact are to be met on the registers of medical hospitals. Thus, in the case of inflamed lungs, Dietl treated large numbers in the hospital at Vienna—first, by blood-letting; second, by large doses of tartar emetic; and third, by diet only. Under the bleeding and antimonial treatment, the deaths were in the ratio of 1 to 5 patients; while in those treated by diet alone, they were at the rate of 1 to 13½. Bennet, of Edinburgh, under a judiciously supporting treatment, lost but 1 patient in 22. Happily the lancet has been to a large extent discarded in human medicine, but it is still resorted to with destructive frequency in the treatment of sick animals. While I would not forbid its use in appropriate cases, I will point out one or two conditions in which it must be utterly discarded. In advanced stages of disease generally; in those already attended by profuse discharges from the bowels or kidneys, or in which extensive liquid effusions have taken place into the limbs, or into internal cavities, thereby impairing vitality and fostering weakness and prostration; and in all diseases, inflammatory or otherwise, which are attended by a low type of fever. This is especially evident in epizootic diseases, which strike down many animals at once, as in *influenza*. If any such affection is associated with a weak, rapid pulse, with dull, sunken, watery eyes, with pale or deep bluish red color of the lining membrane of the nostril, with strong impulse of the heart against the left side, just behind the elbow, and if there is early and rapidly increasing weakness and prostration, avoid the lancet as you value the life of the patient, and support by fresh air, nutritious gruels and mashes, by stimulants, and even tonics. Many animals affected in this way might be saved by an exclusively dietetic treatment, which are now consigned to a premature grave.

The *strangles* or *distemper* of young horses is another example of the value of a supporting treatment. If treated by warm, sloppy mashes, frequent inhalations of vapor from bran soaked in boiling water, and large poultices applied to the swelling on the lower jaw, the termination will be almost invariably favorable; while if harsh, debilitating treatment is resorted to, the results are most disastrous.

Among the common maladies of cattle, those of the stomach hold

a foremost rank. A consideration of the relative capacity and functions of the various parts of the digestive organs in the horse and ox, sufficiently explains this divergence in the general types of their diseases. In the horse, the functions of the stomach are limited and completed soon after a meal is swallowed, while the subsequent progress of digestion and absorption is carried out in the capacious intestines. In the ox, on the other hand, the food is long retained in the enormous reservoirs of the stomach, until it has become thoroughly infiltrated and softened by contact with heat and moisture, until its starch has been changed into sugar by the action of the saliva, until it has become most intimately divided and subdivided by rumination, and the grinding action of the manifolds, and after all this elaborate preparation it is still subjected to digestion in the fourth or true stomach before it can be allowed to pass into the intestines. The digestion remaining to be completed in the intestines is, as might be expected, relatively small as compared with intestinal digestion in the horse. The entire length of the ox's intestines as compared with the same parts in the horse, is as 5::3, but owing to their smaller calibre, their capacity is to that of the horse's only as 5::9. Length : horse, 90 feet, ox, 160 feet ; capacity : horse, 38 gallons, ox, 22 gallons. Turning to the stomachs we find that whereas the horse's stomach will contain about sixteen quarts, the four gastric cavities of the good average cow will hold close upon two hundred quarts, and in many cases more than this even.

Considering the enormous amount of work done in these primary digestive cavities in the ox, it is no longer matter for wonder that he is so very subject to bloating, or tympany, or overloading of the paunch with solid food, to dry murrain or impaction, and drying of the contents of the manifolds from feeding on smutty corn or stalks, from a dry fibrous aliment, or from one too exciting and irritating, and to a similar condition of the stomachs with a corresponding implication of the brain when some form of lead has been swallowed. For all these disorders, alike, strong stimulants and purgatives with a free supply of water will usually clear out the stomach, and bring about a happy result. In tympany or bloating, however, some agent should be given to rouse the torpid paunch into action, and to counteract fermentation in its contents. For this purpose the preparations of ammonia are usually given, such as the common smelling salts (carbonate of ammonia), in doses of half an ounce dissolved in water, or liquor ammonia in

doses of two teaspoonfuls in a pint of water. If these are not at hand, six or eight ounces of whisky, gin or brandy may be given, or, better than all, an ounce of spirits of turpentine shaken up in oil or milk, or two ounces of tar rolled up in paper, and so administered. Two drachms of carbolic acid would have a similar effect. These three last named agents operate mainly by counteracting fermentation and usually act like a charm, and almost instantaneously. If the swelling is such as to place life in imminent danger no time should be lost in getting medicines, but immediate relief should be given by plunging a pocket knife, in the absence of anything better, into the left side, at a point equally distant from the back bone, the point of the hip bone and the last rib. This should be done fearlessly and unhesitatingly, as the paunch lies here in direct contact with the side, and if the point of the agent with which the puncture is made is directed slightly downward it may be pushed in more than a foot without the possibility of contact, except with the contents of the stomach.

I shall refer at present to but one other class of bovine maladies—the carbuncular fevers—mainly represented in our Northern States by the maladies designated *black-leg*, *black-quarter* and *black-tongue*. *Black-leg* is a malady ushered in suddenly by symptoms of very high fever; shivering, followed by great heat of the surface, rapid difficult breathing, accelerated pulse, at first strong and full but soon quick and weak; suffusion of the visible mucous membranes, such as those of the eyes, nose, mouth, &c., of a very deep red, often tinged with yellow; great dullness and prostration, with hanging head and drooping ears; in the course of an hour or two halting upon one or more limbs, and very soon diffused pasty swellings on the shoulders, quarters, or on the body, from blood thrown out into the meshes of the tissues. Soon these swellings are felt to crackle, when handled, because of the decomposition of their constituent parts and the extrication of gases under the skin. The animals die in periods varying from six to thirty-six hours after the commencement of the attack, or, in rare cases, a slow recovery ensues. *Black-tongue* is introduced by the same general symptoms of fever, prostration, flushing of the mucous membranes, &c., but in place of the halting and swellings of the surface, the tongue is swollen, covered with blisters, and later becomes of a deep red or even black hue. These diseases are essentially connected with an undrained soil, rich in organic matter; a soil saturated with liquid during the winter

and spring, but drying up and exhaling its noxious organic products during the droughts of summer and autumn. For this reason they are much more prevalent in the malarious districts of the South than they are in our Northern States, and assume many other forms beside the two I have mentioned, and in hot, dry summers, especially, devastating the herds most extensively. In all its forms, this disease is associated with fermentative changes in the blood, which, with the carcass of the animal, commences to putrefy two or three hours after death. In the dead body the blood is always black and tarry, varying according to the number of hours the animal has survived the onset of the attack; it solidifies into a loose clot or not at all; it stains the hands, paper and other objects more deeply than ordinary blood, by virtue of the broken up condition of the globules and the universal diffusion of the coloring matter, and it contains special organized germs (bacteria or vibriones), which find in this disintegrated blood a natural habitat. Other agencies contribute to the development of these diseases, such as sudden accessions of plethora in animals which have been starved at one period and over-fed at another, inferior quality of food, which deteriorates the health and lowers the power of vital resistance, drinking of stagnant water, &c., but the main cause is unquestionably an undrained soil rich in organic remains, and in a climate which dries and bakes this soil at certain periods of the year. I could point to many farms in the south of Scotland, and in England, where, before the adoption of a thorough land drainage, these maladies yearly recurred, but from which they have disappeared with the inauguration of a more porous condition of the soil. Wald reports, concerning the district of Potsdam, which was formerly decimated by these maladies, that since the cultivation of the meadows and the feeding of the cattle in doors the losses have been greatly diminished. Buhl reports, from Donanworth, where these maladies were formerly rife, that they have completely disappeared since the advice of Pettenkofer was carried out in the drainage of the wet lands. I forbear to advance further instances of this kind, though their number might be indefinitely extended. By reason of the short duration of these affections and their extreme fatality, remedial treatment proves, too often, valueless. When time is allowed, the bowels should be opened by glauber salts, half to one pound, according to the size of the animal, and drachm doses of crystallized carbolic acid dissolved in a pint of water should be given at intervals of eight

hours, until improvement is manifest. A lotion of the same kind should be applied to the local swellings at equal intervals, the blisters on the tongue being cut open, and the tumors of the skin scarified, whenever crackling indicates the presence of gas. Dashing of cold water over the surface is often useful when the fever heat is intense. Carbolic acid may be likewise used in the food or water as a preventive. A caution is demanded for those who may handle the bodies of such animals in life or in death. In very many cases a virulent poison is developed, capable of fatally communicating *malignant pustule* to man by inoculation. Hence, any one approaching these animals should use carbolic acid freely, and carefully cauterize any wound or abrasion on his skin.

Not to tax your patience unduly, I will only refer further to certain diseases of sheep, connected, as regards causation, with undrained soil. *Rot* appears to be increasing, rather than otherwise, in our flocks. This disease, as many of you are aware, is a malady of low-lying, wet lands, with rank, aqueous pasture, and stagnant water. It consists, essentially, in a debilitated state of the system, a thin, watery condition of the blood, and the development, in the bile ducts, of an almost unlimited number of the flat, leaf-like worms known as *flukes* or *distomata*. In its earlier stages, this disease is recognizable mainly by the soft, flabby state of the muscular system, and the pallor and yellow or jaundiced appearance of the eye and other mucous membranes. Later it is manifested by increasing emaciation, and dropsical effusions in the more dependent parts of the body, and especially beneath the jaws. The same malady exists, though somewhat less frequently, in cows. The *fluke worms* by which the liver is infested, and has its functions disturbed, is a parasite which has to undergo a series of successive metamorphoses before it can attain its highest stage of development in the liver of the mammal; and in certain of its developmental forms, the imperfect animal can only live in stagnant water. Thus the egg or germ of the fluke will remain undeveloped, unless deposited in water. If in this element, however, it soon pushes off the lid from the egg, and passing out, swims about actively by the aid of microscopic vibrating cilia. This active sporocyst generates a large number of living germs or *cercaria* in its interior, and entering the body of some aquatic animal, brings forth these more advanced forms of its kind. These are flattened, leaf-like bodies, not unlike the perfect distomata, but it is not yet permitted them to develope into these. They leave the

bodies of the animals in which they have been brought forth, swim about freely in the water, and penetrating into worms, slugs and larva of insects, they loose their tail and become enclosed in a cyst. These worms, slugs and larva are inadvertently swallowed by mammals, mixed with their food or water, and then comes the final step by which the distoma attains its full development. The snail or other host is digested in the stomach of the mammal, and the incysted distoma, being set free, makes its way into the biliary ducts of its new host, accumulating, in many cases, in numbers almost beyond computation. It will be thus seen that an essential condition of the existence and successive metamorphoses of the fluke worm out of the mammalian body, is the presence of standing pools of water. Destroy these, and various links in the chain of its existence are necessarily broken, and it perishes either as an egg, in the body of the aquatic animal, or as a cercaria. As the introduction of these flukes into the bodies of sheep is an essential condition of the development of *rot*, fostered, it is true, by the ingestion of the watery and innutritious grasses growing on marshy lands, it follows that the thorough drainage of such lands, and the removal of the stagnant pools, must put an end to the disorder. And this is precisely what we find in practice. Wherever drainage can be made thorough over the entire range allowed the flock, there this disease ceases to exist. And in keeping with this is the fact that when sheep in the earlier stages of the malady are removed from the unwholesome pastures to perfectly dry land, and allowed grain and tonic agents, especially iron and common salt, they usually recover from the malady.

The development of all other internal worms is fostered by that low condition and weakness of constitution which is the inevitable result of a damp, relaxing atmosphere, an undrained soil, and aqueous, innutritious fodder. This is true alike of the *bladder worms* in the brain and liver, or the *round* and *tape worms* of the lungs and digestive organs. There is every reason to suppose, indeed, that in the case of certain round worms, their habitat, out of the body, is in pools of stagnant water. As in the case of the fluke worm, then, not only is their production favored by the weakness that results from the inevitable rank and aqueous grasses which grow on such land, but its pools become a *sine qua non* of the preservation of the parasites.

I might mention other maladies, such as the dropsies, or *yellow-water*, so prevalent on land of this kind, but I will select rather

the *foot-rot* of sheep and cattle, as a further illustration of the noxious influences of land habitually wet and soft. Many, I know, attribute the propagation of this disease to contagion alone, but the elucidation of its alleged contagious or non-contagious properties does not belong to my present purpose. I mean, rather, to give prominence to the notorious fact that there are certain lands on which sheep cannot be turned for any length of time, uncared for, without their contracting *foot-rot*. And such lands present very similar characters to those on which the *liver-rot* or *fluke-distemper* abounds. They are low, soft and marshy, and deficient in stony or hard ridges or knolls. The feet of the sheep, habitually soaked in moisture, lose their flinty hardness and power of resistance, becoming soft, wanting in cohesion, and easily torn. If such horn is dried, it becomes much more brittle than the more natural horn, and being overgrown by reason of the soaking and the absence of wear, it is readily torn or cracked to the quick, or the over-lapping edges, pressing inward upon the sole, bruise it and set up inflammation and ulceration. In other cases, clay and other filth, lodging between the claws in a wet, soft condition, hardens and determines ulceration at the upper end of the cleft. However caused, whether by one of these conditions or by undue wear of the hoofs during a long journey upon hard soil, ulceration once started beneath or in the immediate vicinity of the horn, is quite equal to its own maintenance, and if nothing is done to check it, it will progress, preceded by inflammation, suppuration and detachment of the horn, until one or both hoofs on the affected foot are shed. What is wanted is to pare away all superabundant horn, remove all that is underrun by matter and pressing injuriously on the quick, to thin the edges to make them pliant, afterward dressing with a feather or brush dipped in a solution made with one part of oil of vitriol and three of water, or still better, one part of crystallized carbolic acid to three of glycerine, and preserving the foot from mud, in bad cases, by bandaging it with tar. Simple paring of the foot, at intervals, will usually ward off the disease on land to which it may be said to be native. Laying the sheep walks in the pasture with fine gravel has sometimes been found equally successful. Lastly, many farms in Great Britain could be mentioned, from which *foot-rot* has been virtually banished by a thorough drainage and a consequent increased dryness and firmness of the soil.

As I began by speaking of charms for the prevention of dis-

cases, I will conclude by a *resumé* of a few of the unquestionable virtues of the modern talisman *drainage* as a preventive of the diseases of farm stock. Government reports state that *staggers*, one of the most destructive horse diseases of this continent, abounds everywhere in malarious regions ; but so does the inferior hay and provender, generally, which is, to a great extent, musty and covered with cryptogams. And, when in otherwise healthy localities, the fodder, in connection with a wet season, partakes of these properties, so does this disease spread like an epizootic. Drain off the superfluous water from the soil, render it sufficiently porous, and enable it to give up its unlimited organic constituents to nourish its growing crops, and with judicious feeding of the stock this malady will, to a great extent, disappear. *Periodic ophthalmia* or *moon blindness*, though largely dependent on a hereditary taint, has its attacks tracable, in the great majority of cases, to that coarseness and laxity of fibre and phlegmatic constitution, which are determined by low, wet and undrained lands and a moist atmosphere. Climate and locality has so great an influence on the disease that on the wet lands, to the north of the Pyrenees, nearly all horses are attacked by it ; but the Spaniards, dwelling on the south of this mountain chain, do not hesitate to buy up the young horses which have only had one attack of the malady, since experience has taught them that if these animals are removed to the high grounds of Catalonia, they rarely suffer from another attack. The *dropsies* or *yellow-water* of all our domestic animals are also, to a large extent, determined by the constitutional relaxation due to such soil and climate. In England they prevail, especially on those portions of Yorkshire, Lincolnshire and adjacent counties which barely rise above the sea level, and where drainage is, consequently, very partial and imperfect. My experience in the United States would warrant me in saying that it is a common malady here on undrained lands, and its increased prevalence, during the past year, may be attributed to the aggravation of this, caused by the wet and cloudy summer.

To these, as we have already seen, may be added the *colics*, *profuse staling* and *heaves* of horses ; the *black-leg*, *blood* (*maladie de sang*) and other carbuncular diseases of cattle and sheep, the *rot* and *foot-rot* of these same animals, and most of the *worms* of all farm stock. We have thus placed before us a long list of diseases more or less directly dependent on undrained soil for their development, and which owe their extensive prevalence, in many localities in

America, mainly to this cause. I will not venture even an approximate estimate of the enormous losses from these diseases over the entire continent, but, judging from the reports of the Commissioner of Agriculture, they make up a very large proportion of the entire losses sustained in live stock. And if the statement of the Hon. Horace Capron, in his last report to Congress, is correct, that "a judicious investment in drainage often pays one hundred per cent the first year," the considerations I have offered regarding its effect on the health of stock will, I trust, add materially to the strength of his argument, and lead to a more universal adoption of this desirable improvement.





