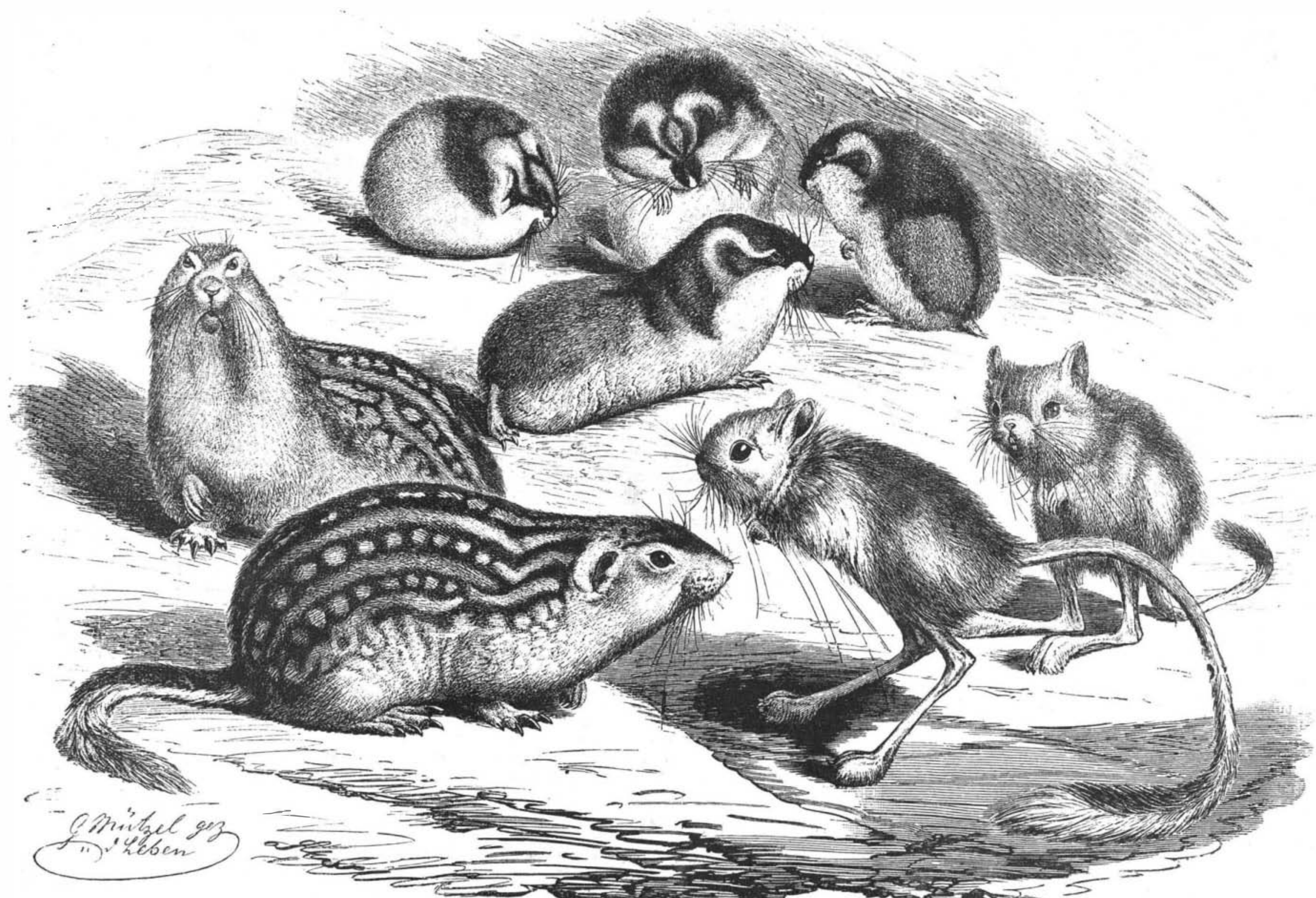
JERBOAS, MARMOTS, AND LEMMINGS IN THE ZOOLOGICAL GARDEN OF BERLIN.

The bird houses of the Berlin Zoological Garden always contain some small mammals, for which a better shelter cannot be found. Here they receive very little attention from the majority of the visitors, but this only adds to the interest of the real friend of animals. We refer to the three small rodents shown in the accompanying illustration, but seldom found in captivity.

The long-legged, thick-headed jerboa (*Dipus aegyptius*, Lichtst.) is a native of northern Africa. A true child of the desert, as Brehm calls them, they live in companies in places which their peculiar organization enables them to inhabit. In the construction of their extremely long hind legs, as well as in the unusual formation of the organs of the senses, especially the size of the eyes, by which the head is made broader than it is long, they bear an unmistakable resemblance to birds; and in fact, if the jerboa is to live in the vast desert, the surface of which is scarcely covered with the thin reed grass, he must rival the birds in activity and sharp-wittedness in order to obtain his poor food and to escape from his enemies. For this latter purpose the perfect sand color of his long, soft coat serves him well. This color is formed by a blue gray ground and the light tips of the hairs. The fore part of the arrow-like tail is dark brown and the rear part white. The fore legs are very short, and are generally held close to the body, being used in eating and in digging the caverns for the company, but not at all in traveling, which is accomplished by the use of the hind legs and the tail. When moving short distances the jerboa takes little tripping steps, but during flight it takes jumps that are colossal, comparatively speaking, and these follow each other so quickly and regularly that the animal seems to be flying over the ground.

The leopard marmot (*Spermophilus hoodi*, Richs.) is a North American representative of this species of rodent, which is spread over the northern hemisphere. They live gregariously in the plains of the United States, and are known by the pleasing and striking marking of their fur with stripes and spots, which will be better understood by a glance at our illustration than by even a long description. This pretty coat and their activity and intelligence hold the visitor who has the good fortune to see them a long time at their glass box, half filled with earth. The greater part of the day they spend in their burrow, where they carried a quantity of hay and food last fall. Since then they have been sleeping their winter sleep, from which it was difficult to waken them that they might serve as models for our illustration. Very little is as yet known about the life of these little creatures when wild, but judging from observations of their ways when in captivity, their habits must be about the same as those of the common marmot, excepting the differences which would be caused by the variations in the climatic conditions of their native haunts.

The lemming (*Myodes lemmus*, Pall.) is as well known by tradition as it is little known by actual sight, and is the little, thickset, and short-tailed field mouse which, by its migrations, has given rise to the numerous fables and to a certain mysterious light in which it appears in the natural histories. Of course we have long since learned to trace these migrations—which are not as numerous nor as regular as the old-time stories would lead us to believe—to their real source; that is, their rapid increase in a favorable climate and the consequent scarcity of food. Even without this mysterious nimbus, the lemming is a very interesting little creature, which, like the field mouse, bears the same relation to the common mouse as the hamster. Like the latter, the lemming is thickset, has a short tail, and its markings are more or less regular in color. The individuals differ in this respect, the ends of the black hairs sometimes being light and sometimes not. The lemming also resembles the hamster in character, showing the same courage, amounting to foolhardiness, for the little creature will leave his home to defend it by squealing and biting even when the contest is with men. But, while the hamster is disagreeable and even dangerous when angry, the much smaller lemming produces only amusement and merriment by his bursts of passion. Brehm's descriptions of the droll actions of these Liliputians when any one passes through their district, threatening the domestic peace of one or another by coming, voluntarily or involuntarily, too near their holes, are very entertaining. The Norwegian lemming lives on the high mountains of Scandinavia, in the region between the growth of trees and the perpetual snows. Still farther north, in Lapland, he lives in the swamps of the plains, for he knows how to use every dry spot. Other species of the genus are found, in Asia and North America, throughout the entire frigid zone. It is difficult to keep lemmings in captivity, and those under my care are the only ones I know of. Our picture is the first one drawn in Germany by a master hand from living subjects.—*Illustrirte Zeitung.*



JERBOAS, MARMOTS, AND LEMMINGS IN THE ZOOLOGICAL GARDEN OF BERLIN.

CHICAGO will probably have one of the finest libraries in the world in the course of a few years. Mr. W. L. Newberry, one of the earliest residents, left the sum of $250,000 for the purpose, and a temporary building has been used for some time. It is now intended to erect a magnificent edifice, capable of holding 300,000 volumes.

Tetanus Treated by Absolute Rest.

Prof. Renzi, of Naples, records several cases of tetanus successfully treated by absolute rest. The method advocated is as follows: The patient's ears are closed with wax, after which he is placed in a perfectly dark room far from any noise. He is made to understand that safety lies in perfect rest. The room is carpeted heavily in order to relieve the noise of stepping about. The nurse enters every quarter of an hour with a well shaded lantern, using more the sense of touch than sight to find the bed. Liquid food (milk, eggs in beef tea, and water) are carefully given, so that mastication is not necessary. Constipation is not interfered with. Mild doses of belladonna or secale are given to relieve pain. This treatment does not shorten the disease, but under it the paroxysms grow milder, and finally cease. Numerous physicians attest to the value of this treatment.—*Bulletin Med.*

Consumption of Ties.

Assuming the entire railroad system of the United States to be 160,000 miles, as appears from "Poor's Manual," with the addition of the lines in construction during the current year, and taking 2,640 ties per mile of track, we have in use at least 422,400,000 ties. This estimate, large though the total appears, is under the mark, as no railroad uses less than 2,640 ties per mile, and many of the roads with heavy traffic have 2,816, and in a few cases more.

The life of these ties varies according to their quality and the climatic conditions; but in the East, where only the best ties are employed, the average life is found to be about six years, while in the West, where poorer quality of timber often has to be accepted, and where dry rot and other disadvantages have to be contended with, the average life is from three to five years; so that even after allowing for a few exceptional cases in which ties may last ten years, the average life of ties all over the country cannot be counted as more than five years.

It follows, therefore, that the annual consumption must be about 84,500,000, which, with steady increase of railroad building, must soon exceed 100,000,000—a gigantic demand to be satisfied from our forests each year, when we consider the many other calls upon them, and the fact that at present virtually nothing is being done by the government or the people to replenish our source of supply.

The certain rise in the price of wooden ties, when these facts come to be fully appreciated by the lumbermen who control so large a part of the available timber area, will force the railroads to seek the best solution of the question in the adoption of a metal tie.—*Pacific Lumberman.*

Screw Propellers.

The escape of her Majesty's ship Calliope from the harbor of Apia at Samoa, when the German and American squadrons had to succumb to the fury of the hurricane, was recently noticed in our columns, reference being made to the excellence of the engines with which the vessel is fitted, by means of which she was enabled to make headway against the storm. On this topic something more may yet be said, and the subject is one well deserving full consideration. Coupled with the engines there is the propeller, and although at first the allusion may excite an incredulous smile, yet the fact that the screw of the Calliope was made of manganese bronze will be found, after a little investigation, to be a circumstance that ought not to be disregarded.

We refer to the subject not merely for the sake of demonstrating the advantage which there is reason to believe the Calliope derived from the character of her propeller, but in order to deal with certain data, by which it would appear that a screw of this description really offers a substantial gain in the matter of speed. It is to be remembered that the Calliope made her way against the storm simply at the rate of half a knot per hour; of course her inherent speed was considerable, but the storm neutralized the whole of it, except this small balance left in the ship's favor. What may be termed the effective speed was very little, but that little was sufficient to save the ship. The Calliope may never encounter the like dilemma again, and it may rarely happen that an extra half knot per hour will rescue a ship from destruction. Yet this little half knot, continuously maintained, is not to be despised, especially on a long voyage. Or if the extra speed is not desired, a saving of fuel may be effected, representing in the aggregate a very appreciable sum of money.

Reasons are forthcoming why a screw propeller made of manganese bronze should give a better rate of speed than one of gun metal or steel or any other metal yet known. But, in the first place, we may fall back on ascertained facts. It may be readily conceded that a commercial body like the Peninsular and Oriental Steam Navigation Company would not enter upon an extensive adoption of manganese bronze for the screws of its steamships, unless there was some practical advantage to be gained by doing so. Eleven of its ships are thus equipped, and a striking example on this point was mentioned a year ago, before the Institution of Naval Architects, by Mr. G. W. Manuel, the company's superintendent engineer. The screw blades of the Ballarat, made of steel, had been exchanged for others made of manganese bronze. In this instance, although the gain in speed was only about a quarter of a knot per hour, the effect was seen in a saving of between eight and nine tons of coal per day, or a total of 715 tons on the voyage out and home between England and Australia. The saving in coal represented about half the first cost of the bronze blades. This comparison is the more valuable, owing to the fact that the diameter, pitch, and surface of the propellers were the same in both cases.

Another very striking instance is furnished by the Australia and Zealandia, two steamships engaged in the mail service between Australia and San Francisco. These ships, originally fitted with steel propellers, had manganese bronze blades of exactly the same surface and pitch substituted. The speed was then found to be increased nearly one knot per hour, and the passage was made in two days' less time. A very satisfactory pecuniary result has been secured with regard to these vessels, by the acquisition of postal premiums, the amount being such as to pay many times over for the cost of fitting the new propellers. Eight ships of the White Star line have propellers of manganese bronze, as well as two belonging to the Cunard Company. On the Inman line we have the City of New York and the City of Paris, the latter famous for her extraordinary speed just accomplished on her first voyage to America and back. The Pacific and Orient Steam Navigation Company has manganese bronze propellers for the Orizaba, the Oroya, and two other vessels of its line. The North German Lloyd Steamship Company has done the same with eight of its ships. One of these, the Lahn, of 8,000 indicated horse power, lately made a remarkably rapid voyage.

Some time ago the Scottish Oriental Steamship Company substituted manganese bronze propellers for others of iron and steel in four of its ships, the increased speed ranging from two-thirds of a knot to one knot per hour. The four other steamers belonging to this company were fitted with bronze blades when built. Other instances might be mentioned, but these will indicate the appreciation which steamship companies have entertained for this particular kind of bronze, and there is every prospect that the use of the metal for propellers will extend. Outside the circle of the mercantile marine, we have the example of the British Admiralty. The Colossus was fitted with twin screws of manganese bronze after a series of experiments on the strength of this material as compared with gun metal, the trials being made at the works of Messrs. Maudslay, Sons & Field, in the presence of the Admiralty inspector, with the result that the manganese bronze was found to possess just double the strength of gun metal. Consequently the adoption of the bronze effected a saving of from 20 to 25 per cent in the weight of the propeller. In addition to the Colossus and the Calliope, manganese bronze has been employed for the propellers of the Calypso, Rover, Rattlesnake, and Sandfly. The French government has adopted the same metal for the twin screws of the Tage, Cecille, Forbin, Surcouf, Troude, Lalande, and Cosmao. The Russian government has taken the same course with regard to the Amiral Kornilow and the Rhynda.

We may now say something as to the probable cause of the advantage given by manganese bronze when this metal is employed in the construction of screw propellers. A particular kind of manganese bronze is used for this purpose. There are five different qualities of the metal, that of which the propellers are made possessing great strength and toughness. We have already mentioned the proof of this in the trials made in the presence of the Admiralty inspector. The transverse strength of the metal is stated to be about equal to that of the best cast steel. Hence, as compared with gun metal, a great reduction can be effected in the thickness of the blades, which therefore become finer and sharper. There is also a peculiar smoothness of surface, producing a diminution of skin friction, especially important where high rates of speed are employed. A velocity of forty or fifty miles per hour in the extremities of the blades gives value to everything which reduces the unproductive resistance. The power thus saved is utilized in giving greater speed to the vessel. Steel castings for propeller blades are very rough, and are almost always out of true pitch, owing to the warping which they undergo in the annealing furnace; whereas the manganese bronze blades are almost mathematically true, as shown when tested by the pitchometer.

This metal has the advantage over steel of being more fluid when melted, thereby producing a finer casting. Freedom from pitting and corrosion preserves the blades for a long time in their original form, so that the life of a bronze blade may be reckoned as equal to that of the ship to which it is attached. So great is the saving of weight in the construction of a manganese bronze propeller, that the reduction in the outlay for raw material renders the price about equal to that of a propeller made of gun metal, although weight for weight the bronze is from 20 to 25 per cent dearer. There is also the recommendation that the manganese bronze propeller will fetch a good price as old metal. As compared with steel, manganese bronze is about three times dearer at the outset. But the pitting which so soon takes effect on steel greatly enhances the cost in the course of years, so that after the lapse of a certain period that which appeared the dearest proves to be the cheapest. Taken all in all, there is accordingly much to be said in favor of manganese bronze. In these days, when "commerce destroyers" are in vogue with foreign navies, and vessels to catch these "destroyers" are specially needed in the navy of England, it is well that we should not only know how to make powerful engines, but how to apply such power to the most efficient and enduring propeller. For this purpose we shall expect to find manganese bronze growing in favor as time goes on.—*The Engineer*.

Something New in Photo-lithographic Work.

BY W. T. WILKINSON.

The usual method of making photo-lithographic transfers is upon gelatine made sensitive with potassium bichromate. This is quite sensitive enough to day light or to electric light; but if transfers are required when neither day nor electric light is available, then bichromated gelatine is useless, and some other method is wanted. Try this. Make a print upon any of the ordinary bromide papers of commerce, using a good negative from a subject in line, by artificial light; and develop the image with alkaline pyro, then wash and place it upon the inking board; next, blot the water with a soft cloth, and dab all over with a sponge saturated with transfer ink, thinned with turpentine; let the turpentine evaporate, then take a glue roller, *i. e.*, a type printer's roller, and roll until the whites are quite clear of ink. Now soak the print in the pyro again for a few seconds, and expose it to the light. Finally, wash free from pyro and hang the print up to dry. When it is dry the print is ready for the transferer, who treats it the same as he would any other photo-lithographic transfer.

The only way to fail with this method is to over or under expose the print, or to use a bad negative. The negative must show perfectly clear lines. Some of the newer papers of commerce contain too little gelatine to succeed perfectly; therefore, it is best to make the paper at home. It is not a very complicated process, as the color of the image under the developer is not all-important. A good formula is:

Gelatine	800 grains.
Water	80 ounces.

When the gelatine is quite soft, melt it at 120° F., and add 320 grains of ammonium bromide. Stir it until it is dissolved, then add ten minims of hydrochloric acid and stir well.

In 10 ounces of water dissolve 450 grains of nitrate of silver, bringing this solution to the same temperature as the gelatine solution; now proceed to pour the silver solution into the gelatine in a very thin stream, stirring it vigorously all the time. Now strain it into a warm dish, and tilt the solution so that it is only along one edge of the dish. Having made a small roll of the paper, lay one edge of the roll upon the liquid, and as it curls take hold of it and lift it slowly up, when the paper will unroll itself and receive a nice even coat of emulsion. Hang it up to dry, and repeat until all the emulsion is used.

For half tone transfers, use the bromide and chloride of calcium with 200 grains extra of gelatine, drying the paper at as high a temperature as possible without melting the gelatine. Paper with this emulsion upon will be very hygroscopic, and must be kept very dry. Before use, always dry the paper, and warm again before developing, so as to encourage reticulation of the gelatine.

This paper is to be exposed under a half tone negative, developed and washed, then inked up as directed for the line transfers, followed by immersion in the developer, and subsequent exposure to light, washing, and drying. To transfer to stone, trim with a pair of long shears, then put it into the damping book until quite limp. Then sponge the back of the transfer with a solution of oxalic acid 1 part, water 100 parts. Take great care that none of this solution gets on the front of the transfer. Lay the sheet in position upon a cold, dry stone, and pull it through the press, with plenty of pressure, five or six times, without lifting the tympan. The paper can be lifted off, leaving the image in ink on the stone. Gum it in, and leave it for five or six hours before rolling up.—*Photo. News*.

Rubber Stamp Ink.

The usual rubber stamp inks are prepared with water soluble aniline colors and glycerine. A good formula, which we have tested practically, is given by Dieterich:

BLUE RUBBER STAMP INK.

Aniline blue, water sol., 1 B.	3 parts.
Distilled water	10 "
Pyroligneous acid	10 "
Alcohol	10 "
Glycerine	70 "

Mix them intimately by trituration in a mortar. [The blue should be well rubbed down with the water, and the glycerine gradually added. When solution is effected, the other ingredients are added.]

Other colors are produced by substituting for the blue any one of the following:

Methyl violet, 3 B	3 parts.
Diamond fuchsin I	2 "
Methyl green, yellowish	4 "
Vesuvin B (brown)	5 "
Nigrosin W (blue black)	4 "

If a bright red ink is required, 3 parts of eosin BBN are used, but the pyroligneous acid must be omitted, as this would destroy the eosin. Other aniline colors, when used for stamping ink, require to be acidulated. —*American Druggist*.

Improved Indices.

Burr's patent combination index, manufactured by the Burr Index Co., of Hartford, Conn., covers a long felt need in the way of improved indexes. We speak from experience, as we have had the Burr index in use in the SCIENTIFIC AMERICAN office for over two years past. Our first order was for an index for 10,000 names. The work proved so useful we soon ordered another of still larger capacity.

This index is extensively used by the United States and Canadian governments, leading railroads, banks, insurance companies, and representative firms in all parts of the country. The system is complete, the plan simple for general use, readily understood, and so arranged that any name can be found at once.

The indices are made with great care, from the best of material, calculated for constant and hard use: made of any size, ranging in capacity from 500 to 1,000,000 or more names, and the largest number of names can be handled with the utmost rapidity and convenience.

Wild Boars among Us.

According to the *American Field*, wild boars have become very numerous in the deep recesses of the Shawangunk Mountains, that border Orange and Sullivan Counties, N. Y. They are the genuine Black Forest wild boars of Europe, the descendants of nine formidable and ferocious boars and sows which Mr. Otto Plock, of New York, imported some few years ago for the purpose of annihilating the snakes and vermin that infested his estate near the Shawangunk Mountains. After the boars had eaten up all the snakes and vermin in the inclosure, they longed for more, and dug under the wire fencing and escaped to the mountains, where they have since bred and multiplied. They are so ferocious that the most daring hunter is said to hesitate before attacking them. They have immense heads, huge tusks and shoulders, and lank hind parts.