Correspondence.

The Inverted Image Explained.

To the Editor of the SCIENTIFIC AMERICAN:

Under the title "A Curious Illusion," there is published in the SCIENTIFIC AMERICAN of May 25 an article by Gustave Michaud, of the Costa Rica state college, which is presumed to illustrate the manner in which "the nervous element" which upsets the inverted image on the retina may be deceived into overturning an image which by an artifice has been made to paint itself right side up on the retina, so that it will then appear to be upside down.

In this experiment, which is a very pretty one, three, or, for that matter, any convenient number of holes are made in a card with a pin, very close together. A single hole is made in another card. Then, if the card having the number of holes in it is held very close to the eye and an attempt is made to look through the single hole in the other card, held at the proper distance, instead of one hole, as many will be seen as there are holes in the card next to the eye, and the arrangement of these holes will appear to be inverted —that is, if the holes are arranged in a triangle with the apex directly at the top, it will appear to the eye as if standing on its point.

Prof. Michaud says: "The triangle on the retina is arranged just as it is on the card, right side up. The nervous element, however, blindly upsets this image, as it does upset ordinary inverted images, and this gives us the sensation of seeing upset what we know to be erect." If a layman may be pardoned for expressing an opinion, this so-called "nervous element" has absolutely nothing to do with the phenomenon in question, which is easily explainable on purely mechanical lines.

If the experimenter will hold the card with the single hole in it toward the light and rather close to his eyes, both being open and focused for long distance, he will observe two luminous spots instead of the one which he knows to be there, and it may readily be determined that the image which appears at the right belongs to the left eye, and the one at the left belongs to the right eye. This means simply that the eye sees an object in the direction from whence it receives the light emanating from it, and the hole being to the right of the left eye is seen by that eye to the right of the image formed by the right eye, which, as will be noted, is a form of inversion or reversion.

This is all there is to the inversion of the triangle as seen in the experiment, the three portions of the retina which receive the impressions acting with reference to each other precisely as the two eyes do toward themselves. Owing to the greater elevation of the hole at the apex of the triangle the eye receives a pencil of light through it which emanates from a lower point, relatively, than those which pass through the holes at the base of the triangle; hence the image formed on that portion of the retina makes the object appear lower than it does as seen through the latter. The different portions of the retina merely see the object in the direction from whence they receive the light, and the "nervous element" is in no way concerned in the apparent inversion.

It would seem that this simple rule is the true explanation of the much-mooted question as to how the image ordinarily formed on the retina is made to appear right side up when it is actually inverted. The power portion of the retina receives the light from the top of the object, hence sees it in that direction, or right side up, and the same for every other point touched by the image. Accepting this common-sense explanation we have no need for a mysterious "nervous element," which goes about standing inverted images on their feet. The great trouble with this point has been that many people insist on believing, or acting as if they did, that the brain stands back and looks at the image formed on the eye, when nothing of the kind takes place. The eye sees an object in the direction from whence it receives the light, and that to the writer appears to be all there is to it.

Mt. Carmel, Ill., June 3, 1907. D. E. KEEN.

Specific Air Navigation Prizes.

To the Editor of the SCIENTIFIC AMERICAN:

The only rational specification of a proper flying machine that I have yet seen published is that indicated by Mr. Rankin Kennedy, of Glasgow, in the SCIENTIFIC AMERICAN of May 25. It appears to me that any aeroplane dependent alone upon its swift propulsion for maintenance of support, or any machine which cannot by its own contained power "go up, stay up for a time, and come safely down," and moreover maintain its position aloft poised or hovering near one point at will, is in no way the equal of a suitably constructed, gas-buoyed motor airship, which does at the present time these feats with moderate effort and safety to its rider.

The impelled movement of small model machines is also achieved with moderate effort in a variety of ways. Something really superior, and man-bearing, should be required to warrant award of the SCIENTIFIC AMERICAN prize for "flying machines."

Frankfort, N. Y., May 27. CARL E. MYERS.

Wanted—An Army Cooking Stove.

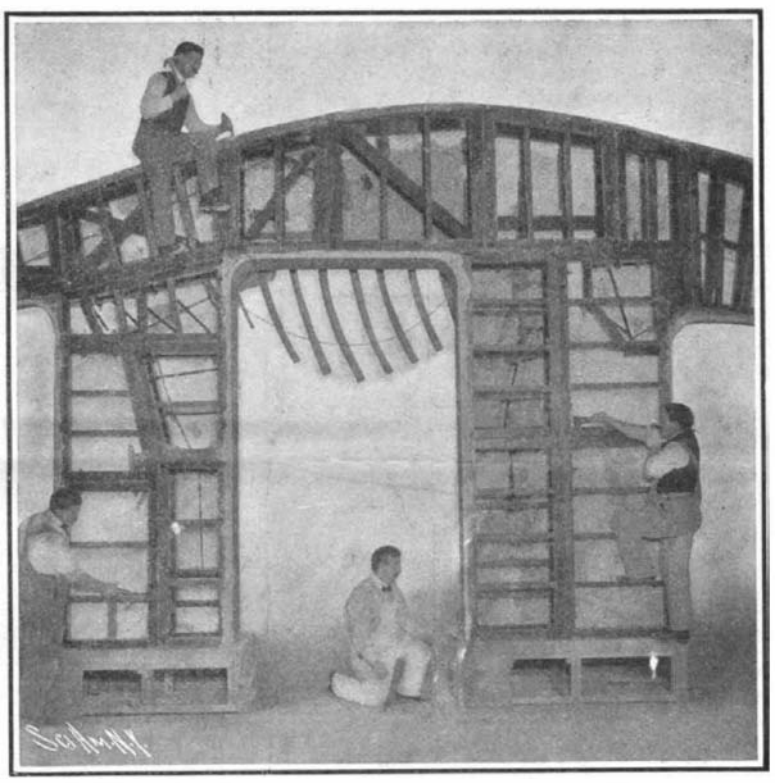
To the Editor of the SCIENTIFIC AMERICAN:

There is need for a contrivance to be used in connection with the oven of a cooking stove as a substitute for the old-time roasting jack, that will properly cook and baste a roast of meat. There are many inventive persons in our country, readers of the SCIENTIFIC AMERICAN, who could doubtless fashion such a machine, and it seems to me that the invention ought to be a profitable one.

My idea of such a contrivance consists essentially of a simple clockwork motor placed outside the oven and firmly attached to the stove or nearby wall, the power to be conveyed to the interior of the oven through a small aperture in the side or back of the oven (not through the oven door) and by a suitable device made to revolve an axis to which is attached two spoons, which in their revolutions scoop up gravy in the baking pan, convey it above the meat, and empty it onto an inclined perforated conduit, that will permit it to drop over the meat and thus baste it, and thus continue till the meat is roasted. The meat is to be laid in the baking pan, and does not revolve. The baking pan to be fashioned so as to have a gutter or rounded channel at one end, where the gravy will accumulate for being dipped up by the spoons. The latter to accurately and easily fit the rounded channel. The bottom of the baking pan to incline toward the gutter, so that the gravy will readily run into it; or the purpose may be accomplished by placing a small piece of iron or other incombustible material under the end opposite the gutter. The inclination need be but slight. The compensation to the inventor would be derived from stove and range manufacturers for the right to use it.

The contrivance, except the clockwork, should allow of being easily taken apart for cleaning and keeping in order. There are now on the market fixtures that pretend to roast meat, but so far as I know, they parboil or stew the meat, and cannot give the flavor of a real roast; indeed, one may say that the taste or flavor of roast meat exists only as a long-ago memory. This would not be so if the cook would place the meat in the baking pan with a little fat for basting, and then honestly baste it at proper intervals, but the cook does not attend to it in this way; for to save this trouble water is used in the baking pan, and the meat is steamed, and not roasted. What is now wanted is a machine that will baste the roast, relieve the cook of an expected but neglected duty, and restore to our tables a form of food known to former generations, and of which the present generation has no knowledge. An inventor, thinking to act on these suggestions, should, if ignorant of cooking, consult an intelligent cook for points to be considered in a perfect roasting appliance. JOHN P. HAWKINS,

Indianapolis, Ind. U. S. Army.



The Skeleton is Mounted in Sections Which Can be Taken Apart and Reassembled.

DIPLODOCUS: THE GREATEST OF ALL EARTHLY CREATURES.

DIPLODOCUS: THE GREATEST OF ALL EARTHLY CREATURES.

BY WALTER BEASLEY.

A splendid 60-foot specimen of the great American dinosaur, Diplodocus, is to have the place of honor in the new Senckenberg Natural History Museum, at Frankfort-on-Main, Germany. For this valuable fossil prize the municipality of Frankfort is indebted to the generosity of Morris K. Jesup, Esq., of New York, president of the American Museum of Natural History, and of Jacob H. Schiff, Esq. Mr. Schiff, as a native of Frankfort, was requested to secure if possible an interesting exhibit from this country, to enrich the new Frankfort institution. Mr. Jesup heard of this appeal and had prepared and mounted at his own expense a diplodocus skeleton from the Museum's collection. The dedication ceremony will take place before a distinguished gathering of scientists and educators, including the German Emperor and Empress. It is probable that Director Herman C. Bumpus will make the official presentation of the diplodocus on behalf of Mr. Jesup.

The skeleton was obtained from the famous Bone Cabin Quarry, located near the Medicine Bow River, in south central Wyoming, and was unearthed in 1899 by Dr. W. D. Matthew, the present associate curator, and Mr. P. Kaison, who dug out the greater part of it, comprising the backbone, ribs, and one hind limb, which were found lying on their sides, the bones articulated in their natural position from the middle of the neck to the tenth vertebra of the tail. The ribs of the underside lay in position; those of the upper side were more or less scattered and broken. The hind limb was nearly all in place. A noteworthy feature of the skeleton is that this is the only one of an amphibious dinosaur, in which all the vertebræ of the back region have been found articulated, in individual series, so that their number is entirely certain. It is thus proved beyond question that the creature had an extremely short back with every vertebra bearing a rib. Before the discovery of this specimen much uncertainty and speculation prevailed as to the number of vertebræ.

The other limbs and portions of the feet and tail are supplied from specimens found in the Bone Cabin Quarry and may possibly belong to the present individual. A few of the missing parts are represented in black outline on the slab matrix. The head is cast from a perfect diplodocus skull in the museum.

Diplodocus was a giant reptile and one of the largest animals that ever trod the earth, ranging from 60 to 70 feet in length. The animal flourished some eight million years ago during the Jurassic Period and Age of Reptiles. This huge lizard-like creature roamed around the marshes and lived in the inland seas and lakes which, during the Reptilian Era, covered Wyoming and various parts of the Rocky Mountain region. Diplodocus was tall, exceeding in height the largest elephant, with long, slender limbs, 10 feet or more in length, and for its huge bulk was considered to have been remarkably agile. The animal was principally aquatic, though frequenting the land at times. The head was astonishingly small, being but 2 feet long, in proportion to the huge body, the estimated weight of which was 25 tons. Charles R. Knight's restoration, here shown, strikingly portrays the characteristic and approximate life appearance of the animal. The short, rake-like teeth around the front of the mouth were useless for cutting or grinding, and were adapted only for pulling up and tearing off the soft, succulent water-plants and vegetation of the lake bottoms on which it fed. A realistic view of both the small head and rake teeth are shown in the photo here reproduced from a complete skull, now in the American Museum.

Diplodocus is credited with having the longest and largest neck known to any animal, living or extinct. The long, flexible, tapering neck of the present specimen is 15 feet in length; in others it has reached over 20. One of the most remarkable structural features of the animal is the whip-like and powerful tail, 30 feet long, constituting about one-half the length of the body. The tail served the creature both as a propeller, enabling it to swim rapidly through the water, and as a weapon of defense on land and a ready means of rapid escape by water when attacked or pursued by the fierce carnivorous dinosaurs of the land. Another peculiar feature of the enormous tail was that it acted as a lever and balanced and supported the animal when it rose up on all fours and assumed a semi-upright position. A series of four or five of the tail vertebræ are so flattened at the bottom and the lower surfaces as to indicate the supposed resting-point when the creature stood up in a kangaroo-like fashion.

The imposing slab matrix is a wooden framework

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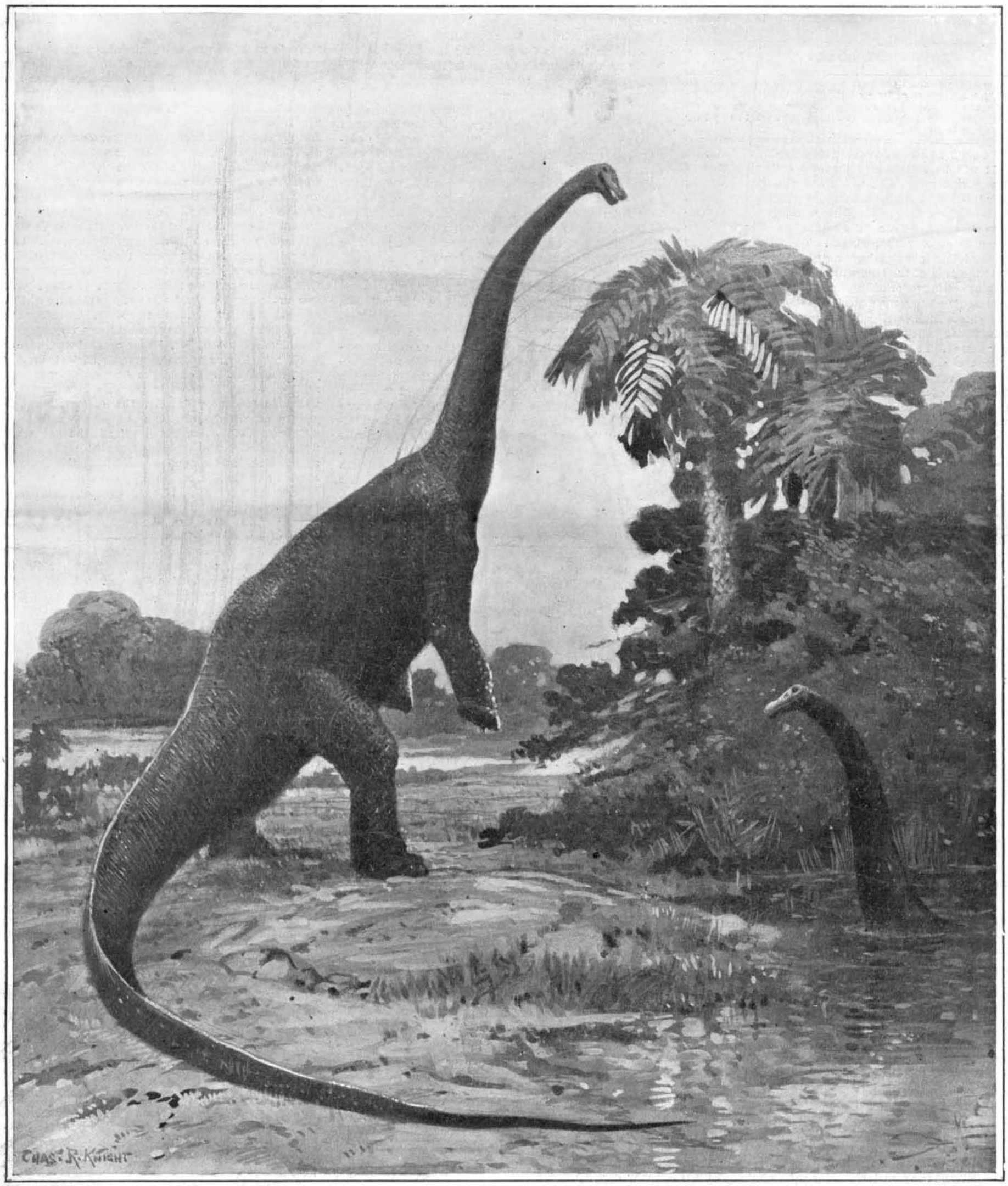
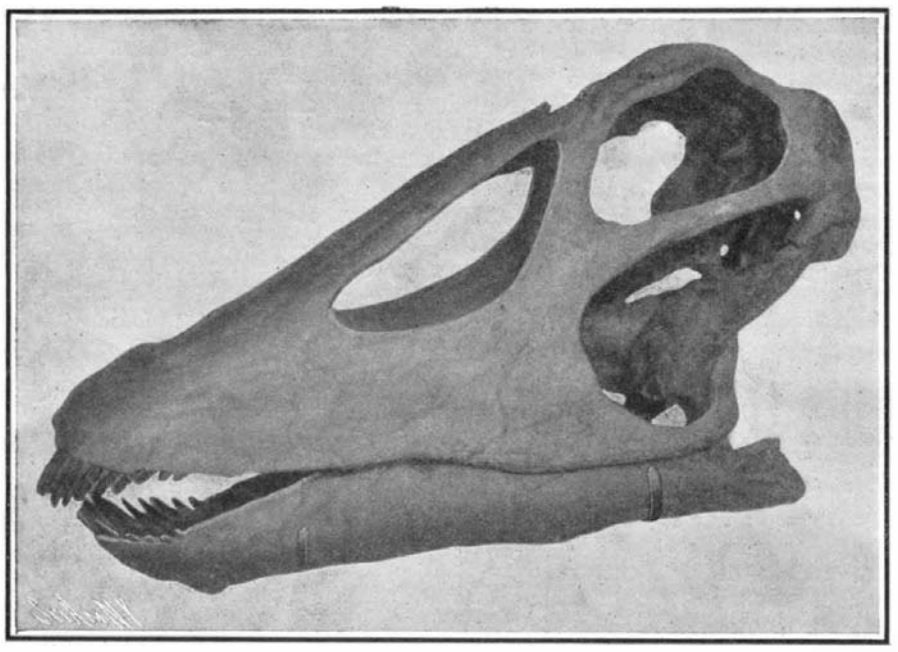


Drawn for the SCIENTIFIC AMERICAN by Charles R. Knight.

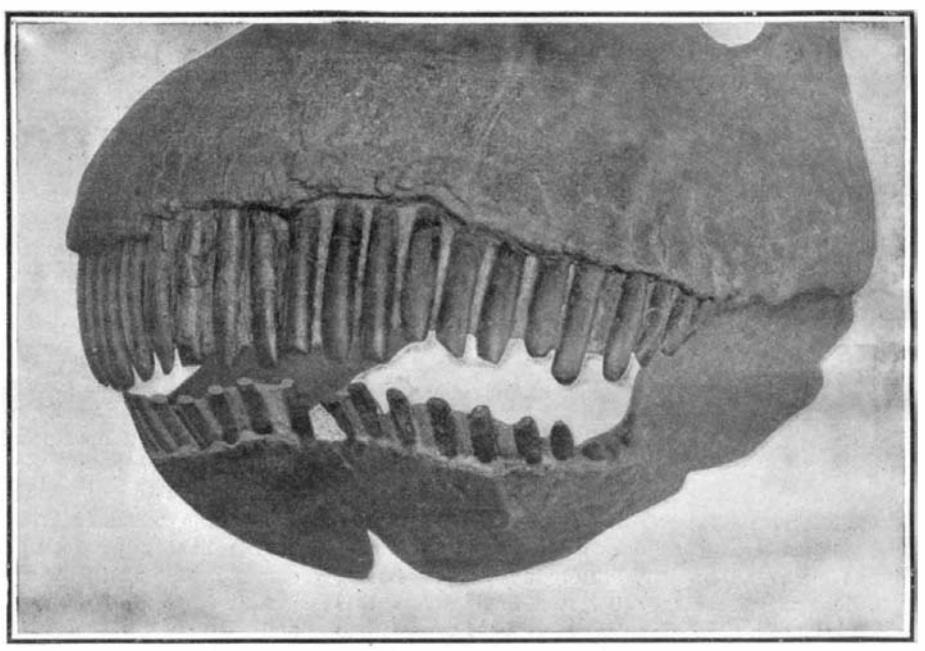
An Extinct Seventy-Foot Reptile that Weighed Twenty-Five Tons. He was not as Terrible as He Looked. A Succulent Tree-Top or a Water Plant was all that He Cared to Munch. Still, He Resented Attack by a Swish of His Heavy, Thirty-Foot Tail.

DIPLODOCUS RESTORED. THE LARGEST CREATURE THAT EVER ROAMED THE EARTH.—[See page 491.]

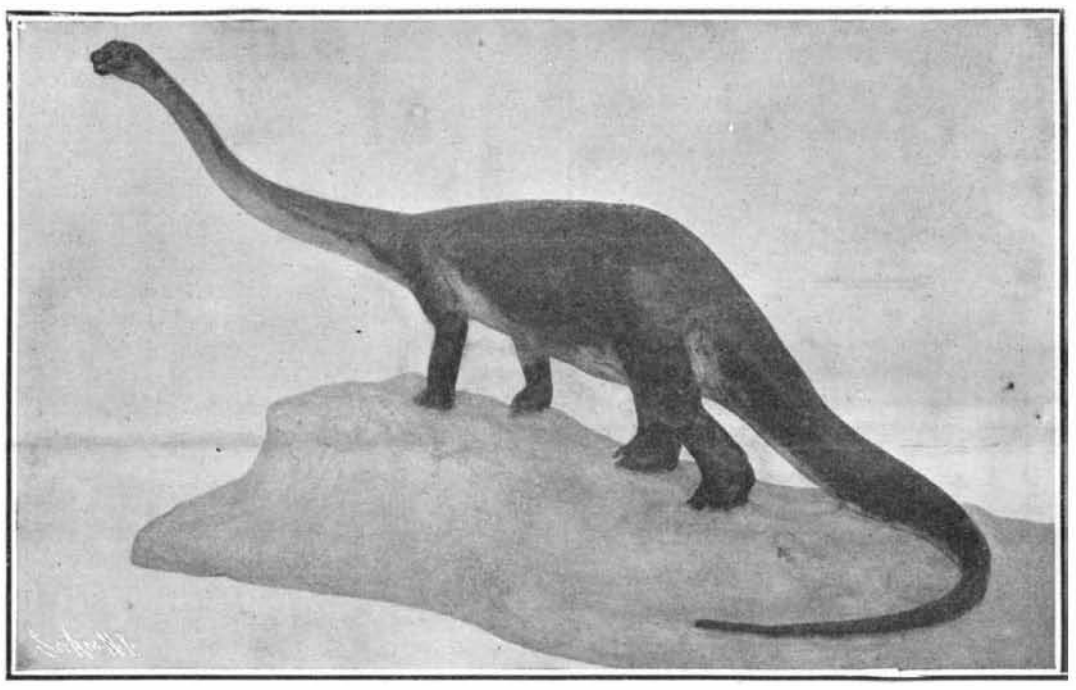
with a plaster foundation, 56 feet long and 13½ feet high, following the curvature of the spine of the skeleton. This delicate and unique piece of fossil engineering work was built by Mr. Harry Beers, of the museum staff. It is in twenty-five sections, each supporting one or more bones. They are so constructed that they can be assembled and bolted together so as to form what appears to be a continuous stone slab, with the skeleton hewn out in bold relief. The sections are framed of kiln-dried spruce logs, screwed together, painted with three coats of asphaltum, to prevent the dampness from swelling or warping the plaster. Three-quarter channel irons are used to form the rests or beds on which the bones are fastened. The wood frames and iron projections are covered with galvanized iron wire mesh and then again with burlap dipped in liquid plaster. On this foundation the plaster matrix was run to the edge of the bones. After the matrix became hard, it was chipped with a stone-cutter's chisel, so that the fossil seems to have been sculptured out of the solid rock. The mounting of the great skeleton was very skillfully accomplished by Mr. Otto Falkenbach, assisted by Mr. Charles Falkenbach, of the paleontological department.



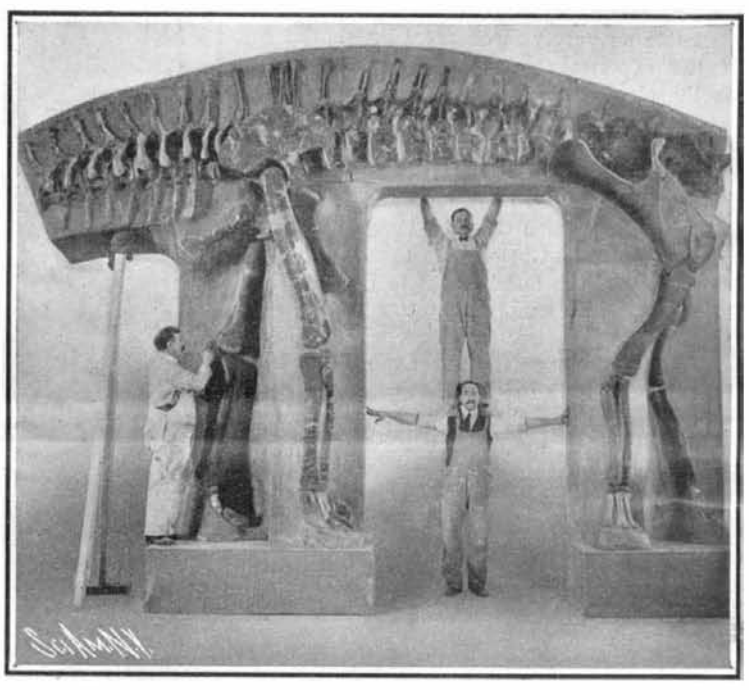
The Two-Foot Head of Diplodocus, Showing the Rake-like Teeth Used for Uprooting the Vegetation of Marshes.



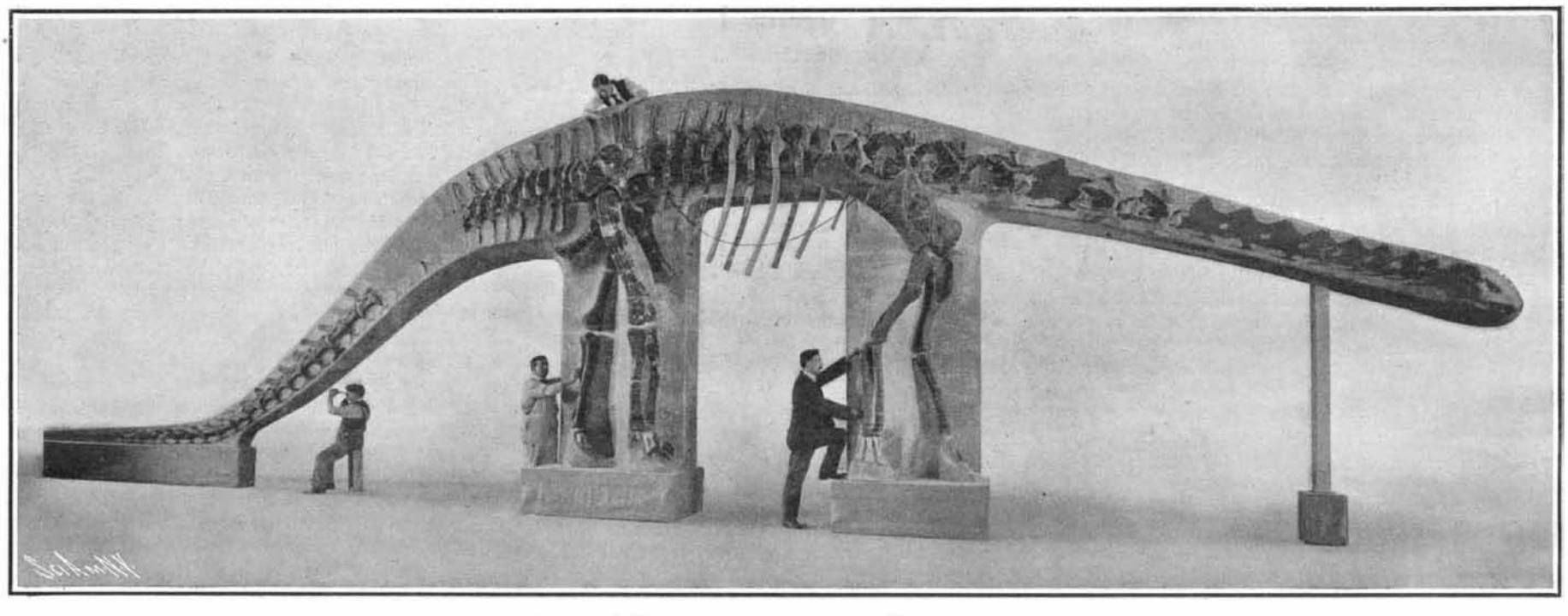
A Front View of the Battery of Blunt Rake Teeth with Which Diplodocus Was Armed.



Restoration of Diplodocus by Charles R. Knight.



Piecing Together Sections of the Great Diplodocus.



Complete View of the 60-Foot Diplodocus Skeleton to be Presented to the City of Frankfort-on-Main.

DIPLODOCUS: THE GREATEST OF ALL EARTHLY CREATURES.

Artificial Sea Water for Keeping Sea Animals and Plants in an Aquarium (according to H. Lachman).—In 50,000 parts of the hardest obtainable well water (i. e., that containing the most lime) dissolve 1,325 parts of chloride of sodium, 100 parts sulphate of magnesia, 30 parts of sulphate of potassium, and 150 parts of chloride of magnesium. These solutions are allowed to clarify by precipitation and are poured off clear. The water must not be used at once, however, but should stand for about three weeks, lightly covered, in a cool place. At the commencement of this period of rest, a few of the algæ (sea weeds) that attach themselves to stones should be placed in the water, to effect its oxygenation. Of such an exactly constituted solution, we can determine the specific gravity, and thereby constantly control the amount of salt in the solution, not only while it is stored, but in the aquarium. Finally, the water is filtered through a clean sponge or through plastic charcoal, and is then ready for use.