
PARUM SUFFICIT.
John Barrow.

862

To L A Lawrence
with his old Friend
Bokers kind regards
June 11th 60

6 May 1878

In Memoriam

Mrs Lawrence
kindly gave me
this Volume to
play – as a
Souvenir of her
most excellent
Husband the
late Dr Lawrence

[illegible]

A

TREATISE

ON THE

STRUCTURE, FUNCTIONS, AND DISEASES

OF

THE FOOT AND LEG

OF

THE HORSE;

COMPREHENDING

THE COMPARATIVE ANATOMY OF THESE PARTS IN OTHER ANIMALS,

EMBRACING THE SUBJECT OF SHOEING AND THE PROPER TREATMENT OF THE FOOT,

WITH THE RATIONALE AND EFFECTS OF VARIOUS IMPORTANT OPERATIONS, AND THE BEST METHODS OF PERFORMING THEM.

BY W. C. SPOONER, M.R.V.C.

AUTHOR OF "A TREATISE ON THE INFLUENZA OF HORSES."

"It is quite time that *Veterinary Medicine* should cease to assert, and commence to prove; that it should re-examine what it has hitherto believed, together with its grounds of belief; and not be content, in these days of a better philosophy, with its ancient dogmas, or with what it acts on from habit, but with that alone which it adopts from conviction."—*M'Culloch.*

LONDON:

LONGMAN, ORME, BROWN, GREEN, AND LONGMANS,

PATERNOSTER-ROW.

1840.

London:
Printed by A. Spottiswoode,
New-Street-Square.

DEDICATION

TO HIS GRACE

THE DUKE OF RICHMOND,

K.G. P.C.

PRESIDENT

OF THE ROYAL ENGLISH AGRICULTURAL SOCIETY.

My Lord Duke,

Permit me to take this opportunity of thanking you for the flattering manner in which you kindly acceded to my request, of allowing me to dedicate this Work to your Grace.

In making the request, I felt convinced that a Nobleman so well known as the liberal and distinguished Patron of the Turf and of Agriculture, could not be altogether indifferent to the advancement of an Art so intimately connected with these pursuits as that of Veterinary Science. I was still further induced to seek your patronage, from your position as President of the Royal English Agricultural Society, which has lately granted to the Professors of the Veterinary College a liberal sum for the purpose of teaching and *disseminating* a knowledge of the Diseases of Cattle, thus connecting more closely the pursuits of Agriculture with those of Veterinary Medicine. It is on these public grounds, —as one of the most honoured of the

Patrons of the Turf, — as a sincere and judicious friend to Agriculture, — and as President of the Agricultural Society, that I beg to dedicate this Work to your Grace.

Aware, as I am, of your intimate knowledge of the Horse, and competency to criticise on all subjects connected with the animal, it will greatly increase my satisfaction should the present work be fortunate enough to obtain the meed of your approbation.

I have the honour to be,
Your Grace's most humble
and obedient Servant,

THE AUTHOR.

Southampton, June 25. 1840.

PREFACE.

About two years since, in a leading article in the *Veterinarian*, after some general observations on the subject, an opinion was expressed by the Editor, Mr. Youatt, that a good standard work on the foot of the horse was much wanted in the veterinary profession. I was at the time so much struck with the idea, in which I fully concurred, that I immediately formed the vague intention of applying my own humble endeavours to filling up the *hiatus*. After a few pages, however, were written, numerous pressing engagements, private and professional, interfered, and so occupied the whole of my time, that I was constrained to abandon the intention I had formed of seeking honour in this new field. The commencement of the last winter, however, bringing with it rather more leisure than I had for some time previously possessed, the old *cacoëthes scribendi* again returned; and seeing the field still unoccupied, I began seriously to devote myself to the accomplishment of my previous design.

Such, then, were the circumstances attending the commencement of a task, which has been carried on amidst numerous other engagements —in such snatches of time only as these occupations admitted. I mention this, not as a justification for the imperfections of the work, which may be numerous, or for its inaccuracies, which I trust are few; but to moderate, in some degree, the pen of criticism, and to induce the impartial reader to balance with candour and kindness its faults and its merits.

In stating that such a work as the present was wanted in the Veterinary Profession, and in assuming that such want is now supplied, I would not be thought to disparage for a moment the just claims of others to consideration and respect. We have had, at various times, many works on the Foot of the Horse, and some of them being of considerable worth.

To pass over those of Mr. Clark of Edinburgh, and of Mr. Freeman, both possessing merit, and the latter distinguished by the beauty of its plates, and the notice of the elastic principle, we find that, in 1800, the late Professor Coleman published a quarto work on the foot, which contained some very beautiful plates, particularly those representing the bloodvessels of the foot, the anatomy of which part was treated with much accuracy and research. This work contained many valuable observations on the economy of the foot, but blended with other ideas, which subsequent practice and observation have shown to be erroneous. In 1806, Mr. Bracy Clark published a very scientific and elaborate treatise on the same subject, which has been succeeded by new and improved editions. To him much credit is due for clearly illustrating and unremittingly advocating the expansive properties of the foot.

In 1820, Mr. Goodwin published an able work on shoeing, which contained some excellent plates of the shoes of various nations, as well as some useful directions on the principles and practice of the art. Mr. G. also notices, in a cursory manner, some of the diseases of the foot.

A few years since, Mr. James Turner published his papers on the Navicular disease, and a new system of shoeing, the merits of which are acknowledged in a separate part of the present work. Besides those we have mentioned, there are other general works which have embraced the foot as a branch of their subject. It will be unnecessary to mention them all, but we must point out those of Messrs. Blaine, Youatt, and Percivall, as possessing peculiar and intrinsic excellencies.

Thus, though there are apparently many, yet, in point of fact, there are very few works which treat extensively on the subject, and these few either large and expensive, or otherwise out of print or obsolete. A work was still wanting, that should, in a somewhat popular and accessible form, contain all, or nearly all, that was known of the Anatomy, Physiology, and Pathology of the foot: it was, likewise, desirable that such work should be written by one who was pledged to no peculiar theories that would bias his judgment, but who would accomplish his task with candour and impartiality, taking truth as his motto and nature as his guide.

It was at first my intention to confine the work to the foot alone; but I found as I proceeded, that it was quite impossible to do justice to the subject of lamenesses without noticing and distinguishing those belonging to the foot from those appertaining to the leg: and the anatomy of the parts were so blended together, that a correct description of the one could not be given without a succinct account of the other; and I felt that, by thus extending the subject, I should be adding both to its interest and utility. Accordingly, the pathological portion of the work is equally devoted to the diseases of the leg as of the foot; and, under the head of "Operations," I have bestowed some time and space in canvassing the rival subjects of the Cautery and the Seton, and in doing justice to the operation of Neurotomy, which, if it has been improperly practised by some, has been undeservedly vilified by others. I felt that justice could only be fully done to this operation, by collecting and arranging the scattered facts that have appeared, not merely of its successful performance, but of the long continuance of its good effects.

It has been my object principally to make the present work interesting and useful to the veterinary student and practitioner; but it has also been my purpose, in a secondary degree, to render it attractive to the medical practitioner, the comparative anatomist, the sportsman, and the amateur. With these views, I have endeavoured to make the anatomical portion of the work clear and correct; the physiological division simple and comprehensive; and the pathological part consistent with the best precepts of practical experience, and the soundest principles of medicine and surgery. In carrying out these purposes, I have drawn freely from the recorded opinions of others, but not without acknowledging the obligation as freely as it was incurred. If I have accomplished these intentions, and my design should be favourably received by the profession and the public, I shall allow myself to indulge the reflection of having added my humble mite towards advancing in its progress, and raising in public estimation, the profession to which I am devoted, the proper practice of which I am fully convinced is accordant with the best principles of humanity and science.

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ON THE

STRUCTURE, FUNCTIONS, AND DISEASES

OF THE

FOOT AND LEG OF THE HORSE.

INTRODUCTION.

THE genus to which the horse belongs, is confined to a very few species, viz. the zebra, the ass, and the horse, which are denominated by naturalists the *Solipede* or *Solidungula*, from the solidity of their feet. In the paucity of its kindred species, the Solipede differs widely from the Ruminant, which is distinguished by the cloven foot; for whilst the former is confined to the few species above mentioned, the latter extends over a much wider range, embracing animals of very different habits and inhabiting very different localities. It belongs to fast animals as well as to slow ones, enabling the one to toil through the heavy soil, and the other to bound over the open plain. We find the cloven foot in every country; — if we extend our observations to the torrid zone, we shall find it adapting the

A

useful camel for toiling through the sandy deserts; and if we take our journey to the ice-bound North, there too we shall find the cloven foot again called into requisition, and, with some little deviation in its structure, again pressed into the service of man. It enables the useful reindeer to transport its master's sledge over the snowy plains of Lapland, and affords the best facilities of communication between the distant parts of that country during the prevalence of the very causes which in this country forbid our intercourse. The cloven foot, then, it must be acknowledged, is that structure which nature has found most convenient for general purposes, and the best adapted to the natural appearance of the globe.

If, however it possesses these advantages, the solid foot has others to counterbalance them: if the former is best suited to nature, the latter is best adapted to art; if the one is best constructed for sandy plains or snowy surfaces, which can neither be changed nor improved, the other can more easily be accommodated to the various roads which the ingenuity of mankind has invented for the readier intercourse of civilisation; and for my own part I regard it as an important fact, that the foot of the solipede is the only one to which an iron defence can be conveniently applied; and whatever evils the practice of shoeing may have entailed, yet it cannot be denied that, without it, the powers of the horse would never have been fully developed, nor could his many important capabilities have been rendered available by man. Thus we find that in ancient times, before this useful invention was discovered, the use of the horse was very limited, and the race confined to a small locality; it was obliged to yield the palm of superior usefulness to the cloven foot; and now, at the present day, one of the principal reasons why the horse is so generally useful, is, because his feet admit so readily an iron defence.

The chief superiority of the horse over other animals appears to consist in the double and combined advantages of strength and speed. The antelope may bound over the plains with the most graceful facility, and the ox may propel or carry a prodigious weight, but it is the horse, and the horse alone, that can follow closely the footsteps of the former animal with a weight that can scarcely be borne by the latter. For the proper accomplishment of these double purposes we find the foot most eminently qualified: it possesses strength and durability in the highest perfection, on the one hand, and on the other a number of beautiful contrivances by which every elasticity is gained, — contrivances, indeed, which cannot fail to please the physiologist, and surprise and delight the inquiring student of nature.

In the present work, it is our intention first to describe, as succinctly as possible, the anatomical structure of the parts which compose the foot and leg of the horse; to follow this with their physiology; then to treat on the subject of shoeing; and to conclude with the pathology of those parts we shall have before described. This mode of arrangement appears best calculated to do justice to the subject, and afford in the simplest method the requisite information to the student and amateur.

ANATOMICAL STRUCTURE OF THE FOOT OF THE HORSE.

THE foot of the horse consists of external and internal parts,—the former being the hoof, and the latter its contents. The hoof is a horny box composed of various parts, which are distinguished by different names: thus we have the crust, bars, sole, and frog.

Fig. 1.

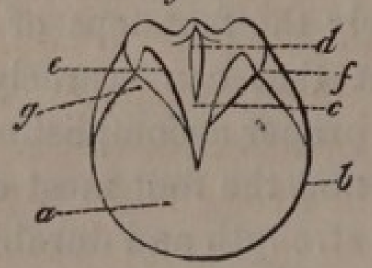


Fig. 2.

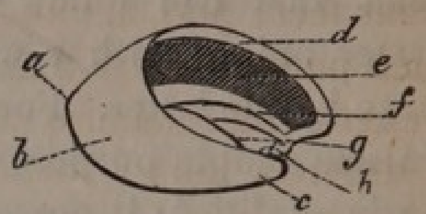


Fig. 1. The lower Part of the Foot.

a, the sole.
b, the outer quarter, showing the spread or greater convexity of the outside quarter. *c*, the frog.
d, the cleft of the frog. *e*, the bars.
f, the heels of the crust, on which the shoe rests.
g, the inner heel of the sole, the seat of corns.

Fig. 2.

a, the crust. *b*, the toe. *c*, the heels of the crust.
d, the internal part of the coronary ring.
e, the horny laminæ.
f, the internal surface of the horny sole.
g, the internal surface of the horny frog.
h, the cleft or frog stay.

The Crust.—On taking an external view of the foot of the horse whilst the animal is standing upon it, all that we see externally is denominated the wall or crust,—the various parts of which are distinguished as the toe, the quarters, and the heels.

The crust possesses considerable strength and thickness; these qualities abounding mostly at the front of the foot, where it is often nearly half an inch thick, and lessening at the sides or quarters, and again increasing at the heels: the outer quarter, however, is considerably stronger than the inner. At the toe or front of the foot, the crust is usually about three inches and a half in depth, gradually diminishing towards the heels, being there not more than an inch and a half. The crust at its lower edge is nearly circular; the circle, however, is never complete, and deviates considerably in different feet; and, in most horses, the outer quarter is much more circular than the inner quarter.* The strength and thickness of the crust varies very much in different horses, — being in strong hoofs half an inch at the front part, whilst in others it is less than

* Mr. Turner, in his work on the "Navicular Disease," observes: — "On inspecting the unshod foot of a four-year old colt (which is fully developed at that period of life), it has been the fashion for veterinary writers to consider its ground surface as a circle. To this I have much objection, having always been struck by the great inequality of its two sides, not only as to the additional thickness of the wall of the outer quarter in comparison to the inner, but the still greater difference in compass or circularity; the outer quarter furnishing far more than is necessary to form the half circle, while the inside is generally much less than a semicircle. This bulge, or fine luxuriant growth of the outside quarter, is generally most apparent towards the heel, — not only forming a much broader basis of support for the superstructure than the inside, but also one of immense strength. The inside column of crust being less strong, and yet placed more immediately under the centre of gravity, it appears to me quite obvious that Nature intended the outer quarter should serve as the main prop of support, whilst the inside quarter, in proportion to the weight and speed of the animal, should expand and oppose concussion."

half this density. Some writers assert that the crust is conical in shape, whilst others contend that its shape is that of a cone obliquely truncated at its lower surface. The subject is scarcely deserving the quantity of argument with which it has been favoured, for not only is it a matter of little importance in itself, but, like the story of the camelion, abundant evidence can be offered on either side. In some horses, no doubt, the feet are cylindrical; but as in the great majority of hoofs, and particularly those which we consider the best, the circle at the upper part is less than one at an equal distance lower down, we shall be more frequently correct if we describe it as the frustrum of a cone. The fact, however, is, that no mathematical figure can correctly describe the exact shape of the foot; for, viewing it in front, we may pronounce it conical, whilst at the same time its lateral aspect may be that of a cylinder.*

* Mr. Bracy Clark, it is well known, contends that the foot is a cylinder, oblique truncated at its lower part, and yet, on examining one of the pasteboard plans of the foot constructed by this gentleman, and which I have in my possession, I find that the circle on the upper part is less in diameter and circumference than one at an exactly equal distance further down; whereas, if the foot had been cylindrical, these two circles would have been equal. Mr. Clark tells us to roll up a sheet of paper in a cylindrical form, then obliquely cut its lower surface, and we shall have the shape of the foot. This may be the case, but it will be a very bad shaped foot, and very different to that represented by Mr. Clark's pasteboard plan. I agree with Mr. Clark, that the circumstance of the lower circumference of the foot being greater than the upper one does not prove it to be conical, because this would arise from its oblique truncation, which Mr. Clark, I believe, was the first ingeniously to point out; but let any one that is curious about the matter take a good foot, mark a circular line round, about an inch from the coronet, then saw the hoof in the direction of this line; he will then find that the lower

The crust at its upper margin, for about half an inch, is thin, soft, and slightly concave internally, and is here called the *Coronary Ring,* which extends round the upper part of the hoof, and is about half an inch in depth. The internal aspect of this concavity presents a vast number of small perforations which receive the terminations of the small blood-vessels of the coronary substance, whose office it is to secrete the crust. The horn at the coronary ring does not suddenly become thin, but gradually so from below upwards.

On tearing the crust from the coffin bone by means of pincers, its structure becomes more fully developed, and it is found to be divisible into three component parts. First, a sort of cuticular substance, which connects the hoof with the skin, or rather the cuticle above, and is then spread over the external part of the crust. This substance is thicker at the coronet than below, and is there termed by Mr. Bracy Clark the *Coronary Band.* This band becomes more developed posteriorly, being thicker and deeper as it approaches the heels, where it is inflected as it were into the substance of the frog, almost in the same manner as the other parts of the crust are inflected to form the bars. Secondly, the middle portion of the crust, which forms its principal substance, appears to be a collection of horny fibres connected by an elastic membrane, running from the coronet to the inferior border of the crust. These fibres being secreted by the coronary substance above, its thickness must depend

circle will be greater than the upper, clearly showing that the foot is not cylindrical, but that it approaches that of a cone.

on the developement of this substance, as affording a larger or smaller surface for the secreting vessels. Thirdly, the internal structure of the crust is formed by the horny laminæ, which, being inflected, are thus laid down one upon another so as to form a solid substance, and in this state are intimately connected with the longitudinal fibres.

The *Bars* may be considered as the continuation of the crust, being similar to it in their structure and appearance. They commence at the heels of the crust, with which they form an acute angle, and extend forwards and inwards about two inches, approaching towards the frog, but terminate before the latter reaches its point. The bars are about the same thickness as the crust is at the quarters, and their greatest depth is about an inch, gradually lessening towards their termination. The bars act as buttresses in forming and supporting the heels of the crust on which the shoe rests. The crust and bars have a strong and intimate union with the horny sole, and on their internal surfaces we find the

Horny Laminæ, which are a number of thin, horny plates fixed apparently edgeways to the crust, and extending from the coronary ring above to the union with the sole below, being about two thirds the length of the crust. These plates are about one twelfth of an inch in width, and are extended on the internal surface of the bars as well as the crust, — being, however, there considerably shorter and narrower. A minute examination of the horny laminæ discovers that the loose edges which approach towards the coffin bone are not smooth, but irregular, like the teeth of a comb, presenting the terminations of an immense number of transverse filaments, of which the laminæ seem to be composed. These fibres, which are intimately connected together by a strong membrane, may be traced on the inside of the crust, and form, indeed, its internal portion, which we have before noticed.

The *Horny Sole* occupies the greater portion of the base of the foot, joining the lower edge of the crust throughout its whole circumference. It is not so stout nor so tough as the crust, being cut with much greater facility. Its actual superficial shape will be best understood by saying that it occupies all the lower portion of the foot not formed by the frog and bars, to which parts it is closely united, and a portion, indeed, insinuated between them. The sole is about half the thickness of the crust, and is usually concave without and convex within; but in some horses this disposition is reversed, and in others the sole is flat, and if so, is generally thin likewise. On the interior surface of the sole we perceive a vast number of small holes, which correspond with and receive the villi of the sensible sole. When the foot is allowed to remain untouched for a considerable period, a portion of the sole exfoliates in the form of flakes, to give place to the new horn. From this circumstance it used to be supposed that the sole was secreted in layers, but it is found to be fibrous in its structure like the crust, — the fibres proceeding forward with great obliquity.

The *Horny Frog* is wedgelike or triangular in shape, the base of the triangle being situated at the back part, and the apex extending forwards into the centre of the base of the foot. It is much weaker in its texture than the sole or crust, but more elastic than either. As it approaches the apex, its substance becomes much thicker and firmer than at the heels, as the posterior part is called. It has a cleft in its centre, which extends about half its length forwards and upwards, somewhat higher than the most elevated part of the sole. The frog, generally speaking, is about the same thickness as the sole, and, like it, its fibres run obliquely forwards in the same direction. On inspecting the interior of the frog, which is the exact counterpart of the exterior, we find a vast number of pores, but smaller than those of the sole, which receive the minute villi of the sensible frog. The heels of the frog are intimately united with the upper and posterior part of the crust, of which, indeed, it seems almost a continuation. The space between the frog and bars is termed the commissures.

Having thus described the component parts of the horny box, we will next proceed to examine its various and complicated contents; to give a lucid idea of which, we cannot do better than begin with the most solid portions, the bones, reserving a description of the more minute parts to an after period.

The *Os Pedis*, or *Coffin Bone*, occupies about half the cavity of the hoof; somewhat singular in shape, but still more so in its construction, it corresponds in great measure to the conformation of the crust, without, however, being so deep, or extending quite so far posteriorly. In this bone, we have the sole at the base, the wall at the sides and in front, and the alæ or wings, which extend posteriorly, besides a large articulating surface above, and an irregular concavity below. The sole is the smoothest part of the bone, and is somewhat arched or concave, to correspond with the horny sole, which it also resembles in its superficial shape.

Fig. 3.

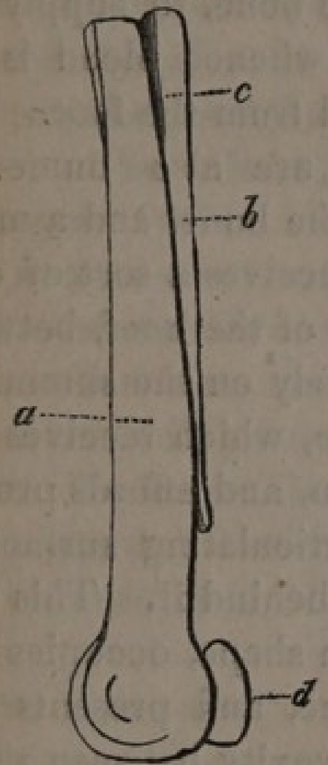


Fig. 4.

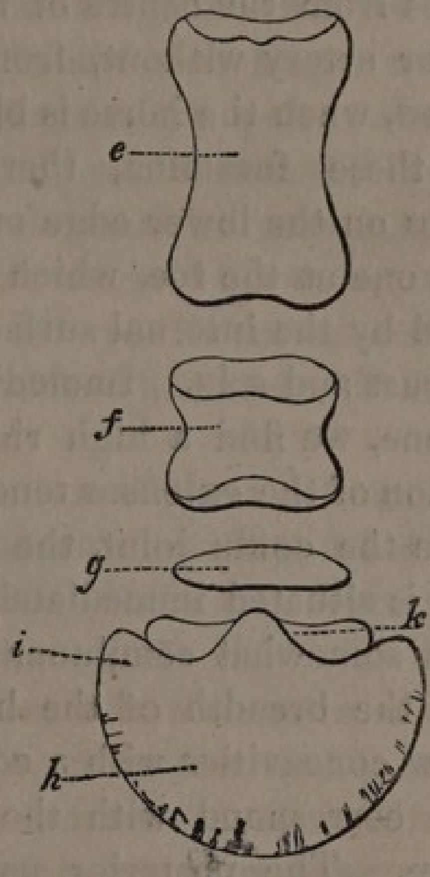


Fig. 3. The Bones of the Leg and Foot.

a, the large metacarpal or cannon bone. (A side view.)
b, one of the small metacarpal bones.
c, the usual seat of splents.
d, one of the sesamoid bones.

Fig. 4. The Phalanges. (A front view.)

e, the os suffraginis or large pastern.
f, the os coronæ or small pastern.
g, the navicular bone. *h*, the os pedis or coffin bone.
i, the alæ or wings of the coffin bone.
k, the coronal process, into which the extensor pedis tendon is inserted.

The *Wall* is extremely rough and irregular for the better attachment of the sensible laminæ, is pierced with numerous foramina for the passage of blood-vessels from the centre of the bone, and corresponds in shape to that of the crust. On its lower edge, at the space of about half an inch apart, we find some large foramina or holes for the passage of arteries from the centre of the bone, to supply the circular artery without, from whence blood is abstracted, when the horse is bled from the foot. Besides these foramina, there are also numerous notches on the lower edge of the bone, and a much larger one at the toe, which receives a sort of clip, formed by the internal surface of the hoof, between the crust and sole. Immediately on the summit of the bone, we find a high ridge, which receives the insertion of the extensor tendon, and affords protection to the coffin joint, the articulating surface of which is situated immediately behind it. This surface is somewhat semilunar in shape, occupies two thirds the breadth of the bone, and presents two shallow concavities with a convexity between them, which correspond with the lower part of the os coronæ. The posterior part of this articulating surface is flattened in order to articulate with the navicular bone, which thus, in some measure, lies upon it,—the three bones uniting to form the coffin joint. The wings of the os pedis are rough, irregular processes, which extend posteriorly nearly as far as the horny sole; to them are attached the lateral cartilages, which are also received into an irregular depression or furrow, which is found on the upper part of the coffin bone, and immediately external to the coffin joint. On the internal part of each wing, we find a groove which conveys the plantar artery downwards and forwards to a foramen, through which it passes to the interior of the coffin bone. The cavity just under the articulating surface of the bone, and behind its sole, is, like the latter, somewhat semilunar in shape, its convex border being situated anteriorly. Its surface is extremely irregular, and we find two large foramina for the passage of the artery before spoken of. Anterior to these holes, and just behind the convex border, we find an irregular surface, partly concave and partly convex, which receives the expanded insertion of the flexor perforans tendon; posterior to these foramina, the surface is also rough for the attachment of ligaments.

The *Navicular Bone* is usually about an inch and a half to two inches from side to side; one third of this measure in depth, and one fourth of it in thickness, through the middle part. It lies with its length transversely between the wings, and partly behind, and slightly upon, the coffin bone. It presents three articulating surfaces, besides a rough ridge on its uppermost part. 1st, Supero-anteriorly, a smooth surface, convex in the middle, and slightly concave on each side, extending the whole breadth, though not the entire depth of the bone, and articulating with the os coronæ. 2dly, Inferiorly, we find a very narrow articulating surface, extending a little more than an inch from side to side, and lying upon the coffin bone. In front of this surface, and on its side, the bone is extremely rough and irregular, for the attachment of ligaments. 3dly, We have an articulating surface, occupying the whole of the posterior part of the bone, on which we find a convexity in the centre, with a shallow concavity on each side, which correspond with the shape of the flexor tendon, affording a smooth surface, on which it glides as on a pully just previous to its insertion below.

The *Os Coronæ*, or *Small Pastern*, a strong, short, and thick bone, lying partly within, but chiefly above, the horny cavity of the foot, is usually about an inch and a half in length, two inches in width, and an inch in thickness at its centre. Superiorly, we find a smooth surface, shaped somewhat like a kidneybean, and having two shallow concavities with a slight convex ridge between them, articulating with the os suffraginis or large pastern. Behind this articulating surface, we find a rough border, a quarter of an inch broad, and extending the whole width of the bone, which receives the insertion of the perforatus tendon. Inferiorly, this bone presents two smooth convexities with a depression between them. This rounded surface extends somewhat posteriorly, giving it an extensive articulation with the coffin and navicular bones. Laterally, this bone is rough and irregularly convex, for the attachment of ligaments and the lateral cartilages. On the upper and posterior part of the bone, we find a smooth surface, which, being lined with cartilage, forms a joint capsule with the perforans tendon, and seems in some measure to rest upon it. Immediately below this surface are several foramina for the passage of vessels to the centre of the bone.

Having now described the bones immediately connected with the foot, and which form, indeed, the principal contents of the hoof, we will next proceed to describe its other important parts.

The *Lateral Cartilages* are two elastic bodies placed on each side, and extending some distance round the foot, externally convex, internally concave, and attached inferiorly to fossæ on the upper border of the coffin bone. They are situated, one half within, and one half above the hoof, and are connected to the extensor tendon in front by membrane, as well as to the os coronæ; from thence, *i. e.* a little anterior to the navicular bone, they gradually widen so as to become perceptible above the coronet, and are continued posteriorly attached to the wings of the coffin bone, but extend considerably beyond them superiorly, and somewhat beyond them inferiorly, so that they lengthen as it were the heels of the coffin bone, and fit into the heels of the crust,—being somewhat incurvated for the purpose. The part which lies above the hoof is of course enveloped externally by the skin, but below this it is covered by the coronary substance, and still more inferiorly by the sensible laminæ. The cartilages become thinner as they proceed backwards, and have there several foramina for the passage of vessels.

The *Inferior*, or, as Mr. Percivall designates them, the *false* cartilages, are triangular bodies somewhat different in structure from the others. They proceed from the lateral cartilages (just as the latter reach the heels of the coffin bone) in an obliquely forward direction, on the internal and inferior part of the wings of the bone, and thus afford a smooth surface, which is covered partly by the sensible laminæ, and partly by the sensible sole. The inferior are much more fibrous in their structure than the lateral cartilages, and the latter become less cartilaginous towards their upper and posterior parts. The lateral cartilages are connected with the navicular bone by means of ligament.

The *Coronary Ligament* as it used to be termed, or the coronary substance, as it is now more appropriately designated by Mr. Percivall, is one of the most vascular parts in the whole body. It is situated, as its name imports, at the coronet, between the sensible laminæ below, and the cutis or true skin above,—of which indeed, if it were not for its important and peculiar functions, we should consider it as a continuation. It is attached internally to the os pedis, lateral cartilages, and extensor tendon, by means of cellular membrane, amongst which numerous blood-vessels ramify; and externally it is attached to the concave coronary ring, to which, from its convexity, it is well adapted.

The coronary substance appears to be composed of three different parts. Internally, a strong white elastic structure, which forms its principal thickness, and a network of blood-vessels, which secrete the crust; and externally, a thin coat generally of a dark colour, and having a number of little villi which dip into the numerous pores visible within the coronary ring.

In proportion to the thickness of the coronary substance is that of the crust,—the strength of the latter being regulated by the developement of the former. Its principal use, therefore, is to secrete the crust which thus grows down from the coronet; but it must also be evident that when the foot is on the ground, some portion of the superincumbent weight must be borne by the coronary substance, and its elastic structure enables it to effect this purpose without injury.

The *Sensible Laminæ* are somewhat similar in appearance, but very different in structure, to the horny laminæ, with which they are connected by a dovetailed union, each horny plate being received between two sensible plates, and *vice versâ.* They are firmly attached by means of an elastic membranous structure to the irregular surface of the os pedis, and are also continued on the lower portion of the side cartilages, where they correspond to the horny laminæ on the inside of the bars of the foot. The sensible laminæ, as their name imports, are extremely sensible and vascular; and, as Mr. Percivall says, are composed of a double transparent membrane, plaited as it were round the bone, so that one of the sides of each lamina is in close contact with another, and the other side opposed to a horny lamina. The sensible laminæ used to be considered as highly elastic; and writer after writer having copied from each other without examining for themselves, the error was perpetuated, until Mr. Percivall demonstrated that the elasticity was not inherent in the laminæ, but in the substance connecting them with the coffin bone, which possesses highly elastic properties, and affords a convenient bed for the numerous bloodvessels which secrete the laminæ. The membrane which connects the horny with the sensible laminæ appears likewise to possess considerable elasticity. The sensible laminæ are of course longest in front, where they are two inches and upwards, whilst at the heels they are scarcely one. Their length, however, does not diminish in the same degree as the coffin bone, because they are partially disposed on the lateral cartilages. The breadth of the laminæ is pretty much the same throughout, being about one tenth of an inch.

The *Sensible Sole* is a vascular and fibrous membrane, corresponding in shape to the horny sole, and attached to the inferior part of the coffin bone. It is divisible into two membranes, with a fine network of bloodvessels between them. The inferior of these coats is very thin, and generally of a dark colour, and has numerous small villi, which proceed in an obliquely forward direction, and are insinuated into the pores of the horny sole. The upper membrane is much thicker than the other, and is fibrous and elastic in its structure; it adheres closely to the coffin bone, is connected at its circumference with the sensible laminæ, and joins the sensible frog.

The *Sensible Frog* is subject to the same divisions as the sensible sole, having like it an external membrane furnished with villi, somewhat finer than those of the sole, which enter corresponding pores in the horny frog. Above this membrane we find likewise a network of vessels, superior to which is the elastic fibrous substance which forms the bulk of the frog. This substance corresponds below exactly to the horny frog, the vacuity of which it fills up, and having, like it, a cleft in its centre, which receives the horny frog-stay. The upper part of this substance is very different from the lower, being yellower and softer, and resembling fat in appearance, from which circumstance it used to be called the fatty frog: since, however, it was discovered, that it had no adipose matter in its composition, it has been designated by no particular name; but, inasmuch as it forms a resting-place for the os coronæ and flexor tendon, we propose to call it the *Cushion*.

The *Cushion*, then, extremely irregular in shape, fills up the space between the lateral cartilages, for which purpose it is exceedingly well adapted, from the very soft and elastic nature of its composition, which enables it to yield in any direction, and to regain in a moment its original position. It forms the fleshy heels of the foot, is intimately connected with the elastic frog below, and with it forms a protection for the flexor tendon and navicular joint.

THE ANATOMY OF THE LEG.

Having now gone through the various bones and tissues contained within the hoof, we will, in extending our examination to the leg, again revert to the bones.

The *Os Coronæ*, or *Small Pastern*, which we have described, articulates above with the *Os Suffraginis*, or *Large Pastern*. This bone is about double the length of the small pastern, but neither so wide nor so stout in its body.*

* See fig. 4. p. 11.

Its upper surface articulates with the metacarpal bone, and presents two shallow concavities and a deeper one between them. The bone gradually tapers from its upper surface, until it nearly reaches the lower, where it again enlarges and forms the lower head of the bone. Its inferior articulating surface has two convexities with a shallow concavity between, corresponding with the superior surface of the os coronæ before described. Anteriorly and laterally the bone is convex, and posteriorly flat and irregular.

The *Metacarpus*.* The leg, or shank, is formed by the *Cannon*, or large metacarpal, and the two small metacarpal bones. The former is a strong cylindrical bone, generally about nine inches in length, an inch and a half in width, and one inch in thickness at its middle part, being larger at both ends.† It is flat or slightly concave at its upper surface, which articulates with the lower row of bones of the knee: its lower extremity is rounded, and also presents a convex ridge and two shallow convexities on each side, and articulates with the upper head of the os suffraginis. This lower articulating surface is somewhat extensive, forming from the front to the back part three fourths of a circle, thus giving extensive action to the fetlock joint, which is formed by these bones and two small ones at the back, called the *ossa sesamoidea*. These sesamoid bones are half-conical half-triangular in shape, about three fourths of an inch in length, and one half of an inch in breadth,

* See fig. 3. p. 11.

† In giving the dimensions of bones or other parts, a horse of an average size must be understood as being referred to.

and present anteriorly a smooth, concave, articulating surface to the metacarpal bone. They receive the insertion of ligaments, particularly the suspensory, by which indeed they are suspended; and are connected together by a strong ligamentous substance, which also covers their posterior parts, and there forms a smooth surface for the passage of the flexor tendons.

The *small Metacarpal Bones* are two long narrow bones, situated half-laterally half-posteriorly to the large metacarpal, and extending about two thirds its length, being connected with it by an elastic ligamentous substance, the fibres of which obliquely intersect each other in the form of an X. These bones have an articulating surface above with the small bones of the knee, the outer with the unciform and the inner with the trapezoid, just below which they enlarge, and then gradually taper, till they arrive within a few inches of the fetlock, where they slightly recede from the cannon, and terminate with tuberculous extremities.

The *Tendons*. We have now to notice the *Tendons*, which form very important parts in the anatomy and physiology of the foot. There are only four of any consequence below the knee, the two *flexors* and the two *extensors*, the former situated on the back, and the latter on the front of the leg It is needless to observe that the motion of a limb is produced by the contraction of the muscular fibres connected with it, and that the tendons serve the purpose of communicating this contraction to the part to be acted on. Thus the action of a muscle depends on its length, and the power on the number and size of its fibres. The muscles of the foot are long, but slender in proportion to their length, and they all become tendinous somewhat above the knee. They do not suddenly become sinews, but gradually so, the tendinous substance extending into the body of the muscle. This it is which causes the limb to taper to the knee.

The *Extensor Pedis* rises from the outer part of the humerus, and upper and outer portion of the radius, and becomes tendinous a little above the knee, where it passes under the annular ligament, and runs within a bursa mucosa on the outer side of the knee. It is tied down by cellular membrane to the metacarpus, inclining gradually in its descent from the anterior and outer part of the knee to the front of the fetlock joint, where it is here intimately connected with the capsular ligament. It is closely bound to the os suffraginis by cellular membrane, and just above the pastern joint is joined by a ligament on each side, which proceeds in an oblique direction from the termination of the suspensory ligament. By the aid of these ligaments, the tendon is rendered double its former width, and affords an extensive protection to the pastern joint, after which it passes over the os coronæ, to which it is intimately connected, and is inserted into the coronal process of the os pedis.

The *Extensor Suffraginis*, a smaller muscle than the last, rises from the upper and outer part of the radius and ulna. Its tendon passes down by the side of the ulna, runs within a sheath over the outer and front part of the knee, below which it is joined by the ligamentum extensorium, and, being thus increased in size and strength, it gradually inclines towards the front of the leg, passes over the fetlock joint, and is inserted into the large pastern bone.

The *Flexor Tendons* are much larger than the *Extensors*, their office being in a corresponding degree more severe.

The *Flexor Pedis Perforatus,* so called because it forms a sheath for the *Perforans*, has a muscular origin from the lower part of the humerus, passes down the back part of the radius, and becomes tendinous above the knee, at which joint it is confined by a ligament, and somewhat lower down by a broader transverse band, called the annular ligament. Just below the knee, the perforatus is nearly cylindrical in shape, having, however, a somewhat flat surface which corresponds to the perforans, the former lying partly behind and partly by the side of the latter. It is here inclosed with the perforatus in a sort of cellular sheath, strengthened by ligamentous substance attached to the splint bones. It gradually inclines however, and about two inches below the knee is found immediately behind the perforans. It here becomes flatter and broader, and presents posteriorly a convex, and anteriorly a concave surface, to correspond with the perforans, with which it is connected by loose cellular membrane, which permits one tendon to slide upon the other. The perforatus continues to get broader and thinner, until, about two inches above the fetlock joint, it forms a complete sheath for the perforans tendon, and at the same place enters a sheath of its own. This double sheath is very curiously formed, and demands our particular notice. For the space of an inch the inner sheath is completely circular, and is formed by the perforatus tendon at the back and sides, and in front by a tendinous substance, shaped somewhat like a crescent, thinner than the sinew itself, with which it is intimately connected. This connecting band becomes still thinner towards its concave border, where it presents a fine edge.

The external sheath is formed in front by the sesamoid bones and the cartilago-ligamentous substance between and above them, and on the sides by a strong ligamentous membrane which passes from the sides of the sesamoid bones to the back part of the perforatus tendon, into which it is embodied. This sheath is the seat of windgalls. The two sheaths, or, rather, the double sheath, for they communicate with each other, become single just below the fetlock, and is here formed by the perforatus on the back and sides, but has in front the long posterior ligament. At about the middle of the large pastern bone, a thin tendinous band is thrown across from one part of the perforatus tendon to the other, thus again forming a circular sheath for the perforans. Just above the pastern joint, the perforatus divides into two portions, each of which is inserted into the upper and back part of the small pastern.

Thus this sheath, which is lined throughout by synovial membrane, extends from two inches above the fetlock to the small pastern joint, a space of six inches: it also, below the fetlock joint, extends several inches from side to side, indeed, the whole breadth of the large pastern bone, and here, being protected by membrane only, is the weakest and most exposed part of the sheath.

The *Perforans Tendon* is closely blended with the former muscle in its origin, but continues fleshy somewhat longer. At the knee it is enclosed with the perforatus in a synovial sheath, and passes under the annular ligament: just below the knee it is rather smaller than the perforatus tendon, and is there flat posteriorly, and concave anteriorly, so that the two tendons together are cylindrical. Immediately below the knee it enters a sheath, which the perforatus tendon, however, does *not* enter, independent of the sheath before spoken of, which both tendons enter in common.

This inner sheath is formed by a strong ligamentous substance, which is attached to the back part of the three bones which compose the lower row of the knee, and also to both splint bones, the space between which it fills. It is broad and flat, or rather concave, and larger than the perforans sinew, for which, with the assistance of cellular membrane, it forms a sheath, not going however completely round the sinew, but embracing its anterior and lateral part, to which it is attached.

This sheath extends nearly half way down the cannon bone, where it terminates by union with the tendon itself, which, in consequence, becomes double its former size, and though before smaller, is now considerably stouter than the perforatus. The perforans then continues for about an inch and a half, when it enters the sheath formed by the perforatus, which we have described: it here gradually becomes wider, until it reaches the fetlock joint, where it is double its former width, and very little diminished in thickness. From hence it becomes gradually narrower and thinner, and its anterior surface, although convex at the fetlock, here presents a depression in its middle, which adapts it to the long inferior ligament against which it glides. On emerging from its sheath it again widens, and immediately enters a synovial bag at the back of the os coronæ, where it has an extensive articulating surface. The tendon now becomes considerably thicker as well as wider, and also somewhat cartilaginous in structure. It here receives considerable pressure from the small, and the lower part of the large, pasterns, which pressure it communicates to the *cushion*, the elastic substance lying between the lateral cartilages, on which it partly reposes. The tendon is now attached by membrane to the lower part of the os coronæ, and upper portion of the navicular bone, thus separating three important cavities, viz. the coronal joint capsule, the coffin joint, and the navicular joint capsule.

Opposite the navicular bone the sinew still further widens, but becomes thinner, and corresponds in shape as well as width to the bone, having a depression in its middle, and being slightly convex on each side. It has an extensive attachment, four inches in circumference, to the rough inferior concave border of the coffin bone.

Besides those we have mentioned, there are two pair of very slender and pale muscles, that seem almost hidden by the surrounding cellular substance, and have altogether escaped the notice of many anatomists. Mr. Percivall designates them *Lumbrici*

Anteriores et Posteriores: the former are found between the suspensory ligament and small splint bones, to which they seem connected, and about midway between the knee and fetlock become tendinous, and just below the termination of the splint bones advance obliquely forwards, and are inserted into the adipose membrane, somewhat above the fetlock joint.

The *Posteriores* are shorter, but somewhat larger, than the others, and are found by the side of the flexor tendon, a few inches above the fetlock, and having reached this joint they give off slender flattened tendons, which appear to form the crescentic part of the sheath which incloses the perforans tendon.

The *Ligamentum Extensorium,* rather a strong ligament, is attached above to the side of the knee, and to the outer metacarpal bone, whence it passes obliquely forwards, winding round the leg. It is united to the extensor suffraginis, and with it is considerably expanded at the fetlock joint, and is inserted into the upper, outer, and anterior part of the os suffraginis. Its principal use appears to be to brace the fetlock joint, and assist the extensor tendons.

The *Suspensory Ligament* is intimately connected with the flexor tendons, and is so called from the sesamoid bones being suspended by it. It is one of the largest and strongest ligaments of the body, and differs from others in being elastic and darker in colour, appearing to possess fleshy fibres. It rises from the upper and back part of the large metacarpal bone, just under the knee, and continues down the leg, enveloped in cellular membrane, between the small metacarpal bones, filling up the vacant space between them. As these bones become smaller, the ligament becomes externally visible, and is particularly conspicuous in thoroughbred horses. At about five eighths of the distance from the knee to the fetlock the ligament splits into two portions, which are inserted into the sesamoid bones, and the cartilaginous substance between them, from whence two ligamentous slips proceed obliquely downwards over the fetlock, and join the extensor tendon just above the pastern joint. The important purposes of this curious ligament will engage our attention in another place.

The *Fetlock Joint*, as before observed, is formed by the articulation of the large metacarpal, large pastern, and the sesamoid bones, which bones being, in common with those of other joints, tipped with cartilage, are bound firmly together by the following ligaments: —

The *Capsular Ligament* is attached round the articulatory surfaces of these bones, and is protected in front by the extensor tendons and the long extensor ligament. Its use is to inclose the cavity of the joint, and to prevent the synovia from escaping. It is lined internally by the membrane secreting the synovia, which is also reflected over the cartilage that covers the extremities of the bones. Thus the extremities of the bones never touch, neither does the cartilage, nor the synovial membrane which covers it; the synovia, a substance very similar to the white of an egg, being interposed between them.

Besides the capsular there are the *long and short* *internal lateral Ligaments*, the former attached to a little protuberance on the side of the os metacarpi magnum, and to the os suffraginis, and the latter running underneath the other, is inserted just behind it.

The *Short Lateral Ligaments* are situated underneath the former, and connect the same bones together.

The other ligaments of the joint, which are all connected with the sesamoid bones and with the suspensory ligament before noticed, are seven in number.

The *Long Inferior Ligament* rises from the lower part of the sesamoid bones, and passing along the posterior part of the os suffraginis, is inserted into the upper part of the os coronæ. This ligament serves to brace the pastern joint, and secure the sesamoid bones; but Mr. Percivall has pointed out another beautiful office it performs. Owing to the obliquity of the pasterns, it must be pressed backwards by the lower part of the os suffraginis, and though not elastic in itself, yet being connected by means of the sesamoid bones with the suspensory ligament, it extends the elasticity of this part actually to another joint.

The *Short Inferior Ligament* has a double origin from the base of the sesamoids, and passes over the os suffraginis, having bursæ at the projecting parts, and is inserted into a rough prominence at the back of the os suffraginis.

The *two External Lateral Ligaments*, the antagonists of the internal lateral before described, rise from the outer parts of the sesamoid, and are implanted, one into the large metacarpal, and the other into the bone below it.

The *Crucial Ligaments* rise from the lower part of the sesamoid bones, and, crossing each other, are implanted into the projecting parts of the back of the os suffraginis. These ligaments are situated underneath the inferior ones, and are appropriately regarded by Mr. Percivall as the hinges of the joint.

By this brief description it will be seen how strongly and securely the fetlock joint is braced; and motion being permitted only in one direction, dislocation is effectually prevented. But when we consider the many ligaments which surround the joint, and bear in mind the wonderful exertions it often performs, we cannot be surprised that the surrounding parts should so frequently be the seat of injury, and the source of lameness.

The *Pastern Joint* is formed by the adaptation of the os suffraginis and the os coronæ. It is much less complex than the fetlock, and has only a capsular and two pairs of lateral ligaments.

The *Capsular* is attached to the borders of the bones, and is closely connected with the extensor tendon in front, and the inferior sesamoid ligaments behind. The long lateral ligaments are attached to the sides of the os suffraginis and the os coronæ.

The *Short Lateral Ligaments*, somewhat stronger and broader than the former, are attached to them and to the two pastern bones. The pastern joint is protected in front by the extensor tendon, and behind by the long inferior ligament. It has but little power of motion, and that little is confined to flexion and extension: it serves, however, materially to diminish concussion, and its ligaments are often subject to disease, being, indeed, the frequent seat of ringbones.

The *Coffin Joint* is formed by the coffin, the small pastern, and the navicular bones, and possesses four pairs of ligaments and two single ones besides. The *capsular*, which is attached to the borders of the articulating surfaces of the bones, is also firmly connected with the extensor tendon in front, and the flexor behind; indeed, these tendons may be rather considered as supplying the place of the ligament at the parts which they severally protect.

The *first pair* pass from the upper part of the wings of the os pedis to the side and middle part of the os coronæ.

The *second pair* are fixed also to the wings of the os pedis at their extremities, and to the os coronæ, but rather behind the first.

The *third pair* run from the sides of the coronal process of the os pedis to the lateral cartilages.

The other ligaments are connected with the navicular bone, and consist of a pair and two single ones.

The *Superior Ligament* passes from the upper and back part of the bone to the tendo perforans.

The *Inferior*, a very broad ligament, is attached to the whole of the lower part of the navicular bone, and to the body of the os pedis, just above the insertion of the flexor tendon, and also to the lateral cartilages.

The *Lateral Ligaments* connect the sides of the navicular bone with the os coronæ.

THE ARTERIES.

We have next to consider the bloodvessels which furnish the foot with its requisite nourishment, and the nerves which endow it with the fine sensibility it possesses.

The *Arteries* will first demand our attention.

Shortly after the *Aorta* issues from the left ventricle of the heart, it divides into two main trunks, the *anterior* and *posterior aorta:* the former supplies the head, neck, and fore extremities; the latter the other parts of the body. The vessel by which the fore-legs are supplied is called the *Axillary*, which commences within the chest, turns round the first rib, and is then found between the scapula or blade bone and the body, in which situation it is securely protected from injury. As it passes downwards it gives off a great number of branches, and takes the name of the bone near which it might be situated. Thus, below the elbow, it is termed the *Radial Artery*, and just above the knee it divides into the two *Metacarpal Arteries*, the *smaller* of which takes its course down the inner and back part of the knee, on the outside of the annular ligament, giving off branches which supply the superficial parts of the knee and cannon bone, then passing down between the suspensory ligament and metacarpal bone, the vessel is expended in branches which supply the suspensory ligament and front parts of the leg.

The *Large Metacarpal Artery* passes under the annular ligament at the knee, within a cellular sheath, and then takes its course down the inside of the leg by the side of the flexor tendons. Before it reaches the fetlock it gets in advance of the tendons, and is situated between them and the suspensory ligament. Just above the joint the vessel separates into three divisions, the middle of which passes between the bifurcated portions of the ligament and the bone, and there forms a transverse arch, from which three recurrent branches wind their way upwards, and, communicating with the small metacarpal artery, supply the neighbouring parts. There are also two smaller branches proceeding from the arch, which supply the fetlock joint. The lateral divisions of the large metacarpal become the two plantar arteries, so called, by Mr. Percivall, to prevent confusion in their description.

The *Plantar Arteries*, at their origin above the fetlock, form an acute angle, from the apex of which gradually receding, they pass over the joint by the side of the sesamoid bones, and somewhat in advance of the tendons, conforming, in their progress, to the prominence of the fetlock and the depression of the pasterns. Below the joint, the artery, still pursuing a straight course, is, from the smaller circumference of the pasterns compared with the fetlock, again brought very near, and somewhat in advance of, the perforatus tendon, and so continues till the termination of the tendon, when the artery itself is hidden from view by the lateral cartilage. It here inclines somewhat forwards, being surrounded by the substance of the cushion; and just within the upper part of the wings of the coffin bone it enters a groove which conveys it downwards and forwards to the foramen, on the posterior concavity of the bone just under the coffin joint. The artery within the substance of the bone takes a circular direction, and joins its fellow on the other side; from which circumstance it is designated, by Professor Coleman, the *circulus arteriosus*. In the course we have described (being common to both) the plantar arteries send out many branches to the neighbouring parts.

The first of importance, after a few small vessels about the fetlock, is called by Mr. Percivall the *perpendicular artery*, and rises about half way down the os suffraginis, and takes its course forwards and downwards to the coronary substance, where it anastomoses with its fellow and forms an arch, called the *superficial coronary*, from whence proceed about eighteen small descending arteries, whose office it is to secrete the crust.

The second branch of importance is the *transverse artery*, which crosses over to the front of the os coronæ, underneath the extensor tendon, and joins the corresponding branch from the other side, forming the superior coronary circle, which gives off numerous small vessels, some of which, passing downwards, communicate with the inferior coronary artery before described.

Thirdly, the plantar arteries, having given off these vessels anteriorly, distribute others posteriorly, the first of which is the artery of the frog, which rises opposite the pastern joint, and enters obliquely the substance of the sensible frog, where it divides into two branches, one going to the toe and the other to the heels of the frog, the latter of which sends branches to the cartilages.

Fourthly, just as the main trunk reaches the coffin bone, a large branch, the *lateral laminal,* is given off, which enters the foramen in the wings of the bone, and then winds round it in a groove to the front of the foot, sending branches in every direction to the sensible laminæ, and then enters by a smaller foramen in the antero-lateral part of the bone, and joins the circulus arteriosus within it. From this artery a branch is given off which joins the *circumflex.*

The *Circulus Arteriosus* presents a corresponding course within the bone, to that described by its external border, and gives rise to two sets of vessels,—

First, the *Anterior Laminal Arteries,* very small and numerous branches, which proceed through the foramina of the coffin bone, and are distributed on the laminæ.

Secondly, the *Inferior Communicating Arteries,* thirteen or fourteen in number, proceed through the foramina in front of the coffin, and supply the

Circumflex Artery, which encircles the toe of the os pedis, and from which blood is usually abstracted when a horse is bled in the foot.

From the circumflex proceed the *Solar Arteries,* thirteen or fourteen in number, which, taking a radiated course towards the centre of the foot, furnish the sensible sole with its requisite nourishment, and form the network of vessels from which the *horny sole* is secreted.

THE VEINS.

Having thus briefly described the arteries of the foot, which pass in such a remarkable manner through the bone itself, protected from injury and secure from pressure, we must next describe the veins, which, being less subject to injury, take their course outside the coffin bone.

The veins of the sole empty themselves chiefly into those of the laminæ, which, increasing in size towards the coronet, are collected together in branches which take an upward course through the coronary substance, and form the *superficial coronary vein*. From them large branches proceed, which are joined by the *deep coronary vein*, which is usually double. These vessels, when injected with wax, present an immense network spread over the lateral cartilages, and, gradually diminishing in number, they at length unite in a single vein just opposite the pastern joint.

The veins of the frog, after ramifying over the body of the frog, ascend on the inside of the cartilages into the substance of the heel. Diminishing in number, but increasing in size, they become a single vein, which, joining that from the laminæ, together form the plantar vein, which, with the veins that form it, are alike on both sides the foot. This vein takes its course upwards by the anterior side of the plantar artery, but rather more superficially situated, and is joined by a vein called the *perpendicular*, and by some minor branches, and towards its termination by some larger ones from the fetlock joint. Above the fetlock the plantar veins gradually approach each other, and unite together between the flexor tendons and suspensory ligament, and above the bifurcation of the metacarpal artery. From this union proceed the two metacarpal veins. The internal and larger one takes a straight course up the leg in front of the artery, and just behind the suspensory ligament; but, about half way up the cannon, we find it between the artery and small metacarpal bone, the suspensory ligament having disappeared between the two splint bones. The external vein is smaller and more deep-seated than the other, but pursues a similar course up the knee, receiving in common with it several branches from the neighbouring parts. At the back of the knee these vessels terminate in a large, anastomosing, transverse vein, joined by numerous branches giving rise to both the deep-seated and superficial veins of the arm, the latter of which is commonly termed the *plate vein*; and from it blood is frequently abstracted.

The *Lymphatics.* — There are a set of vessels called the lymphatics, which accompany the veins in their course, proceeding like them from the foot, and being, like them, some superficial, and others deep-seated. They are considerably smaller, but are more numerous than the veins, and anastomose frequently with each other. They contain a watery fluid, which they convey into the circulating system, and, when distended with this fluid, the limbs present the dropsical appearance so well known.

The *Nerves.*—The fore extremities are supplied with nerves from the *humeral plexus*, which is formed by branches from the fifth, sixth, and seventh cervical and first dorsal nerves. The superficial parts, between the knee and fetlock, are supplied both anteriorly and posteriorly by branches proceeding from the *ulnar nerve* above the knee, whilst the other parts are furnished by the

Metacarpal Nerves, the *external* of which is the continuation of the *ulnar,* and the *internal* that of the *radial* nerve. The *internal* nerve proceeds down the leg, along the anterior borders of the flexor tendons, somewhat behind the artery, and more superficially situated, and, about half-way between the knee and fetlock, sends a considerable branch which crosses obliquely over the back of the flexor tendons, and joins the external nerve nearly two inches below its origin.

The *External Metacarpal* pursues a similar course on the outside of the leg, and they both, after distributing nerves to the flexor tendons, send a large branch just above the fetlock, which descends obliquely forwards, and distributes numerous divisions to the front of the pasterns, and is then dispersed on the coronet.

Below the fetlock, these nerves, like the arteries, are termed the *plantar,* and they pursue a similar course on either side, on the borders of the flexor tendons and a little behind the arteries, and, descending within the lateral cartilages, enter the foramen in the concavity of the coffin, in company with the artery, and distribute their ramifications through the foramina of the bone to the sole.

In this course the following branches are given off: — 1. Just below the fetlock joint an important branch, which runs obliquely forwards to the lateral cartilages, where it is dispersed in numerous ramifications, some of them external to the network of veins, so that we can seldom bleed at this part without dividing a small nerve. 2. A large branch is given off just before the nerve reaches the lateral cartilage, which, proceeding backwards, enters the substance of the frog. 3. Still lower down a branch winds forwards through the foramen, in the wings of the os pedis, and supplies the laminæ.

Besides the parts and tissues which we have thus described, the leg possesses a considerable quantity of cellular membrane, which fills up the intervening spaces between the more important parts, keeping them in their proper situation, and preserving them from injury. In coarse-bred horses this membrane is considerably more developed than in better-bred animals; so that, whilst in the latter we can readily discern the bone, ligament, and tendon, in the round legs of the former no distinction whatever is externally perceptible. The superabundance of this membrane greatly increases the weight of the extremities, and diminishes the animal's speed; but at the same time it preserves the limbs from external injury. We therefore find that it is by no means without its use, for it enables the gummy-legged brute to tread securely amongst thorns and furze; and thus the same injury that would cut asunder the sinews of a thoroughbred horse, would scarcely penetrate the thick skin and teguments of the coarser animal.

In addition to the cellular tissue, we find that the bones of the leg, in common with those of the body generally, are covered with a fine membrane called the periosteum, and the cartilages with a similar material, termed the perichrondium.

The articulating extremities of the bones, entering into the composition of the joints, are tipped with cartilage, which cartilage is covered by a fine membrane that secretes the fluid called synovia. This fluid somewhat resembles the white of an egg, and admirably performs its office of lubricating the cavity of the joints, and preventing friction.

Thus, then, in the composition of the leg and foot of the horse, we have, in common with other parts of the body, bones, cartilages, ligaments, and tendons, skin, hair, cellular and synovial membranes, periosteum, and perichrondium, arteries, veins, nerves, and absorbent vessels; and besides these we find various peculiar structures which belong to the foot alone.

THE PHYSIOLOGY OF THE LEG AND FOOT.

Having now given a brief description of the various parts below the knee in the horse, sufficient, it is hoped, to instil a general knowledge of their structure, we will now proceed to the more pleasing task, viz. the consideration of their functions. And we may here observe, that, next to the human hand, no part of the animal system can better display the evidence of design in the construction of animated bodies, than the foot of the horse — in no other part or animal can we find strength and elasticity so well combined: in the deer, it is true, we may witness more of the latter quality, and in the elephant more of the former; but the one is incapable of bearing burdens, the other of travelling with speed. In the camel, indeed, we may find these qualities admirably combined; but they can only be brought into requisition in the arid plains or sandy deserts of which this animal is a native, and to which his services are necessarily confined: the hardness of our roads, and the sharpness of our flints, would soon destroy the soft cushion of this animal's foot; and, beautiful as its construction may be, it is incapable of being protected with iron. It is the horse, and the horse alone, that can carry his rider with the speed of the wind over every variety of soil, surmounting each obstacle, whether brook, gate, or wall, that may oppose his course, with the agility of the antelope, and supporting his burden at the same time with the firmness and security of the elephant.

To a person altogether ignorant of anatomy, it is matter of astonishment to behold the apparently slight structure of the legs of a well-bred horse, and yet to witness his varied and extraordinary performances; the parts seem to him altogether inadequate to perform their tasks: but if, to gratify his curiosity, he turns his attention more minutely to the construction of these parts, he will find, on the one hand, the greatest possible strength condensed in the smallest compass, and, on the other, furnished with an immense variety of springs most admirably constructed, and ingeniously arranged.

The curious inquirer is disposed to ask, as he proceeds to examine this structure, and to compare it with man and other animals, how it is that there are no muscles or flesh below the knee, when he finds so many in the human hand or foot, as well as in the legs of the feline and canine races? We must reply to this natural question, that from the length of the leg of a horse, and the distance from the body to the ground, if the muscles had been placed below the knee, the weight of these parts would have been so great as to have obstructed very considerably the animal's movements, on the same principle that a pound weight at the end of the long arm of a steelyard would balance many pounds on the short arm. In like manner, the muscles, in which, of course, the moving power resides, are disposed above the knee, and effect their purposes through the medium of the tendons or sinews, which act in a manner as so many ropes in communicating motion to the foot. On the same principle we find, in the construction of the bones of the leg, the greatest condensation of strength, from being arranged in the forms of cylinders, that being the strongest form; and where there is the greatest danger of fractures occurring (the middle of the bones), there we find most weight and solidity; whilst towards their extremities a greater size is afforded for the articulations of joints, and the attachment of muscles: but with this increased size we have a diminished weight and solidity of structure. This allusion to the bones of the leg naturally brings us to consider, in the first place, the uses of those parts nearest the knee. The large metacarpal or cannon bone receives the greater portion of the animal's weight, and transmits it to the bones below. The two smaller metacarpal bones receive some portion of the weight, and from their elastic connection with the shank bone are supposed to act as springs in diminishing concussion. Sir Charles Bell however, in his excellent *Bridgewater Treatise on "The Hand,"* takes a different view of the matter, and conceives that he has discovered their real use. He says, —

"I suspect, rather, that, in the perfect state of the joint, these lesser metacarpal bones act as a spring to throw out the foot when it is raised, and the knee joint bent. If we admit that it is the quickness in the extension of this joint on which the rate of motion must principally depend, it will not escape observation, that, in the bent position of the knee, the extensor tendons have very little power, from their running so near to the centre of motion in the joint; and that, in fact, they require some additional means to aid the extension of the leg. Suppose that the head of the lesser metacarpal bone enters into the composition of the joint, it does not appear that, by its yielding when the foot is upon the ground, the bones of the carpus can descend, as long as they are sustained by the greater metacarpal or cannon bone. I do not, therefore, conceive that this bone can add to the elasticity of the foot. But when we perceive that the head of the splint bone is behind the centre of motion in the joint, it is obvious that it must be more pressed upon in the bent condition of the joint, when the foot is elevated, and that then the bone must descend. If the splint bone be depressed when the limb is raised and bent, and have a power of recoiling (which it certainly has), it must aid in throwing out the leg into the straight position, and assist the extensor muscles of the knee. Further, we can readily believe, that, when the elasticity of these bones is lost by ossification uniting them firmly to the cannon bone, the want of such a piece of mechanism, essential to the quick extension of the foot, will make the horse apt to come down."

Now, though we are ready to admit the ingenuity of the argument, and even to acknowledge that the splint bones may, in some very slight degree, act as Sir Charles contends, yet we can by no means agree with him when he says that it is their principal function, or when he denies their utility in supporting weight and diminishing concussion. Sir Charles Bell considers that they act on the knee joint in the same manner as a spring employed to shut a door. Now, before we concede this, we must bear in mind, that in bending the knee the chief action exists between the radius and the first row of bones, and between the first row of bones and the second; and for this purpose the posterior part of the articulating surface of the radius is rounded, so as to fit into corresponding concavities in the upper row of knee bones, thus forming a hinge joint: so, likewise, the middle joint of the knee presents similar rounded surfaces, having also considerable motion; the lower joint, however, presents flat surfaces, both of the carpal and the metacarpal bones. Now, if a physiologist sees a flat articulating surface, he is disposed to conclude that the joint possessing it is not intended for motion, however well suited for supporting weight and diminishing concussion: and the same chain of reasoning would induce him to expect that, if the small metacarpal bones were intended to act chiefly when the leg was bent, their articulating surfaces would then have been rounded, but that, being flat, they cannot do much in this way. Again, an examination of a recent specimen of the leg will show, that what pressure there is on the splint bones when in a bent position is in a forward direction towards the cannon bone, and in that position is least likely to affect them as springs. We must also bear in mind that there are splint bones in the hind extremity, as well as in the fore, and although similar in their construction to the latter, yet they cannot possibly act in the manner stated by Sir Charles, because their relative situation with the hock joint is exactly contrary to what it is with the knee. Now, if the use of these bones be that for which Sir Charles contends, is it likely we should find them fully developed in the hind extremity, where they cannot possibly act in the manner stated?

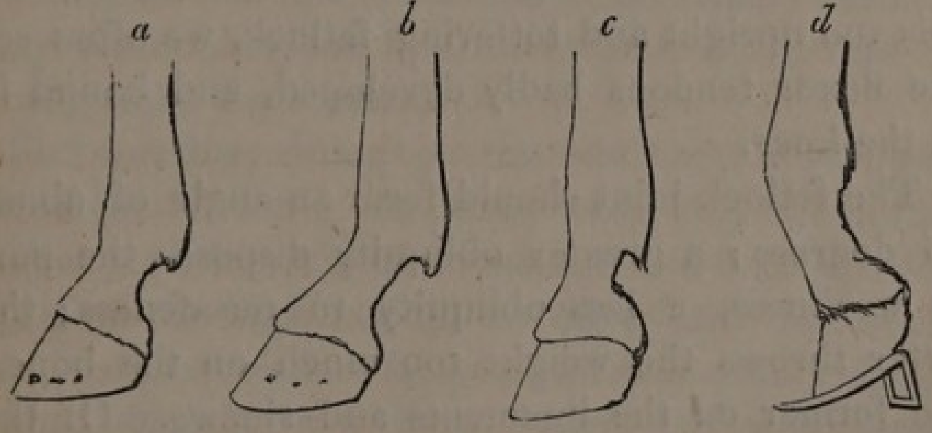
Sir Charles Bell says the extensor tendons, from being so near the centre of motion, cannot act well without assistance when the limb is very much bent. If this be the case, how is it that in the deer, an animal notorious for speed, we find none of these small splint bones attached to the knee? If these bones were essential for the assistance of the extensor tendons, the deer would certainly require them as much as the horse; and yet we find in this animal that these bones are situated at the fetlock joint, connected by elastic ligament to the lower part of the cannon bone, and have attached to them phalanges, so that their use is occasionally to support weight and diminish concussion.

For these several reasons we cannot coincide with Sir Charles Bell in his theory of the function of the small metacarpal bones. Now let us inquire as to their capability of sustaining weight and diminishing concussion. We find that the inner splint bones articulate with a small bone of the knee, the trapezoid; but the unciform, being larger than the pisiform, presses partly on the outer splint bone, and partly on the cannon; but the articulating surfaces of both bones are somewhat higher than that of the cannon, which exposes them still more to pressure. We take it, that even the circumstance of the flat articulating surface of the cannon bone being tipped with cartilage must materially diminish concussion; but that the smallest metacarpal bones, from their elastic connection with the cannon, must still more contribute in taking off the jar. When, however, we see so many horses whose metacarpal bones are united together by ossific matter performing all their paces so admirably, and with such safety, we must not assign too high an office for the splint bones, or consider their elastic connection with the cannon as indispensably necessary for the performance of the functions of the leg. Young horses, of course, possess greater freedom and elasticity in their action than older ones, and to this elasticity, the splint bones, no doubt, greatly contribute.

THE PHYSIOLOGY OF THE FETLOCK JOINT, AND ITS CONNECTIONS.

There is, perhaps, no individual part of the body of the horse more interesting, or more important to the horseman, than the fetlock joint, and none, certainly, which demands or engages more attentively the minute examination of the practised eye. It is, indeed, the good or bad formation of this part which makes the difference, and frequently the only difference, between one animal worth a hundred pounds, and another worth only twenty,—its faulty structure condemning the latter to the purposes of common harness work, and its proper conformation enabling the former to carry a heavy weight over a stiff country with safety and pleasure.

Fig. 5.



a, shows the fetlock joint neither too upright or too oblique.
b, shows the fetlock joint too oblique and too long.
c, shows the fetlock joint too upright.
d, an overshot fetlock joint, with a patten lever shoe.

Important, however, as this joint is to the rider, it is yet one of the most difficult for the amateur to examine, when purchasing of an ordinary dealer; the animal is kept so constantly in fear of the lash, that, however knuckling he may be on his joints, the excitement of fear prevents his exhibiting his weak points. The best way to examine the fetlocks properly, is to approach the animal quietly in the stable, and whilst apparently looking at his eyes, or into his mouth, to cast our own organs of vision down to his fetlock joints, when, if he totters and shakes, however good his other qualities may be, he is not an animal of great value, being in all probability unsafe to ride, and likely to fail in these joints from work. It matters very little whether the horse was, as the dealer generally says he was, foaled so, because the fault is by no means less from being natural. Horses with this upright fetlock may not be disposed to trip, or hit their toe oftener than many others; but, should they do so, they are probably at once thrown off their balance, and come down with great force. Connected with this too upright and tottering fetlock, we often see the flexor tendons badly developed, and bound in at the knee.

The fetlock joint should form an angle of about 45 degrees; a greater obliquity disposes the part to weakness, a less obliquity to unsafeness; the latter throws the weight too much on the bones, the former on the ligaments and sinews. Of the two faults, however, the upright fetlock is the most frequent, and I should say the worst; and when we see it we may prophesy, with some degree of certainty, that the legs will not last out the constitution. A good fetlock, to be deserving of the name, must have the flexor tendons strong and well developed, the suspensory ligaments corresponding, presenting to the eye a flat leg, with three convexities formed by the bone, the ligament, and the tendons. The joints, too, should be large in proportion to the other parts, for, by thus having a large articulating surface, concussion is considerably diminished.

Every one knows that the fore legs should not be placed too much under the body, for, when this is the case, we have generally a bad conformation of the whole extremity, beginning with low and upright shoulders, and ending with knuckling knees and upright fetlocks and pasterns, exhibiting altogether a disposition to fall forwards or come down. It is, however, sometimes the case, that good legs and strong well-shaped fetlocks coexist with low and upright shoulders; and, when this is the case, the good qualities in a great degree compensate for the bad, for the two faults do not invariably accompany each other, but it is their united evil that is chiefly to be deprecated.

For hunting, riding on the road, or for harness, the fore extremities cannot be too good; but as the tendency of this angular formation and high withers is to bestow high action, we often find that such horses are not so fleet in their gallop as others whose fore extremities are more faulty, but who, from going nearer the ground, have their stride greatly extended. It is this circumstance, I take it, that has led to the fact (for the fact it undoubtedly is) that the fore extremities are altogether disregarded in the breeding of thoroughbred horses; and thus we find that three fourths of them have bad fore legs, and weak fetlocks, and, in consequence, break down, either in the first or second year of their appearance on the turf. I freely acknowledge that the performances of a thoroughbred stallion are his chief recommendation, but I would at the same time suggest that more attention should be paid to the state and structure of his fore legs, for, although this might not influence the speed, it will greatly affect the powers of his progeny of sustaining severe training, or lasting long on the turf. Where, we may ask, are the winners of the Derbys and St. Legers of the last seven years? After blazing away like meteors through the sporting world; like meteors, too, they have sunk into comparative obscurity. Nearly all of them are broken down and lame, I would venture to assert, from disease existing within a few inches of the fetlock joint. It would be an interesting circumstance, as affecting the comparative qualities of stallions, if, in addition to their own performances, and that of their progeny, it were ascertained how many years the latter endured before they were taken, or rather were compelled to be taken, out of training.

The *Tendons.* We have before observed, that there are no muscles situated below the knee; if there were, the leg, instead of being light and active, would be heavy and unwieldy as that of an elephant. A pound of substance at the fetlock would require more power to move it than four pounds placed above the knee. Accordingly, we find that the muscles, both those which extend and those which flex the limb, are placed above the knee, and communicate motion to the foot by means of the long flexor and extensor tendons. This being the case, it must be evident that the most onerous duty, viz. that of raising the leg, is performed by the flexors, and accordingly we find that they are more than three times the size of the extensors. There seems, however, to be a greater disproportion between the tendons than between their corresponding muscles, which we must explain, by observing that the flexors, besides their principal use in progression, also contribute greatly to the support of the leg. The animal in a measure stands upon his flexor tendons, which is shown by dividing them, when the fetlock joint immediately becomes considerably more oblique. To effect this function both sinews are expanded at the fetlock, and the perforans also at the back of the os coronæ, and again still more at the navicular joint.

We have before observed, that the perforatus forms a sheath for the perforans, at and below the fetlock joint, thus affording a beautiful mechanical contrivance, for a sheath could not be dispensed with, and yet no material could be spared for the purpose, lightness being so great an object; accordingly, the difficulty is at once removed by the smaller tendon forming a sheath for the larger, by which, without any increase of bulk, the tendons are enabled to act jointly and severally as may be required.

In the operation which we shall afterwards speak of, the division of the flexor tendons, the act of healing unites both tendons together by the intermediate substance that grows between them; the effect of which is, that the two sinews can afterwards only act together; the perforans can no longer slide through the perforatus, but the action of the latter so limits that of the former, that the horse can no longer flex the coffin bone on the os coronæ. The flexor perforans, after emerging from its sheath, expands considerably, and enters a joint capsule, which occupies the whole of the back part of the os coronæ, and in which the tendon and the bone are closely adapted to each other, the former resting on the latter, and this reposing on the soft elastic heels which yield in every direction, thus forming one of the most elastic springs in the whole body. After leaving this capsule, it enters the navicular joint capsule, where the tendon still more expands and intimately corresponds with the navicular bone, over which it glides like a pulley. Thus we find that the flexor perforans is the medium of support of a good portion of the animal's weight, first at the fetlocks, then at the small pastern, and again behind the navicular bone, where it reposes partly on the inferior cartilages, and partly on the cushion of the frog.

For these several purposes, the flexor tendons are endowed with immense strength, far superior in this respect to any cordage which our navies can produce; and Sir C. Bell has shown that the fibres are interlaced in a manner the most compact and tenacious; and thus, in the dead animal, it has been known to support a weight of four thousand pounds.

The extensor tendons of the foot are considerably weaker than the flexors, having only to extend the limb, and not having to support any weight; but at the same time their office is highly important, and on the good or bad performance of it the safety of the horse will greatly depend. We find some horses, though possessing good legs, yet continually hitting their toes; this arises either from weakness or faulty action of the extensor muscles; and thus a horse, very small in the front of the forearm, is seldom very safe. It is common to see horses worked very young with tottering knees; this is often in great measure owing to weakness of the extensor muscles and tendons.

The *Suspensory Ligaments*. The flexor tendons are greatly assisted in their action by the suspensory ligament, which, as we have before observed, rises just below the knee, passes down between the small splint bones, bifurcates, and is implanted into the sesamoid bones. This ligament differs from most others, and from the tendons, in possessing elasticity, and that to a great extent: when the horse is in action, the large metacarpal bone rests partly on the sesamoid bones, which, being hung as it were by the suspensory ligament, puts it on the stretch, and thus a beautiful spring is afforded; their action is well displayed in thoroughbred horses, whose fetlocks almost touch the ground at every step. No sooner is the weight taken from the limb, than this ligament recovers its former state, and thus, preceding the flexor tendons, in their action, catch the limb as it were before they have time to act, by which means it materially assists in flexing the leg, thus affording a beautiful example of the assistance rendered by elasticity, which never tires, to muscular exertion, so liable to weariness and exhaustion. But the action of the suspensory ligament is not entirely confined to the fetlock joint, for the sesamoid bones are connected by ligaments to the os coronæ, on which the large pastern bone in part rests; and thus, as Mr. Percivall shows, the elasticity of the suspensory ligament is communicated to another joint, which, by the common observer, would have been regarded as beyond its influence.

The suspensory ligament thus affords to the fetlock a beautiful spring, and at the same time a firm and effectual bracing to the joint. If we divide the flexor sinews, the animal will still be able to stand without difficulty, but, if we likewise cut through the suspensory ligament, the fetlock joint immediately comes to the ground; thus showing that the principal use of the ligament is to support weight.

We find that in oxen the ligament is more than double the size of that of the horse, whilst the sinews are often smaller; but with an increased size we have a great decrease in elasticity. From this fact in comparative anatomy, we are disposed to conclude that the chief use of the suspensory ligament is to support the fetlock; and its office as a spring, though highly important, is yet to be regarded as secondary. In the action of the limb, we find that a good portion of the superincumbent weight rests upon the sesamoid bones, which, in consequence, recede and descend, or rather move backwards, like a door on its hinges, thus putting the ligament on the stretch; but, in order that they should not be strained too much, a limit is put to their action by the flexor tendons, which brace the sesamoid bones, and support the joint. Thus we see how important it is that the ligament should possess elasticity, and that the tendons should not: if the former were not elastic, we should lose an important spring, and if the latter were so, they could no longer stay the action of the suspensory ligament. The tendons would also, by an elastic structure, be unfitted for the purpose of communicating motion of the muscles; for to do so, it would be necessary to put them on the stretch, before the latter could communicate the requisite motion to the foot. A similar effect would indeed be produced, as if we were to drive with India-rubber traces, in which a certain loss of power must be exhausted in overcoming the elasticity of the traces, before the vehicle could be put in motion.

The *Pastern Joint* contributes towards the elasticity of the leg, in proportion to its obliquity; this inclination taking off the weight from the bones, and throwing it upon the elastic parts behind. The large pastern bone, we have seen, rests in great measure on a ligament, which, though not elastic itself, can act as such, from its connection with the sesamoid bones, and the suspensory ligament, thus affording a considerable spring. The small pastern bone rests, throughout its whole posterior surface, on the flexor perforans tendon, and the latter at this part is imbedded in, and supported by, the soft cushion of the heels, which recede at every step, thus affording one of the most elastic springs in the whole body, though one which seems to have been lost sight of by lecturers and writers on the foot. If any one doubts the action or importance of this spring, he has only to procure a fresh leg and to cut it off at the pastern joint, when he will perceive that the tendon, as high as the coronal bone, is supported by this soft elastic substance, which is embraced and as it were contained within the lateral cartilages, which rise on each side as high as the upper part of the os coronæ. If now he presses on this bone in the same direction that pressure is usually received, he will find that the bone, sinew, and cushion immediately recede, slightly pressing open the lateral cartilages, and the moment the pressure is removed the parts instantaneously regain their former position.

PHYSIOLOGY OF THE FOOT.

We must now extend our inquiry to the functions of the parts contained within the hoof. The os coronæ rests jointly on the cushion just mentioned, and the coffin and navicular bones, the former bone supporting the greater portion of the weight, but not so much in proportion to its size, as the latter. The connection of the coffin bone to the crust is effected by a number of horny laminæ, dovetailing with a corresponding number of sensible laminæ, attached to the periosteum or membrane covering the bone. It is asserted by Mr. Percivall, that the elasticity of the parts does not exist in the laminæ, but in a substance that connects them with the coffin bone: thus, when the superincumbent weight rests on the bone, it immediately descends within the hoof, and, on the weight being removed, the bone immediately rises to its former position. If we macerate the dead foot in water, after some time the horny and sensible laminæ separate, and the hoof slips off, but in the living subject scarcely any degree of violence can tear the crust from the coffin bone, so intimate and tenacious is the union.

From the depth of the coffin bone being greatest in front, the laminæ of course are longest at this part, and consequently possess a greater amount of elasticity than at the quarters or heels, where, however, we find new provisions for warding off concussion.

The horny laminæ are described as 500 plates or leaves, dovetailing with an equal number of sensible plates attached to the coffin bone; but, on minute examination, with the assistance of a microscope, we find that these plates consist of an immense number of transverse fibres, connected together by a fine delicate membrane. We have counted upwards of a hundred of these fibres in the length of an inch, so that there must be at least a hundred thousand of them belonging to the horny laminæ, supposing that each lamina averages two inches in length. On separating the crust from the bone in a recent subject, we find that the horny plates remain attached to the crust, and the sensible laminæ to the coffin bone. A minute examination of the former shows that, although the fibres are connected together into the form of a plate or leaf throughout the greater part of their substance, yet the inner edge of the laminæ appears fimbriated, or, like the edge of a fine tooth-comb, the extremities of the fibres being loose and unconnected with each other. Now, if we consider the fimbriated edges of the horny laminæ, with their consequently immense number of separate points and surfaces, we cannot fail to be convinced how greatly this peculiar structure must assist in strengthening the bond of union between the bone and hoof.

In the sensible laminæ we see a vast number of fleshy plates, which correspond and dovetail with the horny laminæ, and are connected with the coffin bone, as well as with the horny laminæ, by a very strong though very fine membrane. Mr. Percivall says the laminæ are not themselves elastic, but the substance which connects them with the bone is highly so. Mr. P. is quite correct in what he says, and much credit is due to him for pointing out this interesting and important anatomical fact: but he does not go quite far enough; for not only is the membrane in this situation elastic, but also that which connects the horny and sensible laminæ together; for we find that they can be moved on each other with ease: and on detaching a horny and sensible lamina together from the foot, on pulling one up and the other down with a forceps, they yield, and then recover their former position on the counteracting force being removed. When the superincumbent weight rests on the foot, the coffin bone descends somewhat backwards, which may be shown by making a double transverse section of a foot with a fine saw, that is, cutting out a slice one third of an inch in thickness in a horizontal direction, when, on pressing on this portion of coffin bone, we find that it yields mostly in a downward and backward direction, in which direction there seems the greatest elastic power. Now, on trying the elasticity of the membrane which connects the laminæ to the bone, I found, somewhat to my surprise, that it yielded considerably when pulled downwards, and very slightly when pulled upwards. The former action is not exercised when the weight rests on the coffin bone, although it is very much called upon when the animal is in the act of pulling his feet out of heavy ground; for the tendency of the coffin bone, when the weight is resting on it, is to force it down through the hoof; and when the horse is raising the foot, the tendency is to pull the bone upwards out of the hoof. In the former action, therefore, the membrane which connects the laminæ with the bone cannot act in any great degree, inasmuch as it yields but very slightly in this direction: its use, therefore, must be principally to enable the foot to be raised from heavy ground without violence or injury, whilst the elasticity which we perceive, when the coffin bone is pressed upon, must be chiefly owing to the membrane which connects the horny and sensible laminæ together, as well as to some degree of elasticity which the horny laminæ enjoy, by means of the singular structure which we have before pointed out.

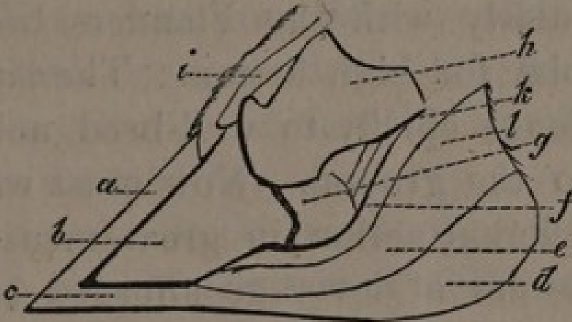
The navicular bone is situated within the wings of the os pedis, and very much under the centre of gravity, so that it bears a considerable portion of superincumbent weight, its inferior border being connected to the coffin bone by a strong ligamentous substance, which thus forms a sort of hinge, on which it moves in a similar manner to that of the sesamoid bones. Thus pressed upon, the bone descends downwards and backwards, pressing on the flexor perforans, which is here expanded to the width of the navicular bone.* The flexor tendon at this part reposes partly on the sensible frog, and partly on the inferior cartilages and sensible and horny sole, so that the navicular bone may be considered to be supported in its centre by the frog in front of the cleft, and by the horny sole on each side. In many hoofs, particularly if the horn be not very strong, a flat indentation may be seen on the inside of the commissures, distinctly marking the exact situation of the navicular bone, being, in fact, produced by its pressure. The navicular bone is situated somewhat higher than the wings of the os pedis, by which it is protected laterally.

The uses of the navicular bone are, therefore, evidently to support a portion of the weight, and to diminish concussion, but principally to act as a pulley and a lever for the flexor tendon. This last function we have considered as its principal use, though it is one not usually thought so much of as the former; but let us consider what would be the consequence if it did not exist: if the flexor tendon went straight from the small pastern to the coffin bone, the result would be, on mechanical principles, that, the advantage of the lever being lost, the horse would not be able to flex the coffin joint so much by many degrees, and we should no longer have that lofty rounded action so much

* See fig. 6. p. 61.

admired — that action, indeed, which enables us, when standing behind the horse, to see the sole of the foot at every step; but, instead of which, the heels would be scarcely raised from the ground.

Fig. 6.



Vertical sections of the Foot.

Fig. 6. A healthy foot divided vertically with a saw.

a, the crust.
b, the coffin bone; the black mark between representing the laminæ.
c, the horny sole; the black mark above representing the sensible sole.
d, the horny frog.
e, the sensible frog.
f, the flexor tendon.
g, the navicular bone in its natural position.
h, the os coronæ or small pastern.
i, the extensor tendon.
k, the upper and back part of the os coronæ, resting on the flexor tendon, and that on the cushion behind.
l, the elastic cushion, supporting in part the os coronæ.

Fig. 7.

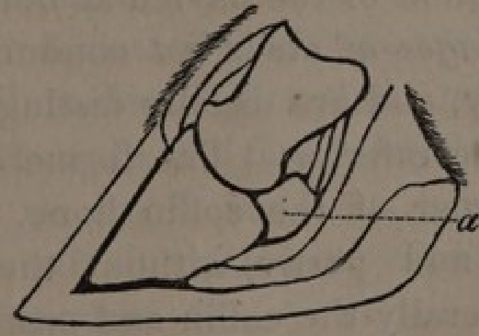


Fig. 7. A section of a contracted Foot.

a, showing the navicular bone in an unnatural, elevated, and more perpendicular position than in the foregoing plate.

Now the position of the navicular bone varies in different feet even in a state of health; in some, resting horizontally on the tendon; in others, placed much more obliquely. The former description of feet prevails mostly with heavy horses, and particularly with the Flanders breed, which are proverbial for high action. The latter variety of feet belongs chiefly to well-bred animals, who go closer to the ground. Now must we not attribute the different action in great measure to the different powers of leverage afforded by the situation of the navicular bone? for, as we have before observed, in proportion to the distance of this bone from the fulcrum of motion, that is, the centre of the coffin joint, must be the degree of its leverage power. Again, we know that, when the feet become morbidly contracted, the action of the animal alters, being less lofty than before, and we no longer see the sole of the foot as he moves along. We also find that from the contraction of the heels and quarters, the navicular bone is driven up, and assumes a more upright position, thus lessening its leverage power.* Ought we not, therefore, in great measure, to attribute this altered action to the unnatural position of the navicular bone?

The *Cartilages of the Foot* conduce very much to its elasticity, and are usually distinguished as the lateral and the inferior. The former, attached to the upper border of the coffin bone, and situated partly within and partly without the hoof, serve to protect laterally the coffin and pastern joint, for

* See fig. 7. p. 61

we find that its upper part is on a level with the latter joint. It embraces the elastic substance which used to be called the fatty frog, and which, being pressed upon, yields in every direction; the cartilages, from their elasticity, readily admitting it. When, however, the cartilages become bony, and lose their elasticity, the concussion of the foot is increased, and the elastic frog and heels can only yield posteriorly.

The inferior cartilages are attached to the inner and inferior part of the wings of the coffin bone. Thus situated, the cartilages extend, as it were, the heels of the coffin bone, and being covered in part with sensible laminæ, they correspond to the bars of the foot. We see, therefore, that the heels of the coffin bone itself do not reach the heels of the crust, for here the cartilages are placed, thus enabling the latter to form a very important spring, and to aid materially in diminishing concussion every time the heels of the foot come to the ground. When the inferior portions of the cartilages are turned into bone, as they usually are when the upper parts are ossified, it must be seen that concussion and lameness must be more likely to occur, than if the superior portions alone were diseased. Horses most subject to this disease are those of the heavy kind, having high action, and bearing very much upon their heels, thus showing clearly the cause of the mischief; the heels being too much pressed, a chronic inflammation takes place, which ends in ossification.

The navicular bones are also attached to, or rather suspended from, the anterior part of the cartilages, and which, from their elastic nature, are drawn slightly inwards by the bone when pressed upon, thus affording another beautiful spring, which, however, is lost when the cartilages become ossified.

The *Cushion*. The elastic frog, as we have before shown, occupies a considerable portion of the back part of the foot. It used to be called the fatty frog by Professor Coleman, but, on being submitted to analysis, it was found that it had no fat whatever in its composition; since then we have been greatly at a loss for a proper designation, for it differs materially from both cartilage and ligament, although, in some respects, it bears a resemblance to both. It is highly elastic, particularly towards the upper part, becoming denser and firmer where it forms the substance which fills the horny frog. We have before shown that the posterior part of the os coronæ rests upon it as upon an elastic cushion.* Its substance is similar to that which forms the soft pad of the camel's foot, which composes the bulky heels of the foot of the ox, and is found likewise in the extremities of canine and feline animals, and which enables them to tread so softly and yet so securely on the ground. Its uses in all these animals are the same — the protection of the joints, and the diminution of concussion. In the horse, it serves to fill up the horny frog, and thus enables it to perform its functions, to protect the flexor tendon and navicular joint, to afford the soft cushion which we have before

* See fig. 6. p. 61.

spoken of, and to fill up the space between the lateral cartilages, and thus to preserve the circular form, and consequently extended basis of the foot, without adding materially to its actual gravity.

The *Frog*. There is much difference of opinion respecting the uses of the frog, some regarding it as of minor importance, others considering it as the most essential part of the foot. Favourite opinions are often pushed too far — sometimes, indeed, over the narrow bounds which separate the sublime from the ridiculous; and thus it is that some years since veterinary surgeons were really getting into sad repute with the practical part of the public, from the determined and unremitting advocacy of these frog-pressing doctrines. Then we had patent frogs and frog-pressing principles *ad nauseam* — it seemed to be the fixed resolve at head-quarters that the frogs ought to be pressed, that they must be pressed, and that they should be pressed: at length, like the story of the man who tried to keep his horse upon sawdust, and who, after various trials and experiments, was just on the point of bringing his plans to perfection, when the animal provokingly died, so likewise, just as these patent inventions were reaching perfection, they were pressed out of the field altogether by practice and common sense — and so now we hear nothing more of patent frogs.

In inquiring into the functions of any part, it is desirable to consider that part in a state of nature, and compare it with analogous appearances in other animals. Thus then we find, that the cloven foot is the one most common to herbivorous animals; it affords elasticity, is admirably adapted to prevent slipping, and can be removed from heavy ground with facility. It was, however, necessary, for the combination of strength with speed, that the foot of the horse should be solid; and accordingly we find the frog occupying in him the same position as the cleft does in the ruminant. This being the case, it at once strikes the observer of nature that the frog was intended to fulfil the same function in the horse as is effected in the ox by the cleft, viz. to prevent slipping; and he is strengthened in this opinion, when he finds how well it is adapted, from its wedge-like form, for ploughing into the soil.

This function, simple as it may appear, must not be thought too lightly of, for although on the hard road, and with the iron shoe, the frog is not called upon to perform this office, yet in the hunting field, and on soft soil, it still accomplishes it. Even with the possession of the frog, the horse of all animals is, from the solid nature of his foot, most liable to slip. In man we have a long and broad basis for support, the os calcis resting on the ground; in the ruminant we find the cloven foot; in the carnivora an extremely irregular surface, formed by the various phalanges, protected by convex elastic cushions; but in the horse we have no corresponding securities, and, if it were not for the inequalities afforded by the bars, commissures, and frog, he would have no stability whatever in his tread. The frog, besides its chief function which we have mentioned, contributes, also, to form part of the basis of support for the animal, and is capable of bearing a moderate degree of pressure.

The cleft of the frog, extending somewhat deeper than the commissures, and forming what Bracy Clark appropriately terms the frog stay, serves some very useful purposes. It strengthens the connection of the elastic frog with the horny frog, and it extends the surface of the latter by disposing it edgeways towards the ground, thus increasing its strength considerably, and removing the greater part of the sensible frog farther from injury. It also, by thus making the surface of the frog more irregular, assists the purpose which we have assigned as its principal function.

The *Expansion of the Foot.* There have been, in days gone by, a vast variety of opinions respecting the expansion of the foot, some contending for, others denying it; and others again appearing as rivals in appropriating to themselves the discovery of its expansive powers. Even at the present day there are a few unbelievers, and amongst them the respectable name of Nimrod, who, in *The Veterinarian* for September last, amongst other useful observations, very justly complains of the discrepancy of opinion that exists on the matter, remarking that the subject ought to be put beyond doubt by well defined experiments. Le Fosse says, many years ago, that the foot expands and contracts, and compares it, indeed, to a saucer, which he says becomes flattened when the foot is on the ground. If therefore, the foot possesses expansive powers, it is by no means a modern discovery.

Mr. Charles, in a paper on shoeing, brought before the Veterinary Association, disputes the foot's expansibility, save from growth; and Mr. Morgan, in some papers in *The Lancet*, still more strongly denies its expansibility, asserting that he has proved his case by actual measurement. We agree with Nimrod, that the matter ought to be decided by well defined experiment, and with this view, long before his paper appeared, we endeavoured to satisfy our own minds on the question, and have subsequently repeated the experiment with the same result.

After the shoe of a moderate size foot was removed, and the sole part pared out, a smooth sheet of paper was applied to it while off the ground, and, being pressed against the foot, the edges of the crust were carefully marked, so as to give the exact size of the foot. This being done, the foot was then placed on a smooth deal board, with another sheet of paper placed upon the board; and the other foot being now held up, the border of the crust was marked with a pencil, taking care that the marks were not made more exterior to the border of the crust than before. On comparing the papers together, the one last taken was found perceptibly wider than the other. The increased width was seen to commence gradually about the middle of the foot, till it reached about half an inch anterior to the heels, when it very slightly diminished. The difference was found to be, as near as possible, one twelfth of an inch at the heels. The experiment was conducted with care and exactness, and clearly proved that the foot expanded from superincumbent weight; and, if the horse had been in fast motion, the pressure would of course have been greater, and the expansion more. This mode of trying the foot's expansion appeared to me preferable to that with callipers or compasses, as every part of the circumference of the crust could be put to the test. It did not appear from the experiment that the front part of the foot expanded at all; so, without asserting that it possesses no power of the sort, we must be contented with observing that, if possessed, it is not in a sufficient degree to be detected by admeasurement. If similar experiments have been tried before, and have failed in producing the same result, it must, I opine, be owing either to their not having been performed with sufficient exactness, or not on the right sort of feet; for I imagine that in large flat feet the same result would not occur, as in these the parts are always expanded to the utmost.

Many persons, I have no doubt, entertain very loose ideas of the foot's expansion. We are told that the concave sole on being pressed upon flattens, and thus expands the foot. But this is much easier asserted than proved. It will not do to conclude, that because the sole is concave it must therefore necessarily expand from pressure, because the pressure is not confined to the centre or summit of the dome, but is diffused on all sides, and is even greatest on the borders near the laminæ; and I take it that pressure in that situation will not operate in expanding the foot. Besides which, the coffin bone can descend a certain degree in the hoof without any pressure on the horny sole, being simply owing to the compression which the soft parts readily admit; and in addition to this we must bear in mind, that the greater part of the superincumbent weight is supported by the laminæ, and that no portion of this weight, thus supported, can contribute in the least degree to the descent of the sole. It may be contended, perhaps, that the circumstance of a stone getting under the shoe, and producing a bruise on the sole, proves that it descends; but we are scarcely justified in drawing this inference, for we can easily account for the bruise arising from the sensible sole being pressed between two hard bodies, the stone and the coffin bone, without supposing anything more than the slightest possible descent of the horny sole; and the same phenomenon is likely to occur, in a still greater degree, in the flat or convex sole. Professor Coleman used to say, that the laminæ could not descend unless the horny sole descended, and that, when the latter was thick and unyielding, the former could not act. This, however, we take to be an assertion without a proof, and it is rather a libel on nature to suppose that the very ability of acting of these beautifully arranged laminæ must depend upon the ever changing strength or thickness of the horny sole. Indeed, as we have before observed, it may readily be seen, by making a transverse section of the foot, that the coffin bone can descend to a certain degree without producing any descent of the sole. We must bear in mind that when the sole is cut away, the weight is still borne by the crust almost, if not quite, as well as before; and the sensible sole from its very nature is not calculated to sustain much pressure. From these several reasons I think we are justified in concluding, that the parts anterior to the toe of the frog possess very little expansive power; and this theory, if correct, will agree with the experiments we have detailed. The case, however, is very different with the posterior parts. The navicular bone, we have seen, rests on the flexor sinew, and the sinew upon the elastic frog in the centre, and on the commissures and sole on each side. These commissures are the highest part of the sole, and form, indeed, a sort of ridge, so that, as any pressure on this part must tend to flatten the ridge, it must consequently expand the foot. Whatever weight, then, is supported by the navicular joint must contribute to the expansion of the foot.

It must be evident, however, that very flat or pumiced feet do not widen when the weight rests upon them, as they are at all times at their full expansion. The cartilages, we have seen, are attached to the wings of the coffin bone, filling the space in the hoof immediately above the heels formed by the crust and bars. This being the case, it must be evident that pressure on this bone, extending to the heels, must in some measure contribute to the expansion of the foot, although by no means in so great a degree as pressure on the navicular bone.

Thus we have seen that the leg of the horse is furnished with a vast number of beautiful springs for the purpose of warding off concussion, and that these springs are mostly situated at the posterior part of the limb. First, we have the splint bones, which receive some portion of the superincumbent weight, and which we do not find in oxen; then we have the suspensory ligament, a spring of much greater importance, and whose operation, we have seen, extends to both fetlock and pastern joints; next we find the elastic cushion, on which the small pastern rests, and which, though unnoticed by physiologists, is yet of much importance. Within the hoofs we find the sensible and horny laminæ, extending so considerably the surface of connection between the hoof and coffin bone, and greatly diminishing by their elastic connections, as well as by their extent of surface, the concussion of the foot. We have, also, the lateral and inferior cartilages, and the horny and elastic frog, thus affording altogether a collection of beautiful apparatus far superior to any which the most skilful ingenuity of man can devise. For, besides these springs we have enumerated, the bones which enter in the composition of each joint are tipped with cartilage, which cartilage is lined by a delicate membrane, secreting an albuminous fluid called synovia, so that neither bones nor cartilages come in actual contact with each other, the synovial fluid being interposed between them. All the superincumbent weight borne both by the splint bones and suspensory ligaments are again transferred to the cannon bone, so that all the weight of each limb is supported by both pastern bones. Below this, however, provision is made, not only for rendering easy the support of the weight, but for transferring a portion of it to the ground, without bearing on the extreme bone. It would be impossible to tell correctly the proportion of weight supported by the coffin bone and hat supported by the other parts, because, in addition to the difficulty of ascertaining it in a single case, this difference is perpetually varying in different horses, some bearing twice as much as others on the navicular joint. Perhaps we should be approaching the truth in a majority of cases, by saying that two thirds is supported by the coffin bone, and one third by the other parts.

Let us consider the vast weight supported by each leg, and the manner in which it is distributed. The weight of a moderate-sized horse is about twelve hundred weight; this, when the animal is standing is supported by the fore and hind legs, in the proportion of two thirds by the former and one third by the latter. When the horse is in motion, say trotting, this weight is supported alternately by one hind and one fore leg, so that each fore leg supports two thirds of the animal's gravity; to this we must add the weight of the rider, and the increased burden occasioned by the momentum of the horse's action. We shall, therefore, be within bounds when we say, that each fore leg alternately bears a weight equal to the animal's entire gravity, all which is supported by the small pastern bone, and is thus distributed to the parts below. A moderate proportion is first communicated to the elastic cushion, from whence it is impressed on the lateral and inferior cartilages, and posterior part of the frog. The remainder, being the principal portion, is transferred to the navicular and coffin bones, the former of which, by the interposition of the flexor tendon, bears partly on the frog and partly on the sole; and the latter, by the intervention of the laminæ, distributes its weight to the crust throughout its whole circumference, and a very slight portion of it is borne by the sole, which may, or may not, bear upon the ground.

Thus, at the same moment, these various actions go on in the foot. The coffin bone descends lower into the hoof, the laminæ, by their elastic connections, permitting it, and the sensible sole is compressed, and perhaps the horny sole opposite the coffin bone, slightly descends. Well, the horny sole, and the anterior part of the frog opposite the navicular bone, descend and expand the quarters parallel to them, whilst, at the same time, the elastic or sensible frog being compressed, is forced down upon the horny frog, and contributes to the expansion of the heels; but if the horny frog meets the ground, the cushion, being pressed upon both above and below, enlarges laterally, and expands the upper part of the foot and lateral cartilages.

This appears to me to be a correct account of the movements of the various parts of the foot, and in it we cannot recognise, to any thing like their full extent, the complicated actions described by Professor Coleman in his lectures. I remember it used to be a favourite experiment with him in his clinical instructions, to exhibit a horse to the pupils with the shoes set off the heels as much as a quarter of an inch, then, letting the horse stand upon this foot, with the other leg held up, it was found that the heel touched, or nearly touched, the shoe, "thus showing," he used to say, "the descent of the heels, and the natural action of the foot." It struck me at the time, that the experiment was not a fair one,—the action was not natural, but forced, and such as could not fail to be the case on the most common mechanical principles, the parts not being rigid but flexible. In the unshod foot, and on the natural soil, the same result would by no means take place; the heels do not penetrate the ground deeper than the toe in the majority of feet. The only difference that we can detect between the heels coming to the ground and the other parts doing so, is that the former, being connected above with elastic substance, yield in a slight degree. If, instead of the experiment of Professor Coleman, a shoe were nailed to the foot, but touched it only at the heels and quarters, there being the same space left between the shoe and the front of the foot at the other parts, as is left between the heel and shoe in the experiment mentioned, then, on the weight of the animal resting on the ground, the toe would descend till it met the shoe; and thus just the contrary result would take place to that which attends Professor Coleman's experiment, — a result in either case opposed to nature, and one which may be attributed wholly to the elastic properties of the foot.

Mr. B. Clark claims the discovery of the elasticity of the foot; but this we cannot acknowledge, as previous writers, and amongst them Mr. Freeman, had spoken of it in their works before Mr. Clark's appeared. At the same time it is very probable that Mr. Clark gained his knowledge on the subject from personal dissections, and not from the works of others, and much credit is due to him for strenuously enforcing the expansive principle.

ON THE FOOT OF THE OX.

THE following essay on the foot of the ox was written by the author some years since, whilst he was a student of the Veterinary College. The subject was proposed by the Editors of *The Veterinarian* as a prize essay, and the paper in question succeeded in obtaining for the writer the prize (a handsome case of surgical instruments). No one can be more sensible of the imperfections of the essay than the author himself, but as there is no other on the subject in the English language, it might not perhaps be thought out of place in the present work, for nothing can assist us more in obtaining correct views of the functions of the foot of the horse, than its comparison with the same part in other animals.

THE METACARPALS AND PHALANGES OF THE NEAR FORE FOOT OF THE OX, WITH THEIR ARTICULATIONS, TENDONS, BLOODVESSELS, NERVES, &c.

In describing the parts below the knee of the ox, it will be advisable, according to anatomical custom, to begin with the bones.

The *Metacarpus*, or *Shank*, is formed of a large and a small bone. The large metacarpal is, with a few exceptions, similar to the corresponding bone in the horse, like which it is round in front and at the sides, and flat behind; but the flat surface is more extensive in the ox, the suspensory ligament being much wider. The lower part of the bone is also much broader, the condyles being double; consequently, it has six convex surfaces, which are received into the six concavities in the two large pasterns. The two lower heads are separated from each other, and the intervening space is occupied by ligaments. From this fissure a wide groove extends upwards to the knee, both anteriorly and posteriorly, which gives it the appearance of two bones joined together; and, indeed, in the fœtus this is actually the case. In this groove there is a foramen at its lower part, for the passage of a large artery. The *small metacarpal bone* corresponds in its situation with the external metacarpal in the horse, and, like it, is attached to the large by an elastic cartilago-ligamentous substance, but differs from it in not being above an inch in length.

We observe a double arrangement in the *Phalangeal Extremities*. They are consequently eight in number, viz. the *two large and the two small pasterns, the two navicular, and the two coffin bones.* Besides these, it must not be forgotten that there are four supplemental or *sesamoid bones.* The phalangeal extremities are shorter in the ox than in the horse. The bones of the duplicates being similar, a description of one of each will suffice. Each suffraginal bone is round and smooth anteriorly and externally, and rough and nearly flat posteriorly and internally. Superiorly it presents three concavities, which receive the corresponding convexities in each head of the large metacarpal. It has an articulation at the upper and outer part of its posterior surface with the internal sesamoid. On the upper posterior division we find a deep sinus, with two large tubercles on each side. Two smaller tubercles are found just below, from each of which a ridge extends to the condyles of the bone. On each side of the lower head two depressions are visible for the attachment of ligaments, and two convexities which articulate with the small pasterns.

The *Ossa Sesamoidea* may be arranged as the *two external* and the *two internal*, so that we may name a right and left internal, and a right and left external sesamoid. Their anterior surfaces are smooth for articulation, their posterior rough for the attachment of the suspensory ligament. They are connected to each other by firm ligamentous bands. The two external sesamoids are alike, with this solitary exception, the left at its outer side is bent anteriorly, to articulate with the right lower head of the large metacarpal bone. They are of irregular shape, and present four articulating surfaces, two anteriorly with the large metacarpal, one laterally with the internal sesamoid, and one inferiorly with the suffraginal bone. They are rather thicker than the internal sesamoids, and extend more anteriorly, giving thereby great security to the joint.

The *Internal Sesamoids* are rather conical in shape, and each has two surfaces articulating with the large metacarpal, and one laterally with the external sesamoid.

The *Os Coronæ*, or *Small Pastern*, in circumference is equal, and in length is two thirds that of the *os suffraginis*. Supero-anteriorly, we find a tubercle, from which a ridge extends to the condyles. This ridge divides the front surface of the bone into two parts. The antero-internal division presents a deep depression, whilst the front external is rounded with the lateral side of the bone. Supero-posteriorly are two eminences, the outer of which is the more prominent. From these eminences two ridges extend to the condyles, inclosing an irregular but smooth concavity. Inferiorly, we find two surfaces divided by a depression, which articulate with the navicular and coffin bones. These surfaces are very extensive, particularly the outer, which extends both anteriorly and posteriorly half way up the bone.

Each *Navicular Bone,* on its upper surface, is rough and nearly flat ; and laterally rough and convex. It presents anteriorly two depressions unequally divided by a ridge ; these articulate with the postero-inferior part of the coronal bone. The posterior surface is smooth for the passage of the flexor tendons. Inferiorly we see two smooth surfaces, with a deep concavity between them : these articulate with the coffin bone.

The *Os Pedis*, or *Coffin Bone*, corresponds in shape to the hoof, by which it is enclosed. At its postero-superior part are two concave surfaces, separated by an elevation of bone, which ends superiorly in a tubercle: these correspond for articulation with the concavity and the convexities of the small pastern. Antero-superiorly are two ridges with a deep depression between them, which is of some extent: these are for the insertion of the extensor tendons. There are two foramina on each side of these ridges, through which arterial trunks pass into the bone.

At the posterior part of the os pedis we find two surfaces separated by a fissure, which articulate with the navicular bone. In this fissure are many small perforations for the passage of minute vessels. The external surface is convex, the internal concave, and nearly triangular in shape: the inferior surface is nearly flat.

The *Fetlock Joint* is formed by the union of the *large metacarpal*, the *two large pasterns*, and the *four sesamoid bones*.

The ligaments are,

1. The *Capsular*, which is attached to these bones around their articulating surfaces, and is lined by the synovial membrane, which is then reflected over the cartilages. This ligament is protected in front by the extensor tendons.

2. The *two Lateral Ligaments* are strong, and arise from the inferior and lateral parts of the cannon bone; they are inserted into the superior and external parts of the suffraginal bones. These ligaments effectually prevent any lateral motion.

3. A *wide Ligament* arises between the lower heads of the cannon bone, and joins the ligamentous substance between the pasterns.

The *Ligaments of the Sesamoids* are five pairs, and a single one, viz. *the suspensory*, *the two lateral*, *the two long inferior*, *two external inferior*, *two internal inferior*, and the *two crucial ligaments*. The *suspensory* corresponds in width to the back part of the large metacarpal bone. Posteriorly it is concave, in order to fit the convexity of the flexor tendons. About two thirds down the bone two portions are given off, which being expanded at the fetlock joins the perforatus tendon, and indeed forms the anterior part of the sheath of the perforans, having become rather cartilaginous in substance. Two portions proceed from the suspensory ligament, just below the last, taking a more external course. Just above the fetlock each portion becomes divisible, and terminates in a similar manner by bifurcating. One division of the bifurcation is inserted into the external sesamoid; the other is continued obliquely to the extensor tendon. Just above the fetlock the ligament sends off two other portions, which are inserted into the superior parts of the inner sesamoids. Two more slips are also given off, the smaller of which is inserted into the ligamentous substance connecting the internal sesamoids. The larger portion is connected to the lower part of the cannon bone by a ligamentous slip, which encircles it: it is then continued between the lower heads of the large metacarpal, enters a sheath formed by a ligament, and is inserted between the large pasterns. By this description will be seen the intimate union between all parts of the shank by means of the suspensory ligament, and the admirable provision made against dislocation. Though this great security is procured at the expense of agility, it accounts, in some degree, for the ox being so strong and so sure-footed.

The *Lateral Ligaments* are fixed to the posterior projecting parts of the external sesamoids, and to the supero-lateral parts of the large pasterns. The *long inferior ligaments* arise from the lower part of the external sesamoid, are continued down the back of the large and small pasterns, and are inserted into the cartilago-ligamentous heels. Just after its commencement a portion passes off to an eminence at the supero-posterior part of the os suffraginis. About halfway down another slip arises, and proceeds to the ridge, which divides the posterior from the lateral part of the bone. The *external short inferior ligaments* are very strong, and are fixed to the lower part of the external sesamoid, and to an eminence on the upper and posterior part of the large pastern.

The *Internal short Inferior Ligaments* arise from the internal sesamoids, and are inserted into the supero-internal part of each os suffraginis. The *crucial* are a pair which decussate: one proceeds from the right external sesamoid to the supero-internal part of the left large pastern—the other proceeds from the left external sesamoid to the right large pastern. These last three pair of ligaments serve as hinges to the sesamoid bones.

The *Pastern Joint* is formed by the articulation of the os suffraginis with the os coronæ. The bones being double, there are of course two pastern joints; and the external and internal parts of the bones not corresponding in shape, the outer ligaments do not resemble those on the inside, and consequently must be described as single ligaments. There are six besides the capsular, and the one common to both joints.

1. The *Capsular* arises from the edges of the bones.

2. The *Long Anterior Ligament*, rather slight in size, arises from the antero-inferior part of the os suffraginis, takes a direction obliquely outwards over the os coronæ, and is inserted at the infero-external part of the bone.

3. The *External Lateral Ligament* is wide and stout, and arises from the depression at the infero-external part of the os suffraginis; passes downwards and backwards to the supero-external part of the os coronæ; and attaches itself to an eminence on its posterior external side.

4. The *Small Anterior Ligament* takes its origin from a rough eminence at the inner and lower part of

the large pastern, and passes to a tubercle situated on the upper and anterior part of the small pastern.

5. The *Internal Lateral Ligament,* large and strong, leaves a depression at the infero-internal part of the os suffraginis, passes downwards, and divides into two portions. The larger is attached to the superior and posterior part of the os coronæ. The smaller is inserted into the internal part of the os pedis.

6. A *Firm Ligamentous Band,* rising from the middle of the posterior part of the os suffraginis, is inserted into the external projection at the supero-posterior part of the os coronæ with the conjunctive ligament.

7. The *Conjunctive Ligament* (so called from its connecting the pasterns together) is common to both pastern joints, and arises from the internal side of each os suffraginis, whence it is continued to the joint, where it becomes lined with synovial membrane. After reaching the inferior part of the large pastern, it turns behind its inferior articulating surface, and having become increased in size and firmer in substance, it forms a smooth surface for articulation with this bone. It is inserted into the outer posterior projection of the os coronæ. From the greater comparative size, from the number of ligaments, and from the insertions of tendons into the coronal bones, as well as from the greater surface of articulation presented by the inferior part of the large pastern, it is evident that the pastern joint is of much greater importance than in the horse.

The *Coffin Joint* is formed by the adaptation of the small pastern with the navicular and coffin bones. Its ligaments are: —

1st. The *Capsular,* which is attached to the edges of the articulating surfaces of these bones.

2d. The *Anterior Ligament,* which is fixed to the external part of the os coronæ, and to the same part of the os pedis. All the other attachments of the joint are formed by the cartilago-ligamentous heel, which is fixed to the posterior part of the os pedis, whence it is continued upwards behind the flexor pedis, to which just before its insertion it is closely united. It is then connected to the sides of the navicular bones, covers almost the whole of the outer and also a great part of the inner surface of the os coronæ. It is attached by ligamentous bands to the infero-internal, to the supero-internal, and to the outer part of the os coronæ. The use of this substance, it is evident, besides connecting together the bones of the coffin joint, is to communicate the superincumbent weight to the posterior part of the horny sole.

On removing the skin from the shank of the ox, we discover that the tendons, ligaments, and vessels, are all covered by a *ligamentous substance,* which being very strong at the posterior part of the tendons, is then reflected between them and the suspensory ligaments, so as to form their sheath. This substance is continued down to the foot, and at the fetlock becomes increased into two firm and distinct parts, which being covered by the skin, here considerably thickened, and this again by horn, forms that part commonly called the *dew claw.* It is connected to its horny covering by very numerous laminæ. This appendage affords considerable protection to the fetlock joint, and, probably, is useful occasionally in preventing the animal from slipping. From each dew claw a strong ligament proceeds to the cartilago-ligamentous heels.

Tendons. — The *Flexor Perforatus* at the head of the large metacarpal bone is divisible into two portions, which become united about two-thirds down the bone. Just above the fetlock joint it again bifurcates, becomes flat, and, being joined by a branch of the suspensory ligament, forms two separate sheaths for the two divisions of the *tendo perforans.* Each portion is then continued down the back part of the suffraginal bones, and is inserted into the postero-superior part of the small pastern.

The *Flexor Perforans* accompanies the *perforatus* within their common sheath. It is single just below the knee, but splits into two portions at the situation of the union of the perforatus. Just above the fetlock, each portion enters the sheath formed by the perforatus, and here increases in size, and becomes firmer in substance. It is smaller and softer at the back of the pasterns; and just before it arrives at the os pedis, it becomes closely connected with the cartilago-ligamentous heels. It is continued behind the navicular bone, where it becomes as wide as the bone itself, increasing in size until its insertion in the infero-posterior part of the os pedis.

The *Right Extensor Coronæ* is situated in front of the metacarpus on the right side of the other tendons. It takes a course to the right os suffraginis, at the upper part of which it becomes more extenuated and broad. Continuing to expand, it has an extensive attachment to the large pastern, and about half way down the bone it splits into two portions. The larger of these continues in a straight direction to the pastern joint, where, being lined by synovial membrane, it forms the anterior division of the capsule of the joint, and is inserted immediately below it into the supero-anterior part of the os coronæ. The smaller portion takes a course obliquely to the right, passes over the capsular ligament, is joined by the external slip of the suspensory, expands considerably, and is inserted into the cartilago-ligamentous heels.

The *Left Extensor Coronæ* is situated on the left side of the extensor pedis; and its connexions, course, and terminations, are similar to the last tendon.

The *Extensor Pedis* is rather smaller than the two preceding tendons, between which it takes its course. Just above the fetlock it splits into two portions, each of which plays within a synovial theca in front of the joint. Each portion continues inclined rather outwardly along the anterior surfaces of the pastern bones, and becomes inserted into the superior and rough portion of the os pedis.

Arteries. — The *Large Metacarpal* artery is situated at the posterior part of the tendo-perforatus. It continues its course in a straight direction with its vein and nerve, until within an inch of the fetlock, where it divides into two trunks. The larger continues in a perpendicular direction at the back of the fetlock joint, and becomes the large *plantar artery*. The *smaller bifurcation* goes off at right angles from the preceding towards the left side, where it divides into two branches. The lesser descends, and, after giving a few small trunks to the joints and other parts, becomes the *left plantar artery*. The *greater division* takes its course upwards, giving off a few *recurrent branches* ; it passes inwardly between the flexor tendons and the suspensory ligament, and joins the *ramus anastomoticus,* coming from the right or *small metacarpal artery*. The *left plantar artery,* descending from the fetlock joint, gives off a branch to the extensor tendons and parts around, and, a little below this, it separates into many small trunks, which subdivide and supply the coronary ligament.

The *Large Plantar artery,* a little below the fetlock, enters the fatty substance between the pastern bones, in which it continues to the division of the foot, inclining, however, towards the left side. At the commencement of the hoof, it is continued between the sensible laminæ and the internal side of the left os pedis, in a direction towards its toe, where it enters a foramen, and within the bone the *arteries of the sole and laminæ* are given off. The branches of the *large plantar* are,

(*A*) which goes off at right angles from the trunk ; and after giving off *a recurrent branch,* enters between the right flexor tendons and the small pastern.

(*B*) goes off just opposite the preceding, and pursues a similar course on the left side. A little below the origin of this artery is given off.

(*C*) which supplies the right cartilago-ligamentous heels.

(*D*) arises near the latter, and takes a direction between the small pastern bones to the anterior part of the foot, where it splits into two portions, from each of which branches supply the pastern; and then each trunk enters a foramen in the internal part of each os pedis, having sent a branch into a foramen situated at the superior part of the bone.

(*E*) arises near the origin of the last artery (*D*), and proceeds to the left side to supply the cartilago-ligamentous heels. A little below this branch is given off (*F*), which pursues a course towards the toe on the inner side of the left os pedis, between it and the sensible laminæ. It gives off *branches to the sensible laminæ and sole*, and then enters a foramen on the inner side of the coffin bone, by which other arteries of the laminæ and sole are supplied. Near the origin of this artery several branches are given off, which supply the heels, sensible laminæ, and the posterior part of the sensible sole of the right coffin-bone.

The *Small Metacarpal Artery* is situated just below the knee, at the right side of the suspensory ligament. It gives off three branches in its course, and then passes down in the hollow between the flexor tendons and the suspensory ligament; and, becoming deeper seated about half way down the cannon-bone, separates into two trunks. One takes a direction to the fetlock joint, and there becomes the *right plantar artery;* the other, a *ramus anastomoticus*, advances between the bifurcations of the suspensory ligament, crosses over to the other side anterior to the ligament, and between its left bifurcation joins the large metacarpal artery. The branches of the *ramus anastomoticus* are,

(*a*) a recurrent artery.

(*b*) a branch supplying the fetlock joint.

(*c*) which enters a foramen in the bone.

The *Right Plantar Artery* accompanies the vein and nerve, and after sending some branches to the anterior part of the pastern bone, and two smaller ones to other parts, then divides and subdivides, to supply the coronary ligament.

THE VEINS.—The *Anterior Plantar Vein* is formed, about half way between the hoof and fetlock, by two branches, each of which proceeds from the front and medial part of the coronet. It then passes up in front of the fetlock, and becomes the *anterior metacarpal vein*, which is joined by an important branch, about one-third above the joint; after this it proceeds in front of the shank to the knee.

The *Left* or *External Plantar Vein* * is formed chiefly by a network of vessels superficially situated at the coronet, and which proceed from the laminæ of the foot. As it passes up the pastern, it receives numerous branches from both deep-seated and superficial parts. This vein takes its course by the side of the fetlock, and becomes the *external metacarpal vein*, which receives a branch from the dew-claw, and a smaller one from the neighbouring parts; and, about one-third of the distance between the fetlock and knee, it sends an important anastomosing branch to the anterior metacarpal vein: just above this, the vein communicates with the *right metacarpal*, by a large branch coming from between the ligament and tendons, and then proceeds up the shank, closely adherent to the suspensory ligament, and deep-seated between it and the bone, and again becomes superficial at the knee.

The *Right* or *Internal Plantar Vein* has a similar origin to its fellow, and receives like branches in its course; and at the fetlock becomes the *internal metacarpal vein*, which, a little above the joint, gives off the *large anastomosing* branch before spoken of. It then proceeds up the leg by the side and a little in front of

* The terms made use of to distinguish the different vessels, perhaps require some little explanation. It must be borne in mind, that the parts below the knee in the *near* leg, are the subject of this essay; the terms right and left will, therefore, only apply to the *near leg*, but the word *external*, which corresponds to the *right*, and *internal* which signifies the *left*, would be more appropriate for either leg, but must be distinguished from the *middle* portions of the division of the foot.

the suspensory ligament, receiving several branches in its course.

Nerves. — The *Posterior Metacarpal Nerve* is situated just below the knee, at the side of the leg, between the suspensory ligament and flexor tendons. At about one-fourth of the distance between the knee and fetlock, it gives off the *inner* or *right metacarpal nerve;* it then takes an oblique direction at the back of the tendons, and about midway between the knee and fetlock a branch is given off, which becomes the *left* or *external metacarpal nerve.* The main trunk continues at the back of the tendon to the fetlock joint, giving off superficial branches; and, passing between the dew-claws, becomes the *posterior plantar nerve,* which accompanies the artery, dividing and subdividing with its branches.

The *Right* or *Internal Metacarpal Nerve* advances towards the side of the flexor tendons, and is continued between them and the suspensory ligament. About midway between the knee and fetlock two filaments branch out, one going to the extensor tendon and the other to the superficial parts. At the fetlock joint this nerve becomes the *right* or *internal plantar,* which sends off the following branches:

(*a*) a filament very closely connected to the artery.

(*b*) another, which advances downwards and forwards, passes under the artery, and then divides into two portions, one of which joins the branch (*a*).

(*c*) a filament, supplying the pastern joint.

(*d*) one supplying the tendons.

(*e*) a branch which subdivides to reach the superficial parts.

After giving off these branches, the *right plantar nerve* passes under the perforatus tendon, then emerging, distributes filaments to the extensor tendon; after which, in numerous divisions, it enters the coronary ligament.

The *Left* or *External Metacarpal* and plantar nerves have a very similar distribution with those just described.

The *Anterior Metacarpal Nerve* is found with the vein just below the knee, and continues its course in front of the metacarpal bone to the fetlock, where it becomes the *anterior plantar nerve.* Its branches are,

(A) which proceeds to the superficial parts a little below the knee.

(B) an important branch which is given off about one-third of the distance between the knee and fetlock, and takes an oblique course (giving off a few superficial filaments) to the inner part of the fetlock joint, where it is situated upon the suspensory ligament. Above the fetlock, a filament proceeds to the extensor tendon, and another to the fetlock joint; and below this, branches are sent to superficial parts, and to the front of the small pastern joint, and the continuation of the nerve is distributed on the coronet.

The *Anterior Plantar Nerve,* just below the fetlock, gives off a branch whose divisions proceed to the antero-medial parts of both coronets. The nerve then takes a more deep-seated course, and midway between the fetlock and hoof divides into two parts, whose ramifications are distributed to the fatty substance between the pastern bones, extending as far as the heels, and to the middle portions of each coronet.

The Foot.—The coffin bone is covered on its superior part, both externally and internally, by the continuation of the thickened cutis, called, in animals of the solid-ungular order of Blumenbach, the *coronary ligament.* It is convex, in order to fit the concavity of the *coronary ring,* but it is much more extensive than in the horse, covering a greater portion of the os pedis. This *coronary ligament* ends posteriorly in the *sensible sole,* and from it inferiorly proceed the *sensible laminæ,* which cover the lower part of the sides of the bone and part of the cartilago-ligamentous heels. The laminæ, in proportion to the increased extent of the coronary ligament, are diminished in length, and join at the inferior edge of the coffin bone the sensible sole, which, after covering the inferior surface of the coffin bone, is continued over the greater part of the cartilago-ligamentous heel, and joins the coronary ligament. The *horny sole* (of course double) is very thick, and resembles in shape a bisection of the same part in the horse. It increases in thickness as it approaches the heels, where it is more prominent than the crust. The *horny crust* corresponds in shape to the os pedis, its outer surface being convex, and its inner rather concave. Its substance is harder but much thinner than the sole, except at the posterior part, where it is more elastic and nearly as thick. The *horny laminæ* are shorter than in the equine genus, so that the part called in the horse the *coronary ring* is considerably more developed in the ox.

On a superficial view of the *horny sole,* we are struck with the dissimilarity which exists between it and its synonym in the horse, and, on a deeper examination of its structure, we find that in its physiology it must also equally differ. It serves, of course, as a protection to the sensible parts above, but, from its great thickness, it is doubtful whether it admits of any descent, yet its convex posterior surface, touching the ground at every step, supports a large proportion of the animal's weight. The ox, not being intended for quick movements, neither requires nor possesses the same degree of elasticity as the horse; yet from the springy nature of the posterior part of *the crust,* and from the yielding quality of the *cartilago-ligamentous heels* above it, together with that arising from the spreading of the cloven foot, enough is provided effectually to guard against concussion, and to afford the animal a firm footing in his natural pastures.

In reviewing our subject, we must observe that there is a much less extent of articulating surface in the fetlock joint, allowing a less free and extensive motion, than in the horse. When fully extended, it does not vary so much from a straight direction; in fact, a superficial observer of the animal must notice the apparently upright position of these parts. This arrangement lessens the grasp of the fore extremity. A diagram of these bones in their greatest degree of extension will bring this fact strongly into view. The same variation in these parts in the greyhound and the bull-dog, connected as it is with the diversity of speed, forms an interesting point of analogy. In examining the foot it will be seen that the angle formed by the large pastern and the cannon bones in the horse is 60° *from a perpendicular line, in the ox only* 30°, making thirty degrees difference in the angles of extension. In observing the contour of the lower part of the fore leg of the ox, we cannot but be struck, too, with the absence of that comely elegance which we admire so much in his rival. In the ox (if an architectural simile be allowable) we are reminded of the ponderous Tuscan; in the horse we seem to view the graceful and chaste model of the Corinthian column. The progression of the former appears to be only a few links from the sure-footed fidelity of the elephant; while the latter, though inferior to the deer in elastic bound, yet possesses an union of strength, security, and swiftness, peculiar to itself, which stamps his superiority for the use of man in all the temperate climates of the world. It is now however, I believe, pretty generally decided, that, for *common agricultural purposes*, working oxen of the fast breed are equally useful with horses, and ultimately more profitable to the farmer, in a pecuniary point of view. On account of the comparative slowness of their paces, and their peculiar structural provisions, oxen are much less subject to that almost infinite variety of injury to which a constant and great degree of concussion renders horses liable. This circumstance, connected with the numerical preponderance of horses in the *actual service* of man, accounts for the profuseness with which authors have dilated on the foot of the one, and their comparative silence on the same subject in the other animal. I do not believe that there is in the English language a single anatomical description of the fore extremity of the ox which can guide a student in his dissection; but I have not had an opportunity of examining the French authorities, and therefore cannot state what information on this subject our ingenious neighbours may possess. I have said that oxen are by no means so subject to lameness as horses; they are not, however, entirely exempt. Ligamentous lamenesses are comparatively the most frequent, and, as oxen are shod for working, they must be subject to some of the maladies which the application of this useful invention unfortunately produces. It is, then, by no means an unimportant desideratum to obtain a full account of the parts below the knee. Such is the object of this essay, which the writer has endeavoured to render as correct as his moderate abilities, the novelty of the subject, and the unbroken nature of the ground he has had to tread, will allow. And if it should have the effect of assisting the student in his dissections, or smoothing in a slight degree the rugged path of anatomical pursuits, he will not consider his labour to have been uselessly bestowed, or this humble essay to have been written in vain.

A COMPARATIVE VIEW OF THE STRUCTURE OF THE FOOT IN VARIOUS ANIMALS.

Many persons are fond of tracing a progressive chain in the structure of various animals, and when they find any peculiar formation to which they cannot assign an use, they at once fly to their favorite theory, and consider it as intended to preserve unbroken a link in their systematic chain; thus, the splint bones in the horse they regarded as merely for the purpose of preserving a graduated resemblance to the various metacarpal bones of man and other animals. It was the celebrated Cuvier who first pointed out the narrowness and erroneousness of these views, and he has substituted for that of a chain, the analogy of a network, regarding each animal as bearing a resemblance to others, to some corresponding in one structure, to others in another. This new aspect of the subject enables us to take a more expanded view of the works of nature; and while it does not preclude us from tracing a gradation from the meanest reptile to the highest animal, it also induces us to extend our vision from side to side, as well as from below to above, and to behold the wonders of creation in all their beauty, harmony, and immensity.

The lover of natural history looks abroad, and beholds all nature teeming with life and enjoyment; and, if by the aid of the microscope he extends his vision, he finds the specimens of existence infinitely multiplied; he sees the same vital principle pervading all classes of beings, from that of the ephemeron of the moment that dances in the sunbeam, whose beginning and whose end is encompassed by the same hour, to that of the aged patriarch, who can look back through the vista of years, and finds chronicled on the tablet of his memory the events almost of a century.

By the aid of another science, that of geology, we are informed of the traces of animal existence in a vast variety of forms, ages and ages before the first man was fashioned by the hands of his maker.

Are we not to infer from these facts, that it is the design of the Creator, that the whole earth should be peopled with animal existence? — Accordingly we find in the swampy marsh and in the arid desert, in the uncultivated forest and in the fertile plain, in the ocean and in the air, myriads on myriads of beings possessing the vital fluid, —

> " Which motion, vigour, and warm life conveys
> To every particle that lives and moves."

How could these countless multitudes of animals enjoy existence or procure sustenance if they were constituted alike? If they were all formed to crawl upon the earth, the earth could not contain them; if to swim in the ocean, or to fly through the atmosphere, these elements would be soon unfitted for their destined purposes. If they fed on the same food, a universal famine would spread through the globe; or if a vegetable diet was their only sustenance, the air would speedily prove pestilentious from the accumulation of animal bodies. Instead of which, we find that some animals are formed to move on the surface of the earth, and others to swim or to fly; some are adapted to live on vegetable, others on animal food, by which means they have all room for their motions, and food for their subsistence. And thus we find throughout nature, a perfect adaptation of the structure of an animal to his wants, habits, and localities; and, although in many instances we may trace an irregular chain of gradation from one animal to another, yet it is not for the purpose of preserving this gradation, such connecting links exist, but rather for the purpose of filling up every void, and peopling the whole expanse of nature with living beings.

Let us see in the construction of the foot alone, how intimately the structure of a part is adapted to the functions it has to perform. The dog and the wolf hunt down their prey, and their feet are admirably constituted for the chace. The angular disposition of the joints, and their corresponding powerful muscles admit of speed; and the various phalanges and metacarpals bestow great elasticity, whilst the last joint of each phalange is furnished with a soft pad, and protected by cuticle exceedingly thick, and almost horny in its nature. The extremity of each phalange is armed with a nail well calculated for digging in the soil, but not intended as a weapon of attack or defence.

The lion and the tiger do not run down but spring suddenly on their prey, in common with all animals of the feline order, and for this purpose they are endowed with immense muscular power; and in order that they should make no noise in their stealthy movements, the pads of their feet, though similarly placed to those of the dog, are much softer in their nature, and defended by a finer and more delicate cuticular covering. Their claws too are most formidable weapons; and, though ordinarily carried in an elevated position, where they can neither injure nor be injured, yet by a sudden muscular movement are darted instantaneously forward, as they descend from a bound of twenty yards on their hapless and unwary victim. The fore feet of these animals are also much used in retaining their food whilst devouring it, and for this purpose they possess in a considerable degree greater than in the dog, though much less than in man, the powers of pronation and supination. This great flexibility and extent of motion of their joints and spine, accompanied by the softness of their feet, incapacitates these animals either for bearing burdens like the horse or ox, or following the chase with ease like the wolf or dog.

The cloven foot is common to so many races of animals, that we find it extended over a great proportion of the surface of the globe, adapted for all climates and all soils, and possessed by fast animals as well as by slow ones. The structure of the cloven foot in these various races, however, is by no means constituted alike; it differs according to the habits and localities natural to the animal. The ox is intended for soft pastures, where it can find its luxuriant sustenance, and its cloven and sharp-pointed foot is admirably adapted to prevent slipping, and to enable the animal to draw it readily from the soft soil. Compared with the horse, the front part of the foot is, as it were, indifferently developed; if we unite the two halfs together, they do not jointly produce that fine specimen of compactness and solidity afforded by the foot of the horse. The laminæ of the coffin bones are comparatively short and weak, and the crust thin; in fact, the animal treads mostly on its heels, which are furnished with a considerable development of the same elastic fibrous substance, which forms the sensible frog of the horse, and are protected externally by exceedingly thick and tough horn.

In proportion as cloven-footed animals are adapted for hard and dry soils, we find the back part of the feet less, and the front part more, developed. Thus the goat has very small heels, but an exceedingly strong crust, almost as hard as the rocks on which this animal delights: the firm composition and irregular surface afforded by the lower surface of the foot, enables the goat to spring from crag to crag, with such remarkable boldness and precision.

In the chamois we find the different parts of the foot somewhat similarly developed, but accompanied with greater elasticity of frame, and the possession of greater speed; and this animal surpasses the goat in the wonderful extent of his leaps, springing a distance of thirty yards at a time, and alighting, with most unerring precision, on a spot scarcely large enough to afford a resting-place for its feet. In the fallow deer we have the most beautiful combination of parts formed for speed; the hoof, neither so strong nor so dry as that of the goat, but the bones light, the joints angular, and the muscles of the loins and hind quarters particularly powerful. The graceful movements of this beautiful animal are seen to most advantage on the smooth park or lawn of its wealthy proprietor, but it can move with scarcely diminished speed through the entangled path, or the marshy surface of the forest. For this latter purpose, it has a peculiar provision, which prevents the feet from entering too deep into the soil. The splint bones, situated just under the knee in the horse, are brought down to the fetlock in the deer, their larger extremities being below, and their points tapering upwards. Each splint bone articulates with a phalange; this, with a second, and that with a third, which last is covered with horn. These bones stand out at an acute angle with the pasterns, but do not extend so far: when, however, the animal enters soft ground, they effectually prevent the feet from penetrating too deep, and also afford, by their spring, great assistance in withdrawing them. This curious and peculiar structure is still further displayed in the rein-deer, where these posterior phalanges form almost a right angle with the pasterns, and extend almost as far; so that, instead of being of occasional use, they are in constant requisition, and adapt the foot, as Sir C. Bell observes, on the principle of the snow-shoe, to the whitened plains of Lapland.

The structure of the foot of the camel is both singular and unique; although actually cloven, it appears solid from its foot-marks, but it has a sole which unites the middle part of the two divisions of the foot together, leaving the toes free. This sole expands considerably from side to side, is extremely elastic, and is composed of a horny covering, and a substance analogous to that which forms the sensible frog of the horse, and the elastic pads of other animals. It forms a soft cushion on which the two last phalanges repose, and thus prevents the foot from sinking into the sands of the deserts, whilst its yielding surface saves it from being injured by stones and other hard bodies. The effect of much moisture on the foot of the camel is very injurious; and thus we find, in this country, that travelling on wet and dirty roads, wears away, and, in fact, destroys the texture of the cushion, rendering the animal exceedingly tender-footed, and an object rather for our compassion than our admiration.

The foot of the elephant has an immense weight to support in soft and swampy soils, and, for this purpose, we find it is broad and circular, and nearly twelve inches in diameter, and has five toes and nails in the fore, and four in the hind feet. These nails have a corresponding number of phalanges and metacarpals, which expand with the weight of the animal, and give security to his tread; the several phalanges preventing the feet from sinking into the soil so deep as they would if they presented a smooth and uneven surface. The bones which compose the carpus or knee in the fore, and the tarsus or hock in the hind extremity, are placed just above the ground, almost like the human foot, the metatarsal bones being short, and resting on the ground. Persons ignorant of comparative anatomy have been much surprised, on seeing the elephant kneel down with his hind legs, as well as his fore ones, when he takes his rest; and they, as well as others who should have known better, have supposed that the flexion of the joints in the elephant is just the reverse to what it is in the horse. The difference, however, is in appearance only — in the horse, the metatarsal bone is so long, that it elevates the hock considerably above the ground, whilst, in the elephant, from the shortness and the position of the metatarsal bones, the tarsus or hock is very near the ground, and, when covered with its teguments, is almost obscured with the foot; the consequence of this is, that the stifle joint occupies the same position in the elephant as the hock does in the horse; it is this joint, therefore, on which the animal kneels, and not the hock, as is vulgarly supposed. The action of the various joints are precisely similar, although, from their situation, they appear so different. If the elephant is to be placed in the chain of gradation, which naturalists used to endeavour to trace, it would be very difficult to assign his proper position; for whilst he is a large herbivorous animal, and his intestines consequently are very similar to those of the horse or the camel, the structure of the feet, and position of the bones of the extremities, are as unlike these animals as they possibly can be. The bones of the hind extremity are, indeed, more like those of man, both in their situation and appearance, than those of almost any other animal. The human legs are better calculated for sustaining weight than that of any animal, inasmuch as they are obliged to perform the same task which is assigned to the four extremities of quadrupeds. The elephant, having a prodigious weight to support, although he possesses four legs, it was necessary that they should be of that form best adapted for sustaining weight; and for this reason the hind legs correspond with those of the human being. We find, in this animal, the possession of the most opposite qualities; in addition to those we have already pointed out, he enjoys a high degree of intelligence, but attended with a huge and unwieldy frame, similar in its appearance to that of the hog; and in the form of the head, and possession of the proboscis, we have a structure *sui generis* — different from all others. The bones of this huge, though not mis-shapen, animal, are placed one above another like a pile of massive architecture; and yet so perfect is the construction of the elephant, that if the most accomplished architect, the most ingenious mechanic, and the best-informed naturalist were to bring their united talents to bear upon the task, they would altogether fail in forming, even in imagination, an animal better calculated to fulfil his destined purposes than the vast beast in question.

Thus we find, from this superficial notice of the foot of various animals, how perfectly its structure is adapted to the peculiar wants and habits of its possessor: that of the dog, for the chase—the lion, for the stealthy movement, or the sudden spring — the chamois and the goat, for the mountain crag; the foot of the elephant, for supporting an immense weight on a soft soil—the rein-deer, for the snows of Lapland — the camel, for the sands of the desert, — each perfect in its kind, admirable in its construction, but unsuitable for a different purpose or an opposite locality.

VARIETY IN THE STRUCTURE OF HORSES' FEET.

A person not practically acquainted with the subject, would scarcely imagine what a great variety obtains, even in the external conformation of horses' feet—a variety existing not only between one breed and another, but even in the same, whether it be the heavy cart horse or the thorough bred. As a general rule, however, liable of course to exceptions, we find that heavy horses have, in proportion to their weight, weaker feet than lighter ones; and another rule, still more prevailing, is that white legs are usually attended with thin and weak horn.

Cart horses were originally natives of soft luxuriant pastures, the tendency of which, assisted by the weight of the animal, is to render the horn thin and weak.

Varieties of Feet.

Fig. 8.

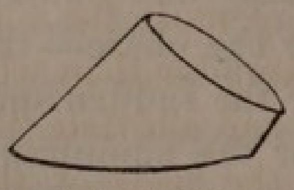


Fig. 9.

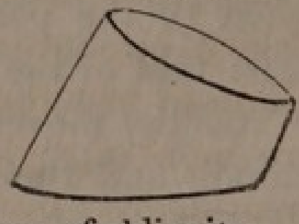


Fig. 8. A foot with a proper degree of obliquity.
Fig. 9. A foot too upright, and its heels much too high.

Fig. 10.

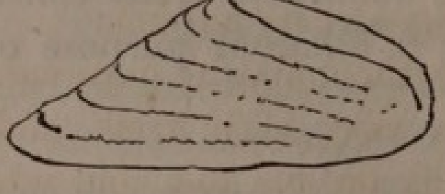


Fig. 11.

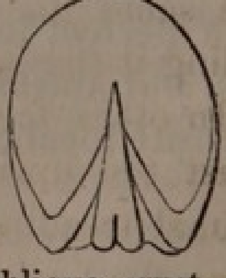


Fig. 10. A foot with low heels, too oblique crust, and wrinkled hoofs.
Fig. 11. A narrow mule's shape foot.

Fig. 12.

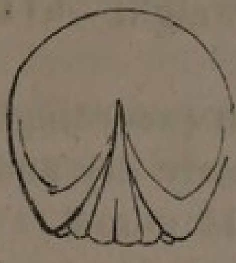


Fig. 13.

Fig. 12. A foot with open heels and healthy shape.
Fig. 13. A foot with contracted heels.

In a good foot, the crust at the anterior part forms an angle of about 45° from the perpendicular, which inclination distributes the superincumbent weight in proper proportion to the toe, heels, and quarters. When the inclination is greater, it must be evident that too much weight is thrown on the posterior parts, and, in such cases, the heels of the shoe are commonly worn down much sooner than its other portions. In such, the connection of the crust with the coffin bone is weaker than in other feet, being suspended more horizontally than vertically, from which circumstance there must be a greater disposition to tear the parts asunder than when the feet are more upright. We can alleviate this evil in a great degree by making the heels of the shoe much thicker than at the toe, thus throwing the weight more to the front of the foot, and yet at the same time, by making it more upright, enabling it the better to support its burden.

In other feet, we see the opposite extreme; the crust too upright, with very high heels, and the animal treading forwards on his toe, and wearing away the heels but little. In such cases it is necessary to lower the heels of the foot, and to make the heels of the shoe thinner than at the toe, by which means we throw more weight on the back part of the foot.

In some feet we see the horn exceedingly strong and tough, in others, particularly dry and brittle, scarcely affording space to hold a nail. In some we find the sole exceedingly arched; in some moderately so; and in others flat or convex. In extreme cases of the former description, the sole is usually very thick, and in the latter extremely thin. The frog, too, equally participates in this variety; being in some very large, and in others very small; in some, the horn being particularly thin, and in others very thick. Large feet are usually weak, but sometimes they are particularly strong; so likewise, though small feet are usually strong, yet occasionally they are extremely thin and weak. We sometimes find numerous rings or wrinkles on the crust, and in others one of the quarters falls in, becoming concave — these are very bad faults: the first is owing to an irregular growth of the horn, and both imply a weak state of the foot.

These are varieties which exist even in the unshod foot before it becomes altered either by shoeing, labour, or disease.

For the purpose of progression alone, the feet cannot be too small; for that of simply sustaining weight, they cannot be too large: but, for the combined purposes of both, a happy medium is the best. Large feet, when out of proportion, are very liable to corns and other bruises as well as to ossified cartilages; and disproportioned small feet to ringbones and other diseases of the joints. The former being produced by the weight of the limb, the latter by the absence of a sufficient basis of support for warding off concussion.

Most people dislike a narrow mule's shape foot, and yet it must be confessed that such feet very frequently prove serviceable for many years, when others of a much more promising appearance become lame. It is a well known fact that mules and donkeys rarely become lame; and when they do, it is still more rarely from disease of the feet, although it must be evident that, from the structure of their feet, the soft elastic parts must be very imperfectly developed. I have known many very valuable hunters go sound for years with very narrow feet; I therefore take it we ought not to reject a horse, valuable in every other respect, from this circumstance alone. Professor Girard, in his Treatise on the Foot, enumerates no less than twenty varieties of feet to be met with either in a natural or diseased state. He mentions the large, the flat, and the convex foot, as of the same character; two varieties of contracted feet, besides the small and the narrow, and the foot with high heels and concave sole; then the hoof growing in rings and circles, and the foot with low and that with weak heels; next the foot with a large frog and that with a small frog; the fleshy foot, and that with a thin crust and quarters; the foot turned up at the toe, that with the toe turned out and turned in; the crooked foot, with one quarter turned in, and the club foot, in which the coffin has sunk from disease. These very numerous subdivisions, however, rather tend to mystify than to elucidate our subject; the fact is, as the foot consists of various parts, the different appearances and arrangements of these parts will admit of almost as many varieties as the arrangement of an equal number of the letters of the alphabet.

On Shoeing.

Such a variety as obtains in the shape and disposition of horses' feet must necessarily demand a corresponding difference both in the shape of the shoe, its application to the foot, and the preparatory treatment of the latter before the former is applied. No one system will answer for all cases; neither can the same principle be always adopted. It is in some measure owing to this fact, that so many different sorts of shoes which have been at various times introduced after being tried for awhile, have been found wanting, and have gone into disuse, or perhaps sunk into oblivion.

Preparing the Foot. The subject of paring has not escaped the fatality which seems to have attended nearly every matter connected with the foot. It has been the subject of the most opposite and contradictory opinions; some contending that it ought to be pared extensively, others forbidding altogether the application of the drawing knife. *Medio tutissimus ibis.* The most judicious plan we shall find to lie between the two extremes, and we shall best arrive at the truth of the matter by keeping in view the nature of the particular foot to be treated.

In a state of nature, the growth of the foot, and the wear and tear are, generally speaking, pretty equal; when the latter exceeds the former, the animal becomes tender-footed, which induces him to rest till the horn becomes replenished. This is the case in South America, where horses run wild in large droves, and are caught as required, worked till they are tender-footed, and then rested until they again become sound.

Our object in paring the foot is to make the removal of horn equal to the growth of the foot; to do that, indeed, which would have been done by wear and tear if the horse had been unshod, and taking his natural exercise. We see the effects of not paring in some horses in whom the shoes are allowed to remain on for some months without being removed; the crust becomes amazingly long, the sole thick, and the animal trips and stumbles at every step. This inordinate growth of horn is more frequently perceptible in asses whose labour is usually light, and whose feet are neglected from motives of economy. In these animals we sometimes witness the crust double the ordinary length, and curling up so that the toe does not meet the ground at all. These cases show that the foot requires paring as a substitute for its natural wear, from which shoeing relieves it; and it is also necessary, in order to have at each time of shoeing a fresh portion of horn for the attachment of the shoe by means of the nails. Some years since very extensive paring of the feet was advised (the frog, however, excepted); at the present day many veterinary surgeons seem inclined to run into the opposite extreme—the butteris having long since been consigned to oblivion, they seem somewhat disposed to assign the drawing knife to a similar destination. This, however, is carrying an amendment to too great an extreme. In preparing the foot for the shoe, after carefully removing any old stubs that might remain, the crust should be lowered with the rasp from the toe to the heels, which being done, the sole should be pared with a drawing-knife. It will generally be seen, that if the foot has been previously stopped, the old flakes of horn can be removed without any difficulty, and they present somewhat the appearance of cheese rind, and altogether different from the tough firm horn found above. Care must be taken to remove a portion of the horn between the crust and bars, so that the heels of the crust should be higher than the heels of the sole. Generally speaking, the removal of these flakes and ragged portions will be sufficient. The bars will simply require cleaning out, removing any loose portions without diminishing their strength in the least degree. The heels, that is, the junction of the bars with the crust will sometimes curl inwards; if so, they should be straightened by the removal of a little horn. It was once almost a general, and still is, a frequent custom for smiths to open the heels as they termed it, by cutting away a great portion of the inferior and posterior portion of the bars — this they thought extremely clever. It certainly, by widening the commissures, made a narrow foot appear wider, but it requires no argument to show that its effect must be to weaken the heels, by withdrawing a great portion of one of the walls or buttresses which constitutes its strength, and thus it assists contraction.

Some gentlemen on sending a horse to the forge, give instructions that the frog is on no account to be touched. Now this is very unwise, for although smiths are always inclined from the facility of the operation to cut the frog unnecessarily, and therefore require to be checked, yet the total abstinence of the knife is likely to predispose thrushes, or if they exist, to render them worse. The frog will grow too luxuriantly and become ragged, inasmuch, as in the shod foot it cannot receive the same wear and pressure that it would if unshod. In consequence of this, the frog often touches the bars, having a vacant space above, which serves to harbour wet and filth, by which thrushes are often produced. Now the commissures ought to be cleaned out so that their deepest part can be seen, and as much of the frog removed as is necessary for this purpose. All ragged portions of the frog should be removed; and if there be any cracks into which the dirt has penetrated, they should be cut out as far as the dirt extends. Thus far the knife should go, and no further; the frog must by no means be cut away merely because the smith fancies it to be too large. It must be evident, that some feet will require little or no paring whatever, beyond the removal of loose irregular parts — the heels of such feet require to be preserved with the nicest care. In weak feet more particularly, though in all feet it is desirable that the removal of the horny sole at the heels should be accomplished with a small drawing-knife; for, if a large one be used, the bars in all probability will be cut away with the sole, and thus the heels will be injuriously weakened. In other feet, the growth is so great as to require a considerable removal of horn at each time of shoeing. Thus, no fixed directions can be given for the removal of horn in all cases —

it must be determined by the nature and condition of the feet.

The foot being prepared for the shoe, it next becomes us to consider the best form of shoe to be applied.

Some persons have fancied that horses, if used to it from their youth, could work without shoes. The plan, however, has succeeded only in very few cases, and that with horses that are worked very lightly and slowly, and on sandy soils. For fast work, on our macadamised roads, or for slow work, in a flinty or gravelly country, it is impossible to obtain from the horse the full benefit of his services, unless we avail ourselves of the assistance which shoeing affords.

In a state of nature, or on soft soils, the crust, bars, frog, and sole, all assist in supporting the weight of the animal; and perhaps in the same proportion as the order in which we have mentioned them. If it were possible, therefore, to invent a shoe, that would enable these parts to support weight in the same proportion as in a state of nature, this would certainly be the best shoe that could be applied. This, however, is impracticable, inasmuch as it is necessary, in consequence of its durability, to apply an unyielding metal. We are therefore obliged to select that part which can best support the weight, and bear with the least injury the insertion of nails. This part is the crust, which in a state of nature supports the greater part of the weight, but on the smooth hard road is obliged, with occasional exceptions, to support the whole. It is impossible to afford to the sole that moderate degree of pressure that would be useful, and therefore we are constrained to remove it from pressure altogether.

History of the Art. — We find that horse-shoes were spoken of amongst the ancient Romans, but they were not attached to the foot by means of nails, but by bands going round the legs, and thus formed were only used on particular occasions.

We are told that the earliest nailed shoe, of which there is any record, was found at Tournay in Flanders, in the coffin of Childeric, king of France, who died in the year 481.

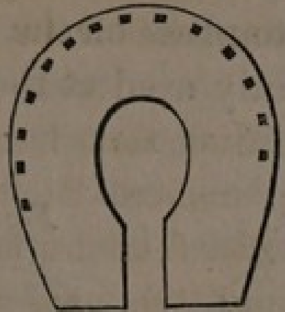
Mr. B. Clark describes two very ancient horse-shoes, found near Silbury Hill in Wiltshire, which, he considers, can vie with that of Childeric in antiquity.

In the history of the first crusade, we find that the poor people, stimulated by the eloquence of Peter the Hermit, shod their oxen, as well as their horses, to enable them to travel better on their way to the Holy Land. The practice of horse-shoeing must have been formerly a more honourable office than at present, for we find that William the Conqueror gave to Simon St. Lis, a Norman, the town of Northampton, and the hundred of Falkley, then valued at forty pounds *per annum*, to provide shoes for his horses.

The first writers we have on the subject appeared in the reign of Queen Elizabeth, and they give numerous plates representing different shoes then in use. It is surprising how little improvement there has been in the practice of shoeing, from this time to comparatively a recent period.

Varieties of Shoes.

Fig. 13. *a.*



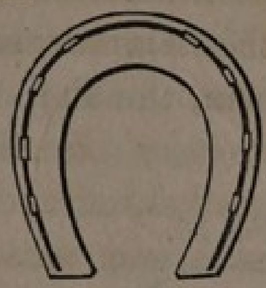


Fig. 14.

Fig. 13. *a.* A copy of a drawing of an old English shoe, from Mr. Clark, of Edinburgh, having no less than fourteen nail holes.

Fig. 14. A common English shoe, from Mr. Goodwin's work on Shoeing (ground surface), with eight nail holes, approaching very near the heels.

The Old English Shoe.—In the plate of this shoe, contained in the work of Mr. Clark, of Edinburgh, it appears to be a very large piece of iron, nearly covering the whole of the lower surface of the foot, and pierced with a great number of holes for the nails. In Mr. Goodwin's work, it appears as a somewhat more shapely article, and presents an inclined plane, from the outer rim to the inner, on the foot surface; the latter rim being very little, if any, thinner than the former. The ground side is somewhat convex, the inner rim projecting more than the outer. The effect of this shoe is to place the foot in a sort of hollow dish, which effectually prevents its proper expansion, the crust resting upon a mere edge instead of a flat surface; and on the ground side, from the inner rim coming to the ground first, the weight is almost entirely supported by the nails and clinches, which are placed four or five on each side, at some distance from the toe, and approaching pretty near the heels. It was somewhat an improvement on this shoe, to make the ground surface flat, and the inner rim on the foot side gradually thinned with the hammer, so as not to press on the sole. In this form, the shoe is frequently used at the present day.

Fig. 15. *Fig.* 16. *Fig.* 17.

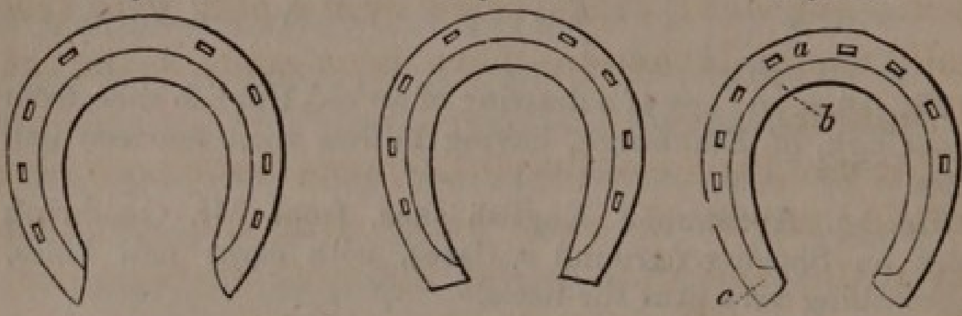


Fig. 15. A seated shoe, recommended by Mr. Clark, of Edinburgh, and taken from his work (the foot surface); objectionable, from the nails being placed so near the toe.

Fig. 16. A seated shoe, from Mr. Goodwin's work.

Fig. 17. A seated shoe, used a few years since at the Veterinary College, showing the nail holes placed at some distance from the heel, particularly on the inside.

a, the level part of the shoe, on which the crust rests.

b, the seated or concave portion.

c, the heels, bevelled outwards, forming an inclined plane, to assist the expansion of the foot.

The Seated Shoe.—The introduction of the seated shoe, for which we are indebted to Mr. Osmer, was a very great improvement in the art. It consists in having the ground surface flat, and on the foot side a narrow surface, on the outside rim (about a third of the shoe in width), for the crust to rest on; the heels of the shoe, for the space of an inch, being altogether flat. The remainder of the upper surface is seated or hollowed out, so that the inner rim is not more than half the thickness of the outer. It was not, however, till this shoe had been advocated by Mr. Clark, of Edinburgh, and practically introduced and extensively employed by Mr. Moorcroft, that it succeeded in supplanting the old method. This shoe has been improved by making the upper surface slope outwards at the heel, the object of which is to assist the expansion of the foot. Since this time, now fifty years ago, there have been a vast number of shoes invented, and patents obtained for many of them; but until within a few years past, very few really useful inventions have been made in the art of shoeing.

The late Professor Coleman stands first on our list, as being one of the most persevering and prolific, but at the same time one of the most unsuccessful, of inventors. His favourite theory was frog pressure, to accomplish which he invented a shoe, the toe of which was double the thickness of the heels. The evils of this shoe in a practical point of view scarcely need pointing out. The strain on the flexor sinews it occasioned — the disposition to stumble from the thickness of the toe, and the want of protection for the heels, were soon found to be insuperable objections to its general introduction. The Professor afterwards invented his frog bar shoe, and his oblique bar shoe; but, however useful they might be for individual cases, they are by no means calculated for general use.

Fig. 18.

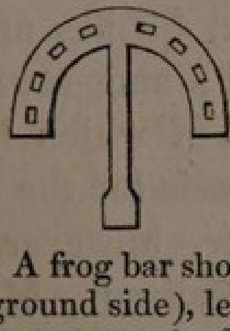


Fig. 19.

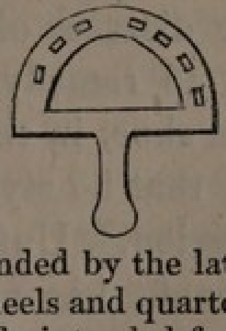


Fig. 18. A frog bar shoe recommended by the late Professor Coleman (ground side), leaving the heels and quarters free, and affording pressure to the frog. Chiefly intended for contracted feet.

Fig. 19. A frog bar shoe recommended by Mr. Simonds.

The first of these shoes has a bar extending from the toe to the frog, being intended to afford pressure to it; the other has a bar extending from the toe to one of the heels; in both, the shoe itself only extends round the toe, leaving the quarters and heels uncovered. These shoes, though useful in the stable, to encourage the growth of weak heels, or to alleviate contracted feet, are found, if used in work, to be extremely liable to be cast, the bar acting as a lever in tearing off the shoe.

Fig. 20.

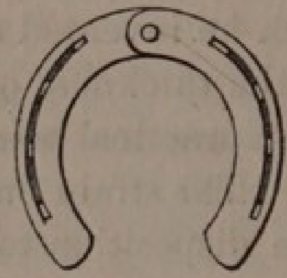


Fig. 20. Mr. Bracy Clark's expansion shoe (ground side), showing the hinge at the toe, intended to permit the expansion of the shoe with that of the foot.

Mr. Clark's Expansion Shoe. — Mr. Bracy Clark has bestowed considerable attention to the subject of shoeing, and has written on the matter very voluminously. Regarding the shoe, or rather the nails, as being the principal source of contraction and other diseases of the foot, he has applied his ingenuity to remedy the evil; and at length he invented a shoe, in the success of which he was so sanguine, that he styled it a basis for the repose of the profession. Unfortunately, however, the expected benefit has not been realised. Mr. Clark's invention was a seated shoe, composed of two halves joined together by a joint or rivet situated on the inner side of the toe, so that the shoe can be expanded or contracted by pressure with the hand. Mr. Clark conceived that the shoe would be expanded by the animal's weight pressing on the foot, and contracted by its removal.

The principle of the shoe is good, no doubt; but, from several causes, it is found to fail in practice. It is in the first place complicated; the movement of the shoe is likely to be prevented by dirt insinuating between the pieces at the place of approximation; then, again, the rivet is likely to be worn through, and the horn injuriously worn by friction; and lastly, it is constructed on the principle that the foot contracts and expands like a bow or piece of bent whalebone; whereas we have shown by experiment, that the expansion of the front of the foot bears no proportion whatever to that of the quarters and heels.

Mr. Clark, however, deserves considerable credit for his unceasing labours on the subject of shoeing, as well as the foot generally.

In the year 1820, Mr. J. Goodwin published a very excellent treatise on Shoeing, and a few years afterwards a second and improved edition.

Mr. Goodwin's work embraces the diseases connected with shoeing; the modes of shoeing practised in different countries, with their advantages and disadvantages; it slightly notices the structure of the foot, and contains some excellent remarks on the subjects of paring and nailing. Mr. Goodwin approves of the French plan of shoeing, in preference to the English; and concludes with recommending for general adoption, what he calls the French modified shoe. The French shoe is convex to the ground, and concave to the foot, so that when the foot is at rest on the ground, neither toe nor heel touches it.

Fig. 21.

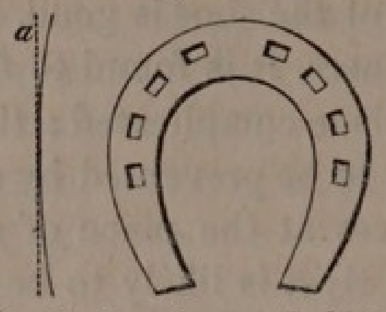


Fig. 21. The French shoe (ground side), showing very large nail holes.

a, shows the rounded shape of the shoe, being elevated both at the toe and the heel.

The nails are driven shorter and more obliquely than on the English plan, and not so near the edge of the crust. The nail holes are punched very largely, without fullering, and the nail with a square head is made to fit it. Mr. Goodwin approves of this plan, with the exception of the convex ground surface, which, in his modified shoe, he makes concave, preserving, however, the turning up at the toe. These shoes were cast of various sizes, so as to fit different feet; but I believe the practical objections to cast iron shoes were found so great, as to prevent their general introduction, and they are now gone into disuse.

The Leather Sole.—The next improvement in shoeing, was the introduction of the leather sole, for which, I believe, we are indebted to Professor Sewell. It consists in having a stout piece of leather, cut exactly the shape of the shoe, covering the sole and frog, and applied between the foot and the shoe.

In the application of the sole, it is requisite first to soak it in water a short time, in order to render it more elastic and softer, and to apply a stopping to the sole, so disposed as to fill up the vacancies formed between the bar and frog, so as to prevent any gravel or dirt penetrating. The stopping we have found best adapted, and most convenient, is composed of two parts of tar and one of fat melted together, and applied on tow. Some little tact is required in disposing the tow, so as to fill up the vacancies we have mentioned. This is best effected before the application of the shoe, by the smith taking a pledget of tow of tolerable size, first doubling, and then twisting it in the middle; then dipping it into the mixture, the twisted part is applied to the commissures, and the ends spread loosely over the sole: this done on each side, the shoe and sole are nailed on in the usual way. The advantages of the leather thus applied are manifold. It diminishes concussion in a considerable degree, by its interposition between the iron and the foot. It preserves the elasticity, and stimulates the growth of the sole, at the same time that it protects it from the effect of nails and sharp flints. It preserves the frog likewise from injury, and from undue moisture, the source of thrushes. It strengthens the crust in weak feet, particularly at the quarters and heels; and affords to the sole and frog, when the surface of the ground is the least irregular, that moderate degree of pressure which it meets with in a state of nature. It may likewise be observed, that, in hot weather, the iron of the shoe becomes considerably heated by long continued travelling; the leather, being a slow conductor of caloric, must necessarily prevent the heat from being communicated to the foot. The disadvantages attending the leather sole are very few. The shoe is certainly rather more likely to be torn off with, than without it, from the greater depth of material to be nailed to the foot; but while this circumstance precludes its adoption in the hunting field, except under particular circumstances, it is by no means sufficient to prevent its advantageous employment on the road. Although the use of the leather sole, is by no means confined to the summer, it is yet at this season of the year that its many advantages are more particularly called into requisition. For my own part, I should advise their employment, for weak or flat feet, all the year round, and, during the summer months, for all horses used on the road, where the additional expense is not regarded. This additional expense will generally be more than compensated by the better condition of the feet, to say nothing of the many broken knees that will be also saved.

The Unilateral Shoe.—The next great improvement in the art, and one which, in justice to its merits, we must characterise as the most important hitherto noticed, consists in applying the nails round the toe, and on the outside quarter, but leaving the inside quarter unfettered. The advantages of this method may be readily seen. The foot, we have seen, expands, or ought to expand, whenever the weight comes on the ground; and this expansion is greatest at the heels and quarters. Now, in the common shoe, the effect of the nails at the quarters must be to resist this expansion. If, therefore, the nails on one side be removed, so that those on the other have no antagonists, the same effect will be produced as if they were removed on either side, on the same principle as a common vice operates, one side being moveable, and the other fixed. A shoe on this principle has been applied for many years, for cases of cutting, the nails being removed from the inside quarter for this purpose only; and it was from witnessing the effect of this shoe in a contracted foot, though applied for cutting only, that first induced Mr. James Turner to recommend its general application. The merit belonging to this shoe is, therefore, due to Mr. Turner, quite as much as if he was its original inventor; and the author reflects with pleasure, that he was one of the first to give the plan a trial, and the very first, after Mr. Turner, to make its merits known to the public, (See *Veterinarian*, vol. iii. p. 271.)

Fig. 22.

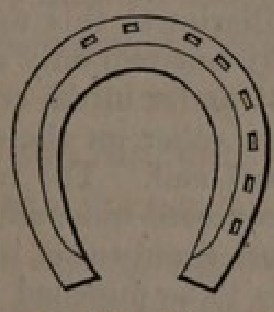


Fig. 23.

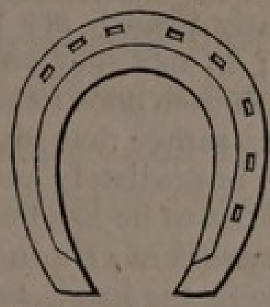


Fig. 22. Mr. Turner's shoe (foot side), showing six nail holes on the outside, and two only on the inside, of the toe.

Fig. 23. Mr. Turner's shoe modified, having an additional nail on the inside, and one less on the outside, of the foot.

It would be well, perhaps, to describe the shoe which I make use of, as it is a slight modification of that used by Mr. Turner.* It is, then, a seated shoe, with the flat part rather wider than common. The web of the shoe for a moderate-sized horse, used on the road, is about an inch in width, but varying according to circumstances, and being narrower at the heels, where the upper wearing surface is very slightly bevelled outwards, than at the other parts. The ground surface quite flat, sometimes fullered, and sometimes stamped; but when the former plan is adopted, the fuller is not deep, or too near the edge, but somewhat wider than common. Three nails are stamped on the inside toe, and five on the outside toe and quarters, with a clip at the toe, and another at the outer quarter. Sometimes, instead of a clip at the toe, the shoe is turned up in the

* When I say the ordinary or common shoe, I mean that well-wrought piece of iron, commonly applied in the principal forges of London and its vicinity, under the appellation of the *seated shoe*, of equal thickness, toe and heel. The flat margin of the foot surface of this shoe, on which the crust rests, should be strictly level, particularly on the inside quarter, as any burr or edge would tend to impede the expansion of the hoof. Clips, judiciously placed, are important auxiliaries to this mode of nailing; in fact they are indispensable; but two only are necessary to each shoe: the clip in front, I prefer in the centre of the shoe, rather than the inside toe; the other on the outside quarter, immediately anterior to the heel nail. The number of nails not to be less than seven, nor to exceed nine, and to be thus disposed of: six in the outside quarter and toe of the foot, and two in the inside toe; no nail hole to be punched immediately in the centre of the toe of the shoe, thereby avoiding any inconvenience which might arise from the joint pressure of the clip and nail at this part; but the first nail hole to be punched to it at the outside toe; and the remaining five as far distant from each other as possible, without the last nail approaching nearer the outside heel than is consistent with the safety of its insertion: the first nail in the inside toe to be punched full an inch from the outer edge of the clip. — *Turner on the Navicular Disease.*

French fashion, as recommended by Mr. Goodwin: this plan is very advantageous, where horses are in the habit of hitting their toe and tripping, or wearing it in undue proportion. When this shoe is applied, in consequence of the nails being absent from the inside quarter, there is a small space, enough for the insinuation of a flattened straw, between the inside heel and the shoe. I have applied this shoe to a mare of my own, for the last nine years; and she had, till I parted with her, a few months since, preserved her feet in excellent condition. In contracted feet, the application of this shoe has materially enlarged the foot,—quite as much as it is desirable to do; indeed, I think, if it were applied early, contracted feet would be altogether avoided. It is also calculated, in great measure, to prevent corns, from bearing so easy on the inside heel.

The principal objection that has been urged against it, is, that it must be more liable to be cast than the common shoe. This, however, is found not to be the case in practice; and it can, without much difficulty, be shown why it is not so. In the first place, there is no scuffling between the nails and the foot, the latter endeavouring to expand and the former to prevent it, as with the common shoe: then, again, the nails are driven into the strongest portion of the foot,—the toe and outside quarter; for it is well known, that in nearly every foot, the inside quarter is the weakest. If there were no nails, either on the outside or inside quarter, the shoe, it is evident, would be readily cast, for the weight of the heels would act as a lever in displacing it, the fulcrum being at the toe. It is necessary, however, that both quarters should be free, in order for this to take place; if the shoe be confined on one side, it is almost the same as if confined on both; for there is no longer a fulcrum at the toe, as before, as long as the outside quarter is firmly attached to the hoof. It must be acknowledged, however, that this reasoning has more particular reference to the road; for, in the hunting field, there is another cause which operates in casting the shoe, viz. the suction of the soil, particularly on heavy ground; and this cause must operate more effectually, when side nailing is employed, than otherwise.

When it is found necessary to apply the leather sole, in conjunction with side nailing, it is sometimes requisite to rivet the leather to the inside heel, or near it, otherwise the sole will be apt to shift its position, and allow dirt to harbour between it and the foot.

In wide flat feet, side nailing is unnecessary; there is no danger of contraction taking place in this description of feet, for they have rather a tendency to expand too much. The nails, therefore, should be placed where they can be best secured,—taking care, however, for several reasons, not to approach too near the heels. For these feet, the shoe should be much wider in the web, than for others; by which means, greater protection is afforded to the sole, and, from the ground surface being more extended, concussion is lessened.

The Hunting Shoe.—In shoeing hunters, there are several evils to be guarded against, to which other horses are not exposed. They are more disposed to cast their shoes, from the suction of heavy or wet land; and they are more liable to overreach, from the nature of their leaps, and the inequality of the ground. The first is a great evil, inasmuch as the sport may be lost, and the horse lamed in consequence; and, therefore, every means should be used to avoid it. If the foot is large, an additional nail may be placed on the inside, and the web of the shoe must be considerably narrower than for road purposes: no evil will result from this, because, in the field, the pressure on the crust is, in a great degree, relieved by the sole and frog. There must be space for a picker to pass between the foot and inner rim of the shoe, but no more, as the foot can then be withdrawn from heavy soil with less difficulty than when the usual space is permitted. To avoid overreaching, the heels of the fore shoes should scarcely project beyond the heels of the crust, and they should be rounded off, instead of being left square, as is usually the case. The hind shoes should also, where there is any disposition to overreach, be square at the toe; set a little within the crust; and the inner rim at the toe should have a piece cut out, so that, instead of a sharp edge, there should be a rounded surface, which, of course, is not so likely to catch the heels of the fore feet. Mr. Goodwin recommends his modified French shoe, more particularly for hunting; and certainly it appears better suited for this purpose than for the road. Its concave ground surface enables it more securely to grasp the soil, and therefore, in slippery countries, it must be useful. It is, however, objectionable for the road, inasmuch as it lessens the surface of contact with the ground, and thus increases concussion. A shoe seated on the ground side, and the upper surface level, is by no means a bad shoe for hunting, particularly if the ground be hilly and slippery.

Shoes for Race-horses.—Mr. Darvill, veterinary surgeon, in his work on the Race-horse, recommends "the surface of the shoe, next the foot, to be perfectly flat, but the surface next the ground should be gradually bevelled off all round, from the nailing part to the inner edge, to give a horse a firmer hold on the ground with his feet."

We cannot do better than introduce, at this place, Mr. Darvill's observations on plating Race-horses, as they are founded on practice and experience.

"Racers should always be plated before they are brought to post, where it can he done with safety. All men conversant with the turf are fully aware of the very great importance of weight. They consider, and very justly too, that every ounce is of consequence, when horses are supposed to be equally matched, and more particularly when they have to come long lengths."

As an accident may happen, even under the best and most careful hands, it is advisable "to plate horses the evening before running, after their coming in from exercise. On the morning that a horse is going to run, it is usual to walk him out on the heath, and then let him take a short canter, merely to see if all is right, and he is well on his feet and legs. If the horse is observed to go stiff or short, and if the groom is of opinion that this is occasioned by any thing wrong about his feet, there will be time to remove the plates, and to give the nails less hold or a different direction."

As directions to be attended to in plating horses, Mr. D. observes, "If there is any difference to be made between the size of the shoe and that of the plate, it is that the latter should be rather less than the former in its circumference round the foot, so that the plate may, to a certain extent, rest in the bed which may have been formed by the shoe. The plate should not, by any means, project beyond the edge of the hoof. And as the crust or wall of the hoof that has often been plated may be more or less broken, the groom should direct the smith, as he is measuring the foot, to make his observations on the most sound part of the crust; and as the nail-holes of plates are placed farther apart than those of shoes, it sometimes gives the smith the advantage of driving his nails into the more sound parts of the foot."

"As plates are narrow, they cannot well come in contact with the sole: they may, therefore, be made flat on both sides. For moderate-sized horses, plates need scarcely ever exceed in breadth three and a half eighths of an inch. The fullering cannot, well, be too coarse, provided it does not too much weaken the plate: it must be made in the centre. The depth of the fullering must be regulated, and the nail-holes punched in it, according to the substance of the plate and the size of the nails likely to be used in putting it on: the heads of the nails (when driven home) should be buried, and on a level with the surface of the plate. In good feet, the nail-holes should begin where the toe may be said to end. There should be four nails on each side: the first and second nail-holes from the toe may be punched an inch or more apart. Be this as it may, the smith must observe to regulate the distance here between these two holes so as to admit of his punching the third within the distance of about an inch and a half of the end of the heel of the plate; and in the centre of the space then left, between the third nail-hole and the end of the plate, the last hole of the four should be punched: otherwise, the plates, particularly of the fore feet, will spring at the heels, from the concussion produced by severe running upon hard ground."

The plate may be either a *full plate* or a *three-quarter* *plate ;* the differences being in their length at the heels, and the latter "seldom requiring more than three nails on each side." "A three-quarter plate is more generally used for country plate horses ; their feet having got out of order from repeated running and travelling, together with the necessity there is of frequently removing their shoes and plates. Some horses' feet will allow of a plate of this sort coming within half an inch of the end of the heels ; and others may not allow of its coming within an inch or more. It is the soundness and substance of the horses' heels and quarters which must regulate the length of the plates." "If a horse is a long striding one, and a free runner, he is likely to be rather a difficult one at his turns ; and although it may show bad judgment to run such a horse over a small round course, yet, if such should happen, it may be advisable, for the safety of both the rider and the horse, to give the latter some hold of the ground, by turning up the heels of his hind plates."

"Whether the plates shall be put on in the stable or on the course, will depend on the distance of the one from the other, and also on the kind of feet the horse may have."

"In removing shoes from bad (weak) feet (for the purpose of plating them), the smith should first knock up the clinches with one end of the buffer, and then with the other start the nails, and afterwards draw them out with the pincers, one by one.

"In putting on the plate, it will be observed, that, if the horse's shoes should not have been removed for three weeks, the hoof will have grown, and from the action and weight of the horse, the shoe will in some degree have imbedded itself into the foot. To this foot, nothing should be done if it can be avoided ; but the plate will lie within the seat or bed formed by the shoe, which will support and assist in keeping it in its place, though sometimes it may be necessary to run the rasp lightly round the edge of the crust."

The sizes of nails generally used for plating, are from Nos. 4, 5, and 6.

"If a horse, after running, has a long way to walk from the course, his plates should be carefully taken off, and his shoes put on. When he walks home in his plates, it is a practice with some grooms to have the plates removed in the stable, and let the animal stand bare-foot. Of this I do not approve. A horse can bear his own weight, and stand or move about in his stall or box, with much more ease to himself when his shoes are on."

"It used to be the custom (and a very excellent one) to foment a horse's legs and feet after running. I should, after that, put wet pads round the crust of the fore-feet, and stop the bottoms with wet tow, before the stables are shut up at night."

"If a horse's feet are weak and low, and he has to run on hard ground, it would be advisable to let him run in his shoes."

Fig. 24.

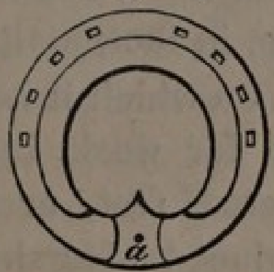


Fig. 24. The bar shoe (foot side).
a, a piece of leather riveted to the shoe, in order to bear upon the frog.

The *Bar Shoe.*—There is no one shoe that has better stood the test of time and experience than the bar shoe, but there is none that requires more tact in its application, for, unless properly and carefully applied, it is worse than useless: we find, notwithstanding its somewhat clumsy appearance, that many horses can go in a bar shoe, when they can go in no other. Its advantages consist in offering a very extended surface for contact with the ground, thus lessening concussion, and, on the foot side, in saving those parts from pressure that are unable to bear it; and thus it is particularly serviceable in cases of corns, weak heels, and sandcracks. It should be flat on the ground, and the web of nearly equal width throughout. It should rest lightly on the frog, or rather there should be a slight space between it and the frog, when the foot is off the ground, which will, when the foot is on the ground, afford sufficient pressure, without its being too great. It is well to rivet a piece of leather to the part opposite the frog, which will afford a better surface for it to rest on. We shall again have occasion to speak of this shoe, when noticing the diseases for which it is more particularly applicable.

Professor Coleman introduced a frog bar shoe, as he termed it. It is, in fact, a tip, with a bar from the toe to the frog, on which it is intended to press: it is not applicable for work, but is useful in the stable, for contracted feet, or weak heels. Mr. Simonds also introduced a bar shoe, somewhat similar, but rather preferable, inasmuch as it is not so likely to be torn off. It consists of a tip, with a bar across from one heel to the other, and another bar proceeding from the middle of the former one, and pressing on the frog. (See *figs.* 18, 19. p. 115.)

Tips are half shoes, going round the toe, but leaving the heels and quarters free. They are chiefly used for horses at grass, or in the straw-yard, as they protect the crust, which is very much disposed to break away if left unshod, and yet leave the quarters and heels to expand. They have even been recommended to be used on the road; but their employment must be very limited in this respect, as they are calculated to throw greater weight upon the flexor sinews, by lowering the heels, than these tendons ought to bear, and they expose the posterior parts of the foot to injuries from flints and nails. And, as the principle on which they are applied can be accomplished by side nailing, I can see no reason for exposing either the horse or the rider to the risk that must attend their adoption on our macadamised roads.

Shoes for striking or cutting.—A great number of horses are in the habit of striking one leg against another; and a great deal of ingenuity has been at different times exercised in search of a remedy for this very troublesome practice. Both the fore and hind legs are subject to cutting, the latter, perhaps, most frequently; but in them it is confined to the fetlock joint, whereas, in the fore legs, the horse may hit either the fetlock, the leg, just above the pasterns, or just under the knee, where it is called a speedy cut, from its occurring chiefly in fast action. It is desirable, before applying a remedy, to ascertain, if possible, the cause, and the part which strikes, whether the shoe or the foot, and, if the latter, what part of it. Many horses strike from weakness, and cease to do so when they gain strength and condition. This is more particularly observable with young horses. Others cut from a faulty conformation of the limbs, which are sometimes too close to each other; and sometimes the toe is turned too much out, or too much in: when the toe is turned in, the horse usually cuts just under the knee.

The objects to be kept in view, in shoeing such horses, must be to remedy, as much as we can, the faulty action, and to remove, if possible, the part which cuts. The part of the foot which strikes is generally that between the toe and the inside quarter, sometimes the inside quarter itself, but very rarely the heels of the shoe. If the horse turns his toe in, in all probability he wears the inside of the shoe most; and, if so, it should be made much thicker than the outside. If the contrary, the outside heel should be thicker than the inside. The shoe should be bevelled off, on the inside quarter, which should also be free from nails.

In the hind legs we often find that a three quarter shoe will prevent cutting when other plans fail; for here the part which cuts is not situated so forward as in the fore legs, so that the removal of the iron altogether from the inside quarter will often accomplish our aim. It sometimes happens that every plan we can adopt will not prevent cutting, and then the only resource is the adoption of boots. Mr. Moorcroft instituted some experiments to show that, when horses are shod thin on the inside and thick on the outside, they carry their legs wider apart than when shod level; and he therefore recommends this plan for all cases of cutting.*

* "To prevent a horse from striking the foot or shoe against the opposite leg, by which it is often bruised and wounded, is an important point, inasmuch as this accident occurs very frequently, and as it not only blemishes and disfigures the leg, but also endangers the safety of the rider.

I have known instances in which horses that cut at the fetlock in harness have ceased to do so when

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"The parts struck in the hind leg are the inside of the fetlock joint and the coronet; in the fore leg, the inside of the fetlock joint, and immediately under the knee; which latter is called the speedy cut, from its happening only when a horse goes fast.

"Young horses when first backed generally cut their fore legs, though naturally they may be good goers. This arises from their placing the foot on the ground too much under the middle of the breast, in order the better to support the burthen to which they are unaccustomed; but by degrees they acquire the method of balancing the weight with the foot in the same direction it would naturally have if they were without it. It may therefore be laid down as a rule with such horses, that until they regain their natural method of going, the edge of the inner quarter of the shoe should follow the exact outline of the crust, but should not be set within the crust, nor should the crust itself be reduced in thickness; as both these practices tend to weaken the inner quarter, and to deform the hoof. And here it must be observed, that the outer edge of the shoe should in all cases of sound feet follow exactly the outer edge of the crust, except just at the heel, where it should project a little beyond the line of the hoof.

"Horses with narrow chests have their legs near together, and are apt to cut when they begin to tire; and with these the practice just mentioned should always be employed. Horses that turn their toes much outwards are, of all others, most subject to cut. It has been asserted that this defect also happens to those who turn them much inwards; however, the author does not recollect to have met with a single instance of the kind in the course of his practice. In horses of the first description it has been long observed, that the inner quarters of the hoof were lower than the outer, and that the fetlock joints were nearer to each other than in horses whose feet pointed straight forwards. These two facts probably led to a conclusion, that if the inner quarters were raised to a level with the outer, and so much the more as they were made proportionally higher, that the fetlock joints would be thrown farther apart, so as to admit of the foot passing by the supporting leg without striking the joint. Accordingly, for the last two centuries at least, it has been usual to make the inner quarter used with the saddle. This must arise from the slower rate at which the horse usually trots in har-

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of the shoe higher than the outer; not only has this been the general practice, but it has been regularly recommended by every writer from that time to the present: and notwithstanding this method has very frequently failed of success, yet repeated disappointments have never led to the questioning of the truth of the principle. Nay, indeed, the reliance placed upon it has been so strong, probably from the simplicity of the reasoning on which it is founded, that, in the cases where it most particularly disappointed expectation, its failure was generally attributed to the practice not being carried sufficiently far, and accordingly the shoe has been still more raised on the inner quarter, and the edges of the crust and shoe have been filed away. When with these expedients it likewise failed, the last resource has been a circular piece of leather placed round the joint to receive the blow of the foot.

" It is now about four years since that a shoe with the outer quarter thick and the inner one thin was, for the first time, in the practice of the author at least, employed in a case which baffled many attempts on the old plan.

" On the first trial the horse ceased to cut, nor has he ever done it since; which can only be attributed to his having constantly worn the same kind of shoe. This circumstance did not then excite in the mind of the author any doubt as to the propriety of a practice which had so long been generally acknowledged, but was rather considered as an extraordinary exception. However, other bad cases, which occurred occasionally since that period, were treated in the same way, and with the same success. These facts, at length, led the author to conclude, that a practice which was so uniformly followed by success, in cases where the established one as uniformly failed, must necessarily repose on a better principle; although for a long time he was completely at a loss how to explain it; for if the action of cutting did principally depend upon the faulty position of the fetlock joints and the feet with respect to each other, and it appeared to be generally agreed that such was the fact, it should seem that a means, which by raising the outer quarters would throw the fetlocks still nearer to each other, would necessarily increase the defect in question; but as the reverse of this actually takes place, it might induce a suspicion that there exists some other cause of cutting which has been hitherto overlooked.

ness, to what he does with the saddle, the former, perhaps, about eight or nine miles, and the latter,

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"A minute examination of this point would far exceed the limits allotted to this division of the work; and, therefore, at present the author will confine himself to that part of the subject only which is absolutely necessary to be understood.

"For horses, therefore, which cut their hind legs, the shoe at the outer heel should be half an inch in thickness, according to the kind of horse and the degree in which he cuts. The web of the shoe should gradually become thinner until it reaches the toe, which should be of the ordinary thickness, and from which it should slope off, and end in a tip in the middle of the inner quarter. This shoe, in point of effect, would be equally proper for the fore feet, were it not that in such horses as are used for the saddle, the fore feet, being more charged with weight than the hind ones, are much more liable to be injured, and a horse thus shod on the fore feet might go unsafe; therefore it is expedient to let the inner quarters of the shoe be thin, and reach to the heel, but the outer edge should be bevelled off, so as to slope inwards. The same kind of shoe is equally well calculated to prevent the speedy cut; observing to bevel off still more strongly the part which strikes, and not to put any nails thereabouts. And here it may be proper to remark, that in sound feet the heel of the shoe should reach as far on the heel of the hoof as to admit of the angle formed by the crust and the bar resting fully upon it; but it should not be carried quite as far as the end of the heel of the hoof.

"In order to ascertain what would happen to a horse shod with different kinds of shoes, the following trials were made:—

"EXPERIMENT I.

"A horse with a narrow chest, who had never cut, and having parallel shoes on his fore feet, was trotted at about the rate of eight miles an hour in a straight line over ground sufficiently soft to retain slightly the impression of the shoes, but not to admit the feet to sink into it.

"Two parallel lines were drawn along the track, including between them the prints of the shoes. By these it was found that there was regularly a distance of nine inches and a half between the outer edge of the near fore shoe, and that of the near off shoe.

eleven or twelve miles an hour; in the latter action, which, being much easier, is usually preferred by the

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"EXPERIMENT II.

"Shoes thick in their inner quarter, and like a tip, reaching only half way on the outer quarter, were then used; and it appeared that the distance between the outer edges of the prints of the shoes, taken as before, were regularly reduced to eight inches and a half.

"EXPERIMENT III.

"The same shoes were placed on the opposite feet, so that the thick heel was on the outer quarter; and the result, under circumstances exactly the same as the foregoing experiments, was that the distance between the outer edges of the points of the shoes, was regularly increased to eleven inches.

"To account for these results, it is necessary to attend closely to the different effects produced by the weight of the fore part of the body, acting upon the two fore feet, when raised on the inner or outer quarters, during the opposite states of rest and action. And first, with regard to shoes raised on the inner quarter: Whilst a horse so shod is standing still, the fetlock joints are certainly thrown farther apart, than when any other kind of shoe is used. Hence it was concluded, that the limb which supported the body, would have its fetlock joint thrown so much outwards as to keep it completely out of the way of the foot in motion. But it appears that the impressions made on the ground by such shoes, are an inch nearer together than those made by parallel shoes, and two inches nearer together than those made by shoes raised on the outer quarter. And this may be thus explained: when the horse is at rest, the weight is supported equally by the two fore feet; but the instant one foot quits the ground, the weight is suddenly transferred to the other, and, by the outer quarter being lower than the opposite one, the fore part of the horse has a tendency to fall over the outside. To prevent this, the moving foot is suddenly brought close to the fetlock of the supporting foot, in order to relieve it by catching the weight, and the foot itself is placed on the ground too much under the middle breast. The same circumstance occurs to both feet in their turn; and the horse, being thus in constant danger of falling to one side or the other, is constrained to bring his feet near together, to horseman, the legs are lifted higher, and, consequently, above the cutting place.

Clicking. — Many horses have the very unpleasant habit of striking the toes of the hind shoes, against the fore shoes. The late Professor Coleman used to say, that this was a sure sign of a bad horse; but I take it, that most horsemen will agree that it is a fault belonging to some of the best, as well as the worst. It more frequently occurs with young horses, and they often click on the turf or soft ground, and not on the road. It arises from the too great activity or length of stride of the hind legs; the fore feet are unable to get out of the way in time: therefore, any thing which detains them, such as a soft or heavy soil, must assist the practice. The principal point to be remedied is the intolerable noise, from whence the evil derives its name, and this is often effected by making the

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preserve his balance, and in doing this strikes the foot against the opposite fetlock.

"It frequently happens, that the more the toes are turned outwards, the nearer the fetlock joints are brought together, and the more the horse is disposed to cut. However, this is true only to a certain extent; for if this faulty position of the lower part of the leg be carried artificially beyond a certain point, instead of producing an increased degree of cutting, in most instances it remedies the defect altogether. The reason of this is just the reverse of what takes place when the inner quarter is raised; that is to say, when the weight of the fore part of the body rests only upon one leg, it bears too much upon the inner quarter, from its being lower than the outer quarter; and thus the horse has a tendency to fall over to the inside of the supporting leg.

"To prevent this, the moving foot is thrown farther from the supporting leg, in order to maintain the balance, and thus the foot misses the fetlock joint."

hind shoes square at the toe, and leaving the toe of the crust somewhat projecting over the shoe, by which plan the crust receives the blow, instead of the shoe, and does not make any noise. It sometimes happens that, from the repetition of these blows, the crust is worn so thin at the toe as to produce or threaten lameness, in which case, the plan of shoeing we have advised must be desisted from, and we must put up with the noise to avoid the greater evil.

When a square-toed shoe fails in preventing clicking, it will sometimes happen that a shoe pointed at the toe will succeed, which no doubt arises from the circumstance of the shoe, having so small a surface to come in contact, it may therefore fail to strike the fore shoe, but may go within, or by side of it.

Overreaching is very often connected with clicking: horses in the habit of doing the latter are most disposed to overreach, and sometimes a large portion of the skin of the heels of the fore feet may be cut out by the hind shoe. The part of the shoe that does the mischief is the inner web of the front part of the shoe, which is often very sharp. The remedy, we have before observed, consists in cutting out a portion of the inner web of the shoe, and filing it smooth.

Dropping. — Some horses are in the habit of dropping both behind and before, which arises from weakness, and too great uprightness of the fetlock joints. In the fore legs, without a moment's warning, or hitting the toe, the horse seems suddenly to give way, and often comes down. In the hind legs it does not occasion the horse to fall, but it often induces him to give way very suddenly on one quarter, to the infinite annoyance of the rider's back, as well as his temper, and sometimes the horse goes lame for a while afterwards: the fact is, the horse knuckles over, and the front of the fetlock often comes to the ground. In the fore leg we can do nothing to remedy the evil in the way of shoeing, but in the hind feet I have, with the best results, had the horse shod on the following plan. The toe of the shoe square, and, if the horse does not click, slightly projecting beyond the crust, and rounded or elevated to the extreme, in the French fashion, as recommended by Mr. Goodwin for the fore shoes.

Dragging the Hind Feet. — Some horses, from weakness or faulty action, drag the hind feet so much that the front of the crust becomes worn away to a considerable extent, from the toe almost to the coronet. In such cases it is necessary to put a clip at the toe of the shoe, sufficiently wide and high as to protect the whole of the part which drags on the ground. If the horse clicks with this, we must put up with the nuisance: of two evils choosing the least.

It is needless to observe how much the preservation of horses' feet depends on the careful and skilful application of the shoe, independently of its being constructed on proper principles. Many horses, with very bad and weak feet, are enabled to go sound for years by this combination of care and skill, whilst with bungling hands a single shoeing would suffice to lame them. It requires considerable tact to fit a shoe properly on a bad and weak foot, so as to save the weakest parts, and economise the horn. Those veterinarians who, like myself, have large shoeing establishments, can bear testimony to the wretched specimens of shoeing that are often brought to our forges, more particularly from country places. It is very common, when an attempt at neatness is aimed at, to find the heels considerably too short, and corns produced in consequence. At other times, the upper surface of the heels of the shoe presents a rough depression in the middle, with two coarse projections on each side: this is done in rendering the heels of the shoe narrower than the other parts, and is the fruitful cause of corns. We often see the outside heel of the shoe considerably within the crust, and the inside heel without it, from improper fitting; at other times, the upper surface of the shoe is extremely rough and irregular, pressing too hard on some parts, and not at all on others, the nail-holes perhaps in the middle of the shoe, and carried very near the heels. These are a few of the many faults often exhibited in shoeing.

Fitting. — To fit a shoe properly, it ought to be made perfectly flat on the anvil, the foot surface having been rendered as smooth as possible; in this state it may be applied hot, though not red hot, to the foot, for a few seconds, when the parts that are above the level are affected by the heat, and should be reduced. Some persons object to the application of the hot shoe to the foot, but their grounds for objections are more imaginary than real. If the shoe be not too hot, or too long applied, I can see no evil likely to follow, and it certainly enables the smith to get a good and equal bearing for the shoe. The circumference of the shoe ought to correspond exactly with that of the foot; for the want of which it often happens that much horn is unnecessarily cut away, and the natural shape of the hoof destroyed. The shoes should bear lightly on the heels, particularly on the inside of the fore feet, and should extend about a third of its width outside the horn at this part, so as to allow for the expansion and growth of the foot. In the hind feet, care must be taken that the shoe does not project beyond the crust on the inside, but should be rather kept within it, so as to avoid cutting.*

Nailing. — However well a shoe may have been fitted, it will not answer its purpose, unless properly nailed on.

There is a great difference in this respect, even in men who have had the same opportunities. A bungling hand will perhaps nail the shoe on, however well fitted, with one heel too much without, and the other too much within the crust: in driving his nails, he may make several attempts at each

* It is scarcely necessary to point out the importance of sending a horse to the forge to be shod. Some gentlemen insist on having their horses shod in the stable; but they can scarcely be aware of the injurious consequences likely to attend the feet of their horses, or they would not do so. It is almost impossible to make the shoes fit so exactly as to require no alteration before they are nailed to the foot; and the consequence is, when the horse is not brought to the forge, if the shoe be too large, there is danger of cutting, and, if too small, the foot is cut away to make it accord with it. Besides which, the bearing is not likely to be correct; the shoe will, probably, press too much on one part, and too little on another.

nail before he succeeds, thus perforating the crust unnecessarily, and weakening it considerably; or he may drive the nails too high up, so that they are altogether buried in the crust; or too near the sensible parts, so as to occasion lameness; or he may fasten the shoe on so insecurely that it comes off in a short time; or he may nail it on with such force as to lame the horse. A good shoeer avoids all these faults, nailing on the shoe firmly, expeditiously, and cautiously; and he exhibits a superiority to the bungler both in the head and the hand, and, I doubt not, possesses in the latter a finer sensation of touch. On the subject of nailing, Mr. Castley has made some very judicious observations in the Veterinarian; he says: —

"Every nail that enters the hoof is to be regarded, more or less, as a wedge driven into wood, having a tendency to break and split it. Some hoofs, like some pieces of wood, are certainly much more difficult to drive than others; but the more numerous our wedges, and the closer we drive them, the more certain we are of splitting and breaking both the one and the other. The common practice with us in the British Isles, has always been to drive the nail along the centre of the crust, or outer wall of the foot, and as high as possible, in order to take a good hold; a method of driving the nail, it must be confessed, which gives it, as a wedge, its fullest force, and is often very destructive to the outer shell of the hoof. The French mode of nailing is much less objectionable in this respect: their nail-holes being punched much coarser, and with a direction outwards, the nails only traverse the crust obliquely; taking a short, but at the same time, a strong hold of it. This method certainly breaks, and injures the hoof much less than that in common practice amongst us, but it also has its objectionable points, as I have before observed. It should, at first especially, be put in execution very carefully, else some of the nails will be apt to make sideway pressure against the sole, and thus be the cause of lameness. It may not perhaps signify much, whether the nail-holes be simply stamped, or punched through what is called a fullering: in both, their direction may be the same, that is slightly slanting outwards. Their degree of hold, or distance from the outer rim of the shoe must depend very much, on the perfect or broken state of the horny box; but in no instance, are the nails to enter beyond the white rim, which marks the line of junction between the horny sole and bottom of the crust. If this system of nailing be carefully practised at first, and steadily persevered in, its advantages will be apparent.

"In putting this plan of nailing into execution, it is necessary to get a firm and sufficient hold; and the lower part of the crust should be allowed to grow as strong and thick as possible, which, it may be observed, it is never likely to do under a system that is continually splitting and breaking it. Rasping the hoof, with a view to give it a neat appearance on new shoeing, is, I am convinced, productive of much mischief to the crust, tending to weaken it, to make it thin and shelly, and consequently more easily split and broken by the nails."

Stopping the Feet. — The subject of stopping the feet has given rise to much difference of opinion, some persons recommending cow-dung to be applied every night, others clay, and some advise no stopping at all. The soles of most horses certainly become excessively dry and hard, unless they are stopped, and if brought to be shod in this state it is almost impossible to pare them. The only objection to stopping is, that it sometimes tends to produce thrush by its moisture: this however can be avoided by using linseed meal ground with the oil, as a stopping, instead of cow-dung. This certainly makes the best and cleanest application, and, as the same meal may be renewed several times, is by no means expensive, and can be obtained when cow-dung cannot be procured. Horses' feet should be stopped every night in the summer, and every second or third night in the winter. It is a good plan too, in hot weather, to apply wet cloths occasionally to the crust; and, if the horn is brittle, to anoint it with a mixture of tar and grease.

Ancient and modern Shoeing compared. — I cannot take leave of the subject of shoeing, without venturing a few remarks on the merits or demerits of the present system as generally practised, compared with that used many years ago, as well as that still practised in other countries. Many persons are very much in the habit of attributing almost all the diseases to which the foot is liable to the mode of shoeing generally practised. The hard roads, the killing pace, the long rest in the stable, and the often sudden alternation from this state to that of its very converse on the road — all these agents are accounted as nothing compared with the much abused shoe. I am by no means prepared to assert that the inflexible shoe is rarely a cause of lameness; but I am disposed to contend that, amongst all the innovations from nature which I have mentioned as productive of lameness, the shoe is by no means the most fertile source of evil.

Putting the last improvement in the art of shoeing, *i.e.* side-nailing, altogether out of the question, there is no one, I think, who fairly examines into the subject, but must confess that there has been a great improvement in the principles, and more particularly in the practice of shoeing, during the last half century. Mr. Clark, of Edinburgh, who wrote, for the time in which it was written, 1782, an excellent little work on shoeing, gives a number of plates, one of which represents the common English shoes as then used, and which appears to be a very large and broad piece of iron, nearly covering the whole of the foot, its foot surface in the shape of a dish, and having no less than fourteen nail holes, with calkins at both heels. Now, no one can doubt but what such a shoe must have been a fertile source of mischief. Its great weight must have materially assisted in exhausting the animal's strength, and distressing the laminæ, so as to produce laminitis in some cases, and, in others, pumiced feet: its coarse construction must have been the frequent source of corns, and its immense calkins that of quittors; while the number of its nails, and the high mode of driving them, must have frequently exposed the foot to pricks. And I think it will be found, that corns, pricks, treads, founder, and quittors, were far more common then, than at the present day. This sort of shoe, with some modifications, was used for many years after Mr. Clark's work was written, and even in the shoe which he recommends as the best that can be used, and undoubtedly a neater, lighter, and better article altogether than that just mentioned, we find the nail holes approaching quite as close to the heels as they are to each other. It is no doubt still the custom, in many places, to place the nails very near the heels, but, as a general rule, they are not inserted so far back as they used to be. And amongst the good effects of these improvements, we find that quittors are extremely rare, pricks less frequent, and contracted feet by no means so common as they formerly were; whilst the animal, at the same time, is enabled to travel with much less fatigue, from the comparative lightness of the shoe which he now carries, the wear of the iron, at the same time, being less.

French and English Shoeing compared. — It is notorious that French horses are comparatively exempt from many of those foot-lamenesses which prove so destructive to English horses. It is equally notorious, that their practice of shoeing, though possessing several excellent points, is yet very clumsy as regards its mechanical execution. A question naturally arises, Is this comparative freedom from foot-lameness to be attributed to their mode of shoeing? Amongst those who reply in the affirmative to this question, we find the very respectable name of Nimrod — respectable not only with sporting writers, amongst whom he stands undoubtedly unrivalled, whether we consider the elegance of his style, the raciness of his descriptions, or the correctness of his general views, but respectable likewise as one whose general knowledge of the horse and horse matters, and whose ardent zeal for truth, and candid acknowledgment of error, when wrong, entitles him and his opinions at all times to every consideration and respect.

Nimrod, in a communication to the *Veterinarian* in August last, remarks, that French horses scarcely ever have corns, and that the smiths scarcely believe in their existence. Now, when we consider that, in general, they use no drawing knives, and that it is impossible to cut out the seat of corn by means of a butteris, we may readily imagine that corns may exist in a great many cases, without their knowing it; and this idea accords with that expressed by Mr. Dawson, an English veterinary surgeon, residing at Boulogne-sur-Mer, whose letter, in the *Veterinarian*, I have had great pleasure in reading.*

* "In the *Veterinarian* for August, I find a letter from that clever writer, Nimrod, 'On the Comparative Diseases and Lamenesses of the French and English Horses.' In speaking of the foot, your correspondent says, 'I see no corns in France, and, what is more extraordinary, hear of none.' Now this astonishes me; for I really think, out of every six French horses that come to my forge, four of them have corns. It is true that the French smiths know little about the disease; but their want of knowledge does not alter the fact of their horses being subject to corns. An instance of this occurred to me the other day in my practice here. I was sent for to see a horse belonging to one of the diligence proprietors. I found him very lame, and in great pain; so much so, that he was down. Upon examination, I felt convinced that the mischief lay in the foot, and I mentioned my opinion to the owner, who, however, differed from me, and imagined it to be a shoulder case. I begged of him to allow me to send for my man, and to have the shoe taken off, to which he consented. The shoe being removed, we found him exceedingly sensitive in the seat of corn, and, after paring for some time (the sole being as thick and hard as board), down we came upon the evil, and, to the surprise of the owner, who had been watching the whole of the operation, we evacuated a considerable quantity of pus. Now the horse had been lame three weeks, evidently, from the corn which had gone on to suppuration, without the French smith being aware that the animal had any thing of the sort. But, allowing that he had been in possession of the seat of the disease, I believe his want of skill in paring the foot, and the horrid tools made use of for the purpose, would prevent the

The French shoeing possesses, no doubt, two very useful points, one being the turning up at the toe,

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possibility of his giving relief. The smith in question is decidedly the best workman I have seen among the French.

"With regard to the French system of shoeing generally, I do not disapprove of it for *heavy* horses. But how long would it answer for horses that go the pace of our English mail coach, and others, where the feet are rendered *brittle* and *bad* from the concussion of the hard roads? For my own part, I do not believe they would keep the shoes on a week. It is with horses that go the pace, which pace is the cause of diseased horn, that the art of shoeing is tested. I admit lamenesses arising from their nailing are not frequent. Seldom, also, are they found in cart and other horses, shod far in the country, in England. The reason is obvious; it is from the immense quantity of horn, with which the feet of all *naturally slow* horses are covered, thereby rendering the liability to injury from nails much less.

"At the commencement, allow me to state, that my experience among French horses is limited; it is therefore evident, from this admission, that I am incapable of giving a general correct view of the subject on which I am writing. But when I said that four out of six French horses that come to my forge had corns, it is still my opinion that I was correct in my assertion. This may in some measure be accounted for, from the fact of my French patrons being somewhat uncourteous to me, inasmuch as they seldom send me their horses until they are in such a crippled state, from feet diseases, either corns or otherwise, as to be almost useless to them; and, what is more singular, we have uniformly relieved these horses. This little fact strongly marks the superiority of the English over the French system of shoeing. I did not intend to convey the idea, that four out of six of them, taken promiscuously, are diseased with corns; nor do I disbelieve that there are many horses, both in France and England, that, with the exception of occasional intervals, work sound with corns. It is not extraordinary nor inexplicable to me, that the French smiths should not be more conversant with the proper treatment of foot diseases, when I see their veterinary surgeons making the blunders they do respecting the feet. For how many of their avowed shoulder lamenesses have I distinctly traced to the feet! I would not dare make this assertion, unless I could bear it out by the subsequent treatment of several of these cases; for and the other the custom of driving the nails very short. Both these plans, however, are adopted in the best English forges; the first, in very many cases, and the second in nearly all. Nimrod, in describing the shoeing of his horse, writes, "there are eight nails, none of which come out more than an inch from the bottom of the foot." Now it is very rare that this distance is exceeded in good forges in England. Mr. Goodwin, in describing the French shoe, says the foot surface is convex, *i.e.*, rounded, not only at the toe, but at the heels too. If this be the case, it requires but little argument to show that the plan would not succeed in Eng-

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it is notorious that we have given immediate relief, merely from properly paring and shoeing.

"Their attributing almost all the lamenesses of the fore extremities, when they cannot see or feel the cause, to the shoulder, appears not to have escaped the natural acuteness of Nimrod. His description of the French shoe is correct; and I am not bigot enough to deny that it possesses some good properties. They who are fond of frog-pressure—among which number is your humble servant, although not going the whole hog,—may have it to their hearts' content with this shoe. But surely, sir, this pressure, carried to the extent which it must be, is at the expense of tendons; and if the marks of firing and budding irons, with which we see so many legs scored, are any proof of it, there is no reason to doubt the fact. In conclusion, Mr. Editor, allow me to say, that with any affairs connected with the foot, we are many years in advance of the French; and also to suggest to Nimrod, (and it is with some diffidence I make the suggestion,) that the horses we have here, or at least such as we have in the neighbourhood, are not subjects on which to test good shoeing, for the feet of those ill-bred animals are singularly sound; and I believe it will be admitted, that the nearer we approach perfection in breed, so much greater is the predisposition to disease in the feet, and, consequently, difficulty in shoeing: therefore I say it is with the feet of well-bred animals only that we can decide upon the superior merits of French and English shoeing."

land, particularly with our light saddle horses, inasmuch as it would occasion great insecurity in the tread. Besides which, the great weight and clumsiness of the French shoe would be productive of far greater injury to our lighter and better-bred horses, than they are to French horses, whose feet, as Mr. Dawson says, abounds with horn.

It has been a subject of remark, not only to Nimrod, but also to many others, and amongst them to Professor Sewell, that the horses used in the French diligences are much freer from lameness than those used in the English coaches. This fact, I think, may be explained without much difficulty, by reflecting for a few moments on the sources from whence these vehicles get supplied with horses. In the English coaches, we know pretty well that three horses out of four are procured from racing and hunting establishments, or from private stables. If we were to inquire into the previous history of one or two teams of horses that it may be our lot to sit behind in one of our fast coaches in the course of a few hours' ride, we should find an infinite variety in the chequered lives of those animals, whom fate or the horsekeepers had at length connected (coupled) together. Let us suppose ourselves seated behind such a team as that in question. The near leader, perhaps, who seems ready to jump out of his harness the moment the expected signal is given by the coachman, and whose glossy skin and small head at once betrays his unstained aristocratic blood, is one on whom the highest hopes were once formed, but formed only to be disappointed, for the very price of his sire's embrace, to which his existence is owing, in all probability exceeded that for which his last owner purchased him. He was found too slow for racing, too small for breeding, too shaky in his fore-legs for a hack, and, consequently, he is condemned as a weed to carry the bars of a stage-coach. But, before he has reached this receptacle for the destitute, he has not escaped, unscathed, his former trials; he shows the effects of training, in the double or treble size of his suspensory ligaments: if he were a low-bred horse, he would, unquestionably, be very lame; but as it is, although he is much more *au fait* at galloping than trotting, his breeding carries him through, and he bears the bars gallantly to his journey's end. But, enough for him, let us bestow a few moments on his companion, a fine old three parts bred mare, who, unlike her partner, betrays no impatience at starting, but stands with one foot stretched out about a yard before its fellow. She moves off, decidedly lame; the coachman thinks it necessary just to let her feel (no more) the lash of his whip, which seems to act like magic in removing a portion of her lameness; for scarcely is the first mile accomplished before it becomes imperceptible, and she does her ten miles within the hour apparently without distress. She has been, for some years, in the habit of carrying a lady, and many a time and oft has she won universal admiration for herself and mistress, by her graceful caracoles in the Park. At length, partly from too much rest, (too much confinement, indeed,) together with other causes, she points her feet, goes tender, in fact, lame; old services are now forgotten; she is allowed no retiring pension; but, being exchanged for a younger and fresher animal, she at last has reached the stables of her present possessor. The wheelers are somewhat larger than the leaders: the off-horse, though not abounding in flesh, looks like a hunter, and a weight-carrying hunter, too; but, on moving off, we find he is lame behind—he has a spavin, indeed, which, not having yielded to the irons, he has been cast in consequence. We look at the off-wheeler, and, perhaps, can find no fault about him; he appears, from his shape and make, like a horse of great value, fit for a nobleman's britchka, or four in hand. His age, too, is all right, only five years old; and, on trotting off, he goes quite free from lameness. With some surprise we ask the coachman, what it is that has brought him to his present work? but our surprise ceases with the reply, "Why, sir, one of his eyes is clean gone, and the other is not much better." Now here is a team of horses, whose average cost, probably, did not exceed 18*l.*; and yet, with scarcely a touch of the whip, they do their ten or eleven miles an hour, without distress or difficulty. None of these horses could have been bred for any thing like this money; and our coaches could never be supplied with such animals, if it were not for the patronage which the turf and the chase receive from those who have wealth to bestow. And although the team which I have described may be fictitious, yet I think few will assert, that, in my description, I have overstepped the bounds of probability; for in this case, as in many others, it will be found that truth is stranger than fiction.

How stands the case on the Continent? — For the French diligences the horses are generally procured comparatively young, and fresh upon their legs; they are probably bred for the specific purpose. There are no racing or hunting stables of any consequence from whence the coaches are recruited, and, compared with this country, there are very few extensive horse establishments used for pleasure alone. The horses, altogether, are inferior in breed to ours; no better evidence of which can be adduced, than the fact of their driving without inconvenience so many entire horses, which thus possess all the additional spirit and endurance the preservation of virility is calculated to afford, and without which these horses would be scarcely equal to their work. In this country, if we were to drive entire horses in the same manner, our list of accidents and upsets would be frightfully increased. Yet a team of English well-bred machiners, though spavined, groggy, and castrated, would beat *into fits* four of these fine French stallions, however superior they may appear at starting. If this be the fact (and I think it cannot be controverted), we may readily imagine, that when French horses become groggy or spavined in the same degree as our English ones, they cannot go the pace like them, but must necessarily be taken out of work, as we very well know is the case with our own low-bred horses. These several reasons will, I think, sufficiently account for the fact of the diligence horses in France being so much sounder than ours, without ascribing it to the superior excellence of their shoeing.

THE PATHOLOGY OF THE FOOT.

Having now given a general sketch of the structure of the foot and leg, condensing those parts that we conceived were of minor importance, and somewhat amplifying where we thought a more particular and minute account was desirable, and having followed up our subject by a consideration of the functions of those parts we had before described; we will now proceed to the still more important branch of our subject, the consideration of those numerous diseases to which the foot and leg are liable.

To do this succinctly, we shall separate the subject into those natural divisions which, from their different character, the diseases appear to demand; and, accordingly, we shall first consider the injuries arising from accidents; secondly, some specific diseases to which the foot is liable; thirdly, strains of the sinews and ligaments with their consequences; and, fourthly, the various operations necessary for lameness, and the best method of performing them.

LAMENESS.

Lameness is the natural language of pain immediately arising from the unequal action of the limb, the horse bearing as lightly as he possibly can on the injured leg. It may exist in every variety — from the severe manifestation of acute pain to the slightest exhibition of partial tenderness. In very acute lameness, most people can point out the suffering limb; but in those of a less severe character, the utmost tact is often required both in detecting the lameness and ascertaining its cause. The perplexity of the veterinary tyro used to be frequently exhibited at the Veterinary College on a lame horse being run out, when the most contradictory opinions were often expressed as to the lame leg. Persons unaccustomed to horses, will more frequently pronounce the wrong limb than the right in cases of slight lameness. The cause of their blunders may be thus easily explained. They perceive that a horse drops the moment one foot comes to the ground, and they immediately conclude that that must be the lame one, fancying that he drops from the pain received when it meets the ground; whereas the fact is, he treads as lightly as he can on the lame foot, and bears his whole weight on the sound one.*

* I met with a case, a short time since, which afforded a curious and rather an amusing instance of discrepancy in opinion on the subject of lameness amongst professed judges.

I was called a considerable distance to examine a horse that had been purchased a few weeks previously; and shortly afterwards appearing lame, the smith who shod him, and who possessed, in his own opinion, considerable skill on the subject, was asked to point out the seat of lameness. He pinched the shoulder with great severity, then drew it forwards with about the same force that a man would employ in pulling down a tree,—a mode of proceeding to which, of course, the animal evinced any thing but a partiality; and then, without a moment's hesitation, swore by his Maker, that the horse was lame in the off-shoulder, and that he was the only man in the town that could find it out.

The next person who saw the horse was not only a professor

It may be asked, Can we detect the seat of disease by the nature of the lameness? Generally speaking, we certainly cannot, though it will often materially assist our diagnosis. In shoulder lameness we can generally ascertain the seat of mischief by the slow and laboured extension of the limb, which is more evident in going down a declivity, and likewise in the walk, than in any other pace, the horse having, in slow motion, more time to move the limb with the care that he wishes. In severe lameness from splints, there is often an unwillingness to bend the knee exhibited; this, however, is also shown in cases of slight strains of the sinews just under the knee. With these exceptions, the seat of

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of the shoeing art, but had actually been to the Veterinary College itself; and although he had never passed the necessary ordeal, was yet, by virtue of a sign-board, a self-dubbed veterinary surgeon. He gave his opinion, however, with much less confidence than his rival; for, having adjusted his spectacles (being rather near-sighted) with much care, and wiped them again and again, he, with many sagacious doubts, expressed himself, that "*there certainly was a sort of a something somewhere*, but he could hardly call it lameness; but yet there was a *something*, and it was in the near hock." Shortly after this, the horse was seen by a farmer, a very knowing hand, who likewise pronounced him lame in the near hind-leg, but not in the hock, but the fetlock joint; and he assured the owner, that a wet bandage and a fortnight's rest would bring him all right again. Accordingly, when I saw the horse, there was a bandage on the fetlock, which, for some little time, had been assiduously kept wet with cold lotions. On running the horse out a few yards, it did not require two minutes' consideration to decide, beyond all question, that the horse was lame, not in the *off fore-shoulder*, not in the near hind hock, nor in the fetlock joint, but in the *off* hock, on which a little examination enabled me to detect ossification about the middle of the joint, on the inside, above the usual seat of spavin.

disease, whether of the foot, the pasterns, or the fetlock, cannot be ascertained by the nature of the horse's action. When called to attend a case of lameness, we should, if possible, first see the horse in the stable, and, without disturbing him, observe whether he points a foot, and in what particular manner he so favours it. We should then have him led from the stable, and trotted gently in hand on the hard road or pavement, giving him his head at the time. Having thus ascertained the leg he is lame in, we should proceed to discover the actual seat of the mischief. For this purpose, the finger and thumb should be carefully passed down the leg, from the knee to the foot, to ascertain if there be any undue heat, or enlargement, or tenderness from pressure; we should also feel carefully the front and sides of the pasterns, as well as round the coronet. If a splint be the cause of lameness, the horse will evince considerable pain when it is pressed, and so likewise will he in lesions of the sinews. Supposing that we have found no sufficient cause of lameness above, we must now direct our attention to the foot. In nearly every case, unless the mischief should be very clearly exhibited elsewhere, it will be advisable to remove the shoe; the foot should then be pared out to ascertain if there be any wound or bruise in it. The nail holes should be carefully examined and pressed with the pincers, or gently struck with a hammer, to discover any symptoms of tenderness; the heels of the sole should be pared thin, and the part struck generally with a hammer: this is much better than pressing the bar and crust with the pincers, as is usually done, for this often produces pain in some feet when there is no disease, and often fails in causing pain in others, when there is a deep-seated corn. The smith, after paring awhile, will very probably say there is no corn; but we must not be satisfied until we have pared almost to the quick. If the horse be *very* lame from a corn, he will almost always favour the foot; but in so doing he will not, however, extend his limb out straight to its full length, but will elevate the heel without extending the foot very far, which will give a knuckling appearance to the limb. Should none of these symptoms be exhibited, we must consider the disease to be deeper seated; and then it is all-important to ascertain if the animal points his foot, for if such be the case, in all probability the cause of lameness exists in the navicular joint.

It will seldom be necessary to go through these various manipulations *seriatim;* we may sometimes pounce upon the seat of lameness at once, and very often detect it after a moderate examination; but there are cases that will demand our utmost attention and experience, and will often put to a severe test the professional talents and tact of the practitioner. Some time since I was requested to examine a horse that had been lame several weeks, the owner telling me at the same time that he did not believe I could do him any service, as the means hitherto pursued had been attended with no benefit, the animal getting worse instead of better. The horse had been under the care of another practitioner, who had pronounced him lame in the coffin or pastern joint, and had bled him from the toe, and afterwards blistered him twice. He rested his foot considerably, and on leading him out evinced considerable lameness. It appeared evident to me, that this very acute lameness was produced by local injury. On striking the sole with the handle of the drawing knife, I found he was very tender by the side of the toe of the frog, and on cutting down on the part, matter issued; it had formed sinuses under the sole, which consequently required to be removed throughout the greatest portion of its surface. The cause of the lameness having been discovered, the horse soon got well. I mention this case, to show how essential it is to employ a careful examination in cases of obscure lameness.

Lameness connected with Shoeing.—Horses sometimes exhibit a slight lameness immediately after being shod, though quite sound before. Such cases may arise from the shoe being nailed on too tight, and is often relieved by removing the shoe and reapplying it more gently. This lameness most frequently occurs in horses with very thin horn, and is ascertained by the manner in which it comes on, and the absence of any other visible causes. The shoe may have an improper bearing, pressing severely on weak parts, or on the sole or heels.

Pricks in shoeing. — Pricks most frequently arise from careless or bungling workmanship; the smith not taking proper care, or being deficient in proper skill, or rendered foolhardy by partial drunkenness. Occasionally, however, it will happen with the utmost care, owing to restiveness on the part of the horse, combined with a particularly thin horn, and perhaps the deceptive appearance of the foot. If the horse be ascertained at the time to be positively pricked, the shoe should be at once removed, the part cut down to the quick, and a little digestive ointment or liniment applied to it. Too commonly, however, nothing is said about the matter, and unless it is very severe, the horse does not go lame. After a few days, however, lameness manifests itself either slight or very severe, and on removing the shoe and pressing round the foot at the situation of the nails, considerable pain is evinced at the seat of the mischief, and on cutting down on the nail hole matter very frequently issues. Sometimes, however, there is no matter formed, but a thin acrid fluid, which denotes that much inflammation still exists in the part, and then the lameness is commonly more severe. In either case, it will be desirable to remove the surrounding horn, and immerse the foot in a warm poultice, which should be continued until much of the tenderness is removed, and the parts present a healthy appearance, when the application of a stimulating tar ointment will effect a cure, care being taken that the shoe does not bear too near the injured part.

Sometimes, on removing the shoe, there is no matter found, and indeed, no wound, although considerable tenderness. In these cases, the nails have been driven too near the quick, although they have not actually penetrated it: the lameness does not come on immediately after the application of the shoe, not indeed until the repeated force of the animal's weight has forced the edge of the coffin bone so close to the nails, as to bruise the sensible parts between these two hard bodies. The best treatment consists in the removal of the shoe, and the application of poultices.

Corns, in nine cases out of ten, are produced, either directly or indirectly, by shoeing;—directly, when the heel of the shoe actually presses on the heel of the horny sole; and, indirectly, when it bears too hard on the crust, or prevents the performance of the functions of the foot.

The term corn is very inappropriate, as it seems to imply the existence of a horny excrescence, as in the human foot, whereas it is a bruise of the sensible sole at its posterior part, in the angle between the bar and crust. The sensible sole is pressed between the heels of the coffin bone above and the shoe below, and in consequence becomes bruised;—extravasated blood is thrown out, and, this being repeated, at length the vessels of the parts, instead of secreting sound horn, deposit a soft spongy material tinged with blood. Sometimes, however, matter is formed at the commencement of the disease which often penetrates deeply, and at other times we find a black discharge.

Corns are found in every description of feet, though most usually in those with thin horn, flat soles, and weak low heels. They are rarely found in the outside heel, and still more rarely in the hind feet. There are corns of every shade and degree, from the slightest speck of ecchymosis to the most extensive and serious injury, the former producing neither pain nor inconvenience, the latter attended with much inflammation, and severe pain and lameness. When a horse is severely lame from corns he will usually favour his foot in a considerable degree; and from his peculiar method of doing this, and a somewhat peculiar manner of going, we can often make a shrewd guess as to the nature and seat of the mischief. It is customary for smiths to pinch the bar and crust with the pincers, but this often fails in very strong feet to occasion tenderness when there really is a deep seated corn, whilst in hoofs with very thin horn it produces much pain when there is no corn. Sometime since I was requested to examine a horse exceedingly lame. The smith had previously removed the shoe, pared the foot, and tried it round with the pincers, and assured me, with much confidence, that there was nothing the matter with the foot. However, feeling somewhat assured, from the manner in which the horse favoured the foot, that the lameness was either from a corn or some other injury of the foot, I directed him to pare again, which he did with the same confidence in his own opinion as before. I then took the drawing knife myself, and after paring the inside heel for a while there presently issued a teaspoonful of pus, much to the surprise and chagrin of the smith. The foot, I should say, was a particularly strong one, and appeared almost insensible to pressure from the pincers.

I mention this case merely to show that it is not safe to decide that there is no corn until we have pared to the very quick.

When matter is thus formed, as in the case just mentioned, the corn is said to be festered, and if not allowed a depending opening, it very soon extends upwards in the course of the laminæ, and breaks out between hair and hoof.

The reason why the inside heel is almost the exclusive seat of corns it is somewhat difficult to explain. All we know is, that the inside quarter is weaker than the outside, and more under the centre of gravity.

Treatment.—The method of treatment for a slight corn, that occasions but little lameness, is extremely simple. It consists in cutting away with a small drawing knife as much of the horny sole at the angle of the crust as can be accomplished without bleeding, then applying with a feather a little muriate of antimony or other caustic, holding up the foot for awhile that the caustic should be well applied to the part. This being done, a shoe should be applied with the pressure removed from the heel. To accomplish this, there should be no nail on the inside quarter, and a space should be allowed to exist between the heel of the crust and that of the shoe, either by taking off the bearing from the upper surface of the shoe, or by removing a portion of the heel of the crust. If the foot will bear it, the latter is the better plan, but if the heels are too weak, the former must be practised, unless we adopt an excellent plan recommended by Mr. Turner, who advises a shoe with the ground surface higher at the heel than at the other parts, so that it does not touch the ground.

Fig. 25.

Fig. 25. represents a foot shod with a shoe turned up at the toe on the French system, and the ground surface of the heel cut away to remove the bearing from a corn.

This plan, though very simple, is yet very judicious, particularly if at the same time a slight space exists between the heel of the foot and that of the shoe. By attending to this method of treatment, and removing the shoe about once a fortnight, corns, in many instances, may be eradicated.

In some horses, when the foot is weak, and the heels low, leather soles may be applied with much benefit. There is, however, an objection to them in cases of corns, which it is necessary to get over—It is that they must either bear on the inside heel, where their pressure must be injurious, or otherwise they will admit the insinuation of dirt and gravel between the leather and the foot. To obviate this difficulty, I have been in the habit of affixing a little piece of sponge to the leather, by means of a stitch, just sufficient to fill up the space between the heel and the shoe in its most expanded state. Mr. Turner's shoe for corns is a still more simple method of obviating the difficulty; the inside heel of the shoe having half its thickness diminished by removing the ground surface, it is obvious that the leather sole can be applied sufficiently near the heel to prevent the insinuation of foreign bodies, and yet at the same time the heel preserved from ground pressure.

For very bad and extensive corns, particularly if accompanied with low heels and a flat sole, we shall find no shoe so useful as the round or bar shoe. For in this description of foot, if the common shoe be applied, although on its first application there may be considerable space between the corn and the shoe, yet in the course of a few days these very often approximate; whilst in the bar shoe, by having the inside quarter as one bearing point, and the frog as another, the inside heel may ride in safety between them, secured from pressure. It is not however prudent to let the frog bear very hard upon the shoe; it is better to rivet a small piece of leather to the bar, and allow a very slight space to exist between the leather and the frog, whilst the foot is off the ground; there will then be quite sufficient pressure when the foot comes to the ground — as much as the frog can bear with comfort, and yet sufficient to protect the inside heel.

Before, however, this shoe is applied, if the corn is bad and the lameness severe, it will be necessary to immerse the foot in a warm poultice for several days, which will subdue the existing inflammation, and prepare the foot for the treatment we have before advised. In some cases the poultice must be continued for some time, until indeed the tenderness is very considerably diminished, and the part assumes a healthier aspect. We sometimes find that corns exist in both heels; when this is the case the affair is much worse, and a bar shoe is still more imperatively called for than before, the bearing of which must of course be taken from both heels.

Festered Corns. — It occasionally happens that corns fester — matter is formed, which, not being allowed any depending opening, rises upwards in the course of the laminæ, and, having produced the most intense pain and lameness, breaks out at the coronet. These cases are often very troublesome; and sometimes the matter forms sinuses into other parts, and a quittor is the consequence.

The best method of treatment is at once to remove the sole at the heel, with a portion of the crust likewise, so as to make not only a depending orifice, but a large and free one. In some very bad cases I have removed the whole of the crust forming the heel from the coronet downwards, and have had no reason to regret this free employment of the knife. We should next apply a warm poultice to the foot, and continue it several days. Some discrimination is necessary as to the proper time to continue the poultice: we should do so until the irritation is removed, and the part looks healthy, but if we apply it beyond this point we shall soften the foot too much, and encourage the formation of sinuses. After the poultices, and sometimes simultaneously with them, we should apply to the heel, with a small syringe, a solution of sulphate of zinc, of moderate strength, and, when the internal parts are sound, the application of the compound tar ointment will best promote the growth of healthy horn.

This ointment, which I have found an excellent application to thrushes, as well as to injuries of the foot generally, is thus compounded : —

Petroleum, ℔ j. (Tar, 1 lb.)
Ol. Palmæ vel Adeps, ℔ ss. (Palm oil or fat, $\frac{1}{2}$ lb.)

To be melted together over a slow fire, and, when properly incorporated, add, slowly and carefully,

Ol. Tereb. ℥ i. (Oil of turpentine, 1 oz.)
Acid. Sulph. ℥ i. (Sulphuric acid, by measure, 1 oz.)

Injuries from Nails, &c. — Horses are often seriously injured, and sometimes entirely ruined, from taking up nails. In such cases both our treatment and prognosis must depend on the situation, direction, and depth of the wound, which it is therefore essential minutely to ascertain.

If the injury is slight, and there is little or no lameness, all we have to do is to cut away the horn round the wound, and apply a stimulant, such as tincture of myrrh, to the part, and over this a little tar ointment to protect the wound from dirt. Should the injury be more severe, after cutting out the part we should immerse the foot in a warm poultice, and continue it till the inflammation is subdued and the wound suppurates kindly, when it may be treated as a common wound, and if, in the course of healing, granulations should sprout above the level of the horn, a little muriate of antimony may be applied with a feather. If there be much horn to be supplied the application of the compound tar ointment will be desirable.

It sometimes happens that a nail enters the commissures by the side of the frog, in such a direction as to lead to the supposition that it has penetrated the flexor tendon and entered the navicular joint. If such be the case it becomes formidable indeed, and demands the utmost caution in the treatment.

Treatment. — We should pare out the foot, thinning the horn in the neighbourhood of the injury very minutely, but taking care not to remove the horn entirely, as we may afterwards require it. This being done, we must prepare for the inflammation that is likely to succeed. With this view we should bleed from a neighbouring part, such as the arm in the fore leg or the thigh in the hind, and administer a moderate dose of physic as soon as the horse is sufficiently prepared. The foot should be immersed in a linseed poultice, which it is necessary to continue for some time. If, in the course of a few days, synovia issues from the wound, a saturated solution of bichloride of mercury in spirits of wine should be applied to the part. It should not be syringed into the wound, lest it enter the joint, where it would produce considerable irritation, but may be applied with a feather or a probe so as for a small portion to enter the wound. Pledgets of lint should be placed on the wound so as to shield it from the moisture of the poultice which it is necessary to re-apply to the foot. This treatment should be continued until the synovia ceases to run, and the after treatment must depend on the circumstances of the case. It sometimes happens that the sinew adheres to the bone, and the functions of the joint are lost, and incurable lameness is the consequence. If such be the case, nothing will avail but the operation of neurotomy.

Nails and other sharp substances occasionally enter the coronet, and if they penetrate deeply the case becomes very complicated and difficult, even if the joint be not opened, in consequence of the wound having penetrated various and important tissues, and having no depending orifice. It is in these cases, and others similar to them, that an intimate knowledge of the anatomy of the foot is more particularly requisite, and will advantageously distinguish the scientific practitioner from the empirical pretender: the latter will be at once surrounded with inexplicable difficulties, whilst the former, from a careful examination, will be able to give a correct prognosis of the sequel of the case.

In these cases we shall generally find the insertion of setons particularly called for, and in many instances they will afford the only means of effecting a cure, as in the following, which occurred to me a few years since, and which is reported in *The Veterinarian*, vol. ix. p. 380. :—

"A horse had been blistered for lameness in one of the hind legs. A few days afterwards the groom found that he had hung back in the night, and torn down the rack and manger, and a nail had penetrated the off fore foot. I saw him soon afterwards, and found that a large nail had penetrated the lateral cartilage, just above the coronary ligament, and had gone for the space of three inches inwards and downwards towards the centre of the foot. At first it appeared as if the flexor tendon and navicular joint capsule must have been penetrated, but more accurate examination gave me reason to hope that such was not the case, but that the course of the nail had been just posterior to the sinew. My first object was to guard against tetanus by poulticing, &c., and this being effected, I tried injections of a solution of the sulphate of zinc; but it soon appeared to me that I should be only losing time by thus groping in the dark, and should at best have a deep-seated quittor to combat with; I, therefore, determined to get a depending orifice at all risks. Accordingly, in the latter part of July the horse was cast, and having had a small seton needle made for the purpose, I began by carefully probing the wound, and found that the sinuses extended in several directions; and I was obliged, in order to afford depending outlets, to insert three setons through the foot — one to the outside heel at the seat of corn from the entrance of the wound; another from this part to the commissure between the bar and frog; and the third from the heel to the centre of the frog. The setons, of course, were regularly moved and dressed; and when healthy matter appeared they were diminished, and the solution of zinc injected. In less than a month the setons were removed, and the coronet blistered, and during this time the hind leg had been again blistered. The horse now becoming free from lameness in both legs, was soon afterwards put to work, where he has continued for the last four months, and never doing less than 100 miles per week in a four-wheeled carriage. The result was the more pleasing and satisfactory, as, during the time the setons were in the foot, the owner was advised by a friend to have the horse shot. The short period between the insertion of the setons and the healing of the ulcers deserves remark, and prompts me to suggest the propriety of inserting setons in many cases of deep-seated quittors with a needle purposely prepared for the purpose."

SPECIFIC DISEASES OF THE FEET.

Sandcrack is a fracture of the crust situated in the fore feet usually on the inside quarter, and in the hind feet generally at the toe, and extending from the coronet downwards, sometimes to the lower border of the crust. These particular localities, in which it is almost universally found, is owing to the inside quarter being the weakest part in the fore feet; and, in the hind feet, to the circumstance that, in draught horses, to which description it is almost entirely confined, the toe is weaker than the quarters, and is likewise the part on which the strain is greatest. The description of feet most liable to sandcrack are those with thin brittle horn, and thus white feet having these bad qualities in the greatest degree are most liable to the disease. The crack is usually produced in a moment, and there is generally a little bleeding at the coronet, from its extending into the skin and coronary vessels.

Treatment. — To effect a perfect cure, that is, not merely to remove the lameness but to eradicate the crack, which indeed should always be done when the horse is of sufficient value, it is necessary to give the animal rest. The edges of the crack should be cut away with a drawing knife from one extremity to the other, and the wound may then be touched slightly with muriate of antimony, and a poultice applied to the foot. The poultice should be continued for several days, our object being to soften the horn, and encourage its growth. As soon as there is sufficient horn above the fissure, we should draw a horizontal line with a firing iron between the sound horn and the crust; our object being to isolate the crack mechanically, and thus cause it gradually to disappear by means of new horn growing from above, and a portion of the old horn being removed at the lower part at each time of shoeing. If this isolation of the fissure be not accomplished, as fast as new horn is produced at the coronet, it will extend itself into it, and thus prove a continual source of irritation. If the crack does not reach the lower border of the crust, it is well to draw a line or two with the iron transversely below as well as above it, and it may be also lightly applied longitudinally to the crack itself. This being done, the parts should be filled up with some adhesive composition, such as the wax used by shoemakers, and a bar shoe having been nailed on the foot resting lightly on the frog, but with the bearing completely removed from the crust opposite the crack, a strap made for the purpose should be buckled round the foot, so as to prevent too much motion. This strap is much better than either tape or tar twine, which is frequently used. It is better to rest the horse until half an inch of sound horn is grown from the coronet; but if he cannot be spared so long, it is still useless to apply the hot iron until there is sufficient sound horn to isolate the crack. We find in cases of sandcrack, that horn to a certain degree of thickness is secreted by the laminæ, though not sufficient to obliterate the crack. Sandcracks in the hind feet may be treated in a similar manner to those in the fore feet; but instead of a bar shoe, a plain one will do made square at the toe, with the bearing completely removed for the space of an inch on each side of the toe, and one or two clips can be made at the sides instead of the one usually placed at the toe.

A False Quarter is sometimes the consequence of a neglected sandcrack, at other times the effect of quittor. Its appearance is that of a permanent fissure in the horn of considerable extent, but not extending through to the laminæ. The fact is, the coronary substance has been injured, and instead of producing a continuous circle of horn, there is a disruption — the part immediately above the crack no longer secretes horn, but a thin portion is still formed by the sensible laminæ, sufficient to protect the laminæ, but not enough to bear weight.

Treatment. — There being a want of secretive power in the coronary substance, our treatment can be but palliative. We have two things to accomplish, one being to relieve the part from pressure, which can be done by a similar shoe to that of sand-crack, and the other to prevent too much motion in the part, which we can effect by means of a strap before recommended.

Thrush is well known to be an offensive discharge from the sensible frog, most commonly from its cleft, but sometimes involving every part. It is one of the very few diseases that are common to the hind as well as to the fore feet, indeed it is more frequently met with in the former; and this fact materially assists us in determining its cause, which is most commonly the filth and moisture of the dung and urine to which the feet, particularly the hind ones, are exposed. If the feet are much neglected, the shoes not removed for a long period, the frog becomes ragged, and dirt and moisture insinuates into the cleft, and between the old horn and the new, and which penetrates farther and farther until it gets through the horn, and then the offensive discharge is secreted instead of sound horn. When the discharge proceeds from the cleft, the frog stay is separated, and thence Mr. B. Clark calls it rupture of the frog stay. We find thrushes existing in every variety of feet, in strong and in weak, in wide feet and contracted ones. Its tendency, however, when allowed to continue unchecked for a long time, is to produce contraction of the feet, unless some powerful causes oppose this tendency.

Many persons have an idea that it is wrong to heal up a thrush; that it is a discharge which acts as an issue in warding off other diseases. If, however, we consider the very small actual amount of matter that is discharged, and that this is secreted at the expense of good sound horn, we cannot for a moment entertain the fallacy. True it is, if the discharge be stopped suddenly by a very strong application, lameness is likely to occur, not, however, from the cessation of the discharge, but from the inflammation which produces this cessation. Thrushes seldom produce lameness, unless the horse treads on a stone, and then he often drops suddenly, and the consequence frequently is a broken knee. This is quite a sufficient reason, if no other existed, why the evil should be remedied without loss of time, and why a bad thrush should be considered an unsoundness.

Treatment.—To obtain a cure we have two objects to accomplish, one to stop the discharge, the other to cause sound horn to be supplied in its place. These results can be obtained by the application of the compound tar ointment before described, a pledget of tow being anointed with the same and insinuated within the cleft, and also to any other part that may be affected. The dressing should remain on the part about four days, and should then be repeated until the thrushes are entirely removed. By continuing this treatment with perseverance, the most inveterate thrushes may be cured. If the thrushes are anywise extensive, a leather sole should be applied so as to keep in the dressing; it must not, however, be nailed to the foot, as it is necessary to remove it, but should be somewhat smaller than the shoe, and insinuated under its seated part, and kept in with splints. Some practitioners are in the habit of employing liquid applications, such as tincture of myrrh, to the thrushes, but this form is not so desirable as that we have recommended, as it is more likely to be affected by moisture, and it does not afford that protection to the part which the tar ointment can render.

Canker is a disease very similar to thrush in its nature, though in every respect considerably worse. Whilst thrush is confined to the frog, canker extends to the whole base of the foot; both sole, bars, and frog are often simultaneously involved, and sometimes altogether obscured by one mass of disease. It is produced by the same causes as the former disease, nay, it is very commonly brought on by a neglected thrush, the disease, whose nature is the same, spreading from the frog to the bars and thence to the sole. Offensive matter is secreted, the horn becomes separated, and in its stead a mass of rank granulations are formed by which the sensible sole and bars become confounded together, and this it is which forms the greatest barrier to the restoration of the parts to a normal state. These granulations are vascular in the highest degree; the parts altogether are in a state of inflammation and unduly supplied with blood.

Canker not unfrequently is produced by neglected grease, the disease spreading downwards from the skin to the heels, or, in some cases perhaps, the acrid matter of grease destroying the horny heels.

Treatment.—To effect a cure (which if the animal is of little value, and the disease much advanced, it is sometimes not desirable to attempt) several objects are necessary to be obtained. We have to remove the fungous mass, stop the discharge, and promote the secretion of healthy horn. If the granulations are extensive, it is often necessary to remove them with a knife, and if this be attempted it should not be *half done*, but at once *freely* and *effectually*. Considerable hæmorrhage will take place, which it will generally be necessary to stop with a hot iron, thus forming our first dressing. In a day or two the parts will slough, and it will then, most probably, be desirable to apply a caustic again, but in a milder form. The muriate of antimony will be a convenient application, as its effects are at once visible from turning the parts white. A powder composed of powdered chalk and chloride of lime may then be scattered on the parts in order to absorb the matter and correct its fœtor. Pledgets of tow should be afterwards laid over the whole, and the shoe continued or not as is found most convenient. By the judicious and persevering employment of this method of treatment very bad cases of canker may be effectually cured.

The treatment mentioned in the following cases is also highly judicious. In *The Veterinarian*, vol. vi. page 28., there is an account of two cases of inveterate canker treated successfully by Mr. Joseph Toombs.

"July 27th, 1832.—An aged draught horse had been lame in the near hind foot for six months; on examination the crust was found to be hollow on the outside, with a fœtid discharge of matter peculiar to canker. After removing the crust from the heel, one third part round the foot, the laminæ were found diseased; spurious granulations had arisen on the surface.

After properly paring out the part, it was dressed with powdered white arsenic.

"10th August.—Foot pared out, and caustic applied as before. In consequence of the animal being wanted for continual service, it was not dressed again until the

"5th October.—Foot pared. Application as before once a fortnight; the foot gradually got better; and on the 3d December was quite well. The animal always rested the day after the application of the arsenic.

"Case 2d. April 20th, 1832.—A six-year old waggon horse, the property of a miller, twelve miles from hence, had been attended by a neighbouring farrier for six months, with lameness of the near fore-foot; fœtid discharge of matter. The part was kept properly pared; powdered white arsenic applied to the spurious granulations when requisite; and the following powders used twice a week:—Sulph. copper in powder, ℥vi.; alum powder, ℥vi.; bole, ℥vi. The horse was turned out to grass. A whole bottom shoe, with a slide at bottom and turned up the side of the crust, was applied to the foot."

Quittor is a sadly troublesome disease, but one which, from the neater and better method of shoeing adopted at the present day, is not so common as it once was. It is caused either by a neglected corn or a bruise; and when it was the custom to shoe draught horses with large calkins on the fore feet, these calkins were a frequent source of injury, either to the coronet of the other foot or to that of another horse. Thus it may occur either in the hind feet or the fore feet, and on the outside or the inside of the coronet; it however more frequently occurs in the fore than the hind feet. Sometimes there is only a simple bruise, and it is then denominated a tread, and though there may be much pain and lameness, it will yield to simple treatment. If however the bruise be considerable, and particularly if the side cartilage be injured, an abscess most probably will form, and the matter will probably produce sinuses in different directions, and it then becomes a quittor. These sinuses may however arise from a neglected festered corn; but then, although the sinuses may be numerous and extensive, the cartilage itself is rarely injured.

Treatment.—When it is evident that matter exists deep-seated, it is better to bring it to the surface as soon as possible, which we can best accomplish by means of poultices. There being an open wound, we should then ascertain, by careful examination with the probe, the number and situation of the sinuses; we may perhaps find them running between the coronary substance and lateral cartilage, and then we shall have less difficulty in effecting a cure. If, however, the cartilage is much injured, then, from the duller organization of this part, the cure becomes more tedious and difficult. The sinuses sometimes extend through the cartilage when the case is of some standing, and have a downward direction amongst the elastic substance of the sensible frog and cushion.

According to the aspect and extent of the case must be our treatment. The external wound should be enlarged, and the foot having been poulticed, a solution of the sulphate of zinc should be syringed into the wound. This treatment, judiciously applied, will in many cases effect a cure. If, however, the sinuses run deep within the cartilage, we shall find it useful to insert setons to get a depending orifice, bringing them out between the frog and bars.

When the cartilage is extensively injured, it is necessary to remove the diseased part by means of the knife, or produce a slough by the application of caustic. It used to be the custom in all cases of quittor to apply corrosive sublimate, twisted up in a little paper and forced into the wound; the effect of which was to destroy a portion of the cartilage, and after a while to cause a slough or core to come away, which was denominated the quittor bone by farriers, who imagined it to be a foreign body, and the cause of the mischief.

The indiscriminate employment of these severe measures is certainly highly objectionable; for if the ulcer itself is healed, it is at the expense of the cartilage, which becomes ossified, and thus is often rendered the source of permanent lameness. If the cartilage be in a carious state, then the application of corrosive sublimate will be desirable, but not otherwise.

The French are in the habit of excising a great portion of the cartilage; but though in some cases, no doubt, the operation may be beneficial, it ought not to be employed when milder methods are at all likely to answer, as the cure is not so effectual when a portion of the cartilage is lost.

ŒDEMA — SWELLED LEGS.

Coarse horses, possessing a considerable development of cellular tissue, are very commonly subject to dropsical enlargement of the extremities, usually denominated swelled legs. The nature of this swelling may be readily detected, and distinguished from that of phlegmon, by pressing it with the fingers, when it pits; that is, the impression of the fingers are left for a short time. It is, in fact, a deposition of the watery portion of the blood in the cells of the membrane; the absorbents or lymphatic vessels are unable to take up or carry into the circulation the serum so fast as it is deposited. It may arise from the weak state of the lymphatics, from cold applied to the legs, from the plethoric state of the system, or from the redundancy of serum in the blood. It exists in various degrees: sometimes the legs are merely filled, as it is termed, producing no lameness, and but little apparent inconvenience; at other times the limbs are immensely gorged, and attended with considerable pain and stiffness. Between these two extremes the disease may exist in every intermediate degree. It may thus appear either in an acute or subacute form, and may be produced either suddenly or gradually; when, however, it exists in a severe form, it usually appears suddenly. The horse perhaps is well over night, but the next morning one of his legs is amazingly swelled, and on handling it, the horse often catches it up suddenly, and so violently that he nearly falls. If the disease be not very soon relieved, large abscesses either form in different parts of the limb, or the skin gives way, the heels are affected with grease, or the vessels become enlarged and the swelling organised, and the horse has for life a big leg. We often see an animal with one of the hind legs twice as large as it ought to be; the poor brute, in addition to his accustomed labour, condemned to drag for life this weary load, which, in nine cases out of ten, is to be ascribed either to the negligence or ignorance of his owner. These big-legged horses usually belong either to poor men or to farmers; the former neglecting them from poverty, and the latter because they prefer treading in the footsteps of their forefathers, and employing ignorant empirics in preference to skilful practitioners.

The *treatment* of a very slight case may consist either in the administration of a dose of physic or a few diuretics; but a severe case demands very prompt and energetic treatment, if we would avoid the troublesome sequelæ to which I have just alluded. It must, however, be materially regulated by the state and condition of the horse, and the most predominating cause of the disease. If the horse be in full condition, we should bleed, and that very freely, particularly if we find, as we usually shall find, that the upper surface of the blood is colourless; when this is the case, there is usually a thick coat of buff. If, however, the horse is in a state of much debility, bleeding is not appropriate; and if the disease is brought on, as it sometimes is, by the redundancy of moisture in his food (the horse being at grass), we must bleed with caution and moderation, and sometimes not at all.

Should the horse be prepared for physic, we may at once administer an active dose; but if he is not so prepared, to lose no time we should give a diuretic ball, and the physic the following day after he has had some mashes. If the swelling extend much above the hock, we may make some punctures with a lancet, which will produce great relief, particularly if the leg be afterwards fomented with warm water. Care however must be taken to rub the leg dry afterwards.

Walking exercise should be given twice or three times a day. It will be necessary to repeat the diuretic medicine every alternate day, and if the animal be debilitated, we should give in addition some tonic: such as,

> Powdered Ginger, 2 drs.
> Sulphate of Iron, 3 drs.
> Either as a powder or in a ball.

If in the course of two days the leg is not so materially reduced in size as to lead us to infer its speedy restoration to a normal state, we may insert a rowel in the thigh. If abscesses should form in the thigh or leg, we must take care to distinguish the case from farcy, to which it then bears a resemblance; but in the latter disease the abscesses are usually smaller, and in the course of the absorbents, which are enlarged, whilst in œdema they are larger and more independent in their position. These abscesses being opened, usually heal with little difficulty; but if the skin should slough, as it sometimes does, the cure is much more tedious. There is, however, a difference in this respect between the human and the equine subject; for whilst in the former the cure of ulcers is tedious and protracted, in the horse it is generally accomplished with speed and safety.

There is a disease very similar to œdema, or humour, as it is commonly termed; but, though usually confounded with it, it is yet different in its nature—in Scotland it is termed Weed. The horse is found in great pain in one of the hind legs, but the swelling is considerably less than in œdema, and is situated above the hock at first, from whence it extends downwards. On examination, we find a swelling in the course of the thigh vein, extending nearly from the hock to the groin, very hot, and extremely tender to the touch. It is in fact a local inflammation of the lymphatic vessels.

The treatment consists in venesection, purgatives and diuretics, together with warm fomentations to the affected part.*

* *Weed in the Horse*, by Mr. J. Anderson.

"The subject of this communication is one which I have not seen fully delineated in the pages of the *Veterinarian*, although it is true Mr. Youatt, in his admirable lecture (No. ix.) on Farcy, does approximate to it.

"It may be necessary to premise, in the first instance, a few observations on the nature of weed, for the sake of elucidation, as the term is not generally known.

"The ephemera, or weed, is a fever of short duration. Agreeably to the etymology of the word, it is a fever which begins, is perfectly formed, and runs its course in the space of twelve hours. It seems to arise from a general irritability of the whole nervous system, or from some local affection: the glandular parts are peculiarly liable to become inflamed and suppurate.

"The weed in the horse is evidently an inflammation of the absorbents.

"*Symptoms.* — The horse is attacked with rigors, caused by the contraction of the capillaries forcing the blood back into the veins. He looks dull; the mouth is hot and parched; and he refuses his food. The respiration is hurried, and there are all the symptoms of fever; the pulse ranging from 80 to 130 in a minute. In a few hours swelling commences in the groin, and in many instances extends to the mammæ, scrotum, and abdomen, and descends down the hinder legs. Great inflammation ensues; the swelling becomes enormous, attended by excruciating pain, tenderness, heat, and throbbing of the arteries. The inflamed lymphatics become inadequate to per-

Chapped Heels.—Some horses are so predisposed to this complaint, that they prove a source of great

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form their functions; hence the great engorgement of the parts affected: suppuration occasionally takes place in the groin, and the discharge is, for the most part, healthy.

" *Causes.* — Change of diet from hard to green food; exposure to cold and wet; the stomach being surcharged; and the horse not having regular exercise. It frequently takes place on a Sunday afternoon or Monday morning, which may be accounted for from many horses not being out of their stable from Saturday night, and during the antecedent week having been at hard labour. When the animal has been once affected, a relapse frequently occurs.

" *Treatment.* — Phlebotomy is indicated, either from the jugular, saphena, or foot veins. Fever medicine is indispensably necessary at the commencement; and it should be followed up with purgatives and bran poultices; and, when they are removed, the inflamed parts should be kept wet with liquor ammoniæ acetatis, and the legs bandaged. When the inflammation is subdued, diuretics may be exhibited; and when the abscesses are matured, exit ought to be given to the matter with the lancet, and the wounds should be washed with the chloride of lime. They should also be dressed twice a-day with unguentum resinosum spread upon tow, until the parts are properly digested, and afterwards with ceratum calaminæ. Should the enlargement become chronic or scirrhous, take of hydriodate of potash, ʒj., lard, ℥j., rub them well together, and form an ointment, a little of which should be rubbed into the tumour night and morning. If this has not the desired effect, then blister.

" In most cases, the above mode of treatment will produce a cure. Should not that, however, be the case, I then pursue the same line of treatment as if I had true farcy to combat. If the constitution once becomes affected, the practitioner will have need of patience and perseverance, and I am sure much anxiety will be his portion; and, after all, he may lose his patient, and then, with some ignorant employers, and by means of the false insinuation of artful empirics, his reputation may suffer for a time. Let him, however, be assured, that the paths of duty and science will ultimately lead to honour and profit.

" The appearances usually to be observed on dissection are, inflammation of the lungs, liver, and pericardium, and often with pus effused in the cellular tissue.

" This complaint may be distinguished from farcy by the annoyance to their owners during the winter months. They have frequently white legs *, and the texture of the skin gives way from the least exciting cause, and a crack takes place, which, from the motion of the limb, becomes widened and deepened, and from this circumstance is often exceedingly difficult to heal. It is usually preceded and accompanied by œdema of the legs, and a thin acrid discharge issues from the wound, and from the irritation and

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more rapid obstruction of the lymphatics; a swelling of a larger magnitude and much more painful, beginning at the groin, and descending; and the pulse more accelerated. In farcy, the swelling proceeds upwards, 'the invariable course of the affection is towards the thoracic duct;' the engorgement is comparatively small; debility is always present, and the ulcers discharge purulent or thin sanious matter." — *Veterinarian*, vol. ix. pp. 269, 270.

* In a debate at the Veterinary Medical Association, on the subject of grease, it was stated by some members that white and grey horses are more subject to chapped heels and grease than other colours, and that this was owing to the fact that light substances radiate less caloric than darker ones, and thus the heat becomes accumulated in the system, and produces grease. This theory may be in some measure correct; but I cannot by any means acknowledge, as a fact, that white and grey horses are more subject to grease than others. I have found that black horses are more subject to the complaint than others, which, I take it, is owing to their being generally coarser bred, and having, in consequence, a superabundance of cellular membrane; and I have found that with cart horses, those of a white and grey colour are rather less subject to grease than others, from their having generally cleaner limbs. Their legs, too, are very frequently darker than their bodies, whilst black horses have very frequently white legs. Why, too, should the legs of white horses be more liable to disease than the other parts of the skin? It is certainly an incontrovertible fact, that if a horse has one white leg and another black, the former will be more likely to be affected with grease than the latter, which is in perfect accordance with the theory before mentioned; but it must likewise not be forgotten that the skin of the white leg is weaker in its texture than that of the black, and thus, from this circumstance, more liable to the disease.

pain produced, it is often attended with considerable lameness — the horse catching up his leg in a peculiar manner on being moved. The treatment should consist of purgatives and diuretics, and, if the system be plethoric, venesection, but not otherwise. The heels being in a state of inflammation, a linseed poultice should be applied to them for several nights, in which there may be a solution of alum or sulphate of zinc. By this medicated poultice we accomplish two purposes at the same time — we reduce the local inflammation, and bring about the healthy action of the part, by the stimulant the poultice contains.

It is scarcely necessary to observe that the heels must be kept clean, and the hair closely cut from them. When the poultices are discontinued, the crack should be washed twice a day with a solution of sulphate of zinc; and, if the horse is obliged to work, a little astringent powder, such as prepared chalk with Armenian bole, should be scattered over the wound. Generally speaking, the cuticle is broken, and the cutis denuded and abraded; but it sometimes happens, from the repetition or long continuance of these cracks, that the cutis itself is completely divided, and the case then becomes very troublesome, and cannot be cured without a cicatrix. And when the wounds appear to be healed, it often happens that, after exercise or work, the great motion of the parts causes a separation of the newly-formed skin, and the heels appear in a bleeding state. In these cases, after the inflammatory action is subdued by the local and constitutional treatment we have recommended, it is necessary to keep the parts as much in a state of rest as possible, and the wound must be kept clean, and stimulated with tincture of myrrh.

It sometimes happens, when there is no crack, or wound, or discharge from the heels, there is often a thick dry scurf. This is best treated by frequent ablution, rubbing the part carefully dry, and applying the ung. hyd. nit.

Grease is a white offensive discharge from the skin of the heels, frequently extending as high up as the hock or knee. It is generally the consequence of the dropsical enlargement of the legs before spoken of, and it is indeed an effort of nature to relieve the inflammation and tension of the integuments. Horses with much hair about the legs are more particularly disposed to grease, and well-bred horses are rarely affected. The skin in grease is usually red, and the hair appears staring, and there is at first considerable pain and stiffness of the part. After a while, however, this stiffness goes off, and, if the disease is neglected, the discharge continues in increased quantity, the skin becomes gradually thickened, and sometimes large excrescences, denominated from their appearance grapes, thickly cover the skin. Sometimes abscesses form about the heels, and large portions of the heels slough away.

Treatment. — The constitutional treatment of grease is similar to that recommended for œdematous legs, regulated, of course, by the age and condition of the animal. Our local treatment is, however, a matter of much importance likewise, as it is incumbent on us to cure the disease, if possible, without making the predisposition of the horse to become affected greater than before. The parts should first be well fomented and cleaned, and the hair being carefully cut away from the neighbourhood, we should then apply a linseed poultice to the heels, in which a little solution of sulphate of zinc has been mixed. This will be found a convenient method of applying the astringent, and, at the same time, the inflammation of the heels will be lessened. In the course of a few days it will be proper to discontinue the poultices, and to apply the astringent lotion alone. If the discharge should be unusually offensive, a little solution of the chloride of lime will be found a useful adjunct to the poultice.

Laminitis, or Founder,

Is, as its name implies, an inflammation of the sensible laminæ of the foot, as well as the elastic and very vascular substance that connects them with the horny laminæ and the coffin bone. It is a disease, compared with other lesions of the foot, of somewhat rare occurrence; but it most frequently attacks horses whose crust and laminæ are weak, and very obliquely placed. We meet with two varieties of laminitis, the acute, and the chronic or subacute.

The symptoms of acute laminitis are very strongly marked, the parts affected being very abundantly supplied with nerves as well as blood-vessels. There is considerable pain and irritation attending the disease; so much so, that the system in general is in a highly febrile state, and the pulse always, and the respiration often, considerably disturbed and quickened. It appears as if some important internal viscus is affected, so great is the urgency of the symptoms; and we might, indeed, at first, be apt to suppose that the lungs were diseased, if it were not for the presence of one unfailing and important phenomenon; and that is, the horse, instead of standing up as he does in pneumonia, in laminitis invariably lies down, being induced to do so by the pain he experiences when his weight rests on the feet. Such, then, are the symptoms of this disease: a quick and generally a full pulse, accelerated respiration, the feet and coronets hot, and the horse almost constantly lying down. It is with difficulty that he can be induced to stand or move, and when he does, his hind feet are placed as much as possible under the body, and the fore ones stretched out, the animal resting almost entirely on his heels: the feet and coronets feel very hot.

The hind feet may be involved as well as the fore ones, but the latter are more frequently alone affected, the proportion of weight supported by them being so much greater.

The causes are, 1st, long continued and rapid exertion on the hard road during the summer months. 2dly, Confinement in a standing posture for a long period, as on board transports. And, 3dly, Metastasis.

That the *first* cause should produce the disease is an object of less surprise than that it does not more frequently induce it, when we consider that the effect of shoeing is to make the crust and laminæ support the whole weight of the animal whilst travelling on the road; and yet these parts so greatly taxed are rarely affected, whilst those which do not support their share, viz. the navicular joint, and the sole and frog, are much more frequently diseased.

Some curious cases are on record of horses becoming affected by this disease on board transports, from being unable to lie down, and the late Mr. Castley has written so valuable a paper on this particular subject, as well as on the disease in general, that we cannot do better than insert it almost verbatim, and it will at once afford a good reason for condensing our own account of this very formidable malady.*

* "It seems to be a fact not generally known, that horses are most particularly prone to this complaint after having been confined for any considerable time together on board of ship. I have had several opportunities of observing this circumstance, but certainly never upon so large a scale as during our expedition to Corunna (Sir John Moore's campaign in Gallicia, in 1808-9). On that occasion, indeed, it prevailed to a very remarkable extent amongst the horses of the hussar brigade.

"This beautiful brigade of cavalry, consisting of the 7th, 10th, and 15th regiments, landed at Corunna about the 20th of November. They had been on board upwards of three weeks, having been detained a part of that time by contrary winds at Portsmouth. As the transports could not get up close to the landing-place in the harbour of Corunna, the horses were necessarily disembarked by swimming them on shore from the ships. They were first lowered down into the sea, and then towed to land at the tail of a boat. After landing, they were put up in a very crowded state; and I may also add, they experienced a very great change with regard to forage, — from oats and hay, to rye and barley; but chiefly rye and rye straw to eat.

"After disembarking, the troops were allowed only a very few days to get ready; and on account of the scanty accommodation to be expected in passing through the province of Gallicia, they commenced marching by squadrons, in daily succession. Each regiment consisted of three squadrons, so that the last to move from Corunna had from seven to nine days' longer rest after the voyage than that which went first;

By constantly standing in one position, the elastic connections of the laminæ are put continually on

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a circumstance well worthy of our attention, as we shall see in the sequel. On that occasion, I was directed to follow a day's march in rear of the whole brigade; to pick up all the horses belonging to it that might be left on the road; and to get them on to Lugo and Villa-Franca. The latter place is seven marches from Corunna; is situated at the foot of the Gallician passes; and was indicated as the principal depôt for sick horses.

"At Betanzos, the first stage, I was not a little surprised to find more than twenty horses left behind; all with 'fever in the feet;' and the greater part of them belonging to the regiment that was the first to march from Corunna. And this continued to be the case, more or less, all along the road.

"Every one who has seen horses afflicted with this complaint may form some idea of the task I had in hand. When in this state, they are found almost continually lying down; and if forced to stand upon their feet they seem to suffer such acute pain as to be truly objects of pity. One would not think of moving them under such circumstances, if that could be helped; nevertheless, by giving them plenty of time, putting little or nothing upon their backs, and driving them before us, we succeeded in getting most of them forward; and strange to say, many of them, even of those that were severely affected appeared to get better every day during the march. Some few acute cases, indeed, and especially where the hind feet were attacked as well as the fore ones, we were obliged to leave behind. But we managed to assemble at Lugo and Villa-Franca about 400 horses belonging to the brigade. Of these, at least one half had been left behind for this one complaint; and the greater part of these, again, were of the 7th Hussars, which regiment was the first to march from Corunna, and consequently had the least time allowed for rest after the voyage. The 10th followed the 7th, and left behind a much fewer number of those cases; whilst the 15th, being the last regiment on march, had very few indeed, in comparison with the other two.

"Now, the plain and obvious inference to be drawn from these facts is, that the circumstance of standing for any considerable length of time together on board of ship, seems highly to predispose the laminated structure of the feet of horses to take on an inflammatory action. Nor is this to be wondered at when we come to consider the motion of a ship, the stretch, more particularly if the shoes are on; and this constant action, though not carried to its

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and the almost unceasing efforts the animal is obliged to make in order to preserve his balance; continually moving his body backwards and forwards, and alternately throwing the greater part of his weight upon his fore or hind extremities.

"In the present instance, the disposition to this complaint might be increased, perhaps, by other circumstances; as the animals being plunged into the sea from the ships, the crowded state in which they were put up after landing, and the change of food. Upon the first of these points, however, I am not much inclined to lay any stress, because it may be observed, the disease did not actually make its appearance until the troops began to move. Neither am I inclined to attribute much to the change of food, although I may here remark, that rye is, without doubt, the very worst grain that can be given to horses; and whilst we remained at Corunna, we saw it frequently produce violent diarrhœa, which, in several instances, was rapidly followed by inflammation of the bowels, and death even in a few hours.

"The crowded state of the brigade after landing, and the insufficient time allowed for rest after the voyage, especially to some of the squadrons that went first, are, I think, to be considered as additional predisposing causes, and probably had a great share in producing the malady in question. And this I take to be sufficiently proved by the fact of the 7th having suffered so much more severely than the 15th on this occasion. Eight or nine days make a good deal of difference; and besides the greater length of time, there is also to be taken into consideration, that as each squadron moved off, more room was made for the remainder, who were thus enabled to lie down and take their rest in the recumbent posture, a matter, I think, of much importance, and should always be attended to when horses are brought from on board of ship. This, together with the avoidance of exertion, at least for some time, are, I am persuaded, the best preventives against the occurrence of this troublesome complaint; and of this I am so well satisfied, that in a code of instructions, which, on a more recent occasion, I have been desired to draw up, relative to the treatment of horses during a voyage, I have said, 'When horses are disembarked, they ought to have as much rest as it may be possible to give them. The practice of getting upon their backs and riding them away from the ships' side, should also be avoided; not only as at that time they are more or less greatest extent, is yet much more fatiguing than when the natural functions of alternate elongation and contraction are permitted.

The truth of this principle is easily illustrated by our endeavouring to stand on one leg for a long

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cramped, and in a state very unfit for exertion, but because such forced exertion is a likely means of bringing on inflammation or fever in the feet, a disease to which horses are most particularly subject after a sea voyage.'

"During the remainder of the Peninsular campaign, the cavalry regiments were, for the most part, landed at Lisbon, where they were always allowed a fortnight or three weeks' rest before they commenced their march; by which practice, any severe casualty of this sort was, in a great measure, avoided. And yet, I believe, every regiment had several cases of inflammation of the feet when they first began to move.

"If there be one disease more than another in which it can be shown that the local abstraction of blood has a decided advantage over general depletion, I will venture to say it is this. My own experience tells me, that the nearer we bleed to the part inflamed the better. Blood, therefore, taken from the foot will relieve with the greatest certainty.

"But during the Peninsular campaigns we had frequently to treat this complaint in situations of peculiar difficulty; for instance, whilst marching—when we had no opportunity of leaving anything behind. Under these circumstances, I found that, although I could relieve, in the first instance, by bleeding at the toe, yet in the warm climate of Portugal, I was liable to lose my patient afterwards, in consequence of the wound I had made in the foot. Suppuration was apt to take place in the sole; secondary inflammation would be set up; and this would be followed by tumefaction, burrowing up and bursting all round the coronet; and then the game was lost. I therefore abandoned the foot altogether, and began to bleed higher up, from the trunk of the vessels coming from the leg and foot. And the result of this practice I found so generally satisfactory, that I had been induced to continue it ever since. We are told, and by a great authority too, that bleeding at the shoulder is uncertain, and that 'the vein itself in general gives out but little blood.' For my own part, however, I must say, that I have never found any difficulty in taking as much blood as I wished; or of producing the effect I desired in this way. It is to be observed, that whenever there is acute inflammation period, or support a moderate weight with the arm horizontally extended.

The *third* cause to which we have alluded is, perhaps, a more frequent one than either of the others. After a horse has been labouring for a

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in the feet, the vessels of the leg and arm are always full; and they may be rendered still more so by placing the animal in a warm bath. But this measure must be put in execution vigorously. The bleeding should be pushed, if possible, to approaching syncope.

"I have frequently practised bleeding from the trunks at the coronet or pastern veins. And here, again, we have a powerful means of relieving inflammation in the feet. The only objection I know of to this part is, that if the horse has to travel, secondary bleeding is apt to take place, even eight or ten days after the operation, which, under such circumstances, may sometimes be a little troublesome.

"We see, then, that we can make our selection. Abstraction of blood from any of these parts is likely to have a good local effect; and if we fail in giving relief by one of these means, we may have recourse to them all, alternately, in daily succession. But with regard to bleeding, I would say, once for all, that we must make an active use of it whilst it is yet time, for that time will soon pass away.

"The next remedy in importance to bleeding, in my opinion, is the warm bath. The patient should be made to stand for several hours together, or as long at a time as he can bear it, in a large tub of warm water, which is to be kept up nearly at the temperature of blood heat. When tired he may be allowed to lie down awhile, and then put in again. This should be continued all day; and at night much good may be done by putting large bran poultices over the feet: some opening or laxative medicine should be given, and a slop diet enjoined. But my chief reliance is upon the active employment of the lancet, and *the diligent* use of the warm bath. With these I have been generally successful in subduing the most severe attacks of this sort in a very few days. But if the symptoms do not appear to moderate within a week, the prognosis will be bad. In a very short time we may expect that a change of structure will begin to take place; and after the vessels have got into a state of collapse, bleeding will no longer be of any use. Counter-irritation, as blisters, &c. may then be employed over the coronet with some advantage."

while under inflammation of the lungs, or the muscles of the chest, it is by no means unfrequent for the disease to leave the part originally affected, and to attack the feet — to fall down into the feet as it is vulgarly supposed. This metastasis is a very singular phenomenon of nature, and one which cannot easily be explained.

It should, however, be observed, that either in pneumonia, or in that acute rheumatism of the muscles of the chest, (a chill, as it is commonly called,) the horse almost constantly preserves a standing posture. The laminæ are thus continually on the stretch; and, though this may not satisfactorily account for the metastasis itself, it may in some measure explain why the laminæ of the feet are more likely to become its seat. Keeping this circumstance in view, it would be well, in some measure, to prepare for the possibility of the feet being affected, by removing the shoes and putting the feet in poultices, and by so doing, not only to keep them cool, but cause the sole and frog to relieve the laminæ, by supporting a portion of the weight. This is more particularly called for in acute rheumatism, the symptoms of which resemble those of laminitis more than any other disease, and which also, more frequently than any other, is likely to produce it by metastasis. When laminitis is thus produced, it is usually less acute than when induced by the other causes we have mentioned; but although less acute, it is more obstinate in its character, and more likely to produce permanent disorganization of the foot.

Treatment. — The disease being severe in its nature, rapid in its progress, and ruinous in its consequences if not subdued, it demands a corresponding energetic mode of treatment. The shoes being removed, the feet should be pared out, and a large quantity of blood abstracted from the toe, taking care that the artery itself is opened, and not merely the vein. We cannot well take too much blood from the feet: if both are affected, four or five quarts of blood will not be too much from each foot. The general circulation should be considerably affected by the local abstraction of blood, and the pulse should be our guide as to the effect produced. To promote the flow of blood, it is well to immerse the foot in a pail of warm water during the bleeding, taking care to mark the quantity of water previously, so as to enable us to judge of the quantity of blood abstracted. If the horse cannot be made to stand upon one leg long enough for the performance of the operation, we should bleed from the coronet, putting the feet in a warm bath immediately afterwards, and, if sufficient blood cannot be procured from the coronet, we should take an additional quantity from the *plate*-veins. After the blood-letting, the feet should be immersed in warm linseed meal poultices, which should be kept wet with warm water frequently during the day, and changed morning and night; and at each of these periods the feet should be placed in a warm bath for half an hour or more. A dose of physic should be given as soon as possible, and followed by febrifuge medicine. Unless the urgency of the symptoms is considerably remitted by the following day, the bleeding should be repeated.

The poultices should be continued for several days together with the warm fomentations, and should then be succeeded by cold applications, applied by means of cloths tied round the pasterns, and made to fall closely over and around the crust. The refrigerating lotion recommended for strains will be found very useful at this stage of the disease. After this treatment has been practised for about a week, we shall find it advantageous to blister the coronet, taking care to foment the parts about twelve hours after the application of the blister, which, by this method, may be repeated in a few days. During the treatment, the horse should be turned into a loose box, and well littered with straw. Should this treatment be successful, as it will be in the majority of cases, care must be taken that the horse does not resume his work too soon; his exercise should be very moderate at first, and gradually increased.

Should the treatment be neglected at first, or not sufficiently energetic, and, in some cases, even in spite of all we may do, disorganisation will take place; the elastic connections of the laminæ will give way, or, at any rate, will be unable to oppose the action of the flexor tendon, which thus, having no antagonist, draws the toe of the coffin bone downwards and backwards, and away from the crust, and the sole, at the same time, becomes convex: and thus we find in morbid specimens of this disease a considerable space between the toe of the coffin bone and the crust, the bone becoming preternaturally upright, and the crust more oblique, this space being filled up by a morbid deposition, the nature of which appears somewhat between horn and bone. When this is the case, the horse is rendered almost useless — fit only for slow work on soft ground, where the frog and bars can assist in supporting the animal's weight.

Fig. 26.

Fig. 7. A section of a foot altered in its shape, from inflammation of the laminæ, which should be compared with *fig.* 5. page 61.

a shows the separation between the coffin bone and crust, leaving a space to be filled up with morbid substance.

b the elongated toe.

c shows the crust distorted from its natural shape and position.

In this *fig.* the sole has been pared thin.

Sometimes disorganisation takes place still more rapidly than this: a thin acrid fluid is secreted instead of horn, which insinuating itself between hair and hoof throughout its whole circumference, the foot at length sloughs off.

Chronic Laminitis is a disease very insidious in its approach, and the first symptoms being obscure, its effects are oftener destructive than the more active malady we have just noticed. In the latter, we can often knock down the disease with the first blow, by means of extensive blood-letting; but in the former, disorganisation has probably commenced before we are called upon to combat the evil. The symptoms, I have said, are obscure: there is lameness, but it is by no means severe at first, and not sufficient to induce the animal to prefer the recumbent posture much more than common; he can generally relieve himself sufficiently by making greater use of his heels. The crust feels warm, and this warmth is constant, but it is often not palpably greater than in a state of health. The surest symptom to direct our judgment is the action of the animal: it is diametrically opposite to that in the navicular disease. He throws as much of his weight as he can on the posterior parts of the foot, his object being to relieve the front portion as much as possible.

The *Treatment* must be very similar to that we have recommended for the acute disease, namely, blood-letting, cataplasms, fomentation, and blisters; but it is necessary to resort much sooner to the last-mentioned prophylactic, repeating it frequently with short intervals.

Sometimes the alteration of structure in the foot is extremely gradual. Disorganisation may be going on for many months—the elastic connections of the coffin bone gradually giving way, and at length ending in pumiced feet.

It is very common for persons superficially acquainted with the diseases of horses to confound founder with contracted feet. Thus we find that a late anonymous writer, *Caveat Emptor*, who writes very sensibly on the subject of warranty, but is sadly at fault when endeavouring to point out the appearances of disease, says,—

"If it appears that towards the heels the semicircular line becomes suddenly straight, and the sides of the foot abruptly approach each other, it may be inferred that the heels are contracted. In these cases the natural position of the foot is partially changed; *the hoof becomes more upright, the sole of the foot descends, and the horse is commonly called 'foundered.'*"

It is scarcely necessary to observe that, in the case adduced, it is the author who is foundered and not the horse, for when the heels contract, the sole of the foot ascends too much, instead of descending. Sir Charles Bell makes a similar blunder. He says in his work on the hand —

"The lighter horse is subject to contractions of the foot. The bones, ligaments, and crust are out of use; the sole becomes firm as a board, the sides of the crust are permanently contracted, the parts have no longer their elastic play, and the foot striking our hard pavement suffers a shock or concussion; then comes a fever of the foot, which is inflammation, and that goes on to its total destruction."

Pumiced feet are very frequently the effect of laminitis, but often occurs without being preceded by inflammation. When induced by the former cause, the case is much worse than when it otherwise proceeds, and it is with much difficulty, and only by considerable care in shoeing, that the horse can be rendered useful, even at slow work on soft ground. When convex feet are not produced by inflammation, they are owing, in greater measure, to predisposition, the foot being naturally weak, the sole thin and flat, and the crust thin and too oblique; the consequence of which is, the coffin bone is hung as it were in the hoof too horizontally, and thus there is a greater disposition to tear the bone from the hoof. In addition to this, the horse is generally heavy, and the shoe causing all the weight to be supported by the crust and laminæ alone, the horse is driven on the road, and the consequence is, the sole gradually becomes convex, the crust more oblique, and thus the pumiced foot is produced.

Treatment.—A cure must not be expected, but the case will admit of considerable palliation. By removing the shoes, and causing the animal to stand for some time on the sole and frog, we may ease and strengthen the crust and laminæ. This may be assisted by applying a dressing of tar and oil to the whole of the foot. The tar to stimulate and strengthen, and the oil to prevent the too great dryness to which the horn is liable.

By adopting this plan from time to time for several days together, we may preserve the horse in a state of usefulness, when he would otherwise be unfit for work.

Much care and skill is required in shoeing a horse with pumiced feet. The sole being thin, it must have plenty of cover, and great care must be taken that it is not pressed upon by the shoe. The usual method of seating the shoe will not suffice; it is necessary to make its foot surface concave almost from its outer edge, somewhat in fact like the old English shoe, which, though prejudicial to the generality of feet, is applicable to these cases; for here there is no contraction to dread — it is too much expansion that we have reason to fear.

The assistance of the leather sole and the bar shoe is called for in these cases; the former for the purpose of diminishing concussion and protecting the sole, the latter for affording pressure to the frog, and thus enabling it to relieve the crust by supporting a portion of the superincumbent weight. Unusual care, however, is necessary in the application of the sole and the arrangement of the tow and stopping under it, in order that there should be no undue pressure at any particular part. Equal care, too, must be exercised in driving the nails in consequence of the thinness of the horn, and for the same reason they should not be too large, although it is necessary that they should be more numerous than common, on account of the greater weight of iron to be attached to the foot. If the shoes be not worn out, they should be allowed to remain on longer than the usual time. The difficulty in nailing on the shoe is often increased by the fact of the horse having, in connection with a pumiced foot, what is termed a *seedy toe*.

The *Seedy Toe* may, or may not, be accompanied by the malady just described. It can scarcely be termed a disease, but rather a natural defect, which may be considerably enhanced by labour and shoeing. Be this as it may, it is a sad disparagement to a horse, and considerably diminishes his value. It arises from too great dryness of the horn, which renders the crust brittle, and causes its fibres to separate, and thus occasions that appearance of the foot which gives it its name. There is evidently a want of that tough elastic material which connects the longitudinal fibres together, and produces that strong bond of union between them and the horny laminæ and sole. Thus we sometimes find that there is a hollow space within the foot, extending upwards and around to a considerable extent, sufficient to enable a large probe to be passed up. The bone is not exposed, nor the sensible laminæ, for they are protected by the internal portion of the crust, formed by the inflection of the horny laminæ before noticed.

Our *treatment* must consist in supplying a much as possible that moisture of which the foot stands in need, and this we shall best accomplish by anointing the foot, and particularly the affected part, frequently with tar and grease. If the mischief be extensive, we cannot do better than apply a blister to the coronet, to excite the development of a new growth of horn, keeping the hoof well anointed at the same time, and cutting away from time to time portions of the dry and brittle horn.

Strains, or Sprains.

The parts below the knee in the horse are so much exposed to wear and tear, and so often called upon for severe and sudden exertions, that they are consequently more liable to injuries, but particularly to strains, than any other parts of the body. It has been too much the habit of writers on the pathology of the horse to confound these various injuries together, or to speak of them all as strains of the flexor sinews, or the fetlock joint. It will be our purpose to distinguish the different lesions from each other, taking personal observation as our only guide.

Strain of the Flexor Tendons. — When we consider the physiology of the flexor tendons, the varied tasks they have to perform, their double office of flexing the leg, and supporting a great portion of the animal's weight, and when to this knowledge we add the severity of labour performed by the horse, we are rather disposed to be surprised that they are not more frequently diseased than they really are. As it is, however, they are parts that very frequently demand our treatment both in the hind and fore legs, but particularly the latter. There are a great many degrees of lameness occasioned by strains of the flexor tendons, some scarcely perceptible, others so severe as to render the animal almost helpless. Sometimes, in cases of lameness, we merely find a little enlargement under the knee; in other cases, a little knot further down, or at the back of the fetlock joint, where the tendons become enlarged, or just behind the os suffraginis, where one tendon forms a sheath for the other. The most common situation of the enlargement, however, is about midway between the knee and the fetlock, or rather nearer the latter joint than the former. In these cases there is some degree of heat perceptible, and always tenderness evinced on pressing the part. If these comparatively slight symptoms be disregarded, and the animal worked on, the consequence is always injurious, and sometimes irremediable. Very extensive inflammation of the flexor sinews is sometimes suddenly produced, but, generally speaking, there has previously been some slight injury which has been neglected. In these severe cases, the whole limb is exceedingly tender and hot, and engorged to such a degree that the two sinews can neither be distinguished from each other, nor from the suspensory ligament. The cellular sheath of the sinews is probably filled with extravasated blood, and the tendons themselves are double or treble their natural size. It is, I believe, denied by some persons, that the tendons themselves are ever enlarged; but to any practitioner who has performed the operation of the division of the tendons for a case in which the sinews have become shorter from a repetition of strains, the question can no longer be a matter of doubt.

The lameness is so severe, that the foot scarcely touches the ground, or if the animal does rest upon it for a moment, the obliquity of the fetlock becomes greater than it was before, from the tendons having lost their bracing power, or perhaps from a rupture of some of the fibres. If we were to cut into the parts in this state, we should probably find the sheath of the tendons full of extravasated blood, from a rupture of some of the smaller vessels, and the tendons themselves, exhibiting greater redness and vascularity than in their healthy state.

Treatment. — When called into a case of this very severe description, we should at once determine not to trifle with the matter. With this view, we should abstract a large quantity of blood, — from eight to twelve pounds, — from the nearest part. The superficial radial vein at the arm presents itself favourably for this purpose; but in horses very well bred, the same vein, lower, not far above the knee, will enable us to effect our object with still greater advantage. It may be necessary to repeat the operation in the course of a few days, and even a third time, if active inflammation should be still going on. After the venesection, the leg should be immersed in a pail of warm water, and there continued for the space of an hour, keeping up the temperature by the frequent addition of hot water. This treatment may be often repeated during the day; and at night a warm linseed meal poultice should be applied to the leg in a stocking, which should be removed early the next morning.

A patten shoe should be nailed lightly to the foot, so as to elevate the heels three inches from the ground, and thus put the sinews in a state of rest. This shoe, though frequently disregarded, is however a matter of much importance. A dose of physic may be administered as soon as the horse is properly prepared, which is the more necessary, as we cannot give any exercise. After the operation of the physic, the diet should consist of mashes, green food, or carrots, with but little or no corn. In the course of a few days, we shall find, in all probability, considerable amendment — the inflammation, pain, and lameness will all be lessened: we shall, however, still find, perhaps, a good deal of heat as well as swelling of the parts. In this stage, I have found it advantageous to substitute cold applications for hot ones. The leg should be kept in a bucket of cold water for half an hour at a time, three or four times a day; and in the interim a linen bandage should be applied, frequently saturated with the following lotion: —

Ammon. Mur. Pulv., ℥ i.	Sal Ammoniac, 1 oz.
Pot. Nit. Pulv., ʒ iv.	Nitre, ½ oz.
Acid. Pyrolig., ℥ ii.	Pyroligneous acid, 2 oz.
Spirit. Vini rect., ʒ i.	Spirits of Wine rectified, 1 oz.
Aq. Fontan., ℥ xx.	Cold water, 20 oz.
Misce.	Mix.

This treatment (the patient being an animal of value) should be perseveringly continued for a long time, until, indeed, the legs are perfectly cool, and the swelling considerably reduced; and during its continuance, the patten of the shoe should be gradually lowered about half an inch at a time. If any enlargement remains, as there probably will in such a severe case as that we have supposed, we should then fire, and that deeply, or we may as well not fire at all. We may afterwards blister the leg once or more, as we may find necessary, or we may rub in the Ung. Hyd. Potass., with a view of encouraging the absorption of the enlargement. By this energetic mode of treatment, I am persuaded we may often render valuable horses again useful — again fit for the hunting-field or the turf, when under a less energetic course of treatment they would remain useless. It is a matter of much importance not to fire or blister the leg until we have achieved the utmost possible benefit that can be attained by our antiphlogistic treatment. It is then—after the leg has been reduced as much as possible in size, by venesection, perspiration, and evaporation, that we can employ counter-irritation with the greatest advantage, and derive all the bracing assistance that the operation of firing is calculated to afford. If we do fire, however, in order to derive the benefit of the bandage, we should fire as deeply as we possibly can without penetrating the skin.

For slight strains of the flexor tendons, our treatment, though similar in principle to that we have recommended, need not be so long continued, nor so actively followed up; and when the inflammation is subdued, a blister will be sufficient, and even this may be dispensed with in very slight cases. Care, however, must be taken in each case, and in all, not to let the horse resume his work too soon.

LESIONS OF THE SUSPENSORY LIGAMENT.

Next in frequency to injuries of the flexor tendons, we find that the suspensory ligaments are most subject to strains. We are less surprised that this should be the case, when we reflect on the continual and severe exertions performed by these parts — more particularly in the hunting field and on the turf. A horse, on alighting from a high fence, comes first upon his suspensory ligaments, before his flexor tendons are called upon for exertion. In the severe exertions of race horses, too, when every muscle is exerted to the utmost, the suspensory ligament, as Mr. Percivall describes it, first catches the weight of the animal, propelled with such a prodigious force, then, after moderating the jar, aids by its elasticity the succeeding progression. Accordingly, we find that hunters and race-horses are considerably more liable to lesions of the suspensory ligament than any other description of horses.

The character of these strains is very rarely so acute as that of the tendons: they generally come on gradually, with little inflammation or lameness. Occasionally the injury is sudden and severe, but then it is rarely confined to these ligaments, for, although they may be principally involved, the neighbouring parts are generally implicated. The usual symptoms are a slight enlargement and lameness at first, or there may be the former without the latter: the horse in this state is usually worked on until both the swelling and lameness greatly increase, and then the case becomes formidable. The enlargement is commonly confined to the ligament below the place of bifurcation, and sometimes one division alone is affected, which is generally that on the inside of the leg. In a few instances the swelling may exist and continue without lameness, but this is very rarely the case if the animal is severely worked. In some cases it is accompanied with other larger swellings round the fetlock, which, however, are of much less consequence, though, from their size, they usually attract more notice.

I have said that enlargement of the suspensory ligament is very common with race horses: I may add, with the exception of strains of the flexor sinews, it unfits more animals for racing than any other cause. Horses, indeed, are rarely fit for the turf after the suspensory ligaments have been enlarged — the inflammation and lameness may be removed, but it is very seldom that they are able to respond with impunity to the severe demands of training. Much of this might be prevented, if the horse were taken out of work as soon as the enlargement became perceptible; whereas, unless his lameness be perceived in the walk or the gallop, (and a horse may be quite lame in the trot without showing it in these paces,) he is worked on without respite or mercy, and compelled to go through his engagements until he is no longer able to perform them, by which time his legs are usually in such a state as to unfit him for future services as a race horse, when, by proper examination, timely rest, and judicious treatment, he might have been preserved for many a day.

It is very common for lameness of the suspensory ligaments to go off after a little rest and cooling treatment, and to return as soon as the parts are again put upon the stretch. This circumstance enables some roguish dealers to take in the unwary with impunity.

The *treatment* must be similar in principle to that we have recommended for sprains of the flexor tendons, compared with which however the antiphlogistic treatment will be of less, and the counter-irritant of greater importance. The leg being properly cooled, it should be fired, for it will rarely be proper to trust to blistering, or to any thing short of the actual cautery. One line should be drawn with the iron in the course of the ligament, and through the skin, which will be found more effectual than a multitude of lines superficially placed. Unless the enlargement be very considerable, one deep stroke will be sufficient; but if not, it may be feathered by others more superficially disposed. After the operation, a long rest will be necessary.

The *fetlock* and its ligaments are often the subject of injury and inflammation. Sometimes we have inflammation and lameness without any injury of the ligaments; the case is then one of concussion, and usually occurs to horses with very small or with upright joints — bone-setters, as they are commonly termed, from the roughness of their action, — the synovial membrane of the joint becomes bruised, and a degree of heat is perceptible, but usually without swelling at first.

Treatment.— Cooling means soon removes both inflammation and lameness, but blistering is generally very serviceable.

Overshooting of the Fetlock Joint. — This appearance of the fetlock joint, which sometimes exists in so great a degree as to render the horse perfectly useless, the front of the fetlock touching the ground almost at every step, is owing principally to contraction of the flexor tendons, but may be assisted by weakness of the extensors. Horses with short pasterns and upright fetlocks are more predisposed to this disease than others. Generally speaking, a slight strain of the flexor sinews takes place just under the knee, which, being neglected, an enlargement forms, the strain is repeated, and the animal, to ease himself, rests as much upon the bones and as little on the tendons as possible; the consequence of which is, the sinews, in obedience to a law of nature, contract in length, and the joint is at first rendered more perpendicular, then knuckling, then overshot. In the early stages of this disease, we may often preserve the conformation of the joint, by the prompt and energetic treatment of the enlarged tendons; but in the latter stage, we must have recourse to the operation of "Division of the Flexor Tendons," which will be described under the head of operations, by which means we may lengthen the sinews one or two inches as may be required, and thus restore the bones to their natural position. We may render the fetlock joint almost as oblique as we please after this operation, by applying a patten shoe, with a greater or less elevation of the heel.

The *Ligaments of the Fetlock Joint* and sesamoid bones are occasionally subject to violent injury and intense inflammation, involving all the neighbouring tissues. The horse is unable to rest any weight on the injured parts; and if both legs are affected, he lies down almost continually. This very severe and extensive inflammation, however well treated, generally produces bony enlargements round the joint, and the horse is seldom fit for active purposes afterwards.

The *treatment* should be precisely similar to that recommended for severe strains of the flexor tendons.

The ligaments of the fetlock are, however, more frequently subject to strains less acute in their character, but attended by lameness, and the usual signs of inflammation about the parts, and should be treated according to the principles we have before detailed. In these less severe cases, it will often be prudent, and more expeditious, after the inflammation has been removed, to apply a milder stimulant than the common blister; such as,

Ol. Olivæ, ℥ iii.	Olive Oil, 3 *oz.*
Liq. Ammon. Acetat., ℥ i.	Spirit of Hartshorn, 1 oz.
Ol. Tereb., ℥ss.	Oil of Turpentine, ½ oz.
Acet. Tinc. Cantharidis, ℥ i.	Acetous Tinc. of Cantharides, 1 oz.
Misce.	Mix.

A portion of this liniment should be rubbed daily on the parts; its strength may be increased by a diminution of the first, and an increase of the last ingredient.

Windgalls are soft puffy swellings, often found in the neighbourhood of the fetlock joint, and which used to be supposed to contain air, from which idea they derive their name. There are two situations for windgalls, one on each side the joint between the cannon bone and the insertions of the suspensory ligament, the other on each side, and somewhat behind the flexor tendons.* The former communicate with the fetlock joint, and the latter with the sheath of the flexor tendons, which we have described in the anatomical part of the work. Windgalls arise from an increased secretion of synovial fluid; and, in some cases, the synovial cavity itself may become enlarged, from the stretching of its membranous covering. They are more frequently found in the hind than in the fore legs, particularly those which communicate with the sheath of the tendons. They are generally supposed to be the effects of labour, and are usually regarded as the sure signs of the horse having been hard-worked. This, however, is by no means entirely correct; for we often find young horses that have been very little used, and that not violently, with large windgalls, whilst others, which have been used with the greatest severity, have legs perfectly clean. Not that I would assert that these tumours have nothing to do with labour, but they are owing still more to the predisposition of the horse. They are, no doubt, immediately occa-

* Windgalls occasionally appear in front of the fetlocks on each side of the extensor tendon, and we sometimes find bursal enlargements in the front of the shank, midway between the fetlock and the knee or hock. In these last-mentioned cases the bursa situated here has enlarged or given way, and they have been successfully treated by puncturing them.

sioned by the action of the tendons and the joint; but the increased synovia being thus secreted, it is a question, whether it does not afterwards rather tend to preserve the parts from further injury than to produce it. I rode a mare nine or ten years with very large windgalls, which appeared when she was three years old, and they never produced the slightest lameness nor inconvenience, although occasionally she was worked severely. This mare would carry much more flesh in the summer than in the winter, and the windgalls always became less as she lost flesh. Windgalls, indeed, are scarcely ever attended with lameness, and when they are so, it is either when they are suddenly produced, and then the lameness is owing to the inflammation which causes them, or otherwise from their becoming organised and changed into solid substance, as they are occasionally in old horses. It is very common for windgalls entirely to disappear in aged horses, which arises from the absorption being greater than the deposition as the animal gets old and poor.

Treatment. — If the windgalls are attended with lameness and inflammatory symptoms, the same treatment should be adopted as is recommended for strains of the ligaments of the joint; but if it is simply the enlargement that is complained of, our object must be, if possible, to occasion its dispersion. If the horse be blistered and turned out in the winter season, the windgalls will, in all probability, disappear, but will almost assuredly return with the renewal of work and the regainment of flesh. Many methods of treatment have been recommended without success; that which I prefer, is first to excite the skin moderately with some stimulant, then to rub in equal portions of iodine ointment and mercurial ointment daily, continuing the application for a long period. This treatment I have found very successful with an analogous disease, thoroughpin, and is, therefore, I think, most likely to be attended with benefit. Unless, however, the horse is of much value, it is scarcely desirable to submit any treatment at all for windgalls unattended with lameness. It is needless to observe, that puncturing windgalls must be dangerous and ineffectual, and cutting them out impossible and absurd.*

Strains of the Ligaments of the Pastern Joint, though not so frequent as those of the fetlock, are yet by no means uncommon. They are generally less acute and more obscure than those of the fetlock; and it is very common for the horse to be worked on, in consequence of the seat of lameness not being discovered, until ossification takes place round the joint, and a ringbone is formed. Horses with upright pasterns are most disposed to this disease, from the greater concussion to which they are liable. The synovial membrane of the joints may or may not be inflamed in conjunction with the ligaments, or the former may be the seat of lameness entirely.

The first symptom of this disease is lameness, slight or more severe, according to the degree of the injury. On minute examination, we may de-

* Although puncturing windgalls with a view of affording escape to the fluid contained is censurable, yet acupuncturation with a needle may be worthy of trial: in this case no fluid escapes externally, as the wound immediately closes; but the benefit is produced by the stimulus of the punctures.

tect increased heat round the pastern joint, but this will escape a careless observer. In the course of a few days, some enlargement is discerned round the joint, which, unless checked, continues to increase.

Treatment.—Bleeding, and that somewhat extensively, should by no means be neglected. The toe of the foot or sides of the coronet are the most favourable situations for local bleeding. The part should then be kept constantly wet with an evaporating lotion until all external signs of inflammation are removed, when the joint should be strongly blistered. The blister should be repeated several times, and if an enlargement has formed, the ung. hyd. potass. cum ung. hyd.* may be used, and the horse should be turned out or sent to plough. A long rest is necessary to establish the cure, but, for my own part, I prefer putting a horse to plough on soft ground to turning him to grass. I met with a case some time since which strikingly illustrates the superiority of moderate work on soft ground to a run at grass.

In April, 1838, I was requested to attend a horse, belonging to a commercial gentleman, that was lame in the near fore-leg. He had been slightly lame three days before, but had performed a journey every day until he became very lame (in the trot). After close examination, I discovered the seat of mischief to be the region of the pastern joint. He was bled from the foot, and the means I have recommended for removing inflammation were adopted, under which the horse gradually got better. In the course of a fortnight the leg was blistered, and in due time the blister was repeated,

* Ointment of hydriodate of potass, with mercurial ointment.

and the horse turned out into a soft well-watered meadow. Before turning out, the lameness could scarcely be perceived, and there was a little enlargement about the joint. He remained at grass for several months, when he was taken up apparently perfectly sound. Shortly afterwards, the horse being for sale, I purchased him. I drove him in my gig for about two months, when he again showed slight symptoms of lameness. I was obliged to work him on a little time longer, during which the lameness increased, and was found to arise from a return of the old mischief. He was then rested, the part cooled, and afterwards a stimulating liniment rubbed on the joint. Very shortly afterwards, being still lame, I lent him to a friend to go to plough. He continued at agricultural labour during the winter, and returned to my stable about April, 1839, sadly out of condition, but free from lameness. I shortly afterwards sold him for a few pounds more than I gave for him, and he has continued at work in single harness on the road free from lameness up to the present time. I relate this case to show the superiority of moderate work on soft ground to a run at grass, where a horse is much more exposed to casualties and concussions. The case also shows how important it is to have patience with these troublesome cases; for here, if, when the horse failed a second time, I had sold him as a lame horse, I should have sacrificed half his cost, and if I had continued using him, he would have been rendered permanently lame.

Lesions of the Coffin-Joint.—The coffin-joint and its ligaments are but rarely subject to disease: so well secured in the hoof, and so well protected by the neighbouring parts, this joint enjoys an immunity from danger which few others possess. The joint, however, is occasionally injured by concussion, and its ligaments are sometimes strained and inflamed. In this state the mischief is often confounded with the navicular disease, which we have yet to notice. The horse, however, does not point his foot as in that disease, and there is usually a much greater heat perceptible about the coronet, and it is also much more curable.

Treatment. — It is a matter of much importance to commence our treatment as early as possible, and not wait for the further developement of the disease, more particularly as its tendency is to occasion ossification of the parts. We should at once bleed freely from the toe or the coronet, and encourage the bleeding by putting the foot in a warm-water bath. Poultices at first, and evaporating lotions afterwards, assisted by making the horse stand in a bucket of cold water twice a day should follow, and should be succeeded by counter-irritation, mild or severe, according to the severity of the case.

THE NAVICULAR DISEASE.

The *Navicular Joint Capsule Disease* (as Professor Sewell terms it, though for the sake of brevity we often make the first and the last word suffice, and term it the Navicular Disease,) is one of the most frequent sources of lameness by which the horse is afflicted, and not only is it one of the most frequent, but also one of the most incurable. We are indebted for the discovery of the true seat of this important disease to Mr. James Turner, whose merits, as a practitioner and a man of science and research, are so well known and so well appreciated by the veterinary world It was in the year 1816 that Mr. Turner (in a brief sketch addressed to the professors of the Veterinary College) first made public his observations and opinions on this important subject. The disease had occasionally been met with by others in their *post-mortem* examinations, but they considered it as a rare occurrence, and the world became no wiser for their observations than before. To Mr. Turner, therefore, the credit is due of first elucidating this disease; for the very circumstance that others had entered on the same field of discovery as himself, and had gathered no fruit, whilst he has succeeded in collecting the most important truths, rather enhances his merit than detracts from it. Mr. Turner, instead of wearying himself with vain and fruitless attempts to cure contracted feet and the lameness that attended them, first made it his business to ascertain by the *post-mortem* examination of morbid feet the real nature of the disease which so long had puzzled veterinary pathologists. Mr. Bracy Clark, and Mr. Blaine, besides others, had very laudably instituted many experiments, at no little expense to themselves, for the purpose of curing contracted feet. They generally succeeded in enlarging the contracted foot, yet, much to their surprise, they could not remove the lameness that accompanied it; and one of the authors above mentioned ascribed this circumstance to the fact that long-continued contraction produced absorption of the coffin-bone; thus, by some strange fatuity, losing sight of the true seat of the evil, although he had approached its very precincts. By farriers and empirics generally the disease was, and still is, ascribed to the shoulders; which idea arose from the circumstance, that after the disease had existed a long time, the muscles of the shoulders would become attenuated from want of exercise, for the horse, of course, would lie down, and favour his fore-extremities as much as he possibly could. Accordingly, these conceited gentlemen, who in all ages have vied with their patients in ignorance, and at the present day are no less distinguished for their presumption, would commence firing and blistering, and otherwise torturing the shoulders, that were as free from disease as any part of the body.

Navicular disease may sometimes come on suddenly, from a bruise of the synovial membrane, but, generally speaking, it is gradual and insidious in its approach.

The symptoms usually are, in addition to the important fact of the absence of diseased appearance elsewhere, lameness and pointing, or favouring the affected foot, to which we may add, though it is by no means invariably the case, contraction, either general or partial. Let us examine these symptoms individually, for their importance demands a separate consideration.

Lameness.— The degree of lameness in navicular disease admits of a variety of shades. In some cases we find it manifested the first hundred yards only; in some it may continue for a mile or two, and then go off; in others again it may continue throughout a journey, but not so severely as at first. This circumstance is common to some other lamenesses, but not so uniformly the case as in navicular disease. So important a symptom is it, that on ascertaining it to be the fact, it of itself leads us strongly to suspect the nature of the lameness. It is customary to say of a groggy horse, "Oh! he will go sound enough when he gets a little warm." This phenomenon, which is common to many lamenesses, but more particularly to the navicular disease, is ascribed to the attention of the horse being called away from the injured part—this, in a great measure, is the case; but we must add, that in the disease in question the secretion of synovia becomes increased from exercise, and the horse is enabled so to dispose his weight, as to rest but very lightly on the injured joint. In some cases the lameness is so slight, that the utmost tact of the practitioner is required to detect it, or the horse may show it on the stones, and go sound on gravel. Should the horse be slightly lame in both feet, the difficulty is still greater, and he may go a long time in this state before the owner thinks him actually lame. When both feet are thus equally affected, however, the action of the horse becomes altered in proportion to the extent of mischief—he no longer bends the knee with the same freedom as before—his action becomes shorter—the heels of the foot scarcely touches the ground, and the shoe will exhibit the toe almost worn away, whilst the heels are undiminished in thickness. These circumstances, whether one leg or both be affected, will at all times materially assist our diagnosis. After the disease has existed in both feet for a considerable period, the horse brings his hind legs under his body, and makes them sustain the greater part of his weight, and in the stable he almost constantly lies down.

Pointing.—We should be cautious in giving an opinion of the cause of lameness until we have seen the horse in the stable, where, if there be any doubt on the matter, we should leave him for a while undisturbed. In many cases, on asking the question, "Does the horse point?" the groom will reply, "Oh yes, he has for a long time!"—The ascertainment of the length of this time will inform us how long the disease has been coming on. In other cases, on asking the same question, we are told he never points. The former reply we may generally depend on, but the latter we must never trust to; for unless the lame foot is thrust out nearly a yard in front of the other, the groom does not consider that the horse points. In a case of this sort (supposing all the time that it is one of navicular disease), we shall probably find, on noticing the horse, that the affected foot is advanced in some degree beyond the other, that there is very little weight resting on it, and none whatever on the heels. In navicular disease the horse always, or at least in ninety-nine cases in a hundred, points either little or much, although it may be unnoticed by the attendants; it is, indeed, one of the most striking characteristics of the disease. We must not, however, always conclude, that because a horse points he must necessarily have the disease, although in the majority of instances we may expect its approach either early or late; but some horses have been known to point for years without going lame: either the horse has pointed from habit, or the alteration of structure in the foot may be sufficient to occasion pointing, and yet by careful treatment prevented from being so bad as to produce lameness. Some persons having witnessed a case in which a horse may have pointed for a lengthened period without being lame, immediately conclude that it is of no consequence; thus confidently drawing an inference from the narrow limits of their own experience, and allowing it to influence their conduct. We may, however, safely aver, that pointing, if a habit, is at best a wretched bad one, having so much the semblance of disease; and from its so frequently being the precursor of lameness, it materially lessens the value of an animal.

If a horse is lame and points, must we necessarily conclude that he has navicular disease? No. He may point from corns, or from other injury at the posterior part of the foot, but then this pointing is different from that of navicular disease. In the latter, the foot is generally set out straight; in the former, it is not extended so far, but the heels are more elevated. In the former, the animal having put his foot in the easiest position, turns his attention to other objects; whilst in the latter, the solicitude of the horse is evidently directed more continually to the part; and if a horse points from corns, the lameness and pain are usually severe.

Contraction.— This is a symptom that, either generally or partially, we usually find attending navicular disease. It is, however, by no means universally the case; indeed, we occasionally find navicular lameness without any contraction, and, on the other hand, quite as frequently extensive contraction without any lameness whatever. Contraction is more frequently the consequence than the cause of lameness, arising as it does most commonly from resting or favouring the foot, which the lameness induces. There are different sorts as well as different degrees of contraction. Putting aside the natural oblong narrow mule's shape foot, which often exists through life unattended with lameness, we may have the heels drawn in, the crust and bars approaching with scarcely any space in the commissures, and the frog much diminished, hard, dry, and preternaturally elevated. In other cases, the contraction may be only on one side, or the foot may appear altogether free from contraction, which may be only found to exist by comparing it with the other foot. There are other cases in which there may be no apparent contraction, and yet the parts are by no means in a natural and proper position; the horny sole is preternaturally arched and thick; and the consequence is, the navicular joint is driven up higher into the horny box, and instead of having a comparatively flat and elastic surface to repose on, it has a hard unyielding ridge formed by the commissures. This deceptive kind of contraction, for pointing out which we are indebted to Mr. Turner, is one which most commonly attends and precedes the navicular disease. Mr. Turner says,—

"The first pernicious consequence of contraction I have invariably observed to be a very gradual displacement of the navicular and coffin bones: they ascend within the hoof, but more particularly the navicular bone and heels of the coffin-bone. This deviation from the natural position is not only observable on dissection, but is quite as apparent in the living foot, by paring down to the quick those commissures or channels between the bars and frog which will be found so morbidly deep, and take so much time for the knife to reach the quick, that a bystander, ignorant of the nature of it, would be induced to remark, that such a horse was devoid of blood in the foot. Exactly in proportion to this morbid concavity externally is the morbid convexity internally, and thus, with a fixed ascent, an unnatural arch is formed; the soft elastic parts of the frog being absorbed, it becomes a rigid protuberance. This protrusion of frog within the foot is accompanied by an undue concavity of sole and rigidity of the bars. The navicular bone lies transversely across this projecting part of the frog, with the long flexor or perforans tendon passing under, and by articulating with the bone, forms the navicular joint. The joint receives its share of the superincumbent weight from the small pastern bone, and with violence in the ratio of rapidity with which the animal moves, and is required to yield and descend in proportion to the impetus. It should also be remembered that it is placed immediately under the centre of weight which is conveyed in a perpendicular direction. The occult or partial contraction abruptly opposes the navicular bone in its descent, and thereby crushes or bruises the delicate synovial membrane lining the joint, which suffers a mechanical injury from the very material which nature bestowed as a defence, and which has degenerated into a hard, rigid, inelastic protuberance, no longer capable of yielding and expanding under the superincumbent weight."

Having given the leading symptoms attending the disease, it would be well, perhaps, here to mention the morbid appearances of the joint which accompanies them, and which *post-mortem* examinations of the malady in its different stages exhibit.

Among some morbid specimens in my possession, one merely shows a slight indentation on the ridge of the navicular bone, and when recent, the corresponding portion of the sinew was roughened. The horse had pointed a long time prior to his death, and was lame for a mile or so on first going off.

Another specimen exhibits holes in the navicular bone somewhat like a carious tooth, together with very diminutive bony deposits on different parts of the surface of the bone. The mare to which it had belonged had been lame for several years in both feet, which were much contracted, and got gradually worse, until she was only fit to go to plough.

Another case developes still greater disease on both navicular bones, which are ulcerated in a great degree, and present also numerous long spiculi on their articular surface; besides which, there is an ossification of the inferior cartilage, so that although the bones have been boiled, the navicular bone rests securely on the ossified parts, which must therefore have materially saved the diseased tendon. The bones had belonged to a very old horse and favourite hunter, the property of Lord Portman, that had been lame for many years, and had consequently been used for agricultural labour.

Another morbid specimen I will mention, and it is one which I met with a short time since. It was the feet of an old horse that had been groggy for some years. The navicular bones in both feet were closely united to the flexor tendons, and on tearing them apart, the fibres of the sinew were lacerated; the greater part of the posterior surface of these bones was denuded of cartilage, and presented a rough appearance, and the bones themselves were situated higher up in the hoof than natural, assuming a more vertical or less horizontal position, as represented by *fig.* 6. page 61., while the navicular bone presented the appearance shown by the annexed *fig.* 28. Although this was the position of the bones, yet the foot, by a common observer, would have been pronounced well shaped; the sole, however, I found enormously thick.

Fig. 27.

Fig. 28.

Fig. 27. The navicular bone in a healthy state.

Fig. 28. The navicular bone in an ulcerated state, from disease of long standing. — The large black marks in the middle are ulcerated spots.

The above are a few cases which exhibit different stages and varieties of the navicular disease; but besides them there are instances in which the tendons are exceedingly attenuated, and others in which the joint presents much appearance of inflammation.

Mr. Turner remarks, —

"In most cases of long duration there is a strong adhesion of the tendon to the navicular bone. When this adhesion is present, there is generally, exclusively of the loss of cartilage, a diminution also of the navicular bone itself, leaving a hole in its centre formed by absorption.

"In the earlier stage of the complaint, there is a deficiency of synovia, but not a total absence of it; the secreting or synovial membranes highly inflamed; an absorption of part of the cartilage of the inferior surface of the navicular bone, more particularly in the centre; and a roughness of the corresponding surface of the tendon. At this crisis there is only a slight adhesion of the tendon to the bone.

"In very recent cases I have not found the tendon adhering to the bone, but I have invariably perceived a lesion or abrasion of a small portion of synovial membrane from the tendon, and generally that part of it which is opposed to the centre of the bone, exhibiting small streaks or shreds in the tendon; whilst the cartilage covering the corresponding part of the bone has appeared discoloured."

Causes. — Having at some length considered the symptoms of navicular lameness, it will be desirable at this place to extend our investigation into its causes. To do this effectually, it will be proper to notice the description of horse most disposed to this disease, and the sort of labour in which it most usually occurs. But before we do this, it will be requisite to observe the fact, that the hind feet are never affected with the disease, nor are the fore feet as long as the animal continues in a state of nature. We are at once then assured that it may be considered as the result of domestication, though to what particular circumstances attending it remains to be considered. Why should the hind feet enjoy an immunity from the disease? In what particular do they differ from the fore feet in their structure and functions? The hind feet, we find, are narrow and more oblong than the fore ones, and not being so much under the centre of gravity, they do not support so much of the animal's weight. It is this last circumstance that forms the chief distinction in the physiology of the fore and hind feet.

We must then consider that the office of sustaining the animal's weight has much to do with the production of the disease. In a state of nature horses are never affected. To what then are they liable when domesticated? They are exposed to hot stables and hot litter, instead of the cool air and moist soil, and they are kept in one position for hours together, instead of being allowed to range with freedom. On the foot is nailed an inflexible bar of iron, and, last not least, the horse, instead of ranging at pleasure and unshod over soft pastures and soils, is compelled to travel with speed on hard and smooth roads. Here, then, are a variety of circumstances that may be brought forward as causes of contracted feet; and we find that each cause possesses some advocates,— like the fable of the besieged town, some cry out for stone, some for wood, and others for leather. Some say it is the nails, and the nails alone, that produce the mischief; some will tell us that it is the want of frog-pressure; others that it is the hard roads and the pace — the killing pace. Like the story of the chameleon, all may be right and all wrong; right as to one cause of mischief, but wrong in confining it to that one alone. We find that cart horses, whether used on the road or the field, are scarcely ever affected with the disease; that light horses, if used for agricultural purposes, are also not liable; and that horses with weak feet are not much disposed to it. The disease, indeed, seems more peculiar to well-bred horses, having strong feet abounding with horn, that are worked chiefly on the road at a quick pace. Hunters are liable to the disease, but by no means so frequently as horses that are used in harness, particularly those working in fast coaches.

From a review of these various circumstances which attend the domestication of the horse, we may, I think, justly conclude that most of them operate in inducing the disease in question. The foot in its natural state has a disposition to contract when at rest, and expand when pressed upon. In a weak foot there is a greater tendency to spread than contract; but in a strong one, we may consider these two antagonist principles as equivalent to each other. When, however, the horse becomes domesticated, every means is used to aid the contraction, and to neutralise the disposition to expansion: the shoe is nailed to the foot when the latter is in its most contracted state, and the horse is confined in a stall the greater part of the day. On a sudden he is taken out of the stable, and without having prepared his joints and limbs by preliminary exercise, he is driven as fast as he can trot, for the space of an hour or upwards, on the hard road, and then during the remainder of the twenty-four hours consigned to the stable. What is the result of this unnatural system? By the joint effects of the shoe, hot litter, and standing in the stable so long, the foot so contracts that the sole is driven upwards, and with it the navicular bone, which thus, as we have before noticed, has a hard unyielding surface to rest on; the joint having been in a quiescent state for many hours, there is probably a diminished secretion of synovia.* In this unprepared state the feet are battered on the hard road, and the result is in many

* Professor Coleman used to consider that a diminution of synovia was a principal cause of the disease.

cases a bruise of the synovial membrane, which may be either sufficient to produce sudden and severe lameness, or so moderate as to occasion the slightest lameness only.

As far as my experience goes, race-horses (or rather horses used for racing, for thoroughbred horses, when used in coaches, are extremely liable to the disease) are not so often affected as other horses; and this circumstance must, I think, be attributed to the fact of their taking a great deal of exercise on the soft ground, where the various parts of the feet meet the soil. They are not taken out of the stable, and compelled to proceed at once with speed, but, even during severe training, are first walked for a considerable period, before they take their gallops, which thus gradually prepares the joints for the severer exertions they are about to perform: hunters, too, as we have before remarked, although exposed to sudden concussions and severe exertions, more perhaps than any other horses, are yet much more exempt from the disease than horses used on the road. How is this? but because they take much walking exercise every day, and particularly on the day of hunting, before their severe exertions commence; and these exertions are taken in great measure on the soft soil, where the frog bars and sole all meet the ground, and greatly assist in diminishing the concussion, and preserving the feet in a healthy state. It is a fact, too, that few will gainsay who have made extensive observations, that when hunters are affected with navicular disease, it is much more frequently than with other horses attended by sudden and acute lameness. The horse goes out perfectly sound, and comes home dead lame, and lame in the navicular joint.

From these various circumstances, we are disposed to draw the following conclusions: —

First, That navicular lameness may be produced suddenly by a bruise on the synovial membrane, without any predisposing cause existing; but that this is by no means frequent.

Secondly, That well-bred horses, with strong feet, are most subject to the disease.

Thirdly, That the lameness is usually preceded by an alteration in the structure of the foot, whereby the navicular bone is somewhat displaced, and has a hard unyielding surface to rest on instead of an elastic cushion.

Fourthly, That this contraction may be either apparent or obscure.

Fifthly, That in feet thus contracted, the lameness itself is yet produced by a sudden bruise.

Sixthly, That contraction is not a direct cause of lameness in itself, although usually considered so by authors, inasmuch as the dissection of morbid feet clearly developes the disease elsewhere; but that, although not an exciting cause, it is yet a predisposing agent.

Seventhly, That contraction is more frequently a consequence than a cause of lameness, being produced by any circumstance that induces the horse to abstain from bearing his weight upon the foot.

Treatment. — In endeavouring to cure the navicular disease, much — indeed, almost every thing — will depend on the length of time the horse has been lame. If the lameness came on suddenly, and but a short time has elapsed, we may then set about our treatment with a reasonable prospect of success; but if, on the other hand, the mischief has been slowly coming on, and preceded by pointing for some time, we may then relieve the animal, palliate the case, but a cure, a *permanent* cure, we are seldom able to accomplish. In seeking a remedy, our endeavours should be directed, first, to the removal of the inflammation in the joint, and, secondly, to the restoration of the various parts of the foot to their natural and proper position. If the injury has been suddenly produced, our treatment will be principally confined to antiphlogistic measures.

The shoe being removed, the foot must be pared out, and the sole thinned, — more particularly that part opposite the navicular joint: the commissures should also be well cut out and thinned. This being done, the foot must be bled freely from the toe: four quarts or more may be taken, and the foot should be then placed in a linseed meal poultice, or one made of bran and meal. The poultice should be wetted several times, and changed once a day; and the bleeding may be repeated in the course of a few days if required. The poultice is to be continued for eight or ten days, and then, when the utmost benefit has been derived from it that it is capable of affording, we may employ counter-irritation.

The importance of venesection in every case of navicular disease must be apparent to every one; for there can be no case requiring treatment, but what must be attended with some degree of inflammation; and in some cases the injury may be confined to inflammation alone. Where we have reason to infer that such is the case, we may indeed confine our treatment to bleeding and poulticing. The benefit of the poultice is inferior only to that of venesection. It softens the horn, changing it from a hard, dry, and almost inelastic substance, to a soft, yielding, and elastic material. The degree of paring that may be necessary, must depend on the alteration of structure that has taken place in the foot. Mr. Turner advises very considerable rasping of the quarters as well as the toe of the foot. He says —

"The treatment should commence with the soothing system, viz., the abatement of inflammation, by abstracting blood locally, until the system is affected generally. Six quarts of blood to be drawn at one operation from an artery encircling the lower edge and toe of the coffin bone, the hoof having been prepared as follows: — the sole to be pared till small specks of blood begin to appear at every part; the bars to be entirely removed; and those channels or commissures between the bars and the frog to be excavated by a narrow drawing knife to the quick from end to end, the projecting part of the crust which forms the ground surface to be somewhat levelled with the rasp from toe to heels, but the shortening of the toe and lowering of the heels to be deferred till another stage of the treatment.

"With the next process which I have to recommend, I am apprehensive many practitioners may at the first view be somewhat startled, but I pledge my professional credit on the safety of the practice.

"It consists in the entire removal of crust at the inside heel, and of the bar adjoining, with rasp and drawing knife, as near to the laminæ as possible, without drawing blood and extending this excision along the quarter, according to the urgency of the case and the period of time allowed by the owner for treatment and rest, thereby leaving the inside quarter isolated from the other parts of the hoof. The direct object in view for sacrificing a portion of hoof so slow of growth, being to unfetter the inside heel of the coffin bone, by taking off lateral pressure from the wing of that bone; and I am urged to do this, not merely because I know it will grow again, but because I also know it will be my own fault if it be not reproduced in such an expanded direction, as mainly to contribute towards the cure."

Mr. T. adds —

"This extensive sacrifice of crust may be quite uncalled for in many of the recent cases of lameness.

"A bar shoe, bearing on the outside quarter, and slightly on the frog, is now to be nailed to the foot on one side only, and the foot and coronet immersed in a cold emollient paste."

Mr. T. "afterwards advises mild physic, and in the course of four or five days moderate walking exercise, and on the sixth or seventh day a repetition of the blood-letting — after which the paste is again to be applied to the crust, and a mixture of tar and hogs' lard to the sole. The foot is then to be permitted to grow, with the exception of the toe, which is to be shortened once a fortnight, and the horse turned loose on sawdust without shoes."

Having pushed our antiphlogistic treatment as far as we well can, we may next seek the aid of counter-irritation. Shall we blister the coronet or insert a frog seton? The latter is, I think, in every respect preferable; we create artificial inflammation and suppuration very near the seat of disease, and we may keep this up almost as long as we please: a month, however, of active suppuration is generally long enough. The only objection to the seton is, that the horse must be kept in the stable; he cannot be turned out or into a soft moist place during the time it remains in the foot.

Mr. Turner objects to the seton on account of its preventing the horse from bearing his weight on the back part of the foot, so as to restore the parts to their natural position. This, however, is but a partial evil, whilst the seton is a certain good; and we may avoid the evil, in a great measure, by the application of the shoe. In favour of the seton we may observe that Professor Sewell recommends and adopts it with much success.

Before the seton is inserted, a shoe should be placed on the foot, nailed on the outside quarter only, which will much assist the expansion of the foot.

By the judicious employment of the treatment we have recommended, varied or modified according to the nature of the case, we may, in many instances, effect a cure; but a love of truth obliges us to confess that in the majority of cases, taking them as they come, no treatment will succeed.

In chronic cases of navicular disease, in which there is no probability of effecting a cure, and but little of relieving the animal to any considerable extent, we have to determine whether we shall recommend the owner to work the animal lame (if he be able to work at all), or advise sensation to be taken from the feet by the operation of neurotomy.

To the subject of neurotomy, however, we must devote a separate article, which its interest and importance well deserves.

It is a matter of much consequence, that when a horse is submitted to the preceding course of treatment, every chance should be given it, by allowing the horse a long rest, viz. from two to four months.

Contracted Foot. — From the observations we have made on the subject of contraction, as a symptom of navicular disease, it will be seen that we do not regard it in itself as a cause of lameness, but in the majority of cases as an effect. Anything that induces the horse to favour the foot will, from withdrawing its proper pressure, tend to produce contraction. Although we do not consider contraction, however, as a direct cause of lameness, we must yet regard it as a disease, unless we are assured that the foot is in its natural state; for, putting aside the probability that may exist of its proving the precursor of navicular disease, it may yet impair the action of the horse, even if it does not produce actual lameness. It may do this partly by forcing up the navicular bone into an unnatural situation, by which means the same length of lever is not afforded to the flexor tendon, and partly by offering a rigid bed for the navicular bone to rest on.

Treatment.—If the horse is very valuable, and time and expense no object, we may employ the treatment recommended by Mr. Turner for navicular disease. We can, however, generally accomplish our end without this extreme method. The feet, however, should be well pared out, particularly the sole opposite the navicular bone; the toe should be shortened, the quarters rasped, and the foot immersed in a linseed poultice. When the horn is thoroughly softened, we may, according to circumstances, apply a shoe with the nails entirely on the outside, or, what is still better, a bar shoe, resting on the frog, or the frog bar shoe, recommended by Mr. Simmonds, or that advised by Professor Coleman. The horse may stand in wet clay a portion of the day, or he may be turned out with tips, on soft ground.

By any of these methods we may succeed in considerably improving the feet, and in great measure removing contraction.

EXOSTOSIS.

The horse, either from natural predisposition or from the severe exertions he is called upon to perform, is certainly more liable to bony depositions than any other animal. Adapted as he is to carry weight, and travel with speed, his ligaments and sinews are severely tasked and exposed to the consequences of over exertion. Yet, in addition to this, we are dispose to conclude, that in the horse, nature more readily seeks to relieve herself by ossific formations than in the human being. Some horses, too, show a much greater disposition to these depositions than others ; the same amount of injury in the one animal will produce them, whilst in others it will have no such effect. This predisposition of some horses to become affected with spavins, splints, or ringbones, is a matter of much importance in breeding; for it is no doubt hereditary, and ought to influence, in some degree, the choice of the mare, or the selection of the sire. It must, however, be acknowledged that the shape of the limbs which may predispose horses to become affected with these diseases is still more hereditary, and an object, therefore, of still greater importance.

The exostoses to which the leg of the horse is liable are — splints, ringbones, ossifications of the cartilages, together with ossific depositions round the fetlock joint.

Splint. — We must first consider the subject of *Splint*, which may be defined as a bony deposit, situated between the large and small metacarpal bones. Splints are so frequent, that few horses become old without them; and in the majority of cases, they produce neither lameness nor inconvenience. In other cases, however, they are attended with much pain, and severe and troublesome lameness. We sometimes find large splints not only unaccompanied with lameness, but which never have been so attended; whilst others, one fourth their size, will often produce severe lameness. This used to be explained, or rather endeavoured to be explained, by saying that the latter interfered with the sinew and the other did not. The enlargement, however, cannot interfere with the flexor sinews; and it is doubtful whether its proximity to the suspensory ligament is ever a source of lameness. The circumstance of splints producing lameness in some cases, and not in others, can be much better accounted for by supposing that where it produces no inconvenience, the ossific deposit is so gradual, that the periosteum, or membrane covering the bone, can accommodate itself to its increased size; whilst in other cases the enlargement takes place so rapidly, that the periosteum becomes painfully stretched, and thus produces lameness. A splint usually occurs about three or four inches below the knee, but sometimes we find it much lower down, and occasionally higher up. In these latter instances the case is much worse, as it is likely to interfere with the action of the knee, and in this situation is often complicated with inflammation of the ligaments of the knee.

Causes.— The proximate cause of splint may be considered as a strain of the ligamentous substance, which connects the small with the larger metacarpal bones, and which may be produced by any thing that throws an undue proportion of weight upon these bones. It is found far more frequently on the inside than the outside, which is considered to be owing to the former being more under the centre of gravity; and also to the circumstance that the inner splint bone receives the whole weight of the small bone of the knee, — the trapezoid; whilst, on the outside, the unciform bone rests partly on the small metacarpal bone, and partly on the large, and thus the latter prevents the former from being pressed from above beyond a certain degree. For the same reason, horses that turn their toes out are most liable to splints. The direction in which the weight is borne by the splint bones is downwards and slightly backwards; whilst the bone, tapering to a point, leans gradually forwards in its descent, and about three inches below the knee, closely approximates to the cannon bone: the consequence of this is, that the fulcrum or pivot is thrown about three or four inches below the knee. This, then, will ex plain in a great measure why splints usually occur a few inches below the knee; although we must consider the whole three inches in which the ligamentous substance abounds most, as being much exposed to the disease.

Treatment.—Professor Coleman used to say, "A splint once is a splint always;"—the two bones being once united by ossific matter, this connection, whatever we may do or apply, will never be altered. It used to be the custom to remove the splint, or rather the enlargement, with a hammer and chisel; the consequence of which was the removal of the lameness and the splint, but the production of a large blemish from the destruction of skin by this barbarous method. Another practice, as ancient and barbarous as the former, was the application of corrosive sublimate, or other strong caustic, so as to occasion a slough; in this case, too, the remedy was as bad as the disease—the horse was disfigured for life. Better and more recent treatment than this was either firing or blistering; the objection to the former, however, was the mark it produced; and to the latter, in common with the former, that though the lameness was removed, it very frequently returned with the resumption of labour.

The more modern, successful, and scientific treatment of splints consists in the operation of periosteotomy, or division of the periosteum which covers the bone. I remember performing the operation successfully seven or eight years since; but it occasioned a large wound which was some time healing, for I cut through the skin the whole length of the splint. Professor Sewell has introduced, within these few years, a much better mode of performing the operation.* The horse is cast, the leg properly

* "It is several months since I introduced a new operation for curing lamenesses in the horse, generally caused by contusions which occasion periosteal and ossific diseases. The morbid growth of bone is so rapid, that the inelastic periosteum cannot accommodate itself to the osseous deposit: hence distention, inflammation, pain, and lameness. The ordinary treatment often fails, or is tedious and uncertain in its results. Of the old practice of firing, applying caustics, puncturing, bruising, blistering, or other stimulants, I had long observed the inefficacy, and for several years I had employed setons beneficially, but I now invariably adopt the new plan.

"The most considerable class of these lamenesses are those resulting from nodes or ossifications, called splints. The operation I call, for distinction, subcutaneous periosteotomy, or division of the periosteum under the skin, without a corresponding external incision. In human surgery an operation, the same in principle, is performed for nodes, but by an incision from without, the scar consequent upon which it is so desirable in veterinary practice to avoid. Some practitioners cut through the skin to the bone with a hot iron: this is a severe remedy.

"The wound takes a much longer time to heal, and leaves a cicatrix, which is liable to abrasions and bruises from the opposite foot by cutting, when on the inside of the leg, and that is a very serious defect.

"The outside of the fore and hind legs are most liable to these diseases from kicks and contusions; next, the inside of the fore-arm or radius, where it has no muscular covering, and also the sharp edge of the tibia, and sometimes the pastern bones, from timber-leaping, &c. I have operated successfully on all these parts, and have found no other mark left than a cicatrised spot where the instrument was inserted. The utility of the operation has been confirmed by several practitioners; and pupils who left the college during the recess last autumn have disseminated it widely among their veterinary friends.

"In chronic cases previous preparation is seldom necessary, beyond keeping the parts for a short time wet with cold water; but where the inflammation is acute, attended with swelling, and a tense adhesion of the skin, these symptoms should be straightened and secured, and then a small opening is made just below the splint, sufficient to introduce a long, narrow, convex, probe-pointed knife, the edge of which is on the convex side; this knife is then passed up under the skin, and by drawing it backwards and forwards on the splint, pressing firmly at the same time, the periosteum is completely divided. A small opening is then made through the skin above the splint, and a narrow seton passed from one orifice to another, after which a bandage is placed on the leg and the horse is released. The seton should be moved and dressed daily with digestive ointment, and at the expiration of a week removed, and the wound permitted to heal. The operation is beneficial in several ways. We abstract blood, though small in quantity yet so immediately from the part, that it materially relieves the local inflammation; then, by dividing the perios-

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first allayed by topical bleeding, fomentations, poultices, and the administration of a purgative, until the skin is relaxed.

"Commence the operation by taking up the skin between the fingers and thumb of the left hand, and make an orifice with a knife, lancet, or with scissars, sufficiently large to admit the probe-pointed periosteotomy knife, which passes under the skin the whole length of the ossification; then withdraw it, cutting through the thickened periosteum down to the bone. Contrary to my expectations, I have found this division of the inflamed membrane attended with very slight pain to the animal. If the disease or lameness be of long standing, a small tape or thread seton may be inserted, and kept in a few days.

"The operation is very easily performed in from one to three minutes; but I consider it necessary only when there exists actual lameness: this, in the majority of cases, is *immediately* removed. A slight inflammation and swelling supervene the next day; the part may be fomented, and moderate exercise given; and generally in about ten days or a fortnight, the animal is fit for work. The enlargement considerably subsides, and, in some cases, becomes quite absorbed."—*Sewell.*

teum, we at once destroy the tension, the source of pain and lameness; and, lastly, by the insertion of the seton, we have the advantage of counter-irritation, and thus prevent the inclination which the parts may have to throw out — fresh ossific matter. And all these benefits we accomplish without any blemish. I have found the operation succeed whenever I have adopted it; but as it is proper to support new modes of treatment by facts, I will here mention a few cases that have occurred amongst others in my own practice. In the month of May, 1838, I performed the operation on a four-year-old grey horse, belonging to Colonel Phipps of this town, which had splints on both legs, but was tender and lame only on the one that had the largest splint. In the course of a month the horse went to work quite sound, and so continued about a fortnight, when he became lame in the other leg, likewise from the splint. The operation was then again performed; the horse resumed his work in a month, and the splints have never failed to the present day, although the horse has bad fore legs, and has been lame twice since,—once from corns, and again from a strain of the flexor tendons.

Another case was a chestnut mare, belonging to Messrs. Westlake and Co., merchants. She was lame from a splint, and a vesicating liniment had been applied several times, which produced temporary relief; but the lameness returned with the resumption of work. The operation was performed in the manner we have detailed; after which the mare was turned out to grass, and on being taken up was put to work, where she has continued for the last eighteen months entirely free from lameness.

A pony, belonging to the same gentleman, was operated on during the last summer, and resumed his work in a month, and has continued sound to the present time.

I should mention, that one effect of the operation has been a considerable diminution of the size of the splint.

In the ninth volume of the *Veterinarian*, page 16., we find two successful cases of periosteotomy related by Mr. J. W. Mayer, in which the lameness was soon removed and the splints diminished in size.

In the twelfth volume, page 466., an interesting case of periosteotomy is communicated by Mr. Joseph Carlisle, being the only one on record for Ossification of the Lateral Cartilages. He says,

"I performed the operation subcutaneously, first making an incision on the posterior ridge of the cartilage and introducing a probe-pointed seton needle over the whole substance. I next introduced my periosteotomy knife and cut freely into the ossific deposit, commencing at the anterior part, and moving the knife to and fro on the lateral parts of the cartilage, nearly severing it asunder. There was extensive hemorrhage during the operation, it being necessary to apply a bandage to stay it. In order to complete this operation, the foot should be well dressed, the sole pared thin and the commissure freely opened, and Turner's unilateral shoe applied. After a few days, an ointment, composed of two drams of iodine, added to two ounces of strong mercurial ointment, was applied to the part daily. This treatment Mr. C. found quite a specific ; the lameness was immediately removed, and the substance gradually disappears."

In the very numerous cases that occur of splints being unattended with lameness, it is better "to let well alone;" but where the lameness is slight, and the horse cannot be spared from work more than a few days, it is well to apply a mild blistering application, such as the acetous tincture of Cantharides, about a tea-spoonful of which will be sufficient for one application, which may be repeated according to the action it produces and the benefit it occasions.

When there is a very large splint so as to become an eyesore, and perhaps liable to be struck by the other foot, it is well to rub in daily the following ointment, with the view of promoting its absorption:—

Hyd. Potass. Pulv. ʒ i.	Hydriodate of Potass powdered, 1 dr.
Ol. Palmæ, ℥ i.	Palm Oil, 1 oz.
Ung. Hyd., ℥ i.	Mercurial Ointment, 1 oz.

To be well incorporated in a mortar.

After extensive splints have formed, the parts often accommodate themselves to the altered functions: on this point Mr. Cheetham, in an ingenious paper on splints, communicated to the Veterinarian, vol. vi. page 544., says: —

"From the numerous inspections I have made, I am brought to the conclusion that the head of the inner metacarpal bone is absorbed sufficiently to bring it on a level with the surface of the large metacarpal, while that where the unciform rubs becomes also flat."

Bony tumours sometimes form in various parts of the cannon bone, but though often large, and consequently offensive to the eye, they rarely produce lameness. They are more frequent with hunters than with other horses, and are often, but not always, produced by blows in leaping. The use of the Iodine ointment forms the best treatment. Still more frequently we find ossific depositions round the fetlock joint; the most usual situation is by the side of the sesamoid bones. Sometimes we find these enlargements on the anterior part of the joint, or on the lateral portions anterior to the suspensory ligament. These swellings frequently exist without injury, but they are sometimes the cause of severe lameness.

Treatment. — When these enlargements are produced by strains of the ligaments, they are much more serious than when they come on gradually without an ostensible cause. In the former case it may be prudent to blister or fire the leg; in the latter, we should recommend the continued application of the Iodine ointment.

Ringbone is a deposition of ossific matter on the pastern bones, which, from frequently extending round them, derives its common appellation. It exists in various degrees, sometimes being very slight, and in others surrounding the bones and altogether obscuring their real form. In some specimens we find the morbid depositions larger than the bone to which it adheres; in some, it assumes quite a grotesque appearance; and in others, the pastern joint is altogether anchylosed, the larger and small pastern bones being intimately united by the bony formation. Ringbones arise either from concussion of the joint or a strain of its ligaments; they may either be rapidly produced by a severe strain, or may, as they usually do, come on slowly. It often happens that a horse is lame, and it is somewhat difficult to discover the seat of his lameness; but after awhile a ringbone gradually forms. Horses with short upright joints are disposed to this disease from the concussion to which they are liable, and more particularly if their action is high; and I have also found, that horses with particularly small feet are likewise, from the same reason, more exposed to these ossifications than others with larger feet. The hind legs are subject to ringbones as well as the fore, but not so frequently, and when they appear behind, they are usually found on the side of the pastern bones, and arise generally from some strain of the ligaments.

Treatment. — Should there be any inflammatory appearances, as there generally are, we should take care to remove them before we have recourse to stimulating remedies. For this end we should employ topical bleeding from the toe or the coronet, and after that, evaporating applications to the part, with the immersion of the limb frequently in a bucket of cold water. When perfectly cool, but not before, we may resort to counter-irritation. In choosing either blistering, or the severer remedy, firing, we must be guided by the extent of the disease, and the nature of the animal's labour; and the question as to whether the owner does or does not object to the marks of the irons. If the horse is blistered, the operation should be repeated two or three times, or the Iodine and Mercurial Ointment may be substituted. If firing be employed, it is necessary to fire deeply, and we may blister a few weeks afterwards. Turning out to grass is desirable, as it ensures a long rest; or, what is still better, after the horse has rested for one month, sending him to plough for several more on soft ground, supposing, of course, that he is adapted for such labour.

Professor Sewell recommends the operation of periosteotomy for cases of Ringbones as well as for Splints; and, although I have not heard of any case of ringbone in which it has been employed successfully, it is yet founded on correct principles, and as such, is well deserving of a trial. It would, of course, be necessary to apply the knife in several places round the enlargement.

Ossification of the Lateral Cartilages is commonly known by the term " false ringbones." It is produced by concussion, and, consequently, heavy horses with high action are more liable to it than others, and more particularly if they are employed on the London pavement. It generally comes on slowly, and originates in different parts of the cartilage in different horses; sometimes commencing at the anterior part of the cartilage, but more frequently at the posterior and inferior part. From the combined operation of great weight and high action, the feet, and particularly the heels, come with great force on the ground; the cartilages being imbedded in the heels of the feet, are therefore the parts that receive the greatest degree of concussion, the consequence of which is, a subacute inflammation is set up, and the secreting vessels deposit ossific instead of cartilaginous matter in the room of that which is absorbed in the usual process of nature. This gradual change of structure from cartilage, so analogous to that which takes place in the early months of the animal's existence, may go on very slowly, or with much greater rapidity. In the former case there may be no inflammation going on, but in the latter there is inflammation, and very often lameness in consequence. A great portion of the heavy dray-horses in London have ossified cartilages; and in the country, nothing is more common than for cart horses with ossified cartilages to work on the road, and particularly at plough, entirely free from lameness. The lateral cartilages, when ossified, are considerably larger than before: they consequently press on the skin and the surrounding parts, and in this way assist in producing lameness and inconvenience. Ossified cartilages are consequently of minor consequence in farm horses, of greater consideration for heavy horses used on the road, still more for dray horses on the London stones, but most of all for horses used for fast work on the hard road. There may be considerable ossification going on in the cavity of the feet, in conjunction with bony formations above or entirely outside them. The inferior cartilages may be ossified, and bony substance may be formed, to a considerable extent, under the flexor tendon.

Treatment. — We are rarely called upon to treat the disease, unless it is attended with lameness, which may either be produced by inflammation going on in the part, or from the greater jar the foot receives from the loss of an important spring. If the former be the case, our object must be to remove the inflammatory disposition, and to stay the further deposition of bone. Should there be any appearances of heat externally, we may first bleed from the coronet, and afterwards proceed to counter-irritation, blistering the part several times.

If the ossification is fully formed, and there is no signs of active inflammation going on, we can then do little more than endeavour to diminish the jar of the foot. It is the practice in these cases to fire the coronet, but no benefit can be attained by the operation: it is both empirical and unmeaning.

We shall, however, find much benefit from the use of leather soles, taking care that the part applied to the heels is the thickest. In conjunction with leather, bar shoes, resting lightly on the frog, will afford still greater relief. If leather soles are not used, a piece of leather, corresponding to the shoe, may be riveted to both heels, which plan will considerably obviate concussion.

By these measures in the country we can generally relieve the horse sufficiently to make him useful, but in London it is often necessary to destroy the sensation of the foot by the operation of neurotomy, the merits and demerits of which will be separately discussed.

Fractures are much rarer in the horse than in the human subject, arising, no doubt, from the greater uniformity in the labour of quadrupeds, and from their being much less exposed to casualties than men. They are, however, by no means unfrequent, and the metacarpals and phalanges are probably more exposed to the accident than the other bones, and they likewise admit a better chance of cure than if the radius or the humerus in the fore, or the tibia or femur in the hind extremity are fractured: from the powerful muscles attached to these bones and the shape of the limb, it is extremely difficult to retain the parts afterwards in a proper position for union, and in the generality of cases it is most prudent to destroy the horse. The want of success that attends the greater number of cases of fractures in the horse, is owing to the following reasons. The restlessness of the animal — the impossibility of making him assume the recumbent position as in man — the difficulty of slinging him for any length of time — the circumstance of his having, in many instances, used the limb after the fracture, thus displaced the bones to a considerable extent — and the fracture extending into a joint, or being very complicated and severe. To ensure a cure, therefore, it is necessary that the horse should be tractable; that the fracture should not be very complicated; that the horse should not have walked a distance on the leg afterwards, and that the bones should not have been much displaced. When these favourable coincidences are present, and the animal is of sufficient value to pay for the expense of a few months' keep, we may then be justified in attempting a cure. Fractures of the pasterns present a greater prospect of success than when the shank is broken. There are some successful cases on record, which we cannot do better than narrate, as they are accompanied by some useful hints and observations on the subject. In the sixth volume of the "Veterinarian," p. 389., we have an interesting paper on the subject from M. Levrat, a Frenchman.

"It is no longer believed by veterinary practitioners, that fractures of the bones of horses are incurable: time and experience have done away with the ridiculous ideas which were formerly held on that subject. All veterinarians know that a fracture is reducible, and there is a chance of curing it when it is situated in a bone which has little motion, and is accessible to the manipulations of the operator and to the pressure of bandages, and especially when the splinters have not been displaced. But it appears to me that some modern authors have committed an error in advising, that, on account of the uncertainty of the result, and the necessary expense of treatment, only horses of great value or of the choicest breed should be submitted to surgical care. In reality (and I am now alluding to fractures of the extremities), it is very seldom, however skilfully the operation may have been performed, that the animal is made perfectly sound: there remains lameness and weakness, to a greater or less degree, in the limb which has been fractured; and sometimes there is a slight deformity. In this state, therefore, it is seldom that the animal can be ridden or driven in a carriage long or rapidly without going sensibly lame; and such are generally the uses to which high-bred and valuable horses are put. They will then be, if not absolutely unfit for their work, at least very unpleasant to use, even after the most successful treatment; they, therefore, can no longer suit the persons who possessed them, and who are mostly very jealous of the good qualities of their horses. One resource, however, remains, which is, to use them for breeding.

"For heavy slow work, such as the waggon or the plough, it signifies much less whether the horse is a little lame, so that he can work. In these sorts of animals a slight blemish is not an essential defect; and there ought to be less hesitation in attempting to cure their fractures, when it is practicable, than those of high-bred horses; for, I repeat, they lose much less of their value. The following cases, added to those already published by skilful veterinarians, will prove that the cure of fractures is not so difficult as it has too long been thought to be, and that the expence of the treatment may be much less than has been imagined.

" *Case* I. — Fracture of the coxal bone (the hip or haunch bone), at the ischium, near the cotyloid cavity (the acetabulum).

" In 1818, a saddle mare of English breed, about eight years old, belonging to a stranger, fractured the right side of the coxal bone at the ischium near the cotyloid cavity. This fracture was got in hunting, when the animal leaped a wide ditch. The lameness which it occasioned was such, that the toe of the foot scarcely touched the ground, so long as the motion was a little rapid: when the motion was slow, the foot was placed straight down; but the limb was with great difficulty moved forward. On applying my right hand to the fractured part, which did not exhibit any heat, and seizing with my left hand the point of the thigh, I felt a movement of the ischium which easily enabled me to judge of the fracture, and its seat, and to discover that none of the fractured parts were displaced.

" I ordered her to be kept quiet for three weeks, and then permitted them to leave her loose in the stable. At the end of two months she was mounted, and exercised at a foot pace; and in another month she was fit to take the longest day's work without going lame: the following year she was sold into the stud of M. le Baron de Staël, at Coppet, where she produced some good foals.

" *Case* II. — Fracture of the first phalange, the larger pastern bone.

" These fractures are not uncommon; I have seen this bone fractured in four horses.

" In two of these horses the bone was fractured into several pieces, and the animals were destroyed, as they were of little value: the other two were cured.

" The two first horses fractured this bone in frolicking on the best possible road.

" Fractures of the pastern bone are discoverable by the want of support of the foot, and the fractured limb: when the toe scarcely touches the ground, the foot is in the air. When the hoof is taken with one hand, and the other grasps the pastern, and with the hand which holds the hoof a semi-rotatory movement is performed, a crepitus will be heard, occasioned by the rubbing together of the two fractured surfaces.

"On dissecting the horses which were destroyed on account of these fractures, I particularly examined the broken bone: in one the fracture was oblique, and it extended almost from one extremity to the other of the bone; the superior piece also presented three vertical fissures.

"The fracture in the other horse was transversal, very irregular at the superior part of the bone: this part offered two splinters of the width of a man's nail, which proceeded from the superior extremity of the bone to its posterior and internal face.

"*Case* III. — Fracture of the large pastern bone; completely cured without suspending the horse.

"The 8th of June, 1829, I was sent for by M. Rouget, innkeeper at Ouchy, near Lausanne, to look at a horse of his which had run down a declivity, when harnessed to a light cart. This was a carriage horse, of the Holstein breed, of a bay cherry colour, and about eight years old. It was placed in a box in the stable when I saw it, and appeared to be suffering, and was much agitated: the left posterior extremity was retracted, and the foot was up in the air. I felt the limb all over, and soon perceived that the pastern was painful when touched, but I could not discover any inflammation: I moved this part every way, but still could not detect the fracture; I could only suspect it. Believing that it was not complete, I confined myself to bleeding the animal, and prescribing a strict regimen of diet for some days, and fomenting the pastern with Goulard's extract, to prevent swelling.

"Three days afterwards I visited the horse again, and examined the diseased part, when I easily discovered the fracture of the pastern bone. I judged that this fracture was oblique, forasmuch as it was not followed by so much inflammation. I had the whole of the inferior part of the limb fomented with arquebusade water, and wrapped a band of very strong linen many times round the pastern: I placed another under the fetlock joint to support the flexor tendons, and ordered them to bathe the fetlock several times a-day with the arquebusade water, and not to suffer the animal to lie down. He was not suspended. For about three weeks he kept his foot in the air; at the end of that time he now and then tried to rest his toe on the litter. Six weeks after the accident he began to rest some weight on the foot, and a few days afterwards he was able to go to a pond about fifty paces from his stable, where he took a foot-bath every day, for about an hour at a time. At the expiration of the third month he was mounted, and was fit for regular service, at a walking pace; but it was observed that he still went lame when he was trotted, and it is probable that lameness continued for a long time.

"*Case* IV.—Cure of the fracture of the pastern bone, without suspending the horse.

"The 4th of August, 1829, I was sent for to see a bay cherry-coloured cart horse, belonging to M. Delamisinne, the Lausanne carrier. He told me that this horse being harnessed to a cart loaded with wood, the wheel guard was broken at a little declivity; and the horse running away had broken the little drag chain, and the wheel had struck his right hind foot, and thus caused a fracture of the pastern bone.

"I examined the horse, and found that the right hind extremity was in a state of flexion, the foot in the air, with an impossibility of bringing it to the ground. I felt the pastern; the slightest movement showed me that a complete fracture of the large pastern had taken place, and I judged it to be transversal, and to be seated in the inferior part of this bone.

"As the animal could not put his foot on the ground, I was obliged to think on some means of getting him to walk to the nearest stable we could find. It was necessary to favour the placing of the foot on the ground, if not so that the animal could rest on it at least so that he might be able to limp on it a little. For that purpose I placed a strong bandage of linen in the pastern, and another underneath the fetlock, to form two supports for the extensor and flexor tendons in this region, and to prevent the movement of the fractured parts. In this manner the animal was got to the stable destined for him, where he was placed on a good litter, and tied to the rack by two straps; but he was not slung.

"I placed three splents, enveloped in tow, one at the front, and the other two at the back of the fractured part. I fixed them on first by a layer of melted black pitch, which I put underneath the fetlock, and then by several rounds of strong bandaging. I left the band which I had placed below the fetlock, and ordered a light regimen for the first five days after the accident; and took away six pounds of blood.

The dressings stayed on for a month after the accident. At the expiration of that time the animal began to try to place his foot on the ground; I then loosened the bandages, without moving the splents. I bathed the fractured part well with lotions of the water of Labaraque, and then replaced the bandage as before; and ordered that it should be thus bathed every five or six days. At the end of six weeks he was able to rest on that leg in order to change his place; and in about seven weeks the dressings were taken off, and the horse was well enough to be led to his own stable, which was at a considerable distance, and where he was allowed to rest for three weeks, from a kind of excess of precaution. From that time to this the animal has done his daily work, drawing a heavy cart on the pavement of a town; and though he limps a little when he is trotted, he does as much slow work as ever he did."—*Recueil de Med. Vet., Nov.* 1831.

In the 7th volume, we have a case by Mr. Moulden of fracture of the metacarpal bones.

"On July 24, 1826, I was sent for by Wr. W. Pain, of Micheldever, seven miles from Winchester, where I then resided, to see an entire cart horse, of great promise, rising four years old, that had, it was supposed, broken his leg in going out of the stable to water; his foot having slipped underneath the sill of the door, which was considerably above the ground, the same having mouldered away and formed an inverted arch. On my arrival, I found the poor animal in a most deplorable condition, standing upon three legs, and the broken one bent inwards; the fracture was transverse, and four inches below the knee. I must confess I was very doubtful as to the result. But '*Nil desperandum.*'

"With the assistance of the owner and his servants, we placed the horse between the shafts of a waggon, and suspended him by means of a cart line to the timbers that went across above, with a couple of sacks moderately filled with wool under the abdomen, and a breeching for him occasionally to recline upon, and which very materially assisted him. Having placed the fractured ends in apposition, I wrapped round them several sheets of brown paper, well soaped, and upon that some fine tow. I then bound these round moderately tigh, with an elastic bandage, and over this were four splints, so secured that they could not shift from the position in which they had been placed.

"Being a large animal, and very wide in his chest, I had a kind of pit dug, filled with soft hay, for the foot to drop into. In the course of a month he would frequently rest upon it with as much indifference as the other leg, for ten minutes at a time. He was kept in this position until the 20th of September, when all his trappings were removed, and, to my great satisfaction, he walked across the stable with a slight degree of limping, but not at all distressed. He was kept in a loose place for two months more, and then sent to plough; worked upon the farm for two years, and then sold for 65*l.* as a stock horse, to a man named Bently, a person noted in that part of the country for horses for that purpose."

In the same volume, we have a communication from a foreign practitioner, M. Gayet: —

"A horse, belonging to the relay from Aure to St. Menehoud, fell, in going with considerable speed down a little descent, and one of the fore wheels of the carriage passed over his fore legs. He was raised on a car, and carried to Orbeval, which was not far distant. A veterinary surgeon being consulted, discovered that the pastern belonging to each leg was fractured, and advised that he should be destroyed. My advice was afterwards asked; and, considering that the horse was only five years old, that he was of some value, and that his keep and medical treatment would not cost much (for he was one of thirty horses on which I was in occasional attendance), it was determined that we should attempt to reduce the fractures. He was carried to Aure, and placed under my care on the 2d of May. He had not attempted to get up since the accident, and seemed to have suffered little by being thus transported from place to place, except that the salient points of his body were considerably excoriated.

"Having taken off the hobbles by which his legs were confined, I proceeded to examine him, and the fractures were easily recognised. That of the larger pastern on the right leg was transversal, and there was neither displacement, deformity, nor shortening; but the mobility of the divided parts was very great, and the crepitus considerable.

"I had more difficulty in discovering the fracture in the left pastern. There was a great deal of heat about the limb, and some swelling round the coronet. The animal expressed great pain when I rotated the limb, and a crepitus could then be distinctly heard. At length I was enabled to assure myself that the fracture was longitudinal. The horse was very tractable during the examination, and the people about him were disposed to do all they could to save him. The fractures on both legs were simple. I ordered the proper bandages to be prepared, and applied them as well as I could.

"I directed the bandages to be kept wet with an emollient lotion; camphorated spirit to be applied to the excoriated parts; green meat to be given, and the litter to be thick, and often shaken and changed.

"*7th.* — He had been very tractable; when he was tired of lying on one side, he drew his knees under him, and then, raising himself on his hind quarters, turned himself on the opposite side, without the least portion of his weight being thrown on his pasterns. Some few turns of the bandages were loosened and displaced. I rectified this, and ordered that the bandage should be kept wet with an evaporating lotion.

"*13th.* — I again tightened the bandages. The animal now began to make some efforts to rise. I therefore contrived to suspend a sling from the roof of his stall, and raised him by means of it, to see what effect it would produce. He soon began to break out into a profuse perspiration, so that at the end of a quarter of an hour I was obliged to let him down. He immediately stretched out his limbs and his head, as it were with an expression of pleasure, and did not move for several hours. I ordered them to draw him up whenever he seemed to be tired of lying, and not to quit him, but let him down again when he appeared to be uneasy in his sling.

"I did not see him again until the 26th, when I did nothing, except to order them still to wet his bandages occasionally with a spirituous lotion.

"On the 5th of June I took off the bandages for a little while, in order to ascertain the state of the parts, and found that a callous substance was forming at the situation of both fractures.

"*27th.* — The bandages were finally removed, and the sling also taken away. The animal could now get up and lie down without aid; but the precaution and management which he used in order to effect this were admirable. I directed that the spirituous lotion should be continued on the pasterns, and that an ointment should be applied to the hoofs, which had grown considerably, and had become very hard. I changed his stable, and induced him to follow me to his new abode, by tempting him with a handful of oats at every step. He was exceedingly lame on both legs, but most so on the left. There was a considerable callus on each pastern, and the left one was very upright, so that I feared that anchylosis would take place on account of the longitudinal direction of the fracture. I surrounded the feet with emollient cataplasms, in order to soften the horn. On the 30th, the foot was pared out, and a high-heeled shoe put on; and on the same day I applied the cautery in a fanlike form (*transcurro-inhérente*) over the whole pastern. The evaporating lotion was continued on the right pastern, and the ointment to the hoofs of both feet.

"*15th.* — The effects of the cautery are already manifest: there is evident motion between the pastern bones, and I have no longer anchylosis to fear. A shoe with a lengthened toe was now put on, and the horse moved more easily. The cautery was applied to the right pastern.

"Walking exercise, gradually lengthened, was recommended.

"*August* 10*th.* — The lameness has very much diminished; it is greatest in the left pastern, which, nevertheless, is regaining its former obliquity.

"At the beginning of September he went to plough.

"The establishment not being willing to keep the horse, he was sold to a post-master for thirty francs, towards the end of the following June; but being badly treated by him before he was in a fit condition for service, he was sent to farm-work. In the mean time, the callus had much diminished in both legs; the horse was scarcely lame, and the cure was regarded as perfect. His present proprietor, however, was unwilling to keep him. He would have to maintain him almost without work during the winter; he therefore tried to get rid of him, and obtained ninety francs for him about the end of December. In other hands, and better treated, the animal gradually got into good condition, and was bought by a farmer at Chalons, who had no other horse, and who employed him in all kinds of agricultural work. I had the satisfaction to see him often, doing well and free from lameness. They called him 'Broken-leg.'"

In the 8th volume, p. 340., we have a case of fractures of the fore arm treated successfully:

"An entire draught horse, aged, received a kick from a mare which fractured the left humerus.

"Being immediately sent for, I found the horse in the stable lying down on his left side, that is to say, on the injured limb. Having raised the horse and examined the limb, I found that the cubitus was fractured transversely from two-thirds of its length upwards, down to its carpian articular extremity, and that one portion was separated from the other. The obliquity of the fracture was from without inwards; so that the exterior carpian extremity was larger than the interior one. It was of one entire piece through the whole of its length, and we might have considered the external part of the bone as perfect, if it had not been for its size.

"This species of fracture presented a fair chance of cure; and, the proprietor liking the horse, which he had lately bought, desired me to undertake the case.

"It is well known that the slings which are ordinarily employed inconveniently compress the abdomen, and the result of this compression is difficulty of breathing, while in the male horse the discharge of urine is often difficult. In order to remedy these inconveniences, Verrier had contrived an apparatus to support the hinder part of the horse, and to which he had given the name of *breeches* (culottes). This apparatus, very complicated, bulky and heavy, although useful in the hospital of a school where a professor may superintend the application of it, cannot find a place in the luggage of a military veterinarian, on account of its price, and the little room that is allotted to him.

"On different occasions that have presented themselves in the course of my practice, when I have been compelled to suspend a horse, I have endeavoured to supply the place of the apparatus of Verrier by contrivances that produce the same result, and the means of which are at hand everywhere.

"I went to work in the following manner. I placed a sack, or a strong cloth doubled, under the chest, of a convenient length, and twenty inches wide; and a cord fixed to each extremity is fastened to the bars or horizontal rafters above. In order to support the hind part, I take two sacks used for oats; I put a little long straw into them; then I fold them lengthways in the form of rollers, and attach a cord to each extremity; I pass the sacks between the thighs, and I raise the extremities of each, the one towards the haunch, and the other towards the thigh: the cords are fixed to horizontal bars above, and I separate the cords, or make them approach each other, as I need. In some cases it is necessary, on account of the tallness of the horse, to give a little more height to the bars, or, on account of his size, to bring the cords closer to each other. It was by means of a machine of this kind that the horse whose case I am now describing was suspended.

As I have said, this kind of fracture is reduced with tolerable ease. The bones being retained in their place by an assistant, I applied large pledgets, covered with pitch plaister, around the limb, particularly where there were any hollows, in order to render the limb everywhere of nearly the same size. I then placed compresses, and made the first turn with a bandage four fingers' breadth. I then fitted to the part four splents of light wood surrounded with tow, and these splents were retained by other bandages.

"I had the pavement of the stable taken up, and a hollow dug under the fractured limb, and this depression was filled with straw, to afford a soft support for the foot.

"The horse was bled; he was confined to white drinks, and several injections were given to him daily.

"No bad consequence resulted from the fracture save a slight enlargement of the limb during the first few days, but which was presently dissipated by lotions of infusion of elder-flowers.

"The only inconvenience which presented itself was a weakness of the loins, on account of which the horse was unable to support himself on his hind limbs, but was continually bearing on the slings. At the end of sixty days the skin was not in the slightest degree excoriated, which proved the advantage of my contrivance.

"On the 25th day, the splents were deranged, and I unrolled the bandages: there was still some slight movement between the fractured pieces. I re-applied the rollers as at first.

"The horse did well — his appetite was good, and his rations were increased. All the functions were properly discharged; but we continued to administer injections from time to time.

"On the 40th day he began to rest on the fractured leg.

"The weakness of the loins, however, continued, and gave me some disquiet as to the future usefulness of the horse. I suspected that it was some sad affection of the part, and I endeavoured to remedy it by emollient cataplasms, and then by tonic frictions.

"On the 60th day the bandages were taken from the limb: the fracture had been well consolidated, and the horse rested his weight upon it. As he was led out of this stable to another, we observed that he was a little lame. Having arrived at his new residence, he lay down; and during three weeks that he was kept there, he was almost continually lying down, although he had the range of the whole stable.

"After all, the proprietor having discovered that the horse would not have been sold had it not been for this affection of the loins, determined to have him destroyed. He walked to the knacker's without the slightest lameness.

"*M. Delaguette.*"

In the 11th volume of the "Veterinarian," we find, p. 12., a paper from Mr. Friend on Fractures, in which, after some judicious remarks, he relates three fatal cases of fracture, to show that in all such cases where it seems to occur without any sufficient cause "the bone has, from some previous accident, as a blow or kick, been starred or cracked, though the parts still retained their relative positions, from the immense power of the periosteum and the facial attachment of the muscles, &c., and that the exertion subsequently used, displaces that which in reality had been broken before, and satisfactorily accounts for some of these tedious cases of lameness from blows, &c. which, being supposed only to have produced simple contusion, create a wonder in the minds of our employers that they are not sooner cured." In these opinions of Mr. Friend we most fully concur. Mr. F. adds a case of fracture of the humerus without displacement, which he treated with depletion, absolute rest, astringent application, and low diet, under which it perfectly recovered.

In the same volume, p. 144., there is an interesting paper on the subject from Mr. Mayer, in which he supports Mr. Friend's views, and strongly advises the employment of splints and bandages, so as to prevent the displacement of the bones; in support of which, he adduces a case of fracture of the tibia, to which he applied an adhesive plaster, and over this three splents on the outside and two on the inside, bandaging the whole limb from the stifle to the fetlock, and keeping the parts wet with a cooling application. He also mentions a successful case in which the large pastern bone was fractured and displaced.

At p. 208. the following case of fracture of the ulna is related by myself:—

"About a year and a half since, I was requested to attend a horse belonging to George King, Esq., of Redbridge, in order to decide whether it was worth while to keep the animal, or to have him destroyed. It was a spirited and favourite horse, and very excellent in harness. He had been kicked about three weeks previously by another horse just below the elbow of the near fore leg, and had since this period been attended by a professor of the veterinary art residing near the spot, whose treatment consisted in sundry applications of certain stimulating oils to the part affected, the horse being at the same time, and by his recommendation, turned out with other horses in a water meadow; so that, when I saw him first, he was tormented with the flies, and jumping over the ditches with three legs, whilst the fourth was dangling in the air.

"On examining the part attentively I discovered a longitudinal fracture of the ulna to some extent; and I began to fear, from the long period that had been suffered to elapse, and the irritation thereby produced, and the allowing the triceps muscle to continue its action during this time, that the result would be unfavourable. However, I had the animal confined to a shed, placed a high-heeled shoe on the affected limb, inserted a seton near the part as a counter-irritant, and also to assist in keeping the limb quiet, and some days afterwards applied a charge round the part. The animal was kept about two months under treatment, during which time his amendment was plainly manifested: he was then turned out for several months, came up free from lameness, and has worked sound up to the present day.

"When called in to a case of fracture, the veterinary surgeon has many considerations to weigh in his mind before he decides either to attempt a cure or to destroy the animal. He has to consider the nature of the fracture; whether (should circumstances prove favourable) a union of the bones is likely to take place without any after lameness; whether the animal is sufficiently steady and quiet to submit to the necessary restraints; and whether the value of the horse is sufficient to defray the expenses arising from his medical treatment and keep for a long period.

"In the majority of cases these considerations will be of an unfavourable nature; and he will feel it his duty to advise the destruction of the animal. There are, however, some cases which, judiciously treated, are likely to terminate favourably, and, if the horse is of sufficient value, may fairly be taken in hand. The more intimately and immediately, however, the fractured bone is connected with muscles, the greater is the probability that the sequel will be unfavourable, because it is so very difficult, and, indeed, almost impossible, to prevent these muscles from contracting and pulling asunder the fractured bones. This it is which places us in so disadvantageous a position compared with the human surgeon, for however quiet the animal may be, yet the sling is a poor substitute for the horizontal posture."

A case somewhat similar I have since met with, in which it was necessary to sling the animal for a long time; but it was attended with success.

To these I could add some successful cases of fracture of the large pastern, in which the bones were not displaced. One, a coach horse that had walked some miles afterwards: no other treatment but bandages and cold applications was used; the animal took great care of the lame leg; and the parts united, though accompanied with some ossific enlargement.

Another was a very singular case of a thorough-bred mare, that had injured herself in racing, and could scarcely be got to the stable, where she almost constantly preserved a recumbent posture — the pain she experienced when standing being so excessive. I found one fetlock dreadfully strained, and the large pastern of the other leg fractured, but not displaced. The case appeared hopeless; but as the mare was likely to be useful as a brood mare, she was put under treatment, which consisted chiefly of antiphlogistic measures. The fractured leg entirely recovered, but very considerable bony deposition took place round the joint of the other fetlock, which rendered her afterwards lame, though fit for the purpose intended.

In a late number of the "*Medical Gazette*," the use of plaster of Paris was recommended for fractured limbs in the human subject, and some cases cited in which it had proved very successful. It well deserves the attention of Veterinary surgeons.

In cows we have a greater chance of being useful than in the horse; for, from the quiet nature of the animal, we have a reasonable prospect of union afforded, and if the case should be complicated, we may have recourse to amputation, of which there are several cases on record.

In the fourth volume of the "Veterinarian," Mr. W. Shield relates a case of amputation of the near hind leg of a cow, for a fracture of the tibia.—He says, p. 619. "After making a circular incision through to the bone, then separating the muscles about three inches anteriorly and posteriorly for the flaps, I next tied the arteries; then sawed off the leg as close up to the muscles as I possibly could, and afterwards brought the flaps together and stitched them with a strong thread, then bandaged the whole up." Three months afterwards the animal he says, "was able to go to the fields and seek her meat as before."

In the sixth volume, we have p. 533., a case of amputation of the fore leg of a heifer, "by Mr. Geo. Linton, in which he writes :—Being called upon to attend it, I found it necessary to amputate the broken limb about an inch below the knee; and I substituted a wooden leg in its place. The beast did well, and lived two years afterwards; and, when slaughtered, weighed upwards of forty stone, of 14 lb. to the stone.

OPERATIONS.

Having considered the various diseases to which the foot and leg of the horse are liable, we will now devote a portion of our space to the examination of those operations which we find it necessary to employ, our object, being not only to point out the best mode of performing them, but also to examine into their *rationale*. It is, indeed, the possession of this knowledge, the why and wherefore of our treatment on all subjects connected with horses, that should distinguish the man of science from the ignorant pretender.

As in the employment of many operations we find it necessary to make use of restraints, it will be proper to notice them first.

The Twitch is a simple, and well-known, and probably very ancient instrument, consisting of a stout stick, with a hole at one end, in which is introduced a strong piece of cord, about a foot in length, and then tied. This cord being placed on the back of the right hand, the muzzle of the horse is then held by the same hand, and the cord slipped from it to the muzzle, and the handle of the twitch is then twisted by the other hand, or by an attendant.

The severity of the twitch can be increased by twisting it to almost any degree. The immediate purpose is to produce pain, and its ulterior end is, by the infliction of this counter-irritation, to abstract the attention of the horse from the pain we may be inflicting by some necessary operation. It also induces the horse to remain quiet, by the increased pain experienced when the animal is restless. The twitch being an instrument of torture, though of a necessary kind, we should never employ it unless actually essential. It is, doubtless, often had recourse to when gentle treatment would not only suffice, but prove more effectual; and by its too frequent employment, the temper of a horse is often irretrievably spoilt, and an unpardonable cruelty uselessly inflicted. Grooms and horsekeepers are sometimes in the habit of making use of it whenever they dress a troublesome horse; this is a practice which never ought to be permitted, for in such cases a great degree of torture is daily inflicted on the poor animal, either to save the labour, or gratify the ill temper of his attendant. The mere throwing a cloth over the eyes of a horse will often render him quiet, and produce a better effect than the twitch.

The *Side Line* consists of a single hobble and rope, and is used principally in operations on the hind legs, in which case the hobble is placed on the pastern of the leg that is not to be operated on, and the rope being attached to it, is passed between the fore legs, then over the near shoulder, and down the off shoulder, and under the rope, to the near side where it is held by an attendant; the leg is then drawn forwards, and elevated from the ground, and the rope being tightened the leg is kept in this position — the animal standing on three legs. When the side line is employed, it is generally better to use the twitch at the same time. A very convenient, light, and portable side line is formed by the head pieces of two, and the rein of one, web-headed halters — the web part is not to be formed into a head-stall, but is to be cast over the neck like a collar, and the other web, forming a noose, is to be placed on the hind pastern; the rein then connects the one with the other, so that we can draw up the leg without difficulty. It is also useful if we want to draw the leg forwards, as in castrating, after the horse is cast; and it is likewise serviceable in casting the horse, if attached to the roller.

In order to perform a great number of operations with safety to the operator as well as to the patient, it is necessary to cast the horse. To do this, therefore, at once safely, expeditiously, and effectually, is a matter of great importance, and demands our utmost attention in the operation and the employment of the best and most convenient apparatus. It was formerly the custom, and it is still frequently the case with unbroken horses in the country, to cast them by means of a cart line, the middle of which, being formed into a noose, is thrown over the neck; the two ends are then passed between the hind legs round the heels, and are then drawn forwards so as to bring the legs together, when, if the animal does not disentangle his legs he presently falls down. This method is a very barbarous and unsafe mode of casting a horse, and never ought to be employed if the hobbles can be applied.

This method of casting the colt has been improved by Mr. Carter, a description of whose ropes or hobbles may be seen in the report of the proceeding of the Veterinary Medical Association, p. 217. vol. xi. of *The Veterinarian.*

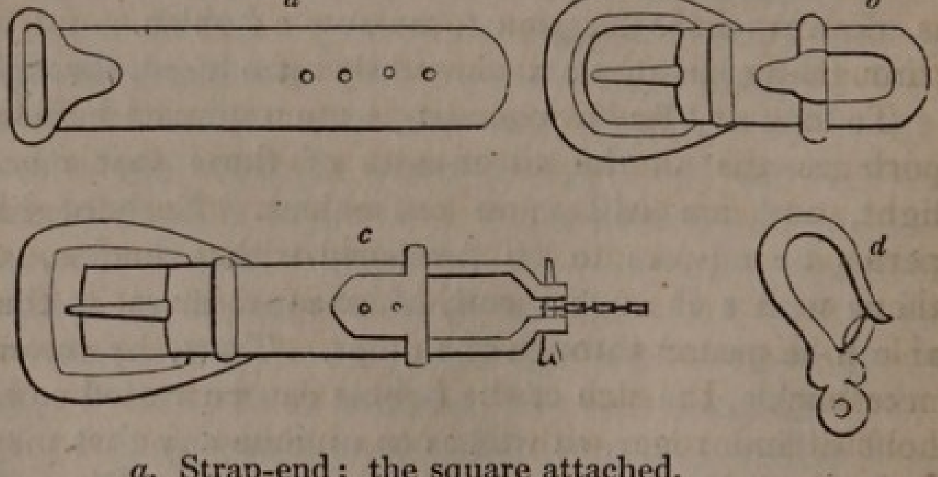
The common hobbles consist of four straps, each having a buckle and an iron D sown into the leather. A rope is fastened to one of these hobbles, and made to pass through the D's of the others. The rope being pulled, the legs of the horse are drawn together, and the horse is thrown down: when the operation is completed, the straps are unbuckled, and the legs being at liberty the horse is allowed to get up. The principal objections to these hobbles are, that it is necessary after the horse is cast to fasten the rope so that the animal shall not loosen it in his struggles, which occupies both time and trouble; the other objection is, that if the horse should struggle when perhaps half the hobbles are unbuckled, it might be a very awkward and perhaps dangerous affair. To obviate these two inconveniences has been the object of several practitioners. I, for my part, for several years past, have been in the habit of using hobbles that avoided the evil complained of. Two of these hobbles consisted of a strap with a D to each end; these were generally buttoned on the hind pasterns, having a small strap and iron button for the purpose. Those on the fore legs are furnished with buckles, and one of them with a single D, and the other with a sort of double D, permitting the chain to run through it, and afterwards attached to it with a screw. This last hobble is generally placed on the near fore leg, and the chain is then drawn through the single D's of the fore legs, beginning with the near and the double D's of the hind legs; and the end link is then screwed to the near hobble. The chain is long enough to go through each hobble, and a rope is attached to it. When the operation is performed the screw is withdrawn, the hind hobbles of course come off, and the animal can rise without difficulty, and the fore hobbles can be removed when he is up. When it is necessary to unloose one of the hind legs whilst the horse is down, the hobble with the buckle is affixed to it instead of to the fore leg. In casting, I invariably use the roller, and web and rein attached to it, which being pulled on the contrary side to that of the hobble rope, the horse is cast much quicker, with less struggling, and precisely on the spot we intend. After he is down, I always employ the cross straps, attached above the knee of the fore legs, and above the hock of the hind legs. These straps are of great importance; they afford a great security in case a hobble or link of the chain should break; they materially diminish the struggling of the animal; and they are useful in straightening the leg when we have occasion to unloose a hobble.

Mr. Gloag has very praiseworthily introduced, through the medium of *The Veterinarian*, some improved hobbles which possess all the advantages of those just mentioned, and are still more convenient. Each of his hobbles he advises to be furnished with a buckle, as well as with a D at each end, of unequal sizes, so that one can be passed through the other. Thus, by means of the buckle, the size of the hobble can be varied so as to suit different legs, as well as to unloose any that may be required during an operation, and the D's will enable every leg to be free the instant the screw is withdrawn.

Mr. Daws has still further improved these hobbles, and I cannot do better than introduce his description of them, as well as his drawings, which are given in the eleventh volume of *The Veterinarian.* He says:—

"The alterations I have made are, first, in having the iron work a size larger, so as to admit of an easier passage for the chain which, in my opinion, should not be more than eighteen inches long; the long D's should be an inch and a half wide, and two and a quarter inches long in the clear. The squares should be made sufficiently large to allow the others to pass through them with freedom. Each hobble should have a curved buckle, two inches in the clear, the leather of the same width, and not less than half an inch in thickness, and four inches long, with a galling leather under each buckle, and the long D attached to it by means of an iron chape and rivets. The strap end should not be less than eighteen inches long, with the square attached to it by the same means as above. Instead of the cottrell recommended by Mr. Gloag, I have found it more convenient to have one of the long D's made open at the curvature, and its end tapped for the screw, with its head downwards as in the diagram.

Fig. 29.



a, Strap-end; the square attached.
b, Buckle, and D attached.
c, Buckle with open D and screw.
d, The hook.

"This hobble I always place on the near fore leg, and it matters not which side the horse lies upon after the operation, as the thumb-screw is removed with more ease than from the cottrell. The hook for securing I have made with a spring, and there is no necessity for a small chain attached to it."

From the description of these hobbles, it must be evident that they can be placed on the legs, and removed with the greatest facility, and any leg that may be required, can be unloosed by means of the buckle during an operation.

Mr. Gloag advises the chain to be 2½ yards long, so that there may be no impediment to the passage through the D's, by the place of junction between the rope and the chain. Mr. Daws, on the other hand, prefers one of eighteen inches only. It is a matter of little importance which plan is adopted — only taking care that we have either the one or the other, and not a medium between the two. It is necessary to have some portion of chain, in order that the hook may be inserted in the link so as to secure the hobbles on the leg. Mr. Gloag's plan is probably the most secure, as the weakest part of the rope is the place where it is joined to the chains. Mr. Daw's method, however, is the lightest, as he only leaves chain enough to secure the hobbles after the horse is down; and the rope passes with greater facility through the D's than the chain would.

To country practitioners it is often a matter of importance, that the means of casting a horse should be as light and portable as possible, as it is often necessary perhaps to pack them in a portmanteau, and convey them on horseback, in which case of course it is desirable to dispense with every thing that is not absolutely necessary. In such case, if we take with us the four hobbles and rope, with the cross hobbles for two legs, and the web and rein, we shall no doubt get a roller and any thing else we may require at the stable of our patient.

Local Bleeding.—We have in several diseases of the feet and fore legs, recommended the abstraction of blood from the nearest part. This is a branch of treatment, though too frequently neglected by the practitioner, yet of great importance. To use a sporting phrase, "we should never throw away a chance," and this we certainly should do if we were not to avail ourselves of the advantages afforded by topical venesection. A pound of blood abstracted from the immediate vicinity of an inflamed part, will often be more effectual than 10lbs. taken from the system generally. To demonstrate its advantages, I cannot do better than mention a striking case. I was sent for, about two years since, to see a horse of Col. Fagan's, in this neighbourhood. About two hours previously he was taken to exercise, and being very fresh he jumped about a good deal, and returned home very lame of the near hind leg. When I saw him he could scarcely stand on the leg — he had in fact thrown out suddenly a large curb, and there was considerable heat, swelling, and tenderness of the part. I immediately abstracted five or six quarts of blood from the thigh vein, and by the time I had pinned up the orifice, the horse was much relieved; a patten shoe was applied, and the part kept wet with an evaporating lotion. With this treatment the horse returned to his work in three weeks, perfectly sound, with scarcely any appearance of the curb, though no other treatment was employed. This I am quite sure he would not have done without the powerful assistance of local venesection.

The situations most favourable for local bleeding are the toe and coronet, in both hind and fore feet; the inside of the arm and elbow joint in the fore leg, and the inside of the thigh in the hind.

To bleed at the toe, it is necessary to remove the shoe, and pare the sole thin throughout its surface, and at the anterior part between the crust and toe of the frog, until the blood oozes through the horn, then with a small sharp drawing knife a portion of horn should be quickly cut away, so as to open the circular artery of the sole. It is frequently the practice in bleeding from the toe, to remove the horn immediately at the junction of the sole with the crust, and allow the blood to trickle slowly into the vessel. This is a very tedious method of operating, and is attended with little or no benefit. We must bear in mind that the artery lies within the vein, and that to take away a sufficient quantity of blood, it is necessary to open the former, which we may know is accomplished by the blood being of the red arterial hue and jutting out in a full stream. Some practitioners are in the habit of thrusting the point of a lancet into the vein and artery, when the horn is sufficiently removed. This, however, is a very bad practice, the stream of blood is likely to stop before we wish it, and to require fresh lancing, and the wound is very likely to fester, and matter to form and underrun the sole. I attended a case some time since, which a wiseacre had bled in this manner, and who recommended the horse to be sent to work the next day. The consequence was as might have been anticipated, the horse became dreadfully lame, and when I saw the case the matter had completely underrun the sole, which it was necessary to remove throughout its whole extent. The sensible sole was, also in a very unhealthy state, and it was some little time before it could be got well.

When a sufficient quantity has been abstracted, it may easily be stopped by means of a pledget of fine tow, over which the shoe may be nailed, or a poultice applied, as may be required.

In bleeding from the coronet, all that is necessary is to plunge a lancet through the skin to the lateral cartilage, taking care not to penetrate too far; by so doing, we divide some of the numerous veins which form a sort of net-work, just before they unite to form the pastern veins. Either the inside or the outside may be selected, but we must take care to be on our guard, as the horse may strike out his leg from sudden pain, produced by dividing some one of the nervous branches which ramify over the cartilage. The bleeding may be assisted by the immersion of the foot in a bucket of warm water. We can seldom abstract so much blood or so rapidly from the coronet as from the toe, but it has this advantage, that the wound is less likely to fester.

In bleeding from the arm we may either select the vein on the inside of the radius, six or eight inches above the knee, or at the arm opposite the elbow joint, where the superficial brachial is commonly termed the plate vein. In well-bred horses the vein, at the former situation, is well developed, though not so in coarser animals; and if we bleed for inflammation below the knee, it has the advantage of being more immediately connected with the diseased parts, whilst the plate vein receives numerous branches from the adjacent muscles. In bleeding from the lower situation, it is better to apply the finger of the left hand on each side of the vein to keep it steady, and to open it with a lancet. We should by no means use a fleam, for if we do its point will be driven through the vein into the bone, where it will probably be broken off. The plate vein, however, lying on soft parts, may be opened either with the lancet or fleam; indeed the latter is most convenient, as the vein is so apt to roll away from the lancet, whilst with the fleam the skin and the vein can be instantaneously penetrated together.

The saphena vein, inside the thigh, may likewise be opened with either instrument, but the fleam is most convenient here likewise. It is sometimes a very troublesome affair to pin up the orifice, particularly if the horse is not quiet, for the blood usually comes more freely after it has been flowing for some time than at first. The plan I usually adopt is the following:—"the fore leg on the same side as that on which we bleed being held up, I place one hand in front of the thigh and one behind, feel for the orifice with the left hand, and pass the pin with the right through each lip of the wound separately, and then in the same manner wind the tow round the pin sufficiently to stop the blood. Care should be taken here as well as in the neck, not to draw the skin too much out, as this will be very likely to occasion a considerable swelling, from its permitting the blood to escape between the vein and the skin.

In all cases attended with much inflammation about the hock, or parts below it, venesection from the thigh is of great importance.

Blistering. — Very little need be said on this subject, for it is an extremely simple operation though requiring some care and attention. It may, however, be observed, that a part should not be blistered whilst in a state of active inflammation: as long as heat can be detected in the part, antiphlogistic treatment may be employed with greater advantage. The object of blistering is to produce an inflammation and serous effusion on the surface of the skin, and by so doing to abstract inflammation from another part: thus to take advantage of a law which obtains in animal economy, that two equally strong inflammations cannot exist at the same time in the same neighbourhood; as one increases the other diminishes. When, therefore, a subacute inflammation is going on round any joint or sinew, producing morbid depositions, we apply a blister to the skin in which there is no inflammation, and thus we cause the vascular action, that was employed in producing diseased structure to be harmlessly expended on the surface of the skin. Such is the purpose of a blister, from which it may be seen that it is essential to its beneficial operation that the part to which it is applied should be free from inflammation; for if the irritation which may be going on in a deeper seated part be so great as to involve the integuments with it, then a blister applied to the latter would be adding fuel to fire, and increase the morbid action it was intended to subdue.

It must be evident that we cannot blister without producing pain and irritation, and, this being the case, it must be equally evident that the unblushing pretensions of many inventors of blisters are altogether void of foundation. Whoever that has had a blister applied to his own skin but what has experienced its unpleasant and painful effects? and yet we have some empirics who tell us, that their blisters may be applied to horses without any precautions being taken to prevent blemishing! Is it at all likely, that if there were any application that would raise a blister without producing pain, that human practitioners should have been so blind to their own interest and the comfort of their patients, as to take no advantage of it? There are many substances that will produce irritation of the skin; such as euphorbium, oil of turpentine, tartarised antimony, prussic acid, and many others, but there are none that will blister so well or so effectually as the Spanish flies. These invariably form the basis of every regular blister, and can readily be detected in James's blister, or in any other that has been offered to the public in the form of an ointment. Euphorbium and oil of turpentine, if applied to the skin, will produce great irritation and pain, but not vesication in any commensurate proportion; the former should therefore be avoided, and the latter moderately used.* Tartarised antimony will raise the cuticle in a great degree, but causes pus to be effused instead of serum, and is consequently more likely to produce a blemish, and is therefore to be avoided as a common blister, though, in particular circumstances, it is advantageous. Prussic acid will produce a very good blister: it is however very expensive in its concentrated form, but in an ointment, called oil of bays, I have found it a very useful adjunct to our blistering ointment. We may produce almost any degree of action we please from the slightest discharge of serum to the most extensive blister, by rubbing in either a small portion or a large portion of our vesicating application. If we only wish to produce a moderate effect, it is better to apply it in a liquid form; as in all cases where we do not wish to re-

* Oil of turpentine loses its painful effects when diluted with oil or lard.

move the hair. If a strong blister is required, it is better to cut off the hair as closely as possible, and well rub it in, in the form of an ointment.* About an ounce of the ointment, generally speaking, will be sufficient for one leg of a moderate size horse; it should be rubbed in until it has apparently disappeared. It should be observed, however, that in some horses half an ounce will produce more effect than an ounce will on others, depending much on the breed, but more on the nervous irritability of the animal.

If a very mild vesicatory is applied, it is unnecessary to take particular precaution afterwards; but if a strong blister is used, it would be the greatest folly not to tie up the horse's head during its action. It may be true that six or eight horses out of ten would not gnaw the legs, but if the others would do it, it is quite a sufficient reason why the whole should be debarred from the danger; besides which, they may seriously blemish themselves by lying down. I saw a horse, some time since, a few hours after the application of James's blister: he was almost mad, tore up the pavement with his fore feet, and tried by every means to get at his legs with his mouth; and I am quite sure would have seriously blemished himself, had not the groom prudently tied up his head, contrary to the directions given in the advertisement and label of the ointment. The horse's head should be tied up for two or three days, after which a cradle should be placed on the neck, plenty of litter afforded, and the animal encouraged to lie down. The after treatment of the legs must depend on circumstances: if we wish the effects of the blister to be quickly removed, either for the purpose of a second blister or in order to use the animal, we may wash the

* The following recipe I have found adapted for all purposes in which a blistering ointment is required: — Lard or palm oil ℔i., melt over a slow fire, then add oil of bays 4 oz. oil of turpentine 1 oz., camphor liniment 1 oz.; when nearly cold, stir in cantharides very finely powdered, 4 oz.

legs with warm water and soap, before the discharge from the surface gets dry. If, on the other hand, we wish to increase the discharge, or raise a second action, we may apply the second day some oil of bays. If the horse is going to be turned out, we should rather keep the dry scurf of the blister on as long as possible, as it acts as a sort of charge, and braces the leg. Very little unguent of any sort should therefore be applied.

When all four legs are to be blistered, it is better to do two at a time, as the extensive irritation produced by the action on four legs at one time is sometimes attended with bad consequences; such as inflammation of the lungs from metastasis.

Firing.— In approaching the subject of firing, I am fully aware that I am treading on tender ground. There are some high authorities in our profession who altogether condemn the practice, who deny its superior efficacy over other milder applications; and, on the other hand, there are others of extensive practice and great repute, who confidently maintain its superior advantage, in numerous cases, over other methods of treatment. Amongst them are ranged the great majority of country practitioners, and it must be confessed, that many who leave the Veterinary College, prejudiced against the actual cautery, have, after a time, been found amongst its supporters. Messrs. Turner, and some others, carry the operation to a greater extreme than the body of the profession: they advocate the practice of actually penetrating the skin, in a great number of cases.

The application of the hot iron certainly inflicts considerable pain, and unless we have at least a commensurate degree of benefit we are not justified in resorting to so severe an application. For my own part, I must confess, that while the operation is no doubt often uselessly employed, and in many instances may be dispensed with, yet there are cases that will yield to the actual cautery, and to no milder remedy. In such cases I think we are fully justified, even on the score of humanity, in inflicting a temporary pain in order to prevent a constant one.

The practice of firing is very ancient, and we find that it was formerly used on the human being, and is still in foreign countries in some degree. It is necessary to inquire into the nature and effects of firing, in order to understand its efficacy. A number of lines being made in the skin with a hot iron, a considerable inflammation takes place, and thus the principal use is to produce a considerable counter-irritation, and this irritation, too, continues a much longer time than a blister; the increased action of the vessels, indeed, continues, in order to supply the new skin in the place of that which the operation has removed, and thus to create a new and long-continued demand for the blood that would otherwise be employed in forming morbid deposits.

Then again it is contended that firing acts as a permanent bandage; this however is denied by some, but it is certainly the fact, that after a leg has been fired tolerably deep, the skin feels much tighter than it did before, and more so than the other leg if not fired. This may arise chiefly from the increased thickness of the new skin which forms the cicatrix, and partly from a contraction of the old skin, so as to meet as near as may be at the edges; a disposition which we find evinced in the cicatrisation of wounds of the skin. This pressure, however, of the skin after firing, is undoubtedly attended with an useful effect. But after all, the best argument in favour of firing is the practical benefit that we find arises from it, and by no means unfrequently, after other methods have been tried without success. We must not however forget, that one benefit that attends the operation is, that it ensures a long rest for the animal, and obliges him, by the stiffness it produces, to keep the limb in a state of rest much longer than he otherwise would.*

* "The cautery" says M. Vatel, "is the most powerful of all tonics; it is the excitant par excellence. It may also, in cer-

The actual performance of the operation demands no scientific knowledge whatever, but yet calls for no little tact and gentleness of hand in order to perform it at once effectually, uniformly, and with as little blemish as possible. To do this we should, in the great majority of instances, cast our patient. For curbs, and where the surface to be fired is very small, and the horse is not particularly irritable, we may do it with the assistance of the side line, but in other cases the operation is attended with some degree of danger, both to the horse and the operator, which is by no means desirable to incur when a horse can be cast so easily. Besides which, the operation cannot be so neatly performed, unless the horse stands very patiently; and if a fore leg is being operated on, it is necessary for the other leg to be held up, and the horse to stand during the operation upon the lame leg, which may be productive of much injury, particularly if he should plunge, as he probably will, and thus come down with great force upon the injured limb.

Many practitioners attach great importance to the direction in which the lines are drawn; some prefer the horizontal, others the vertical, and some the oblique direction, whilst others again think it a matter of no

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tain cases, be considered as capable of producing an important and salutary revulsion. When it is not applied on parts which are already in a state of super excitation — irritated, inflamed — it is one of the most valuable veterinary therapeutic agents. Applied to weakened limbs, it causes them to recover, to a certain extent, their former vigour, their perpendicularity, and both the suppleness and the firmness of their motion. It effects a resolution of chronic and œdematous enlargements of the limbs. It opposes the return of certain pathological states produced by organic debility. It is highly serviceable after muscular distentions, sprains, luxations, &c., when the inflammation has disappeared, but the lameness remains. Effusions in the articular cavities, and white swellings of the joints, often yield to its power. It removes or it arrests the progress of bony humours, such as curb, spavin, ringbone, &c.

consequence what form they assume. These various directions are, I fear, often arbitrarily assumed, and preferred without reason to others. It appears to me, that for the purpose of tightening the skin and forming a permanent bandage, the vertical direction must be the best, for a reason that must be apparent to every one; but then, on the other hand, it is likely to leave a much greater blemish than the other forms, because the hair does not grow immediately on the fired place.

The horizontal direction is less likely to show the marks than the vertical, because, as the hair of the leg grows from above downwards, the fired place will be covered by the hair immediately above it. From these circumstances it appears to me, that the preferable direction must be the oblique, inasmuch as this combines the advantages of the others without the objections to which they are liable, for it must be evident that the oblique direction will permit the hair above to overhang, and thus, in great measure, cover the cicatrix below, whilst it approaches sufficiently the horizontal course as to derive the benefit of the permanent bandage this form is intended to produce. In firing the fore leg for, as we may suppose, an enlargement of the sinews, it is better, for the correctness of the operation, to draw a horizontal line immediately on the back of the leg, and one on each side, perhaps midway between the anterior and posterior part of the leg; and if we have to fire round a joint, it is desirable also to draw a vertical line in front; thus in the latter case dividing the joint into four compartments, and drawing the oblique line between the vertical ones. The advantage of this plan is, that these short oblique lines can be drawn with much greater accuracy than when extended half way round the joint. It is desirable, for the neatness of the operation, that the oblique lines should meet each other at the vertical ones, by which there will be greater uniformity in the appearance of the leg afterwards, and the lines are more likely to be made at similar and equal distances from each other. If the hand of the operator, either from nervousness or timidity, or other causes, be unsteady, the probable consequence will be, that the lines will be neither straight, at equal distances, nor at a proper uniform depth, and the operation will either be ineffectual or will greatly blemish the horse. The lines should not be drawn too close to each other, as there will then be danger of the skin between the lines, ulcerating, and thus producing a great blemish ; a space of about half an inch will be a proper distance between the oblique lines. They should be drawn, too, with the same depth from one end to the other, unless the disease for which we fire may require greater severity at one part than another. The proper depth that the irons should penetrate has engaged much discussion. It is very possible to fire so lightly that there shall be scarcely any appearance on the leg afterwards ; but this mode of firing is quite useless, a blister would be quite as well. It is generally recommended to fire until the lines are of a deep brown colour, but the depth must be regulated in some measure by the thickness and sensibility of the skin, as well as the urgency of the case. Generally speaking, I object to Mr. Turner's severe firing so as to penetrate the skin, on account of the great blemish it leaves, and the long time the parts are in getting well.* We may fire with great severity without actually penetrating the cutis, and then the blemish is considerably less ; an object of much importance with many of our patients. For enlargement of the sinews and the majority of other cases, it is, I think, better to keep within

* Mr. Turner says, "My practice in firing horses has convinced me that the success of the operation, if performed for the removal of lameness, where the ordinary means have failed, whether situate in a joint or a sinew, depends solely on making each separate line or lesion from end to end, completely through the skin or common integuments, cutis as well as cuticle, and boldly exposing the cellular tissue, forming the immediate covering of ligaments, tendons, periosteum, &c., with all due caution, of course, not to pass the instrument so near as to wound or sear these important structures."— *Vet.* vol. iii. page 504.

the bounds of Mr. Turner's extreme method; but it must be confessed that there are cases, and particularly amongst hunters, that require the very severest treatment, and will yield to no milder method. Amongst these, enlargement of the suspensory ligament is the most frequent, when a single vertical line in the course of the ligament through the skin will often be more serviceable than a multitude of superficial lines; and if there be only one such line the blemish will not be much, but if the extensive nature of the enlargement demands other lines equally severe, we must take care that they are wider apart than they would be if superficially made.

With regard to the pain inflicted by firing, it is undoubtedly severe, but has yet, I take it, been somewhat overrated by the warm opposers of the operation. At any rate, the pain is not in proportion to the severity of the operation, for after a certain degree it numbs or deadens the part. And with regard to the after pain of firing, it is not greater than blistering, for I have known horses that have evinced the greatest irritability and torture under the operation of a blister, and little or none at all after firing.

The French have introduced a method of applying the cautery without producing any blemish, by interposing a piece of bacon rind between the iron and the skin. The operation is extremely tedious, and it is very much to be doubted whether it is superior in its effects to a strong blister. The very long time it is necessary to keep a horse down in an uncomfortable if not painful posture, and during the time the almost constant application of the hot iron, renders it, I imagine, altogether more cruel than the ordinary method of firing, whilst its effect must certainly be greatly inferior.

Abstract of the Discussion on the Iron and the Seton.

"In the month of April, 1837, an interesting debate took place amongst the members of the Veterinary Association on the comparative benefit of the actual cautery and seton, and is reported in the abstracts of their proceedings for that year. On this occasion the opinions of a number of able practitioners were recorded, and although we cannot give more than a brief summary of the whole, yet such an abstract is rendered valuable by the importance of the subject.

"The debate was opened by Mr. Mayer, jun., who read a very able essay, in which he first traced the great antiquity of firing, then adduced the opinions of some modern writers, who advised the use of the iron as a dernier ressort. Mr. Mayer next adverted to the seton, tracing its history and explaining its rationale; and he afterwards related some cases of diseased hocks in which he first tried the seton, which failed, and he then had recourse to the cautery, and with success. In conclusion, he considered the seton as a mild counter-irritant, and was chiefly of service in diminishing inflammation, and as such was applicable to diseased joints in their early stages, but for exostosis and chronic disease he gave the preference to the firing iron.

"Mr. Sibbald, a practitioner of forty years' standing, without condemning the use of the seton for particular cases, yet gave his decided preference to the actual cautery. Mr. Thomas Turner bore testimony to the superior merits of the irons, but reprobated the plan of superficial firing, which he considered as no better than a blister. He always left very visible marks, and if the enlargements were of long standing he penetrated the cutis, and so likewise in cases in which the sinews were much enlarged. In this deep method of firing, the possession of nerve, tact, and science were called for, but with this there was no evil to be dreaded.

Dr. Billing, an honorary associate, recommended the use of the moxa to veterinary practitioners, having found it of great advantage in neuralgic and other diseases in the human subject. He placed a cone of moxa on the affected part, kindled it and suffered it to burn to ashes.

Mr. Simonds considered that both the seton and the iron possessed advantages, and could not be dispensed with, but did not believe the former would subvert the use of the latter. He advocated deep firing, but not quite to the same extent as Mr. T. Turner, except in a few instances.

"Mr. E. Braby preferred the iron for most of the lamenesses of the horse.

"Mr. Hutchinson said that he had fired horses deeply for spavins, and they continued lame. He then had recourse to setons, and they became sound.

"Mr. C. Spooner (now assistant professor) made some very useful observations on the relative merits of the two operations, stating what he considered to be their effects, and in what manner they acted beneficially. He considered that in many cases the horses were worked too soon after the seton, and were not allowed the same rest as they would if they had been fired, and this was the reason of its failure. He was, however, an advocate for firing in certain cases, as a dernier resort, and then he would fire deeply, for setons were far preferable to superficial firing. He had injected the limbs of fired horses, and had found blood-vessels that had never been seen before — in fact, a new organisation brought about by the bold application of the iron. It was therefore a scientific operation for parts essentially injured or broken down, but for spavins he preferred the seton, as, from its long-continued action, it was more likely to produce good effect. In the spavin, the difficulty was not in flexing the joint, but in resting upon it, in bringing the heel to the ground, and it was the synovial membrane and the cartilage that were diseased, and that produced lameness.

"Mr. James Turner spoke strongly in favour of deep firing; considered that, in some cases, it produced immediate benefit by penetrating the morbid deposit and dividing its substance. He considered that firing produced an artificial bandage, in which opinion Mr. Mayer also concurred. Mr. Turner had found setons very advantageous in cases of stifle lameness from injury, and also for tumours on the point of the shoulder.

"Mr. Cheetham spoke in favour of the iron, and considered it acted in producing a bandage, and was preferable to the seton.

"Mr. Holmes had seen benefit both from firing and setoning in hock lameness, but preferred the former for enlarged tendons; the seton, however, did not blemish like the iron.

"Mr. T. Turner related a somewhat extraordinary case of a valuable hunter having been severely strained in the sinews, so much so that the fetlock almost touched the ground, and the leg was greatly swelled. The horse was fired so deep that the lesions were seven months in healing, but in the following season he carried his rider as well as ever. The other leg broke down quite as badly, and the severe operation was again had recourse to, and with the same success as before.

"Mr. Richmond spoke in favour of the seton, the good effects of which he had seen; but preferred the iron for chronic cases. Mr. Dunbar bore testimony to the benefit of the seton.

"Mr. Youatt entered somewhat largely into the subject, explaining the nature and effects of the various counter-irritants we employ, speaking in favour of each, but giving the preference to the cautery in many cases. He objected to the seton, that its action must necessarily be limited to a small space, and although it might be preferable for disease of the hock, yet it was not admissible where the injury extended over a large surface. He, however, objected strongly to the deep cautery lesions of Mr. Turner, on the score of humanity.

"Mr. Sparrow advocated the superiority of the seton, and mentioned cases in its favour.

"Mr. Daws took a comparative view of the two operations, each of which possessed peculiar advantages, but gave the preference to the iron for the generality of cases. He objected, however, to the deep cautery lesions of Mr. Turner, which he had found to produce extensive inflammation and sloughing.

"The debate concluded by the president, Professor Sewell, who expressed his decided conviction of the superiority of the seton in almost every case. He preferred it, because it gave less pain, produced less blemish, and was more successful. He was glad to find that it was no longer the practice to fire the colt in order to strengthen the joint, and that the operation itself was not so frequently practised. For splints and ringbones, and bony tumours of all kinds, he had recourse to subcutaneous periosteotomy, with the best results, and for other cases he employed the seton, and would never adopt the actual cautery again."

Thus concluded this important discussion, which, although some rather conflicting opinions were expressed, is yet fraught with many useful hints and much valuable information. The numbers were certainly in favour of the cautery, but the opinions of the advocates for the seton deserve great consideration, for the latter would certainly be preferable if equally advantageous from its being neater and producing less pain and blemish.

With regard to my own opinion of the subject of discussion, I would give the actual cautery the preference in cases of enlargements of the sinews or ligaments, but for spavins I would prefer the seton, having in these cases found the cautery so frequently fail. For ringbones and ossified cartilages, although I would not discard the iron, I should prefer trying periosteotomy, which has been found so advantageous in splints. For enlarged tendons I prefer deep firing, though not through the skin — not because the latter is more painful, for that is to be doubted, but on account of the extent of the lesions and the time they take in healing. For curbs, too, we should blemish as little as we possibly can consistent with proper effect. For enlargement of the suspensory ligament I prefer Mr. Turner's plan, limiting the lesion however, if possible, to one line; so, likewise, for tumours about the fetlock.* I would, in fine, dispense with the iron in many cases where it is now employed, but when called for, use it effectually, at the same time availing myself of the seton and the periosteotomy knife as much as possible. Thus, without discarding altogether an old and faithful servant, I would afford every scope for the full development of the energies of its modern and scientific rival.

The frog seton. — This operation consists in the insertion of a seton through the substance of the sensible frog, entering at the cleft of the horny frog and coming out at the heels, or *vice versâ.* Unless the horse be particularly quiet, it is better to cast him, as there is danger of his plunging on the first insertion of the needle, and before it is passed through. If, however, we do venture on performing it standing, we must not forget to apply the twitch, which must be held by one assistant whilst another holds up the leg to be operated on. The needle, which is curved for the purpose and furnished with some wide tape, which should be double, is then passed through the skin into the substance of the heel, taking care that by its direction it shall make a proper exit (which it does by the second application of the hand) through the horny frog. The seton may be increased in thickness by the assistance of some fine tow joined to the tape by an orifice made in it, and should then be anointed with digestive ointment, and after being passed backwards and forwards several times, a large knot should be tied at each extremity. Before the operation, the horn of the frog should be cut away just at the cleft, not only for the easier performance of the operation but in order that the matter produced by the seton should have a free exit.

If we cast the horse for the performance of the operation, the foot to be operated on being the uppermost, and the cross hobbles applied, the web should be fastened

* The use of the budding iron has been suggested for firing. It is certainly likely to blemish less, when deep firing is required, and is in many cases to be recommended.

round the crust, just above the heels of the shoe, and drawn forwards so as to bring it straight, and out of the way of the other feet. A truss of straw or a bag stuffed with straw should be interposed between the foot and the ground, so as to keep the former steady, and the operation may then be performed, the seton needle either entering from below or from above: the former is the most convenient method in the recumbent position of the animal, but the latter is the safer, and enables us to select precisely the best situation in the heel for the insertion, an object of greater importance than the selection of the proper spot in the frog for its exit.

The effect of the seton is to produce considerable inflammation and suppuration of the parts through which it passes, and it is accordingly made use of in cases of navicular disease; and from its passing so near the joint capsule it is decidedly the best counterirritant that we can employ in these cases. After local bleeding and poultices have been carried to some extent, the frog seton is more likely to be serviceable than any other measure; and where ulceration has not gone on to a great extent, it is often productive of the greatest service — in some cases altogether curing the lameness, and in all alleviating it.

The seton should be kept in at least a month, being daily moved, dressed with ointment, and cleaned. A fortnight previous to its removal the seton should be diminished, which may easily be done by cutting a hole in the old tape, then putting the end of a single and smaller piece of tape through the former, which, after the knot has been cut off, may be drawn out, pulling the new piece of tape with it. Care must be taken afterwards by attention and cleanliness that a thrush does not succeed the seton.

Mr. Morton has lately invented some medicated tape for the purpose of setons, the merits of which have been testified by two practitioners, Messrs. Simonds and Stovely, who state in its favour that it excites suppuration quicker than the common tape, requires no ointment to be employed, is cleaner, and does not produce granulations at the edge of the wound. Mr. Morton, animated by the true spirit of liberality and science, disclaims all secrecy in medicine, and tells us candidly his method of preparing the tape. He says, "One part of pulverised cantharides is to be digested with a gentle heat for fourteen days in eight parts of the oil of turpentine. The solution being filtered, to every ounce an equal portion of Canada balsam is to be added, and in this mixture the cotton cord or tape is to be immersed until fully saturated; after which it is to be drawn between the finger and thumb and dried."

NEUROTOMY.

This operation is likewise known by the different appellations of nerving, unnerving, and the nerve operation, and consists in the division and excision of a portion of the metacarpal or plantar nerves, thus destroying sensation in the foot. The nerves which arise from the spinal column have been found, by the discoveries of Sir Charles Bell and others, to have a double origin, one from the back, or, in brutes, upper part of the chord by a number of filaments which coalesce, and then form a sort of knot called a ganglion; the other portion rises in a somewhat similar manner from the under or anterior part of the spinal column, and joins the other without forming any ganglion. Thus though the nerves are apparently united, the filaments are yet distinct, each having its neurilema or nervous covering. The former is the nerve which communicates sensation; the latter, that which conveys the power of motion, and a part is endowed mostly with sensation or with motion, according as the filaments of the former or of the latter predominate. It is a law of nature that no structure nor function is ever supplied in a situation where it cannot be brought into operation; consequently as the motion of the limbs is effected by means of the contraction of the muscles, and there are no muscles, there are therefore no motor nerves below the knee; sensation alone is cut off; and pain being the cause of lameness, the effect ceases with the removal of the cause.

The honour of the discovery of this important operation belongs to Professor Sewell. We are told that Mr. Moorcroft and others had previously performed it; but, be this as it may, they never publicly introduced or recommended it, and could therefore have had no confidence in its merits. It was Mr. Sewell, and he alone, who first generally practised and recommended it for incurable foot lameness. Like most other discoveries it has met with assailants from all quarters, both in the profession and out of it; and not a few of them have been owing to the careless and indiscriminate manner in which many practitioners have performed it — heedless altogether as to the nature and history of the case, or of the work the horse was afterwards to perform. This was the fact more particularly during the early days of the operation. There were groggy horses all over the country — far more than there are at present, particularly in coaches. Many of these had been lame for years, and were at once submitted to the operation, and soon afterwards resumed their work at a quick pace on the road; the consequence was, in a number of cases, the inflammation, that perhaps had never subsided, became vastly increased from the renewal of severe labour, and the unusual boldness with which the animal put his foot to the ground and bore his weight upon it; swelling and morbid formations succeeded, or, in other instances, suppuration supervened, the hoof sloughed off, and the animal was obliged to be shot.

In other cases, where lameness had existed for years, and ulceration had been going on to a great extent, and the flexor sinew had become attenuated, the horse, with the removal of pain and lameness — no longer having these often useful monitors to tell him of the consequences, treads boldly on these diseased parts, and the thin sinew, which perhaps never would have given way as long as the foot possessed sensation, suddenly snaps like a thread, and the horse presents the sad aspect of walking entirely on his heels, the toe being elevated from the ground.

Notwithstanding these deplorable results, which the practitioner should always bear in mind when he recommends the operation — in spite of their very frequent occurrence in times past, and their occasional recurrence at the present day, the operation still continues to be successfully practised when performed with discretion, and proper care is exercised afterwards; and although, as I said before, it is vilified by a few veterinary surgeons, and often condemned by the ignorant as a cruel and barbarous operation inflicted on a dumb creature, yet I, for my own part, having fairly tested its merits, must regard it as one of the most merciful and humane operations that surgical science has ever invented for the relief of suffering quadrupeds. The operation should never be had recourse to but as a *dernier resort*, until other remedies have been tried and have failed; unless it is very certain that they cannot possibly be of service: then, if after fairly explaining to our employer the nature and effects of the operation, pointing out more particularly that, though it relieved the pain and removed the lameness, yet it did not cure the disease — that the animal accordingly should not be regarded as altogether sound, and therefore should not be worked fast or immoderately — after taking these precautions, then, if a mishap should afterwards result, neither the operation nor the operator can be justly blamed.

The nature of the cases which justly call for the operation of neurotomy demands peculiar attention, as well as those from which we have the best reason to anticipate success.

Diseases of the navicular joint capsule form the bulk of foot lamenesses, and, consequently, those which too frequently from their incurable nature call for the aid of neurotomy. In these cases, if the horse be of sufficient value, it is better to treat the case as we have before advised, for we have the chance of our measures being successful; and, even if they are not, they are much more likely by their removal of inflammation, to render the after-performance of neurotomy safe and durable. If the foot is strong, and there is but little contraction, the operation is more likely to succeed; but should there be a great deal of contraction there is danger of inflammatory action going on external to the joint, and enlargements of a soft spongy nature taking place. If the foot is flat and weak, the operation is not to be recommended, as there is great danger to be apprehended from bruises and pricks in shoeing. And here it may be observed, that great care should be always used in shoeing afterwards; the smith should be cautioned that the foot does not possess its usual sensibility, and that he must not expect the horse to flinch from the nail going too close; every nail must, therefore, be driven with unusual care. From the want of these precautions being given or observed, cases have occurred in which the horse has been pricked, and which has only been ascertained by the hoof coming off from the extension of suppuration within. This being the case, the nails should be driven low, and where they cannot possibly injure.

It was doubted when the operation was first introduced, and there are some who doubt it still, whether, if nervous communication were cut off, the proper secretion of parts could be carried on in the foot. The fact, however, is, there are a set of nerves which supply the various arteries of the body with nervous energy of a peculiar kind, and which are independent of those of common sensation, both in their nature, distribution, and course. Accordingly, we find that the hoof and other parts of the foot are reproduced with the same energy after the operation as before; and even extensive wounds have been found to heal with equal facility. We have here much pleasure in referring for further information to Mr. Youatt's beautiful lectures in the *Veterinarian*, where the separate functions of the nervous system are admirably enforced and clearly explained.

The operation is sometimes performed for ringbones and ossifications of the cartilages. In these cases, we must always suppose that other treatment has been previously tried without success; and, we must bear in mind, that from these ossific depositions there has been considerable loss of elasticity, and consequently great concussion, and that the operation is likely to increase this concussion, by preventing that care being taken which pain and lameness produces. This being the case, the operation should not be performed unless the horse be too lame to be useful; and, after the operation, means should be used to ward off concussion by the interposition of leather between the foot and the shoe, and the employment of the horse in *moderate* work only.

The operation should not be performed when there are corns, unless they are very slight; because, these corns are likely to increase and fester without the animal testifying their existence by the exhibition of lameness.

There are two situations for the operation of neurotomy, the high and the low, the former being above the fetlock, the latter just below it. Each of these situations are attended with peculiar advantages and disadvantages, the nature of which it is well to understand. It must be borne in mind, that each metacarpal nerve just above the fetlock joint gives off an important branch, which takes an oblique course towards the front of the pasterns, and descends to the coronet, on which it is dispersed after giving off branches to the neighbouring parts. This being the case, it must be evident that if the operation be performed below the departure of this branch, the front of the foot and coronet will still possess a degree of feeling of much importance to the animal, and which will enable him to travel with a greater degree of safety than he would possess if sensation were entirely cut off.

When, therefore, we have reason to be pretty certain that the disease is limited entirely to the sphere of the navicular joint, and the horse is of sufficient value to make the possession of a slight degree of sensation an object of importance, we may justly give a preference to the low operation. In favour of this situation, it is proper to mention that Mr. Sewell (whose opinions on all veterinary matters are worthy of much respect, but on the subject of neurotomy deserve peculiar consideration) — that Mr. Sewell generally advises and practises the low operation. On the other hand, it must be observed, that although the low operation generally removes the lameness at first, yet it is by no means unfrequent for it to return some weeks or months afterwards, either from the extension of the disease beyond the sphere of the joint and the dominion of the nerves whose source is cut off, or otherwise from some anastomosis of nerves which cannot easily be anatomically traced.

The return of lameness, and the necessity of another operation, after so much time and trouble has been expended on the horse, is very annoying both to the owner and the surgeon; and it has induced many practitioners altogether to discard the low operation even in those cases where it is likely to be more particularly called for.

From a consideration of these various circumstances, added to the result of my personal experience on the matter, I am induced in the majority of cases to give the preference to the high operation for the following reasons: —

First. — Because in a great majority of cases, comprehending ringbones and ossified cartilages, the disease has extended itself beyond the range of those nerves whose communication the low operation cuts off; for nothing is more frequent, than in cases of navicular disease of long standing, for the coronet to be affected with morbid depositions.

Secondly. — Because, likewise, even in those cases where we have reason to believe that the disease is confined to the navicular joint, the horse is often of such low value as to make the probability of a failure after a short time a strong argument against the performance of any operation at all. And, although it is very true, that when the low operation succeeds, there is considerably less danger of those distressing consequences occurring which we have before mentioned, such as the rupture of the flexor tendon, or the loss of the hoof, yet it must not be forgotten, that the very cases in which there is the greatest danger of these sequelæ occurring, are those which, from their severity, extent, and long duration, are most likely to call for the high operation, because the low one is not by any means likely to succeed. Notwithstanding these objections, there are cases in which the preference ought to be decidedly given to the low operation, such as those in which, in addition to the disease being apparently confined to the navicular joint, the horse is a valuable animal, and more particularly if he is valuable as a hunter, and the owner is determined to continue him as such. In such cases, the horse is likely to be much more useful and safe with the possession of *some*, than with the absence of all sensation in the foot; and even if lameness should return, the value of the animal will occasion a second operation above the fetlock to be less objectionable, while, as we have before observed, it will render the first well worthy of experiment.

Before the operation is performed it is necessary, nay, all important, that the leg should be cool — not simply free from inflammation but in a state of preternatural coldness. If the practitioner venture on the operation before this state is produced, he will have at best a very troublesome affair from the vascularity of the smaller bloodvessels, it will occupy a much longer time, and from the greater dissection of parts required, the wound will neither granulate so well nor so quickly, but will leave a much greater blemish than otherwise. In one or two cases I have been induced by the persuasions and impatience of the owner to operate before the leg was sufficiently cool, but have always had reason to repent so doing.

The Operation. — To perform neurotomy at once expeditiously, neatly, and successfully, it is necessary to possess, in addition to a thorough acquaintance with the anatomy of the parts, a coolness and steadiness of hand, together with the skilful manipulation of the scalpel and other instruments. To some persons the operation may appear so easy as scarcely to demand these qualities; but any one who, like myself, has ridden a distance of some fifteen miles on a summer's day, and performed the operation, perhaps, under a meridian sun, has, I am quite sure, found the qualities which I have enumerated most urgently called for. In most works in which the operation is noticed, we are told, that after the horse is cast an incision should be made in the skin a little above the fetlock, and between the flexor tendon and the ligament, some cellular membrane dissected, the vein, artery, and nerve exposed, and the former divided and then excised. From such descriptions as these the operation appears extremely simple and easy; but the experienced practitioner does not require such information, and to the student it will be of little use, for, if he attempts to perform the operation with the feeble knowledge afforded by the descriptions he reads, he will very probably meet with unexpected difficulties, which are likely to confuse and baffle him; for it is notoriously the fact, that in some cases a portion of cellular membrane has been mistaken for the nerve, and has been dissected out.

The horse being cast by the method before advised, with the leg to be operated upon uppermost, the cross straps are to be buckled on, the web applied to the foot just above the heels of the shoe, which being then released from the hobble is drawn forwards by an assistant, so that by the cross straps pulling in one direction, and the web the other, the leg is brought perfectly straight. A truss of straw covered with a horse cloth or a bag stuffed with straw, is then to be interposed under the leg to be operated on, so as to afford it a firm and secure resting place; and a piece of tape may be tied tightly round the leg, just below the knee, so as to diminish sensation. The operator having all his instruments in readiness will find it convenient to kneel on one knee. In a very well-bred horse, the pulsation of the artery on the inside of the leg may be seen, and in most horses felt in the hollow between the flexor tendons and suspensory ligament. Having felt it, a free vertical incision is to be made, with a convex-edged scalpel, about two inches and a half above the fetlock joint, and slightly posterior to the artery. The incision, by a second application of the knife, is to be lengthened to about an inch and a quarter. A little cellular membrane may next be removed by means of the knife and forceps, so as to distinguish the artery from the nerve. The quantity of cellular membrane necessary to be removed will depend on the breed of the horse, and the state of the legs; if they are very clean, it is scarcely necessary to remove any, and the less taken away the better, and the sooner will the wound heal. But I would advise the inexperienced operator to act on the safe side, and not venture to divide the nerve until he is quite sure he has it, and that it is separated sufficiently from the artery as to ensure the safety of the latter. Some bunglers having made one or two slight vertical incisions in the cellular membrane, have mistaken it for the nerve, and taken up a portion, and divided it; others have actually mistaken the artery for the nerve (which, when covered with membrane, it much resembles), and divided it.*

* A young man, not a great many miles from the metropolis, affirmed that a lame horse which he examined had the navicular disease, and he recommended the operation of unnerving. The horse was cast; the operation lasted only two hours, and the animal got up as lame as ever, and so he remained, the operator continually maintaining that "the muscles of the arm had not yet come to their proper tone (!) and, that after a few days' more exercise, all would be well." The poor beast, however, got worse and worse, and was at length destroyed. It occurred to the groom that all was not right, and he cut off the legs and carried them to the family surgeon. He obtained the assistance of another veterinary surgeon, and lo, and behold! not a single nervous fibril had been touched.

Having clearly made out the nerve and artery, a curved needle threaded is to be passed under the nerve, at the upper part of the incision; the thread is then to be cut and twisted several times with the left hand, by which it is slightly drawn up, whilst it is separated from the artery and cellular membrane sufficiently for a probe-pointed bistoury to be passed under it, which, being done, the nerve is to be quickly divided, the pang of which induces the animal to struggle violently, but this struggle is generally the last he makes. The nerve is now to be carefully dissected out to the full extent of the incision. The edges of the skin may, or may not, be connected with sutures, but the bandage should be applied, and the horse turned for the operation on the other side.

The inside of the leg requires more care than the outside, inasmuch as the nerve lies close to the artery in the former, and in the latter there is no artery very near it. It is better, therefore, to operate on the inside of the leg first. The precise situation of the nerve is pretty much the same in every horse, being in the inside, somewhat behind, and within the artery; and in the outside, rather nearer the sinew than the ligament. When the low operation is preferred an incision is to be made just behind the course of the artery, which may be felt, and extending from about the middle of the fetlock joint to somewhat below it.

After the operation is completed on both sides, a

Another case came under my own cognisance in 1832. A gentleman of the Four-in-Hand Club had a horse exceedingly lame. It was subjected to the operation of neurotomy. It was kept down a full hour, and a portion of the nerve was supposed to be excised from both legs, and on both sides. The lameness was not in the slightest degree removed: the gentleman was in great wrath, and I was sent for. A small piece— two or three lines — of the nerve had been taken away from one leg; I excised a large piece on that side, and completed the operation on the other side, and on the other leg. The horse got up sound, and is sound at the present day. — *Youatt's Lectures.*

linen bandage, being rolled from each end to the middle, is then to be carefully wound round the leg, so as to assist in keeping the edges of the wound together.

The after treatment of the wounds requires much care and attention, for, when they are not nicely managed, the granulations being too luxuriant and unchecked are skinned over, and form an enlargement, which, from its connection with the divided nerve, is endowed with acute sensibility, and from its prominence is very likely to be struck by the other leg, the pain of which often throws the horse down. The bandages may remain unmoved for two or three days, but should be frequently wetted with cold water, as it is an object of much importance to keep down the inflammation that succeeds the operation, as otherwise the leg may be permanently thickened. Some practitioners prefer sutures and some not. Mr. Sewell, I believe dispenses with them. If used, there should not be more than one, or at most two to each wound, and they should be situated rather to the upper part, so that the discharge can flow freely from the lower part. If we have not the opportunity of seeing our patient frequently it is better to apply sutures, as they will serve at any rate to keep the lips of the wound pretty close to each other, at any rate for some days. The wounds will scarcely ever heal by the first intention. A substance has been removed, the vacancy of which must be supplied, to effect which the suppurative process is necessary. After a few days the parts may be treated as a common wound, being carefully cleansed and dressed daily, and when the granulations rise above the level of the skin, which they are pretty sure to do, they must be carefully kept down with caustic.

CASES OF NEUROTOMY.

Having now described the nature and effects of Neurotomy, as well as the best method of performing it, we cannot do better than establish its importance, by a collection of a number of authenticated cases, scattered through the pages of the *Veterinarian*. The first communication on the subject, is from the able pen of the late Mr. Castley, whose loss is generally deplored by the profession. He gives us in the second volume of the *Veterinarian*, the history of two valuable and successful cases. He says,

"On the first of October, 1819, a bay gelding, then five years old, belonging to the regiment in which I have the honour to serve, fell suddenly lame of the near fore leg on the road between Hounslow barracks and Hampton Court. He was ridden by a serjeant, who reported that in going through Bushy Park at a moderate trot his horse became all at once very lame; that he dismounted immediately, thinking there might be a stone in his foot; but finding that was not the case, he led the animal quietly home. Next day when I saw him, he was excessively lame. I could see nothing to account for it in any part of the leg. I had his shoe taken off, but we could discover nothing wrong in the foot. And I should here remark, that this horse had a particularly fine strong circular hoof, in short I never saw better feet in my life. He was taken into the hospital stable, bled at the toe, ordered physic, &c., and placed in observation. A month afterwards, the lameness was no better, but there was no apparent cause. The foot was cool; the horse did not seem to point or rest it forward, but stood upon it in the stable as firmly as upon the other; and yet, when put in motion, he was as lame almost as if his leg was broken. I began to think it possible, that there might be some muscular or other injury in some part of the shoulder. We took a quantity of blood from the axilla, and a blister was applied, in the liquid form, over the whole extent of the shoulder: it was repeated at the end of a fortnight, the lameness not being at all relieved. It was not till about the end of December, three months after the accident, that the lameness began at all to abate; and then the horse was ordered to take a little gentle walking exercise. A fortnight afterwards the lameness had again increased considerably; from which circumstance I was led to conclude, that the foot was the more probable seat of lameness; and I determined to try the effect of nerving. On the 10th of January we proceeded to operate, exercising a portion of the pastern nerve (rather more than an inch on each side) below the joint. To my no small surprise as well as satisfaction the horse got up from the operation and trotted sound; in a month he was in the ranks, and he remained in the regiment upwards of eight years afterwards, during which time he continued quite sound, although he was sometimes put to very considerable exertion. The following year we went to Ireland, where the duty is often severe for horses. In 1826 this horse was one of the party at Kensington barracks for escort and despatch duties, all of which he went through without flinching. Towards the latter end of that year two squadrons of the regiment were ordered to embark for Portugal; he was selected as an effective horse, and he remained so all the time we were in that country. On the return of the troops early in the spring of 1828, a great number of horses were cast and sold at Lisbon, and this was one; not, however, for lameness, but because he was getting old, and considered not worth bringing home again; even then he fetched near 20*l.* sterling. I regret exceedingly, that I had not an opportunity of examining the foot of this horse, as I wished very much to ascertain what really had taken place there; for I infer, that the foot, unquestionably, was the seat of lameness, from the circumstance of the horse going sound immediately after the operation.

Case 2. is a brown gelding, bought for the regiment at Ballinasloe fair, in Ireland, then four years old (in October 1822). After this horse had been in the regiment about two years he was observed to stand frequently pointing or resting his fore feet in the stable, more particularly the off one. The hoofs, though of rather a brittle kind, appeared not to have any tendency to contraction. We shod him carefully, amongst other things with the leather sole, and he never went absolutely lame till the hot summer of 1826, when, one of the party stationed at Kensington, he was sent in, after a severe ride on despatch duty, very lame in the off fore leg, and admitted under treatment on the 14th of June. Bleeding from the foot, repeated blistering over the coronet, frequent purging, were some of the means employed, and with considerable relief to the lameness; but exercise always seemed to make it worse again. Toward the latter end of August it might be called a chronic case of foot lameness; and the conviction on my mind was, that it was navicular lameness. This was a very fine horse: a half-yearly inspection was fast approaching, and I knew he must be cast if I could do nothing more for him. I, therefore determined, as a dernier resource, to try the effect of the nerve operation. On the first of September, this measure was put into execution, the horse having been lame nearly three months; and, like the last, he got up from the operation, and went sound. Instead of being cast, he was mounted, and in the ranks at the half-yearly inspection; and, what is more, he has remained sound from that day to this. He was one of the effective chosen for the expedition to Portugal. He carried his rider so well when we were in that country, that he was thought too good to be left behind; and he is now present with the regiment, as effective as any horse we have. He still points his feet a little in the stable; but the foot on which the operation was performed has, I think, now the stronger and firmer crust of the two."

A Case of Neurotomy, related by Mr. Christian. Vet. Vol. III.

"About two years since, a horse fell suddenly lame of his near fore foot, for which he was bled, poulticed, physicked, and turned out with one of Mr. Coleman's patent frog-shoes. At the end of three months that foot measured three-fourths of an inch broader than before, and he was to every appearance sound; but on his first going out, he became lame, and the gentleman determined to have him unnerved: it was performed early in the spring, and about one inch of the nerve excised. He got up, and went free from lameness. He was hunted all that season, and some portion of this, until, by an accident, he fractured one of the lumbar vertebræ, and was obliged to be destroyed on the spot. After death I had the pleasure of examining his foot, which put on the following appearances: — The anterior ligament uniting the navicular with the coffin-bone, was partly ossified, as was also that one which joined it to the flexor tendon. The navicular bone itself was carious in two parts, and the peridesmium and pericondrium were united, and the joint almost destitute of synovia. Such were the appearances on dissection; before the operation, the horse was so lame as to be *entirely* useless; but after the operation, he was as good a horse as any in the field. Such is the state of the case, and very plainly sets forth the utility of an operation which will hand down to posterity the name of the gentleman (Sewell), who revived if not discovered this very valuable mode of alleviating suffering."

Three Cases, by Mr. Ed. Rickman. Vet. Vol. III.

Case I. The low operation. — "A bay gelding, five years old, the property of Mr. Wheeler, of the Raven Inn in this town, became suddenly lame upon the near fore leg without any apparent cause; his foot was examined, and every means were used to ascertain the cause of his lameness; he was repeatedly blistered round the coronet, and turned out for three months; at the expiration of which time I saw him, and he was then so lame that he could scarcely walk into the stable. I recommended the operation of unnerving; but Mr. Wheeler had a great aversion to it; and it was some time before I could prevail on him to allow me to so.

I at length operated upon him below the fetlock, but, from some motive or other, which I cannot now account for, I only took out about a quarter of an inch of the nerve. The horse got up perfectly sound; and in a short time afterwards Mr. Wheeler put him in harness, and used him as a post-horse for twelve months, when he again became lame; it then occurred to me, from the very small portion of nerve which I had taken out, that the nerve might have united; and I again operated upon him, upon the fetlock joint, and removed rather more than an inch: he got up perfectly sound, and worked as a post-horse for nearly three years, when he met with an accident in one of his hind legs, and was shot.

The Low Operation in both Feet successful.

Case II. "was a very beautiful chestnut horse, then six years old, the property of a farmer in the neighbourhood, who had refused one hundred guineas for him. He had very good circular feet, but rather strong: he became a little lame in both, but rather more so in the near one. The farrier who attended him used every means to get him sound, such as paring the soles, blistering his coronets, &c., and finally I believe, he fired him from his hoofs up to his knees; he was then turned out for six months, and came up worse than he went out. The proprietor became quite tired of having him *farriered* any longer, and was determined to sell him for what he would fetch. Mr. Robert Wilding, a friend of mine, related the case, and wished my opinion respecting the operation of unnerving. I advised him to buy the horse, which he did for 12*l.*, and I operated upon both legs below the fetlock joint; the horse got up quite sound; and Mr. Wilding, who is a very superior horseman, rode him two seasons with the Shropshire hounds, and whenever they had a run he was always in front. At the end of one very long run, Mr. Wilding so far distinguished himself that a gentleman offered 200 guineas for him. Mr. Wilding would not warrant him sound, and, consequently, the bargain was not concluded. He was afterwards sold as a nerved horse to a Mr. Gittins for very little short of 60 guineas, who rode him two years with Sir Richard Puleston's hounds; and the last time I heard of him was, when a gentleman told me he saw Mr. Gittins ride him over a very high park fence near Sandorn Castle. He had then been operated upon four years, and went perfectly sound. This horse was considered one of the most brilliant leapers that was ever put to a fence."

The Low Operation successful.

Case III. "was a large brown horse, seven years old, belonging to a medical gentleman at Wenlock in this county. This horse had very good feet, although rather strong. In the summer, which was a very hot one, he became lame on the near fore leg, and every means were taken to discover the cause of his lameness; he was bled in the toe; a seton passed through the frog; blistered on the coronet; had several doses of aloes, &c.: all to no purpose. He was then turned out to grass for several months; and, like the chestnut horse, came up worse than when he went out. Mr. Humphreys, a grocer in this town, bought him for 10*l.*, and I operated upon him below the fetlock joint: he got up quite sound, and the wounds were so nicely healed, that no one could discover he had been unnerved. Mr. Humphreys, a short time after, made an exchange with a gentleman for a horse, which he (Mr. Humphreys) sold for 70*l.* The gentleman, I believe, drives the horse which I unnerved, in his gig up to this day, perfectly sound. The other six cases all did remarkably well, and worked for several years."

In the same volume, a case is related by Mr. Gregory, in which he performed the high operation for chronic lameness, and the horse was hunted the following season.

Six Cases of Neurotomy, related by Mr. W. S. Rickwood. Vol. III.

Operation on both Legs. — "In 1818 a grey cart mare, six years old, the property of Mr. Brazier of Goldington, in this neighbourhood, was examined by me. She was very lame in both fore feet, in consequence of very extensive ossification about the coronets, and was scarcely capable of moving on the hard road. I operated on both legs: she became sound, and worked in Mr. Brazier's team about two years afterwards, when she was sold at Potton fair for 30 guineas."

Operation on both Legs.—"In 1818, a grey gelding belonging to W. Pedley, Esq. of Barford, in this neighbourhood, was very lame in both fore feet, in consequence of much contraction of the hoofs. I operated on both his legs: he became sound; and Mr. Pedley regularly hunted him in the Oakley hunt for several years afterwards. The horse was sold after Mr. Pedley's decease, a short time since, by auction, and was then sound in his action."

Three Cases of Neurotomy on the Hind Leg.—"In 1822 a chestnut cart horse at Oakley, the property of the Marquis of Tavistock, was very lame on the near foot behind, in consequence of complete ossification of the lateral cartilages, and extensive ossific disease round the coronet. She scarcely ever placed the foot on the ground, but generally moved on three legs. Her sufferings prevented the periodical œstrum; she had not bred for years. About two months after the operation she went to work, and moves sound. She has bred several healthy foals, and works as usual."

"In 1823 a bay galloway, the property of Mr. Charles Short of this town, surgeon, was wounded by a nail in the navicular joint; the wound healed, but the animal remained very lame. I was called in. After the operation he became sound, and has remained so up to this time. He is now the property of Captain

Davis of this place, who works him regularly on the road."

"In 1824 I operated on a galloway, the property of Mr. John Palmer of Goldington, in this neighbourhood. He was very lame on the near leg behind, in consequence of ringbone. I had previously fired and blistered with no good effect. After the unnerving operation he got up quite sound, and continues so up to this period. He has for some time past been let out as a hack in this town."

One nerve excised on both fore legs.—"In November, 1828, a black post mare, the property of Mr. Bass, at the George Inn in this place, was extremely lame, in consequence of much contraction of both feet. She could not stand up in the stable a sufficient time to take her necessary food. I operated on one nerve in each leg only. When the wounds were healed she was taken out to work, and is as useful as any of the other horses; continues standing in the stable as long as most horses that are sound; keeps to her regular work, and does not move lame.

Several similar cases have come under my care in this neighbourhood, in which the operation has been equally successful."

At p. 311. Mr. Richard Cortis relates a case in which he performed the high operation for ossified cartilages and foot disease, and in seven weeks afterwards the horse resumed his work in a carriage, where he had continued seven months, when the case was related.

Two Cases of Neurotomy, by the Author, from the Vet. Vol. III.

Case I.—"An aged black mare has been lame for several years in the off fore leg, which bears the marks without having received the benefit of the firing irons. She has been taken out of the coach for some years, and has since been working on the farm; but her lameness increased so much of late that she could not even continue this work. On examining I found the fetlock joint hot and tender; an exostosis had formed round it, and also round and above the hoof. In May last, the mare being thrown, I excised about an inch of the outer metacarpal nerve, and three-fourths of an inch of the inner pastern nerve. I was induced to make this distinction from observing that the heat and exostosis were but very slight on the inner part of the fetlock joint; and I wished to preserve, if possible, a slight portion of feeling to guard against accidents. The mare, on rising, appeared to walk and trot without lameness, and, as soon as the wounds admitted, resumed her work. In five or six weeks afterwards, having been rather hard worked on the road, I was informed she was as lame as ever. I found the inner side of the fetlock joint hot and painful, though on the outer side the inflammation was scarcely perceptible.

"I determined to cut off all sensation whatever; and as soon as the inflammation was sufficiently reduced by cooling treatment, I operated on the inner side above the fetlock. The amendment was immediately evinced; the animal walked and trotted free from lameness, and soon after went to work, where she now continues. In August last the mare was worked post on a rough road, and in consequence became lame in the near fore foot; this lameness, however, was removed by antiphlogistic treatment in a fortnight; and the neurotomised limb stood sound throughout."

Remarks.—Is not pain frequently a cause as well as an effect of inflammation? And does not the operation of neurotomy lessen it by removing the irritation? What think you, Messrs. Editors? In this case, the lameness appeared to be occasioned by the friction of the sensible parts against the exostosis; and the first operation removed the pain, and prevented, in great measure, inflammatory symptoms taking place on the outer side of the fetlock; and the excision of the inner metacarpal nerve not only cured the lameness but prevented any inflammation again recurring, although exposed to causes which lamed the other foot.

Case II. — "A chestnut horse with very high heels and rather contracted feet was lame in both fore feet, which lameness had been gradually increasing for some time past. This horse had acquired, in a very marked degree, that peculiar short gait characteristic of groggy horses, and which, perhaps, cannot be better expressed than by a remark of the coachman who drove him, who on being asked how the horse went, replied, "Why he went like an old soldier with a pair of wooden legs." He had been blistered and turned out to grass without any amendment.

"In the latter end of July last, the pastern nerves of both legs were excised, and the horse went better immediately after the operation, but did not step out with the wished-for freedom; he had been too long in the habit of suspending his weight by the extensors to call his flexor tendons into sudden action; however, he went to work in about three weeks, and still continues there, working occasionally at post on the road. The amendment which did not appear very great at first has gradually increased, and the horse now steps out with a freedom very different from his former shuffling gait."

Neurotomy on the Hind Leg for Ringbone. By Mr. Tombs. *Vet.* Vol. IV.

"Previous to my departure for India I was asked by an acquaintance in the country to look at a blood filly of his. On inspecting her, I ascertained that she had got an enormous ringbone on the off hind pastern: she was exceedingly lame, and had been blistered repeatedly with no good effect. I told him that it would be advisable to excise a portion of the nerves going to the foot; he most willingly assented to have the operation performed. I excised a portion of the metatarsal nerves, and ordered the wound to be treated accordingly. The reason why I did not divide the nerves immediately below the bifurcation, was on account of the ringbone being so large and extensive; indeed it was nearly impracticable. I did not hear the result of the operation till my return to England, which was a short time since. My acquaintance informs me, that the lameness began to diminish about three hours after the operation was performed; in three days there was a total cessation of lameness. As soon as the wounds healed he put her to active work; she appeared to be perfectly upright; he raced her three times, and then sold her. She is now performing active service, and quite free from lameness. I could enumerate several successful cases of neurotomy, but this will suffice."

Neurotomy on the Hind Leg. By Mr. Christian. *Vet.* Vol. IV.

"In August, 1830, I was requested to see a pony which had been lame for some months, and when I saw it it was almost entirely useless. After a careful examination I found a small exostosis growing from the inner and inferior part of the large metatarsal of the near hind leg. I pursued the antiphlogistic system of bleeding, purging, and evaporating lotion, and the pony became much better, but still far from sound; after which I recommended a strong blister, which was repeated thrice; still he continued lame, and I advised the owner to have him destroyed. The pony being a great favourite, he wished that I would pursue my treatment, which I thought might give a chance of success. It occurred to me that neurotomy might be of service, and I determined upon the operation by excising a portion of nerve just above the enlargement of bone. The pony was prepared in the usual way by bleeding and physic, and immediately after the operation there was a visible alteration in his action. I ordered that he should be turned out for three months; at the expiration of which time he was perfectly sound, and still continues so although worked excessively hard: the pony was lame, more or less, *prior to the operation* for twelve months."

Another case was that of a cart gelding that had been lame seven years with ringbones and contracted feet. He was operated on about six months since, resumed his work in three weeks, and continues perfectly sound, though worked on the hard roads in a coal waggon.

In the seventh volume of the *Veterinarian* two cases are related by myself, of the perforans tendon being ruptured, one a twelvemonth, and the other a few months after the operation. The horses, however, were entirely useless before.

In the annual report of the Veterinary School at Alford, we find under the head Plantar Neurotomy the following cases: —

"It has been practised eight or ten times within the last eighteen months, whether for osseous tumours on the fore part of the coronet, or contracted feet, or old lameness. In the first of these cases the anterior branch of the nerve alone was divided; in contraction of the foot the posterior alone was operated on. In three horses with contracted feet, and on whom it was necessary to excise the nervous trunk on each side of the cannon bone, the precaution recommended by M. Berger was adopted, to leave an interval of some days between the first and second operation.

"All the horses that were thus operated on were returned to their proprietors free from lameness, and we know that many of them are working at the present time."

In the seventh volume of the *Veterinarian*, p. 241, some interesting cases of neurotomy are related by Mr. Simpson.

"*Oct.* 1, 1833. — Early in the year 1832, two horses belonging to Sir William Heathcote, Bart., were admitted into the Veterinary College as patients, being incurably lame in the fore feet. The operation of neurotomy was performed upon both, by Mr. Sewell, below the fetlock; and, after a reasonable time, they were discharged, *free from lameness*; at any rate, in the regular trotting out they appeared to go quite sound. At the expiration of a few months after their arrival at Hursley Park, they were put to work, and certainly very great improvement was manifest in their action; in fact, no lameness was perceptible, and it was thought they were as efficient as ever. At length, however, after a little extra work, a trifling degree of tenderness was to be noticed, accompanied by a pointing of the affected foot. (Only one foot was lame in one horse, both in the other.) This sort of thing gradually increased: every day the lameness became more perceptible, until, at last, it was as bad as before the operation, and the two horses were nearly useless for every purpose, exeept the plough, &c. Being at Hursley to-day on other business, I happened to notice these horses, and was conversing at the time upon the very subject of neurotomy with Sir William, as regarded another horse of his. I had been explaining the different effects of the high and low operations, and their respective applicability to individual cases, when he remarked, that the horses in question were almost ineffective in their present state, and asked me if (for the sake of experiment), I could see any objection to a repetition of the operation *above the fetlock*. After some little conversation, it was arranged that neurotomy should again be tried without loss of time; accordingly both horses were ordered to my infirmary at Southampton, to be immediately placed under preparative treatment.

"14*th*. — To-day the patients were operated upon *above the fetlock*.

"*Nov.* 10*th*. — Turned out into the park.

"In January last the above horses were taken up, and immediately got into working condition. Neither of them have shown the slightest lameness, but they appear to have as good use of their legs as though they were perfectly sound. How long this may continue it is not for me to say. With regard to the return of the lameness to so great an extent after the original operation, it becomes a question of considerable practical interest to ascertain the cause. Its gradual reappearance would strongly incline one to think that it must have been brought about by a revival of the nervous function, either by means of anastomoses with some of the numerous neighbouring branches, or by a communication between the divided ends of the nerve. Inferring that a portion was actually excised, I should rather adopt the former proposition; and if that is really the case, it speaks volumes in favour of the high operation; because when the main branch of the nerve is divided, or a portion of it excised, the only way in which sensation can be re-established, is by the transmission of the nervous fluid along the course of the original trunk; anastomoses, in this case, being almost out of the question. This, however, is a point which dissection alone can render clear to us; but, as it appears to me to be of no small practical importance, I shall not let pass any opportunity of thoroughly investigating it."

"*Dec.* 18, 1833. — A very old but splendid bay horse, belonging to —— Lamprey, Esq. has been sadly lame in the off fore foot for some months. Endless plans of treatment have been adopted with him, but all have proved useless. To-day I was consulted about him, and as it was pretty clear that the day for setting him right had gone by, I recommended neurotomy. This was acceded to, and the horse was ordered to undergo proper preparation.

"26*th*. — A portion of the metacarpal nerve was excised on both sides, just above the fetlock.

"*March* 14*th*, 1834. — The horse, being quite free from lameness, was put in harness and driven about twelve miles. He appeared to go very well; but, on arriving at his journey's end, it was found that the off hind hoof was covered with blood, and the heels of the neurotomised foot were dreadfully bruised and cut from repeated blows from the corresponding foot behind. To remedy this, the toe of the hind foot was ordered to be shortened as much as possible.

"18*th.* — He was driven again to-day, but without the least diminution of the unpleasant and dangerous contusions, although he does not appear to feel the slightest pain either at the time the blows are inflicted, or when pressed upon and examined afterwards. Being nearly twenty years old, Mr. Lamprey decided to destroy him, rather than be at any further trouble concerning him.

"This is a consequence of neurotomy which was certainly altogether unlooked for by me; but it is clearly caused by that operation, because previous to its performance there was not the slighest disposition to any thing of the kind, although the patient always had a lumbering way of going. It appears there was not the same activity in the affected foot as before the operation — it could not get out of the way of the hind foot; yet this is a thing which one would not expect, because, although sensation in the foot is destroyed, still the locomotive powers of the leg are unimpaired. Such, however, has been the consequence of neurotomy in this individual instance. Whether it be of frequent occurrence I know not; but such of your readers as have met with any similar cases would benefit their profession by narrating them. Although this is certainly an objection against neurotomy, still it ought to have no effect in deterring any practitioner from having recourse to it; because there can be no question between the decided and permanent inutility of an animal, and the mere distant possibility of a consequence like this."

These cases are interesting — the latter from the very unusual and singular occurrence that followed, and the former two cases from the necessity of a repetition of the operation after some months, and which forms an objection to the low operation.

The sequel of these cases the author can supply. The perforans tendon of each gave way about two or three years afterwards — one whilst the horse was at the farm work, and the other from being ridden hunting by the keeper. In steady work the latter would probably have lasted several years longer.

In the eighth volume of the *Veterinarian* we have another report, from the French school, in which we find, under the head Neurotomy, —

"Twelve horses, whose fore feet had been so contracted, and the heels so narrowed, that they were of no service to their owners, have been operated upon and rendered free from lameness. Three, among others, of a valuable breed, having been operated upon successively on the two fore feet, have been made quite right.

"It has been said, that after the complete section of the two nerves above the fetlock, the flexor tendon of the foot, below the point of operation, is liable to be ruptured during the exertion of much speed, or when the horse is put to unusually heavy draught. This accident has happened, during the present year, to two cabriolet horses that had been operated upon eight months before. One of these animals was brought to the school, and destroyed there. The foot was dissected with much care, and the softening of the tendon was observed, reaching some distance above and below the laceration. There was, besides, a transverse fracture of the navicular bone. The owner of this horse, however, had two others, which have been operated upon more than two years, and who work well every day, and are not in the least degree lame.

"The horse that was the subject of the second accident was at the school a few days ago. He presented the same appearances as the former one. It is probable that the rupture was produced in both by similar lesions.

"These are the only accidents that have occurred during the four years that neurotomy has been practised at our school; and we have operated on twenty-one patients. They are so few in number, that they prove nothing against the operation; and both the proprietors acknowledged that they were attributable to their abuse of their horses. Were they, however, more numerous, we should persist in asserting, that neurotomy is a most important and valuable operation; because it restores to usefulness many horses that were rendered almost incapable of service, and for which we at present know not of any remedy."

In the same volume (p. 131.), Mr. Simpson relates a case of neurotomy, in which an extensive fistulous wound was produced by an injury some months afterwards, but which was healed up as completely and as rapidly as if the operation had not been performed, clearly proving, if any proof were necessary, that deprivation of sensation does not in the slightest degree impair the vital properties of the foot.

In the tenth volume of our periodical Mr. Charles Morris relates three cases of neurotomy. The first for chronic foot lameness, the second for a ringbone on the outside of the near fore leg, and for which the outer metacarpal nerve alone was excised, and with perfect success, although the horse had been fired and blistered previously with no good effect. The third case was not attended with complete success.

Mr. G. M. Marshall relates a case (p. 241.), in which the operation was performed for chronic foot lameness, and the horse was put to work in a coach at the end of five weeks, and so continued free from lameness to the time the case was written, about two months afterwards. It would have been better if Mr. Marshall had waited some nine or ten months before he related the case, for it is not the circumstance of the lameness being removed, but the continued capability of the animal that makes the case valuable, such as that mentioned by Nimrod, page 354. "I remember Mr. Marse riding a nerved horse over Leicestershire two seasons, and he carried him very well.' He also mentions a case in which the hoof and shoe of a nerved horse were cast into the air together whilst working in a coach.

In the eleventh volume of the *Veterinarian*, four interesting cases of neurotomy are related by Mr. Edward Hickman :—

Case I.—" There are at this time, in this town, several coach and post horses working sound that I unnerved two or three years ago. Mr. Peter Hilton, an extensive carrier, had a large waggon horse, seventeen hands high, which was lame on the near fore leg. He had been blistered repeatedly on the back sinews, had a run at grass for six weeks, and every other remedy that was deemed advisable was tried, but the horse got worse. I was consulted, and I found him to be lame in the foot. I advised Mr. Hilton to have him unnerved, which, after some time, he agreed to, the horse being so lame at the time that it was with much difficulty he walked to the casting-bed. After the operation he became quite sound, and continued to lead Mr. Hilton's team for two years."

Case II.—" W. H. Griffiths, esq., of this town, had a very beautiful little thorough-bred mare, which his daughter, Miss G., was accustomed to ride, and which was a great favourite. She became lame with the navicular disease; and, after every means that could be devised to cure or relieve her were tried without success, it was determined by the worthy owner to have her unnerved. I operated on her below the fetlock, and she got up perfectly sound; and, after carrying Miss G. quite as safe as before the operation for eighteen months, she again became lame on the same foot. Mr. G. being much disappointed, as I was myself, by the nerve uniting, he was resolved to have another operation. I now unnerved her above the fetlock. She was again sound, and resumed her old station for two years, when she was sold to a lady in Birmingham. This is an excellent case to show they do not stumble in the way so often asserted."

Case III.—In May, 1833, I was requested to see a horse belonging to A. W. Corbett, esq., of Sundern

Castle, that was lame with the navicular disease; he had been bled in the toe, blistered on the coronet, &c. &c., without effect. Mr. Corbett wished to have him operated upon. I considered it a good case, one leg being only affected. I operated on him: he got up perfectly sound, and carried Mr. Corbett's huntsman for two seasons, and was afterwards ridden as a hack."

Case IV. — "In the spring of 1836 I was sent for to Hawkstone, to examine a chestnut horse, the property of Sir Rowland Hill, bart., M. P. He had been lame on the near fore foot for six months; was bled in the toe, setoned in the frog, and every imaginable means to cure him had been uselessly tried. I recommended Sir Rowland to have him unnerved, which he agreed to: when the horse was brought out of the stable to be cast, the groom came to me, and said Sir Rowland would sell him for 25*l.* The operation was performed; the horse became sound, and Sir Rowland sold him to a gentleman for a good round sum, far exceeding the 25*l.* He hunted all last winter; and a friend of mine saw him standing at a livery-stable in London last summer, to be sold — price 100 guineas."

"I also this summer unnerved a six-year-old horse for Mr. Minton, of Astley, which had been lame for six months, and was *doctored* by various men of the old school, who had repeatedly blistered him from the foot to the top of the shoulder. The horse still getting worse, Mr. Minton wished very much for me to purchase him at a low price. I operated on him. The horse got perfectly sound, *and was sold as an unnerved horse* for 40*l.* in less than six weeks after the operation."

To this numerous collection of cases, which are of themselves quite sufficient to establish the value of the operation, I will add a few more that have occurred in my own practice.

It is now nearly five years since I performed the high operation on a horse belonging to Messrs. Grey, of Bishop's Waltham. It was a case of navicular disease, attended with ossified cartilage and some degree of contraction of the flexor tendons. The horse had formerly been a hunter, but had been cast in consequence of lameness, and for some years past had been worked in a waggon. At length the lameness increased so much that he was no longer useful, and he lost flesh surprisingly in consequence of the pain he was in. After the operation the horse was turned to grass, in order to recover his condition, which he very soon did, and whilst out he was seen to leap a five-bar gate, in tip-top style. In due time he resumed his work, and since then I have had the pleasure of seeing him scores of times entering the town at the head of the team in gallant style, and a few months since I attended him for another disease.

About two years and a half ago I operated on a pony belonging to —— Wooldridge, esq., surgeon, of Botley, that had been lame a long time, from navicular disease of the near fore foot, attended with ossific deposit round the pasterns. The following winter, the pony (contrary to my advice) carried a lad hunting, and being particularly fleet was one of the foremost in many a run. Since that time he has been used in harness with another pony, continuing free from lameness up to the time I last saw him, about six months ago.

I could mention many other cases, but I have not known enough of their after history to make their relation valuable.

Punctured Wounds of the Navicular Joint successfully treated by Neurotomy. By Mr. Harry Dawes. *Vet.* Vol. XII.

"A young bay mare was received into my infirmary on the 10th of July, 1838, with a puncture of the near hind foot, which she had received from a nail accidentally picked up in the street whilst engaged in her usual work. The nail had pierced the navicular joint through the outer commissure, in a backward and upward direction. The lameness was considerable, and much constitutional derangement supervened. Antiphlogistic measures were adopted. A copious discharge of synovia flowed freely from the wound in the foot for some time.

"It was at last arrested by the pulv. alum comp. Various ulcerations in the heel and around the coronet now ensued: they, however, yielded to the treatment adopted. From the time the animal received the injury, she never put her foot to the ground.

"A patten shoe was applied to the other foot, in order to induce her to throw a portion of her weight upon the affected leg.

"August 1st. — The wounds are all cicatrised, the horny sole has sloughed, and a new one has been secreted in its stead. The lameness is still very considerable. She is removed to a small paddock, to have the benefit of voluntary exercise, the patten shoe being lowered by degrees occasionally. Very little benefit followed this plan of treatment.

"September 14th. — Remaining in the same state, and no appearance of improvement, I suggested to her owner the propriety of neurotomy, to which he readily consented. The operation was performed above the fetlock joint; and I have now the satisfaction of frequently seeing that which had been deemed a hopeless and incurable case perfectly recovered, and the mare pursuing her accustomed labour.

"Another case which occurred to a bay horse, exactly similar to the foregoing, may not be unacceptable.

"March 12th, 1839. — The near fore foot was the one injured in this instance: similar results followed, save that there was no ulceration above the hoof, and the treatment exactly corresponded with the former case.

"June 1st. — He had been blistered and turned out without benefit, and the symptoms presented were those which other horses exhibit when suffering from chronic navicular disease.

"The operation of neurotomy below the fetlock joint was resorted to in this instance, and with results equally successful as the former case."

Cases of Neurotomy related by Mr. PERCIVALL. — *Vet.* Vol. XII.

"In the Autumn of the year 1837, Lord W. B. showed me, for my opinion, a brown horse, lame in the foot, sixteen hands high, and full of strength and breeding, and worth, sound, at least 200 guineas. It proved a case of disease in the navicular joint. Large and repeated blood-lettings from the lame foot, succeeded by blisters upon the pastern and long rest, removed the lameness; but work invariably caused a relapse. He was naturally a pigeon-toed horse, both in standing and action; in fact, his only fault lay— where imperfection but too frequently lies — in the formation of his fore legs. In July, 1838, his lordship, tired of fresh attacks of the lameness, said one morning to me, "P., I am resolved to have the brown horse nerved — what think you of it?" "Why, what I think of it is this, — that it will probably restore him to soundness; but that, should you intend to hunt him, you may one day or other come down, horse and all, and meet with some very serious accident." The horse was neurotomised and became quite sound, and remained so, his lordship riding him in the interval as a charger until March, 1839, when he fell lame in the other foot. His lordship being away at the time, I treated the lameness by blood-letting from the arm, warm bath, and poultices, and was in this mild manner amending the case when Lord B. returned. It being just at season of the year when a charger is indispensable, and my patient's master being impatient, and inflexibly set against any more long doings, I was, at his instigation, prompted once more to have recourse to the knife. The horse was now neurotomised in the other, the near fore leg; and with the same success as before. After this he went on doing charger's duty until last January, when he fell lame in the off fore — the foot that was first operated on. For this, warm baths and poultices, and a sweating blister afterwards were ordered, and all became well again. A few weeks afterwards, having only been exercised in the interval, he, however, once more failed in the off foot, though he trotted feelingly on both. Warm baths and poultices, and rest without his shoes, have again restored him sufficiently to show at an auction, a destination to which I have at length counselled his owner to send him.

"In the same month, July, 1837, on which I operated on the above-mentioned, I neurotomised a horse I had given me by a captain of our regiment, having on him at the time navicular disease of the near fore foot, and being dead-lame in consequence. He arose from the operation sound, and has remained so in my stable ever since. I now ride him three or four or five times a week, never sparing him as a hackney about town; and he has on no occasion shown any failing whatever upon his fore feet or legs, which were at the time of the operation, and still continue, remarkably clean.

"Mr. Thomas Turner had a horse of his own, on whom he operated, and afterwards rode him two seasons hunting, and with as much confidence, I have heard him say, as though he had never been the subject of lameness or operation.

We have thus collected together no less than sixty-three cases of the successful performance of neurotomy, nearly all of them being on horses that stood sound a considerable time afterwards, some of them being hunted, and others severely worked. Of these cases we find twenty-seven in which it is not mentioned whether the operation was performed above or below the fetlock. There are eight cases of the low operation on one leg, and two in which it was thus practised on both legs. We have thirteen cases of the high operation, nine out of which are on one fore leg, two on both fore legs, one on one side of the leg only, and one on both legs, but one side only of each. Besides which, we have six cases in which it was performed on one or both hind legs. There are many other cases mentioned, though not related; and there are two instances in which the operation failed.

DIVISION OF THE FLEXOR TENDONS.

This operation has been performed with great success for overshooting of the fetlock joint, generally the effect of the repetition of strains of the flexor tendons, which become enlarged in size, and contracted in length, and the joint, in consequence, becomes first upright, then overshot; the front of the fetlock approaching or touching the ground. The animal is now rendered useless, and the operation in question can alone restore his utility. It was formerly thought that divided tendons would never unite, and still more lately it was considered that their wounds would be always attended with danger; but the operation in question shows that unless a joint or bursal cavity be opened, the healing process will go on with equal facility in tendons as with other parts.

The operation itself is by no means difficult; the horse is cast in the usual way, and the straps applied as for the operation of Neurotomy. A vertical incision is next made through the skin, midway between the knee and fetlock, which is above the sheath of the tendons, about an inch and a half in length, and the sinews being exposed, they are to be divided cautiously with the scalpel, taking care not to injure the nerve and artery. The sinews being divided, the fetlock joint may be bent into its proper position, the leg bound up, and the horse released. It is generally necessary to nail on a patten shoe of moderate height afterwards to prevent the joint from becoming too oblique, and the patten can be afterwards lowered or otherwise, according as the case may appear to demand. The parts may afterwards be treated as a common wound, great care being taken to keep down the granulations which soon rise above the level of the skin. If the case go on well, the sinews are united in the course of a month, by the intervening substance, which thus actually lengthens the sinews one, two, or three inches, as may be required. The horse soon becomes fit for slow work after the wound is healed. One curious circumstance attending the operation is the intimate union that takes place between the perforatus and the perforans tendon, so that the latter can no longer act independently of the former, but is limited by it, the effect of which is, that the coffin joint can no longer be flexed to the same extent as before, and the horse is precluded from speedy travelling. The effect of the operation is consequently to limit and almost nullify the pulley-like action of the navicular joint capsule: there being therefore no longer the same action, there cannot be the same friction between the bone and tendon. This being the fact, it has occurred to me, whether we cannot avail ourselves of this circumstance in cases of long standing navicular disease, for which we may wish to perform neurotomy, but are afraid that the sinew has become attenuated, and will give way in consequence. If we divide the sinews at the same time as we excise the nerves, shall we not, by uniting the perforans with the perforatus, so neutralise the navicular joint as greatly to lessen the probability, if it does not altogether preclude the chance of the rupture of the tendon? The subject at any rate is worthy of much consideration.

There are many cases of division of the flexor tendons related in the *Veterinarian;* the first I believe is described by Mr. Castley, as performed by Professor Dick; and in the 5th vol. of the *Veterinarian,* Mr. Henderson, of Edinburgh, describes two cases—the first in 1824, was a horse condemned to the kennel, in consequence of a crooked fore leg, though good in other respects. Immediately after the operation the horse walked a mile and a half, the wound did well, and he worked in the service of a Canal Company four or five years. The second case was not so entirely successful; the horse died soon afterwards from another disease, and on examination of the leg the pastern bones were found in a carious state, from which it was improbable that the horse would have been useful if he had lived.

Mr. H. says the first person, who was noted for performing the operation, was a man of the name of Bracket of Carstairs.

The French schools we find have likewise had recourse to this operation; for we find in the Report of the Alfort school, *Vet.* p. 93. vol. vii., the following account: —

The success attained in our school by the division of the perforans tendon, in horses lame in the fetlocks, has induced many of the neighbouring proprietors to send to us, in order that they might be subjected to this operation, many horses which this infirmity had rendered unserviceable. These animals were accordingly operated upon; and, as two of them work in the immediate neighbourhood of the school, we have been enabled to satisfy ourselves that they were completely cured; and that the limbs operated upon have recovered all their strength, although these animals were put to hard work much sooner than prudence would have justified. Desirous of knowing to what extent of injury of the part the section might be made with success, Messieurs Renault and Delafond have operated on some old horses, so lame and bent, that they could only rest on the point of the toe.

These animals, some of which had exostosis of the coronets, and which had been sold to the knacker, as incapable of performing any work, were operated upon in the same manner as those mentioned above. The limb had become straight, and the foot was freely put to the ground three weeks after the division of the tendon. These horses were destroyed; and we were convinced, by dissecting the tendons, that in that space of time the portion of tissue which reunited the two ends, had already assumed very much the appearance of tendon.

In the same volume, p. 137., Mr. Holford relates an unsuccessful case of division of the flexor tendons of the hind leg. Much credit is due to him for publishing a failure of the operation, as it is calculated to put practitioners on their guard, and to lead them to reflect rightly before they venture on the operation. The case, however, is by no means sufficiently unfavourable as to throw discredit on this valuable prophylactic. It appears that it was the hind leg operated on, and that the horse was used on the banks of a canal. Now, if we reflect that in heavy draught horses the flexor tendons of the hind legs are exerted considerably more than those of the fore extremities in drawing heavy weights, and that canal work is that above all others most calculated to strain the horse, we cannot be surprised that the sinews should again become strained, and the same diseased process supervene.

I had a case somewhat similar a few years since: the horse was perfectly useless, and I operated on the hind leg, recommending that the animal should be worked at plough, or some light work; instead of which he was very soon afterwards put to severe work in a carrier's waggon, and in consequence soon became lame. If either this horse, or Mr. Holford's, had been afterwards worked lightly, in all probability they would not have failed. We, therefore, learn from these cases the following facts: — That there is a less chance of success when the hind legs are operated on than when the tendons of the fore legs are divided; and in the former instances, the horse ought to be used in light agricultural labours, and not in severe draught.

In the same volume, p. 349., there are four cases of division of the flexor tendons of the fore leg, related by Mr. W. Young, three of which were successful, and one unsuccessful, but the last was worked too soon after the operation.

P. 439., there is a communication from Professor

Dick, first explaining the reason why the case related by Mr. Castley proved unsuccessful, being from too early and too severe work, contrary to the advice given. He then says, "A horse belonging to one of the proprietors of the stage waggon which travels between Edinburgh and Newcastle, worked nearly six years, afterwards another belonging to Mr. Bartholomew, a farmer, continued to do his work for nearly a similar period, and many others have done equally well." He afterwards advises the heels of the shoe to be elevated a little, so as to keep the part as easy as possible until it has acquired mature strength.

In the same volume of the *Veterinarian*, p. 642., there is a case of division of the tendons of both fore legs by myself, which, being somewhat remarkable, it will be well to relate it here, together with the remarks with which it was accompanied:—

"In the course of the last twelve months there have been many cases of 'division of the flexor tendons' detailed in *The Veterinarian* *, but as there is no case in which the operation has been performed on both legs, I will proceed to narrate one that has come under my notice; but before I do so, it may, perhaps, be as well to say a few words of the effects of the operation, and the nature of the disease for which it is put in requisition.

"Overshooting of the fetlock joint appears to arise most commonly from a chronic inflammation of the flexor tendons, particularly of that portion immediately below the knee. As an inflamed tendon causes much less pain in a flaccid than in a tense state, the animal is induced to flex the limb when at rest, and, in the course of time, the tendon becomes considerably shortened; the horse goes on his toe, and is rendered useless.

* It is rather singular that nine cases out of ten should occur in North Britain. Is there any thing in the breed of horses there used, or the mode of working them, that makes them more disposed to contracted sinews?

On division of the sinews they separate for the space of an inch, and the leg is easily restored to its natural position; granulations are thrown out on the divided ends, and in a short time an union takes place, accompanied with an elongation of tendons, which can be regulated by the form of shoe adopted during the healing process. It is astonishing in how short a period this junction again takes place; but it is some time before the new substance becomes tendinous in its nature, or is capable of performing properly the office of a tendon. The object Nature has first in view, is to unite the parts; this is accomplished by granulations, which remain for some little time extremely vascular and weak; but when the first object is obtained, the new substance gradually accommodates itself to its destined function, and acquires the firmness and structure of tendon. It must, however, be plainly perceived, that by this process, the two sinews, the perforatus and perforans, become incorporated together at this place of union, and ever afterwards (like the Siamese twins, if the simile may be allowed) are precluded from acting independently of each other: the os pedis cannot be flexed on the pasterns unless the pasterns are at the same time, and in the same degree, flexed on the metacarpus; and the horse becomes unable, of his own accord, to present the sole of the foot in a supine or inverted position: this, though of minor importance for slow draught, is of sufficient consequence, in my opinion, to preclude the animal from ever being put to fast work. There is another circumstance connected with the operation that has not been pointed out; but it strikes me that, as the tendons are generally in a state of chronic inflammation at the time the section is made, much benefit must arise from the fact of putting them in a state of *absolute* rest for a considerable time. The unsuccessful case related by Mr. Holford, in March last, by no means shows the inutility of the operation; for his horse should have been put to agricultural or other moderate work to have given it a fair chance; and it is by no means surprising that the animal became lame when put to the most trying of all draught, on the banks of a canal: and besides this, as the lameness was first caused by a kick, and was so severe that blistering and firing afforded no relief, is it not extremely probable that the original injury was the cause of the return of the lameness? Mr. H. should have said whether or not the part operated on failed — whether, in fact, the new connecting substance became painful and inflamed; for, if not, the operation could not have been the cause of the failure."

Case.—" In the latter part of December, an old black horse was given me, for the purpose of experiment, by Mr. Caiger, coach-proprietor, of Southampton. He had been working in a coach for years, and for some time past had been gradually getting more upright, until, at length, the fetlock became so overshot that he was rendered quite useless, and was condemned to the dogs. He had not been in work for upwards of two months, and for the last three weeks he had been at grass, where the leg had become worse, and from the inconvenience he had in reaching the ground he was nearly starved. He was brought with difficulty seven or eight miles, going completely on his toe, and occasionally tumbling over on his fetlock. On the 30th December, I divided the tendons; the part was dressed as a common wound; and in about seven weeks, as he walked pretty well, I lent him to a neighbour to work in a cart. Here he continued for about six weeks, occasionally working hard on bad roads, when he became lame of the other leg (which, however, was rather upright before). He was worked a fortnight after this. The near leg stood sound, but the lameness in the off leg, and the pain and swelling of the tendons increased, and he became nearly as overshot as he had been on the near leg. Wishing to try the effect of dividing the perforatus alone, I did so, and it enabled me to put the limb sufficiently straight; but the animal stood in much pain, and I found, in the course of a few days, that the joint was again becoming perpendicular, from being rested.

I therefore, before the wound closed, divided the perforans. In so doing, I found the substance of the tendon quite red, and it bled freely, showing that, in an inflamed state, the sinews are abundantly furnished with red blood. The horse was much longer recovering the use and strength of the off, than he had been of the near leg, arising, I imagine, from the parts having been more actively inflamed. I kept him for about ten weeks, and then sent him a distance of 45 miles, where he was turned out for a month, and then taken to plough. At this work he has continued for the last nine weeks, working every day. I saw him about three weeks since, and found the legs quite firm, and free from all inflammation."

This horse continued at work for several years afterwards.

In the 8th volume, p. 426., there are two cases related by Mr. Samuel Goodworth, one of which succeeded, and the other failed. In the latter the sesamoid bones were anchylosed with the cannon, and were fractured by the force employed in reducing the limb to its proper position.

In the 9th volume of the *Veterinarian* there is an interesting case by Mr. Cowell, in which the sinews of the hind leg were contracted from an external injury received a long time before. The sinews were divided with perfect success, and the horse continued sound twelve months afterwards, when the case was related.

This account comprises the whole of the cases on record of division of the flexor tendons, and sufficiently proves that, in the great majority of instances, horses, entirely worthless from contracted tendons, may be restored to a state of usefulness; and they not only prove the importance of the operation, but afford some highly useful and practical hints as to the proper cases for selection.

In the same volume in which the last case is contained, there is an account by Mr. J. Hayes of the successful treatment of a horse, in which the flexor tendons were divided by accident; and, although the case is very different in its nature from those before related, yet it is so interesting and valuable in itself, that it well deserves to be recorded as a pleasing instance of the triumphs of veterinary surgery, and we cannot find a better place for its insertion than the present: —

"On the 6th of February, 1825, I was sent for to Mr. Loyd's, Oldfield Hall, near Altrincham, Cheshire, in which place I then resided. Mr. Loyd had started that morning in his one-horse phaeton, to go to Manchester. When he had got about one mile on the road, the horse took fright, and dashed to the other side of the road, where, coming in contact with some heaps of broken stones, he upset the vehicle, and by his kicking and struggling completely divided the flexor tendon of the left hind leg, about four inches above the large pastern joint. They managed to get him home with great difficulty. When he walked or stood, the superior pastern joint was resting on the ground, the foot lying with the heel on the ground, and the toe turned uppermost in front of the leg. The opinion of the people about him was, that he should be destroyed; but he being a fine animal, and a favourite one also, Mr. L. was reluctant to give the order. I explained to him the nature of the accident, and what was the general opinion of veterinarians on divided tendon; and I added, I had a doubt on my mind as to the supposed improbability or impossibility of uniting a ruptured tendon, although I was fully aware of the difficulty of the case. I had never seen or heard of the experiment being fairly tried; but expressed a desire to attempt it, and said that if he would allow me to do so I would charge nothing if the result was unfavourable; to which he readily assented.

"I first got a very strong shoe made, with the heels continuing up the posterior part of the pasterns, as far as the great pastern joint, where the two heels, as it were, joined together, and formed a strong iron stay, which continued up the posterior part of the shank, as high as the hock joint. This was made so as to hold the leg, and bear standing on, in the same position as a leg in its proper sound state. This stay was well padded on the inside; with loop-holes made in three different parts of it, for padded straps to go through and buckle round the leg.

"Thus the two ends of the tendon were brought together, and a little tow dipped in balsamic tincture was applied firmly to the wound by a thin bandage. The shoe with the stay was nailed to the foot, and firmly buckled to the leg. The leg was fomented three times a day. I abstracted some blood, and gave him two mild doses of physic, followed by a little fever medicine; dressing the wound once in two days, until the beginning of March, when, the wound being healed, I put a large charge on the leg, and buckled on the stay as before: this was suffered to remain until May, when I ordered shoe, stay, and all to be taken off. I then blistered the leg, and turned the animal out to grass, where he remained until the middle of July; he was then taken up and put to work as before, with not the least perceptible lameness. He remained sound afterwards, although they kept and worked him regularly in the same manner as their other horses for six or seven years."

The iron stay used in the foregoing case might, I think, be employed with great advantage in cases of fractures, as it could be modified according to the bone broken, and thus act as a secure splent.

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