## SOME WONDERFUL FLIERS.

BY C. F. HOLDER.

The most striking and interesting animals of the olden time, particularly that known as the Mesozoic, were the fliers—reptiles adapted for a life on the wing, and so marvelously constructed as to be the subjects of never-ceasing curiosity.

The flying lizards, or *Pterosauria*, have left their imprints on the bottom of our great inland Cretaceous sea, that now, a dry, arid basin, lies exposed, a wonderful and prolific collecting ground for the geologist.

The first pterodactyl was discovered by Colleni, in 1784, and attracted as much attention at the time as the discovery of a *bona fide* sea serpent would to-day. The naturalists of the period, and even later, were completely nonplussed. Colleni himself described his find as a fish. Blumenbach thought it a bird. Sommering was equally positive that it had mammalial characteristics, while Spix was certain that in its structure he saw a form intermediate between the monkeys and bats. On the other hand, Macleay considered that it was a connecting link between the birds and the mammals, and so the war of opinions waged until, in 1800, Cuvier determined its proper position.

The European pterodactyls were veritable dragons, their long beaks were armed with sharp teeth, and they ranged in size from a foot to sixteen feet across the wings. Naturally the American forms are the most interesting to the reader upon this side of the water, and they possessed characteristics that were remarkable in the extreme. They differed from European forms in being devoid of teeth, and compared to them they were veritable giants. To Prof. Marsh, of Yale, is due almost the entire credit of the discovery of these gigantic creatures, to which he has applied the name *Pteranodon*. They all come from the bed of the old Cretaceous sea of the West, or the locality in Kansas that is known as the chalk deposit or bed. They ranged from creatures as large as a snipe to monsters having a spread of wing twenty-five feet across.

In the accompanying cut a conjectural view is given of one of the largest of these animals, showing how, possibly, it may have appeared when alive, the figure of a man being introduced to give some idea of the size. Such a picture is, of course, faulty from the total lack of material to work upon, but it will, perhaps, serve the purpose intended, of showing how like the typical dragon these strange creatures were. Prof. Marsh, in referring to these forms, says in substance:

The first remains of pterodactyls found in this country were discovered by him in the autumn of 1870, near the Smoky Hill River in western Kansas. These belonged to a gigantic species, which he described as *Pteranodon occidentalis*. The geological horizon from which they were taken was the middle Cretaceous, or the same from which he took the now famous toothed birds. For several years he kept collectors at work in the locality, with such success that the Yale College Museum now has the remains of over six hundred of these reptiles. All of the large ones belonged to the genus *Pteranodon*, and a single species of another genus, *Nyctodactylus*, was also found. In one of the large forms—*Pteranodon ingens*—the skull alone measured four feet in length, and the appearance of this toothless monster can well be imagined.

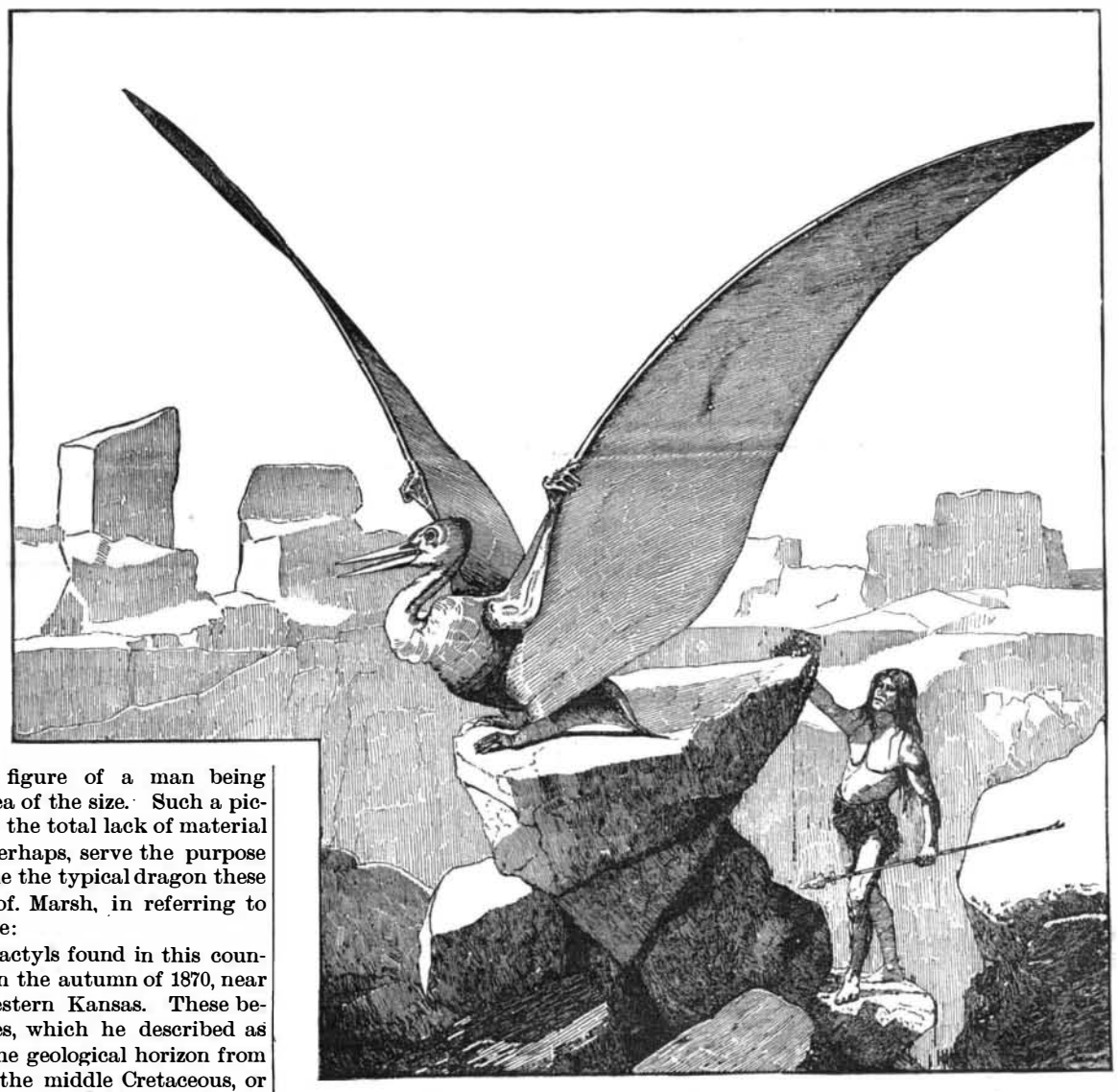
An extremely interesting feature of these forms is their resemblance in structure to the birds; in reality they were reptilian bats, forming, perhaps, a link between the reptiles and the birds. Some of the striking features are the long neck and head; the jaws, perhaps protected by beaks; the skull, with its large orbits, and the brain. The sternum was keeled, as in the birds, and the shoulder girdle was bird-like. On the other hand, the pelvis and limbs are those of a lizard, while the enormously extended little finger seems a unique feature. The limb bones were hollow, as in the birds, and they also had air cells, so that these strange creatures seemed to combine the features of several groups.

Of the Old World and toothed forms the *Rhamphorhynchus phyllurus* was, perhaps, the most remarkable. It was also secured by Prof. Marsh, and is now in the museum at Yale, while casts can be seen in the geological collection of the museum at Central Park. It was found in the slate at Salenhofen, Germany, and is principally remarkable for its extremely long and rudder-like tail. The specimen restored represents a curious, bat-like creature with leathery wings, with a long snout filled with teeth, so that it was quite ferocious in appearance. On the ground it probably waddled along with a tottering tread, much like that of the bat; but when it rose in the air, its strange make-up was still more apparent. The tail commenced like that of the bat, but it was very long, and at the extreme end widened out into a veritable rudder, that was evidently used to steer this weird, dragon-like creature through the air.

The rudder was composed of two membranous leaves or folds, that extended from each side of the tail, forming a leaf-shaped organ, supported and held in shape by numerous bones, like the ribs of a fan, that branched out from the backbone and held it in place, so that there was no flapping about, the rudder always being steady and at the will of its strange possessor.

The appearance of the western country at this time can hardly be imagined. There probably could be seen hundreds of dragon-like pteranodons at the close of day rushing out of their dens or from the forests, and soaring about as do our bats of to-day! Such was their great size that, if they congregated in numbers, as we are led to suppose from the enormous quantities of their bones found, they must have fairly darkened the earth as they soared along.

It is probable that they found much of their prey in the water, and evidently dived into it much after the fashion of our pelicans, though their victims may have been some water birds that floated upon the surface. As their habits were quite similar to those of bats, in all probability they clustered on the cliffs on the sides of streams, clinging to the edges or, perhaps, the branches of trees in groups, fanning the air and each other with their great leathery wings, or snapping their jaws at one another in fierce rage; and when alarmed they would rise in vast flocks, casting dark shadows on the waters below, and soar noiselessly along, the terror of these ancient days.



BAT-LIKE PTERANODON OF A FORMER AGE.

The story of these animals is entirely told by the hardened rocks that contain their remains. They died, fell to the earth, or possibly into the water, sinking to the bottom, and as the animal matter became macerated and was lost, the bones retained their natural position, and soon became covered with a thin coating of mud that concealed them like the clay of a cast. Year after year fresh layers of sediment were deposited, until, finally, perhaps the stream changed its course, or the land became elevated, so that the water was withdrawn and the mud began to harden in the sun, in time becoming a solid rock. Leaves and the debris of vegetation fell upon it, mould accumulated, seeds took root, and soil formed, until in years a thick stratum of earth was deposited and great trees covered the ancient beach. This period may have lasted for ages; then, from perhaps a sinking of the crust, would come a change; water would flow in and kill the trees, as we often see in overflowed ponds and lakes; the roots would in time decay and then disappear, or be covered up with a deposit of mud that would perhaps form in ages another stratum hundreds of feet thick; and so this piling and growing would continue until finally our bat-like creature is buried far beneath the crust, to be dug out ages after by the miner; or, again lifted to the surface by some cataclysm or earthquake, it becomes exposed, and tells the story of this olden time.

### How Rails are Pounded.

If we stand at a moderate distance from a railroad track and watch an express train as it rushes past, everything seems perfectly adapted to its purpose, and the engine and train seem to glide over the rails with perfect smoothness. This smoothness of action, however true it may be with respect to the ears, is, in the case of the engine itself, only apparent. The ordinary locomotive, owing to peculiarities in its construction, so far from being in reality the perfect machine which poets rave about, is quite a different affair. This is, however, in a great measure due to difficulties which are, owing to the peculiar condition under which they arise, practically very hard to overcome.

The locomotive, as generally constructed, says a writer in the publication called the *Locomotive*, is subject to very severe internal disturbing forces, some of which are of such a nature that they not only (at high speeds) seriously strain parts of the engine itself, but become an actual element of danger, on account of their tendency to cause breakage of wheels, rails, and even bridges, unless great care is exercised. Probably the most serious of these internal disturbing forces is due to the fact that it is simply impossible to perfectly balance the reciprocating parts of the engine in the ordinary form of construction. In consequence of this lack of balance, an engine in motion delivers through its driving wheels a series of blows upon the rails at every revolution, which, in the case of an ordinary express engine, running at a speed of 50 miles per hour, has been calculated to be equal to a load of over six tons, suddenly applied. This is repeated at the above mentioned speed over four times every second. The effect of this tremendous blow so often repeated is seen in the breakage of rails in frosty weather, and unless due care is exercised it is the prime factor in the destruction of bridges. The cause of this "hammer blow" is this: To prevent injurious regularities of motion in a horizontal, or fore-and-aft, direction, and which would be seriously felt in the train, one must put sufficient weight on the driving wheels to counterbalance the crankpin hub, crankpin parallel rods, and one end of the connecting rod. Thus we see that there is necessarily an excess of counterbalancing weight in a vertical direction, and it is this excess which strikes the severe blow above referred to. The effect of this blow on the driving wheels themselves is to flatten tires after a comparatively short season of running; this flattened spot may easily be seen by examining the wheels of an engine after they have run a few months. A good idea of the magnitude of this hammering action may be obtained by examining this flattened spot.

With the high speeds which will be demanded of our railroads in a few years, it seems to us that it will be a measure of very great economy, if not absolute necessity, for railroads to adopt some modified form of construction which shall enable more perfect balance of the reciprocating parts to be attained, as the saving of fuel, and wear and tear of rolling stock and roadbed, to be gained thereby would be very considerable.

A NEW alloy of manganese and tin is brought out by Messrs. Billington & Newton, of Longport. It is suitable for bearings in which shafting is required to run at high speed, for steamship propellers, and where a high degree of tenacity and closeness of grain are requisite.