gliding plane, and still more so the propelling power, increase with the velocity. For instance, a thin foot-square gliding plane weighing one pound soars with the least expenditure of power at a speed of about 40 miles an hour, and at 80 miles an hour the power required is more than twice as much.

Again, the friction on a long railway train may equal or exceed the true head resistance, while on a short train or single car, the friction is comparatively inconsiderable. Now, though the head resistance may be very greatly reduced by sharpening the front and rear, the skin friction cannot be reduced appreciably by any treatment. Hence, it is apparent that the total air resistance of a long train or hull cannot be reduced very largely by any treatment, whereas the resistance of a single coach, like a street car or automobile, may be reduced several per cent by use of suitable prow and stern.

In conclusion, it may be said that both theory and experiment show that the atmospheric friction about equals the head resistance on symmetrical hulls of easiest shape, on double-edge sword shapes of least resistance, and on soaring planes gliding at the most economical angle of flight.

THE MORO FIRE MAKER.

BY C. H. CLAUDY.

The match has been said to be the greatest civilizer of the world, but it has not yet completed its work. There are still tribes of barbarous and semi-barbarous people who use nature's means for producing fire, either by friction with or without apparatus, or the contact of two substances which produce a spark, as flint and steel.

The Moros, of great interest to us on account of our experience with them in the East, use a method distinctive from other savage races, and of interest not only for its uniqueness, but as showing the effect of environment on invention.

This apparatus consists, as shown in the accompanying photograph, of a bamboo stick, a bit of china, and tinder. The cylindrical cases, which are also shown, are part of the device as it is used, one being a case for tobacco, and the other a case for the china and tinder. The whole, connected with cords, is worn at the belt. To use the apparatus, the native takes the bamboo firmly in his left hand, and in his right holds the bit of china by the finger and thumb, and on the thumb side pinches a bit of tinder. The edge of the china is then struck sharply down and along the bamboo, producing a bright and long spark, which catches in the tinder and ignites it. Very little practice is required to enable even a novice to light a fire by this means. Obviously, when the apparatus was first devised, no china was available, and doubtless some sharp stone took its place. Now, however, bits of broken china, such as are found in cheap eating houses, are regarded as best for the purpose, and universally used.

The thoughtful reader will at once draw an analogy between this means of fire making and the flint and steel of our own ancestors. In the eastern tropics, however, bamboo is the commonest of woods, and so was doubtless observed many times to make a bright spark when struck where flint, in contact with metal, was seen once. In consequence, after the first bright thinker had devised this way of using the spark, the method held its popularity and obtains to this day, although the flint and steel is so much simpler, easier, and more portable.

The philosophy of the device will at once be apparent. The sharp edge of the china scrapes off a bit of bamboo—not much, because the wood is hard and the outside has quite a glaze—but enough to be made incandescent by the friction of the stroke. The tinder catches this spark, and the desired flame is the result.

The photograph was made from the object in the possession of Mr. W. W. Dinwiddie, of Washington, D. C.

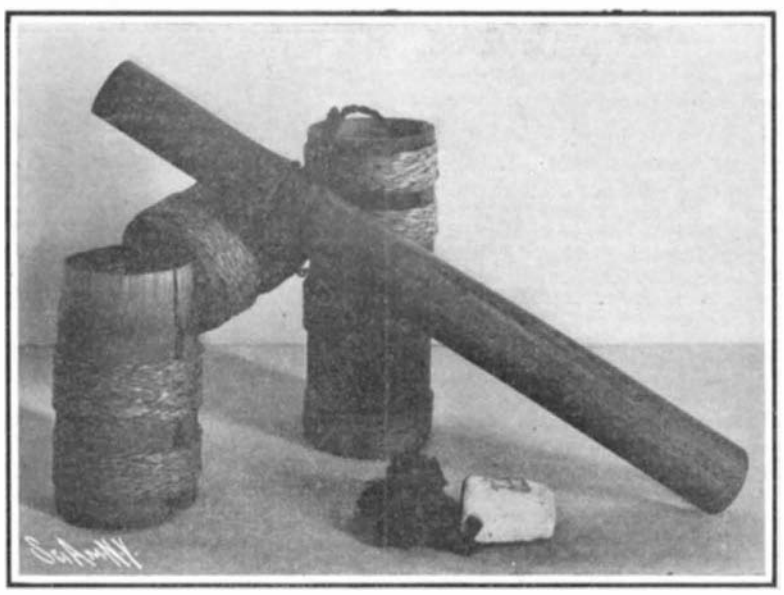
A Japanese observatory has been built at Chemulpo and was opened in March, 1905.

MOUNTING A MONSTER SEA ELEPHANT.

BY HAROLD J. SHEPSTONE.

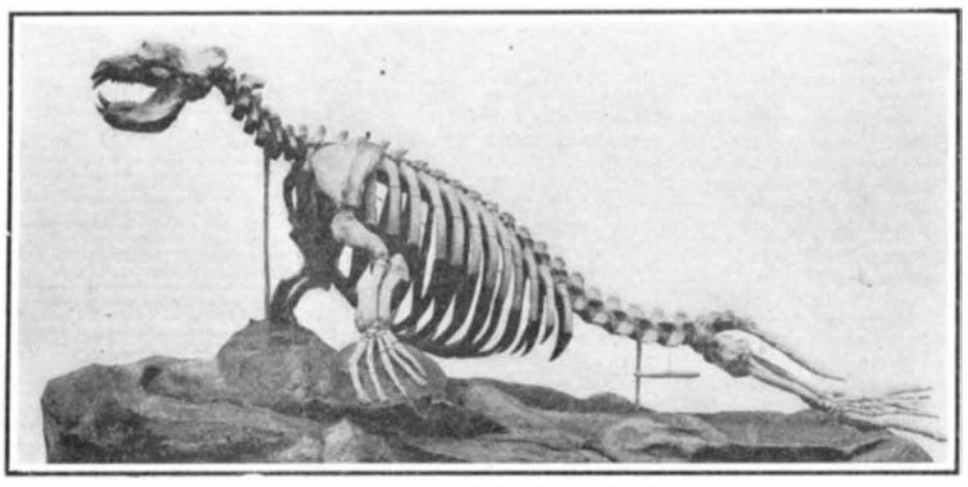
A new and interesting attraction at the Berlin Zoological Garden is a mounted specimen of a monster sea elephant. It can claim the distinction of being the largest sea elephant that has ever been killed, while the mounting of the giant animal is undoubtedly a clever piece of taxidermic work.

It was found some eighteen months ago by whalers off the coast of the Falkland Islands. They promptly surrounded the monster, and subsequently slaughtered it—no easy task—and the hide with the raw skeleton was purchased at a high price by Mr. J. F. G. Umlauff, the proprietor of the famous Umlauff Museum in Hamburg.

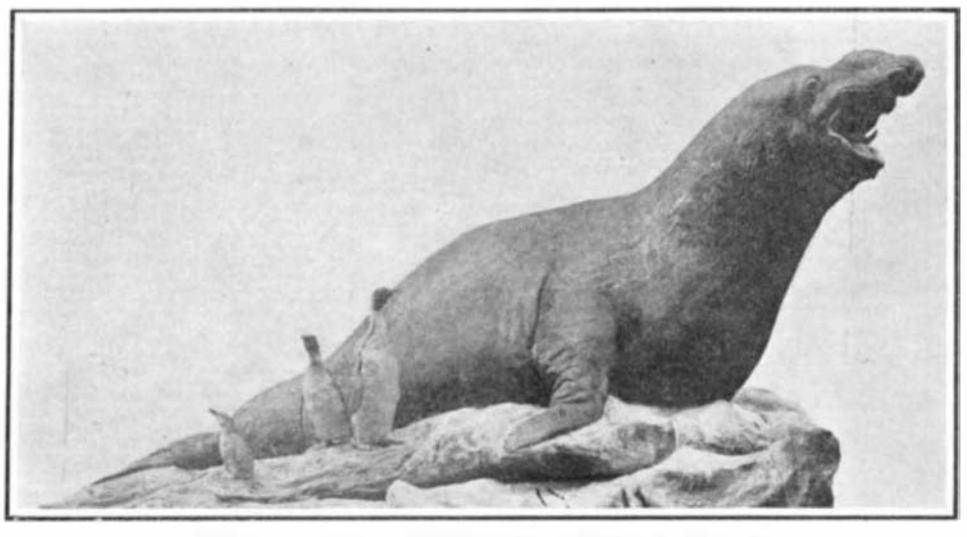


MORO FIRE MAKER. BAMBOO TO BE STRUCK WITH CHINA AND TINDER.

He at once commenced the difficult task of mounting the giant sea mammal. It took him six months to complete the work, which cannot be regarded as an excessive amount of time. A laborious piece of work was the removing of the fatty matter from the skin, which was entirely permeated by blubber canals. Before the animal was finally dressed a model was made, and there being a distinct lack of pictorial representations of the sea elephant, the artist had very little material to guide him.



Skeleton of the Giant Sea Elephant.



From the tip of its tail to the tip of its tusk the specimen measures 21 feet.

THE GREAT SEA ELEPHANT. A REMARKABLE PIECE OF TAXIDERMIC WORK.

Some idea of the size of the monster may be gaged from the fact that from the tip of its tail to the tip of its tusk it has a total measurement of nearly 21 feet. Such an animal, when alive, would weigh 10,000 pounds, or nearly 4½ tons. The circumference of the body at its widest part is some 18 feet. The skull alone measures 2 feet 3 inches long and 1 foot 3 inches high. The sea elephant, or seal elephant, is in many ways an interesting creature. So far as size goes, he can give points to the walrus, but he is certainly not so ferocious looking. Except for the curious nose (whence his Greek name) he is just a big black seal fairly agile in the sea and clumsy ashore, like all his kind. He is about the bulk of a hippopotamus, although more hirsute and with a less extensive opening of the jaws. He holds among seals the unique position of being common to both hemispheres, although from the ardor with which he has been hunted, very few specimens exist now north of the equator. Just now, however, the sea elephant is enjoying a respite, and is consequently increasing in numbers rapidly, particularly in the southern seas. He forms practically the only population of many an otherwise lonely series of barren rocks in the Antarctic Ocean. His food consists chiefly, if not entirely, of cuttlefish. Formerly the animal was hunted by whalers upon all the islands of the Antarctic Ocean, notably Kerguelen's Land and the South Shetland, where they abounded in immense herds. The creatures were slaughtered for their hides and blubber.

The animal has derived the title elephant from the fact that it possesses a kind of trunk, or proboscis. This characteristic is only found, however, in the old males. It extends quite a foot beyond the angle of the mouth. In other respects, also, the males are distinguished from the females, more especially by their size. The female, on the average, attains only half of the length attained by the males, and only one-third the weight of the latter. Old males also lose the hair from the nether part of the neck, the skin thickening in this part and getting barky and cracked, deep intersected furrows dividing it into irregular patches. The tusks of the males reach a length of four to five inches, their external part being smooth and conical, while the part imbedded in the flesh is furrowed and slightly curved. The tusks of the males are solid; at the lower end only a slight cavity appears, while in the female they are shorter, and, moreover, almost hollow up to the point. Sailors and seal-hunters are fond of using these hollow teeth of the females for pipe-bowls, quills from the wings of pelicans supplying suitable stems for the pipes. The monster sea elephant seen in our picture has been mounted with penguins beside it. As already stated, it is the size of this sea mammal that has attracted attention. Even old, experienced whalers declare they have never met a larger specimen.

The first marine engineering in the modern sense was the adaptation of the steam engine as already in familiar use on shore to a modification of the centuries old method of mercantile propulsion, the oar. Some attempts were actually made to adapt the steam engine to a series of oars, which would have meant something like a mechanical trireme; but of course the trained mechanical sense soon saw that the collection of the oars in a revolving wheel was the correct solution. As oars had been used on both sides, so it was natural at first that the paddle wheels should be on both sides; a center wheel was also tried, but it is interesting to remark that practically about the same time that the sidewheels were used on the seaboard, the first marine engine was the shore engine modified to suit the circumstances, and thus on the seaboard the engine was designed and worked with what we now consider an exceedingly low pressure. On the western rivers, where the change has been made in the location of the wheel, there was also the additional change of dispensing with the condenser and using very much higher pressures. It was doubtless due to this fact—that the first non-condensing engines really carried a very high pressure—that the term "high pressure," in the early days meant non-condensing. The reason for the difference is of course very clear; the western rivers are very shallow and it was necessary to make the machinery as light as possible; on the seaboard and the rivers of that section there was deep water and the vessels could carry heavy machinery.