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Contents:

(Illustrated articles are marked with an asterisk.)

DECISION OF AN IMPORTANT PATENT LITIGATION.

For nearly twenty years the monopoly of making glycerin from fatty bodies by the action of highly heated water under pressure has been held by the owners of the Tilghman patent; and various parties, supposing the patent to be valid, have paid tribute to the monopoly. Its days are, however, numbered. The Supreme Court has decided against the patent, in two cases brought against R. A. Tilghman, and the complaints are dismissed. These cases have been carried on for a long time, and have been heretofore decided by the Circuit Court in favor of the patentees. They have involved the employment of much legal talent and the examination of many scientific witnesses. The Supreme Court now reverses the Circuit Court decisions, and requires the plaintiff to pay all the costs. These will necessarily be heavy.

The Supreme Court held that the scientific witnesses who were examined differed so widely in their testimony that they gave little aid to the Court in settling the question. The Court was therefore compelled to depend chiefly upon the comparison of the descriptive portions of the specifications, and came to the conclusion that the results and process claimed by the patentee could not be realized in the manner described in his specification, and that the defendant did not make use of any process covered by the original patent. Among other things it appeared, from the original specification of the inventor, that it was necessary for him, as a matter of safety, to use an apparatus capable of standing the enormous pressure of ten thousand pounds to the square inch, although he expresses the opinion that an actual working pressure of two thousand pounds to the square inch would answer.

The defendant only needed three hundred pounds to the inch to make his process successful.

In so simple a matter as the effects of hot water upon grease, it would seem as if scientific experts ought to be able to give intelligible information to the Court. But in this case they only succeeded in contradicting each other. This is, however, explained by the Court in its remarks as follows:

"Chemical and mechanical experts were examined as witnesses on both sides in about equal numbers. Those called by the complainant expressed the opinion that the patented process may be applied, by the means and in the mode of operation described in the specification, so as to accomplish useful results, and of a character to give commercial value to the new product. On the other hand, those examined by the respondent express opinions widely different, and most or all of them are of the opinion not only that the means and mode of operation described in the patent cannot be so applied that the invention will be practically useful, but several of them state that the attempt to apply it without the exercise of extraordinary precautions must be attended with danger to the operator.

"Most of the expert witnesses made experiments in applying the process, and in the course of their examination were required to state the results of the same as supporting their opinions; but experiments made, as most of these were, with small apparatus, admitting only a small charge of the fatty substance or mixture to be treated, are not entitled to much weight in determining such an issue, however satisfactory the analysis may have been to the chemist who conducted it, as the issue necessarily involves very difficult questions of mechanics as well as of chemistry.

"Taken as a whole, the evidence convinces the Court that the patentee never did succeed in introducing his invention into practical use, by the means and in the mode of operation described in the specification, to such an extent as would warrant the Court in finding that issue in his favor."

In another column we give a brief *resumé* of the findings of the Court.

THE AGASSIZ MEMORIAL.

No more fitting monument of the great naturalist so lately passed away can, we think, be reared than that which already exists in the Museum of Comparative Zöology at Cambridge. Begun by him and for years the cherished work of his life, the collection has grown steadily in extent and value until at the present time its renown is worldwide. It was founded by him, with that spirit of self abnegation which characterizes his life, not as an evidence of his own matchless skill and profound learning in the study of Nature, but as a means of education to others, and as a school to be open to all who might desire to possess themselves of the vast store of information enclosed within its walls.

Agassiz labored as a teacher, but not from books nor of the learning of others, but rather as one who, a preceptor in the truest sense of the term, points out to his pupils the means by which they may question Nature for themselves and obtain their knowledge from her infallible responses. There is a particular appropriateness therefore in the plan proposed that the teachers and the pupils of the country should contribute the funds for a suitable memorial in his honor; and the selection of the Museum above referred to as the object of the contributions, which will serve to establish it on a firm, enduring basis, is the most creditable and suitable that could be made. The money, which it is suggested shall be collected on the birthday of Agassiz, May 28, 1874, is to be set apart and known as the Teachers' and Pupils' Fund of the Agassiz Memorial, and remittances are to be made to the Treasurer, Mr. J. M. Barnard, room 4, No. 13 Exchange street, Boston. Every teacher or scholar who desires to add something, however small, and thus take part in the memorial, is invited to do so. We trust that, without doubt, the sum raised will be sufficient for the purpose intended. However great it may be, it certainly must fall far short of repaying the debt of gratitude which from the country to Agassiz is so justly due.

THE GENESIS OF THE HORSE.

The specialized structure of the small group of animals, of which the horse is the chief member, used to form one of the strongest supports to the theory of specific creation. No other mammals depart more characteristically from the average type, and none seemed to show more positive proofs of design in the adaptation of the modified parts to suit the purposes of man.

Curiously, the same order of animals is now among the best supporters of the theory of evolution. When Cuvier found, in the tertiary beds of the Paris basin, the horse-like yet characteristically distinct remains of the *palæotheria* (one of which was figured in the SCIENTIFIC AMERICAN of April 4), they seemed to him to offer to the evolutionists of that day a problem of the toughest sort. By what process could the single-toed horse be evolved from these many-toed predecessors, in the short time that had elapsed since those comparatively recent beds were deposited, and where were the connecting links?

With the progress of geological discovery, other fossil forms, more or less closely allied to the horse, came to light in various parts of the world, and with each addition the line of descent seemed to be more clearly marked. When Darwin wrote his "Origin of Species," enough was known to justify, to his mind, the hypothesis that the peculiar legs and feet of those animals had been produced by a long course of variations from the less specialized forms of former periods; and he expressed the belief that, though they had not been, and might never be, discovered, the intermediate forms had made a continuous series. By his opponents this confident belief, in what no one had ever seen, was taken as evidence only of his abandonment to theory. He had created a system, they said, without substantial basis in fact, then argued the existence of improbable facts, because the theory called for them. "Show us one of those hypothetical connecting links," they replied, "and then your doctrine will have something to stand on."

As in many other instances, so in this, increasing knowledge has proved Darwin right, and his critics wrong. One by one the predicted connecting links have been discovered, to the number of thirty or more, and the horse's pedigree is now practically complete for several geologic periods.

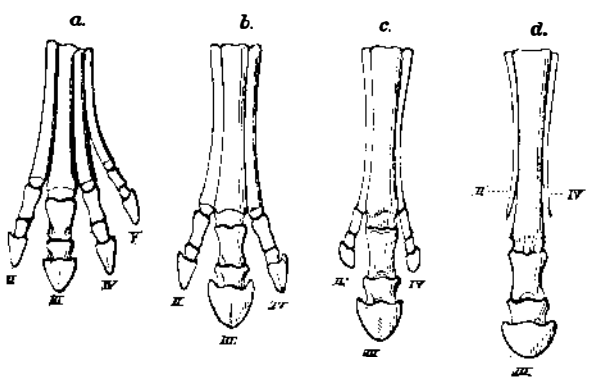
In his annual address before the London Geological Society, in 1870, Huxley reviewed the case as it stood at that time, making out a tolerably complete lineage, connecting the horses of today with the fossil horses of the quarternary period, the *hipparion* of the later tertiary, and the *anchitherium* of the middle tertiary, or miocene period. The process by which the last named had been converted into the modern horse was one of more and more complete deviation from the average form of hoofed mammals. The *anchitherium*, for example, had three serviceable toes on the fore foot. In the *hipparion*, the lateral toes did not touch the ground. In the horse, these supplementary hooflets have disappeared, and nothing remains but splints of bone to hint at the vanished digits. Corresponding changes went on in other parts of the skeleton. Though the specialization was less marked in the *anchitherium* than in the *hipparion* or the horse, yet, as compared with other mammals, it was still great. In view of these facts, the speaker asked whether it was not probable that, if we were to pursue the investigation to the eocene period, we should find some quadruped related to the *anchitherium*, as *hipparion* is related to *equus*, and consequently departing less from the average form.

The intimation has been justified by the discoveries of later years, especially in our own country, where the line of descent appears to be more direct and the record more complete than has been found in the Old World. It reaches clearly to the eocene period; and the remains already known supply—as pointed out by Professor Marsh in the current number of *Silliman's Journal*—every important intermediate form.

"The natural line of descent would seem to be through the following genera: *Orohippus* of the eocene, *miohippus* and *anchitherium* of the miocene; *anchippus*, *hipparion*, *protohippus*, and *pliohippus* of the pliocene, and *equus* of the quarternary and recent."

The development in size, from the earliest form to the latest, was something remarkable. The *orohippus* was abou the size of a fox. The miocene forms were as large as a sheep. *Hipparion* and *pliohippus* equalled the ass in hight; while some of the quarternary equine forms rivaled the modern dray horse. Accompanying this change in size, the species of the successive genera exhibit an increasing concentration of the limb bones, and a progressive elongation of the head and neck, with corresponding modifications of skull. The changes in the limbs were steadily toward their simplification by the enlargement of their axial element and the reduction of their lateral ones. As a part of this process, the number of toes was reduced, until the third toe alone remained effective.

The nature of these changes is shown in the accompanying diagram, showing the forefeet of the typical genera of the series.



The *orohippus* had all four digits on the fore foot well developed, with three toes on the hind foot. In the *miohippus* of the next period, the fifth toe has disappeared, or is only represented by a rudiment. The *hipparion*, as already noticed, has three toes, but the outer ones have ceased to be of use. In *equus*, the last of the series, the lateral hoofs are gone, and the digits—except in rare cases, as pointed out by Darwin in his great work on "Animals and Plants under Domestication"—are represented by rudimentary splint bones.

The changes in the head and neck, though less fundamental, steadily approximated the character of the modern horse. It is an interesting fact, adds Professor Marsh, that the peculiarly equine features acquired by *orohippus* are retained persistently throughout the entire series of succeeding forms.

But how came the *orohippus* with its specialized characteristics? As Huxley looked for a less specialized form than *anchitherium* in the eocene, so Professor Marsh infers an earlier ancestor of the *orohippus*, perhaps in the lower eocene, with four toes on the hind foot and five in front, and to this a still earlier ancestor, possibly in the cretaceous period, with five toes on each foot, the typical number in mammals.

Since it is impossible to say with certainty through which of the three-toed genera, that lived together during the pliocene period, the succession came, Professor Marsh makes the interesting suggestion that possibly the later species, which appear generally identical, may be descendants of more distinct pliocene types, as the persistent tendency of all the earlier forms was in the same direction.

THE SUPPRESSED MEMBER AGAIN.

Not long since we noticed some of the manual evils resulting from the customary repression of the left hand, and advocated, on physical grounds, its culture equally with that of the right hand. It seems that there are not less cogent mental reasons for developing the two sides of the body impartially.

It is coming to be well known that mental development is the result of properly directed physical training: that the brain grows in size and power by the varied exercise of the senses and the will in mechanical employments quite as rapidly as by purely intellectual efforts in study or otherwise. It is equally well known to physiologists that most men are one-sided in their heads as in their bodies. The two halves of the brain are rarely developed symmetrically, as may be readily seen in the "conforms" or head measures accumulated by hat makers supplying individual customers. To some extent, the difference in the contour of the two sides of the head may be due to unequal pressure on the nurse's arm, or to the habit of lying chiefly on one side while sleeping, thus causing a permanent displacement of the walls of the skull; but the main reason appears to be our one-sided habit in education.

In his fourth lecture before the Lowell Institute, Boston, of which we print a *resumé* on another page, Dr. Brown-Séquard observes that the study of the facts relating to the brain has led him to believe that "each half of the brain—paradoxical as it may seem—is a whole brain," each lobe being normally competent to perform all the functions of both, not so vigorously, of course, as the two acting together, yet with apparent completeness. Unfortunately, however, the most of us are single brained as we are single handed, and for the same reason. We fail to do what is really needed to give us two working brains. "There is no question, concludes this skillful observer, "that it is our habit of making use of only one side of the body that consigns to one half of