

for in all probability it was made when the carbons contained impurities to such an extent as to give this peculiar appearance.

It is interesting to-day, when the manufacture of carbons has reached such a state of perfection that the carbons are homogeneous in texture and almost entirely free from impurities, to consider the vast difference in their appearance when in operation, in comparison with the earlier forms. This comparison is facilitated by the science of photography, which has reached its present development during practically the same period as electricity. This makes it possible for the arc to now tell its own story, and we have from direct photographs the exact appearance of the arc in operation. No retouching of the negatives, or changes in them to the least extent, have influenced the character of the prints for the half-tone cuts herewith shown. Fig. 2 illustrates a continuous-current open arc after operating for seventy minutes at 110 volts and 25 amperes. This should be compared with Fig. 1 to show the superiority of the present carbons; and also particularly to exhibit the characteristic bridge of incandescent carbon particles which is always present between the poles. The upper carbon shows the crater whence the major part of the light from the continuous current arc emanates, and the appearance of this positive carbon also indicates in an imperfect way the doubly rapid rate of its disintegration compared with the negative. Fig. 3 is another illustration of an open arc after two hours' operation at 110 volts with 25 amperes. The arc is purposely made a little shorter than in Fig. 2 and the crater is less prominent, the photograph being taken with the carbons in an exactly vertical position. A good deal of trouble was experienced in photographing the arc so as to have both carbon pencils show distinctly, as well as the arc itself, because of the hot gases rising about the upper carbon and obscuring it. This difficulty was finally overcome by placing a second arc in such a position as to have its light focused by a lens upon the carbons of the light to be photographed, and then giving either a preliminary or subsequent exposure of the carbons, when the arc was not in operation, to that given upon the burning arc. The exposure of the cold carbons was of course several thousand times that of the arc. No color screen was employed for any of the work, as it seemed better for many reasons to avoid using one, if possible.

Fig. 4 shows an alternating-current open arc after sixty minutes' continuous operation at 108 volts and 30 amperes. It will be noticed that the upper carbon appears to diminish in size a trifle faster than the lower, due to the hot gases passing upward around that pole and assisting disintegration.

Photographs taken respectively of alternating and continuous-current inclosed arcs are shown in Figs. 5 and 6. These pictures were of course made through the inner cylinder, which immediately incloses the arc, and so are less distinct than those of the open arcs. Fig. 5 illustrates the disposition of the alternating inclosed arc to wander. Fig. 6 does not indicate such a disposition, though it is doubtless present to some extent in the continuous as well as the alternating-current light. It seemed, however, at the time of photographing that the tendency of the alternating arc to wander was much greater than that of the continuous-current arc. The results thus shown in Figs. 5 and 6 were obtained on lamps which had been in operation for a sufficient number of hours to give the carbons a normal, typical appearance, yet the photographs are quite unsatisfactory in some respects, and it is the intention of the writer to improve upon them in the near future.

Fig. 7 is only of interest in so far as it shows a good reversal picture produced by the alternating arc when the exposure is properly timed to obtain this effect. The work of photographing the arc thus described was undertaken by the writer, at the University of Wisconsin, for the purpose of obtaining, if possible, a suitable illustration of the arc to be used in a new book on Electricity and Magnetism, by Profs. D. C. and J. P. Jackson.

In conclusion, it may be noted that it does not seem necessary to attempt to picture the arc in modern books on physics and electricity by such antiquated illustration as is commonly used. It is not to be objected to so much, of course, on the ground of ancient history considerations, as upon that of incompleteness and incorrectness. It seems of much

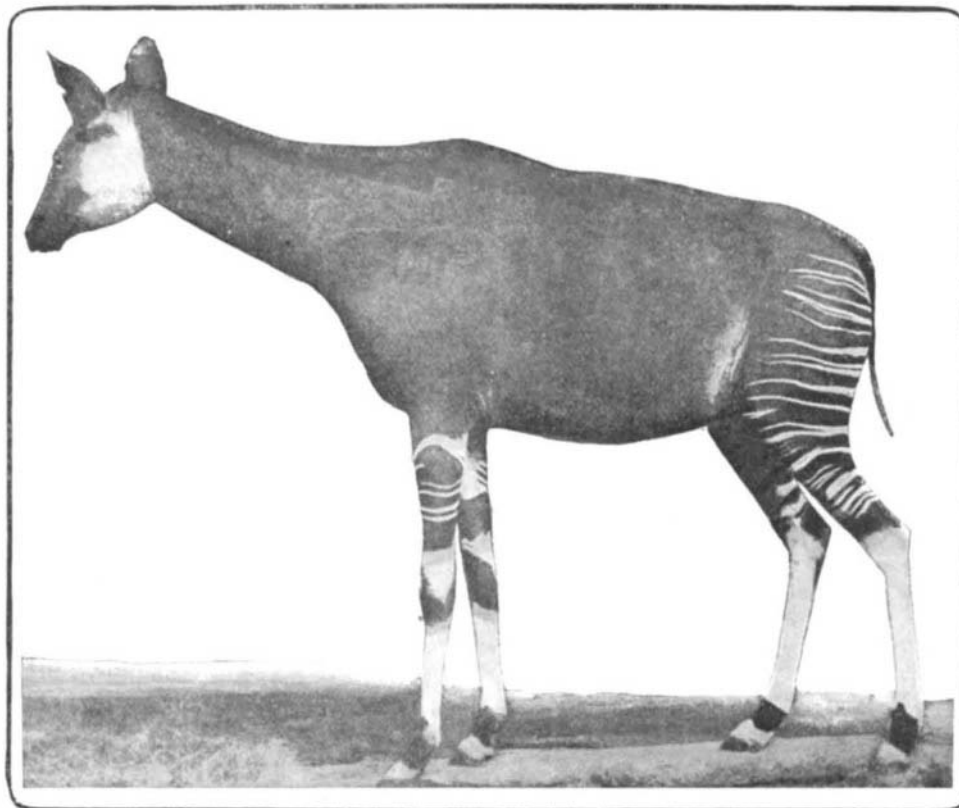
importance that new books should exhibit, so far as possible, new and original illustrations. Such illustrations appeal to the eye of the student more readily, assist in elucidating points in the text, and enhance the value of a book.

THE OKAPI—A NEWLY-DISCOVERED ANIMAL.

In the heart of Africa, near the River Semliki, by which Lake Edward and Albert Nyanza are connected and British East Africa (Uganda) and the Congo Free State separated from each other, a new animal has been discovered which has attracted unusual attention among zoölogists. Stanley, at the time of his second journey in this region, had heard from the natives of a peculiar striped animal that was neither antelope nor zebra, and yet as large as a horse. He never had an opportunity of seeing this creature, a fact that he ascribed to his caravan, which was so large that a wild animal would flee before it. Sir Harry Johnston, the British plenipotentiary in Uganda, was more fortunate. He received from the natives two dark-brown striped hides, which he sent to Eng-



HEAD OF THE OKAPI.



THE OKAPI—A NEWLY DISCOVERED ANIMAL.

land. Mr. Philip L. Slater, the well-known secretary of the London Zoölogical Society, gave it as his opinion that the animal might be considered a new species of zebra and christened it accordingly Johnston's zebra (*Equus Johnstoni*). Soon after Johnston received from an officer named Ericsson, stationed in the Congo Free State, not far from the Semliki River, a complete hide with the hoofs, together with two skulls. With this material it was finally ascertained that the new animal was a ruminant related, perhaps, to the giraffe, but still more closely related to the Tertiary genera of *Halladotherium* and *Samotherium Boissieri*. The giraffe family, of which these fossil animals and the newly-discovered creature are members, is distinguished from all extinct and living ruminants in so far as the space between the eye tooth and the first molar is greater than the similar space in any other animal, and that the eye tooth is provided, not with a single, but with a double crown. Eye teeth and incisors are found only in the lower jaws in most ruminants. Moreover, all camelopards have an elongated neck and long forelegs and somewhat shorter hind legs, so that the spinal column

slopes down sharply to the tail. The Okapi is perhaps one-third the size of the giraffe. At least this would seem to be the relative size from the hides sent by Johnston to London. From the occiput to the first caudal vertebra the animal measures 2.25 m. The height from the ground to the top of the head is 1.83 m. The English zoölogist Ray Lancaster is of the opinion that old bucks would probably attain a length of 3.05 m. and a height of 2.44 m. The hair of the Okapi is short and straight, as in the horse. Nowhere is the hair very long, with the possible exception of the forehead, where it projects in the form of a short, bushy growth over each eye. The neck, the hind-quarters and the crown of the head are a dark chestnut brown; the face is white and has a fox-red stripe on each cheek. The deer-like ears are a bright reddish brown, fringed with blue-black. The tail is also dark brown, moderately long and tuftless. The forelegs from the carpus to the shoulder are ringed with white. The rear members are similarly marked, but the stripes are extended up the hind-quarters to the very tail itself.

The sex of the animal whose hide was sent to London has not been determined. Ray Lancaster, for reasons which he has not given, believes that the animal was a male.

Johnston estimates the number of the Okapi in the forest of Semliki at 2,000 or 3,000. The animals have an elongated upper lip, which may possibly serve as a means of prehension, since the food taken consists of foliage of trees and bushes. The animal is beyond a doubt a surviving species of an old extinct genus closely related to the *Halladotherium* and *Samotherium* of the middle Tertiary, and may possibly be related to the now extinct many-toed ancestors of the horse.

For these particulars and our illustrations we are indebted to our German contemporary, *Illustrirte Zeitung*.

The Building Edition for October.

It is a rare treat to turn over the pages of the October issue of the building edition. This number is filled with exquisite illustrations of houses of varying prices, and in addition there are two pages of engravings of Mr. P. A. B. Widener's residence near Philadelphia, and also a page devoted to modern colonial porches. The subject of the editorial is "Heating the House," and is one of the technical articles which have proved so popular to readers of the Building Edition. Prof. Warren Powers Laird, of the University of Pennsylvania, talks interestingly on the "Town Beautiful." Those who are reading regularly the "Talks With Architects" find them both interesting and helpful. "Monthly Comment" and the departments, such as "Household Notes," "Legal Decisions" and "New Building Patents" are published as usual.

The Current Supplement.

The current SUPPLEMENT, No. 1346, has for the leading article an account of the train de luxe of the Cape to Cairo Railway, every modern convenience being offered to travelers through the heart of the African continent. "German Fire Engines" describes in detail a number of the leading types of fire engines. The Inaugural Address to the British Association by Prof. Arthur W. Rücker is continued. "Pig-Iron Casting Machines" describes a unique method of doing away with sand-molds. "Asia, Cradle of Humanity," is by W. J. McGee. "A Simple Method of Light Wave Measurement" is by L. H. Horner and is adequately illustrated. "Further Discoveries in Crete" gives an account of Hogarth's recent discoveries. The usual "Trade Suggestions from United States Consuls" and "Trade Notes and Receipts" are published. The engineers' report on the Brooklyn Bridge is also given.

Contents.

(Illustrated articles are marked with an asterisk.)	
Arc, photographing electric* ... 249	Inventions, recently patented... 251
Automobile record... 243	Motor and propeller, electric... 245
Books, new... 251	Naval construction, delayed... 242
Bridge, deterioration of the Brooklyn... 242	Notes and queries... 252
Building edition for October... 250	Okapi, the*... 250
Burial monuments of North Africa*... 248	Petrification, curious example of*... 249
Coal industry, bituminous... 243	Schooner, seven-masted steel*... 248
Cold storage... 247	Science notes... 247
Convention, street railway... 246	Shooting stars... 247
Cordage, manufacture of*... 241, 244	Stuttgart gives an ichtyosaurus... 247
Countries, civilized, population of... 246	Supplement, current... 250
Cup races, aftermath of... 242	Telegraph repeater*... 245
Inventions, index of... 243	Transatlantic record breaker... 242
	Windmill, curious*... 246