

A MULTICYCLE FOR THE BLIND.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The possibility of cycling becoming a pastime in which the sightless would be able to participate would appear impossible, but a visit to the Royal Normal College and Academy of Music for the Blind at Upper Norwood, London, would serve to dispel this illusion. Among the various recreations provided for the blind pupils at this institution none is so popular as cycling. In order to enable the scholars to indulge in this sport numerous machines have been acquired, but owing to the peculiar conditions prevailing they are necessarily of special design. The most popular of these machines is the multicycle shown in the accompanying illustration, which, as will be seen, is devised to carry a team of twelve cyclists.

This cycle, which was designed and constructed by one of the foremost cycle manufacturing firms of the United Kingdom, is built up of six two-wheeled members, each adapted for two persons, coupled together, there being a connecting bar between each successive pair of wheels to form the complete train. The machine, which is of substantial build and devised to carry riders of either sex, has a total length of 28 feet.

Each pair of wheels is a complete unit in itself, including differential gearing in the single axle, and seats for two riders, one being in front of the handle bars, which are of the usual design for the rearmost of each pair of riders, while the front seat has side handles such as was the practice in the old tandem tricycles. The frame is of special design, the front seats being carried on vertical supports, as is also the handle-bar pillar connecting with the axle, while the rear seat is supported upon the raised hump of the bar connecting succeeding pairs of wheels together, except in the case of the extreme rear rider, where the seat is also carried on a vertical pillar from the main framing of the machine. The connecting bar itself is swiveled and the machines are coupled up by this moving joint with sliding pins, the connection in front being made with the steering handle-bar column of the preceding machine and at the opposite end to the main frame of the axle to the succeeding unit. By this arrangement perfect lateral play is provided such as is required in negotiating curves, while the system also enables the train to be split up into sections, such as a quadruplet, sextette, octette, or train for ten riders.

Of course the machine has to be guided and controlled by a sighted person, who in this instance occupies the second seat, which gives command of the first pair of handle bars. The slightest deviation to either side of the front wheels is transmitted through the coupling bar to the second pair of wheels, the driver of which can act in concert, thereby conveying the same intimation to the third unit, and so on to the end. The drive is of the ordinary rotary type geared to 51 and each rider participates in the propelling action. Even the sharpest curves can be rounded with facility and ease. Each handle-bar is equipped with a powerful brake and the machine can be pulled up dead within a short distance when the whole of the braking facilities are simultaneously applied, rendering it perfectly safe.

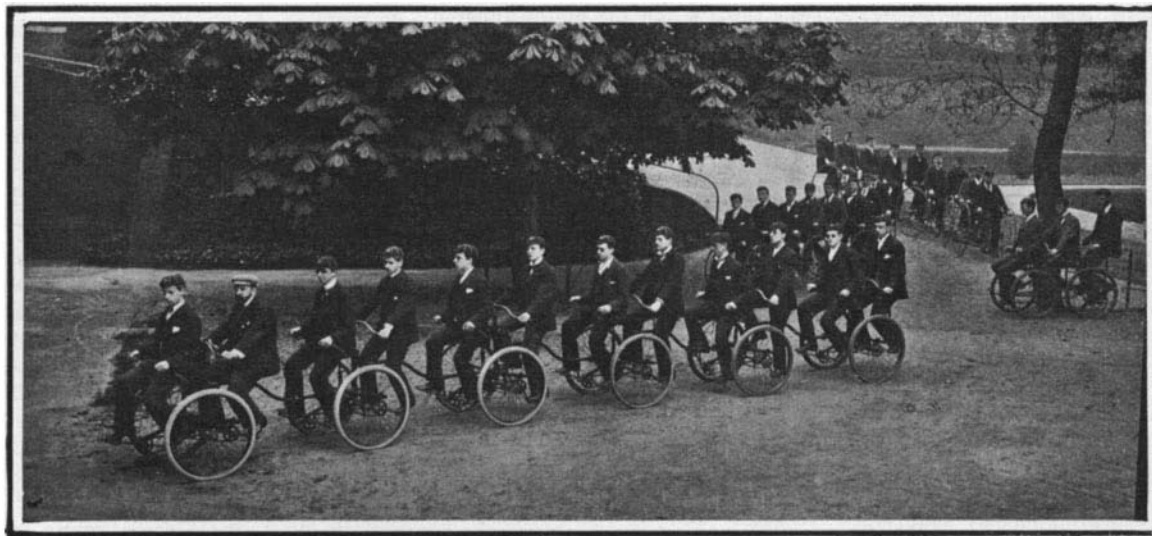
The pupils do not by any means confine their participation in this recreation to trips around the extensive grounds surrounding the institution, but under the guidance of a competent sighted captain are frequently to be seen upon the high roads of the neighborhood. From time to time long excursions are undertaken into the country, the longest journey in this direction being a round journey to Brighton on the south coast, a total distance of 100 miles. For this journey a special crew was selected from sixty candidates and the trip was accomplished in 10¾ hours' actual running time, an average speed of 9.75 miles per hour.

ACTION ALOFT; OR FIGHTING TOPS, PAST AND PASSING.

The use of the fighting top may be traced back through the Dark Ages right into the depths of antiquity. That the warships of ancient Egypt were equipped with fighting tops in which stood slingers ready to sweep the decks of an adversary, we know from wall paintings discovered at Thebes; and among the ruins of Khorassan and Nimrud have been found other representations of the top showing that its use was not confined to the land of the Pharaohs. Its shape was frequently that of a drinking cup (*carache-*

sium). In the war galleys of the Greeks, Romans, and Carthaginians the use of the fighting top was far from universal, possibly because of the ramming tactics then usual. At the high speed at which these long, narrow vessels were propelled, a collision would have jerked masts and tops overboard; indeed, their masts were often made to lower, and sometimes were even landed before an engagement. Fighting tops were frequently rigged up on board mercantile vessels, which were slower and broader craft, with the object of assisting in their defense against pirates. In the warship proper their place was taken by lofty towers substantially constructed of iron and timber, although, according to a French work on navigation, platforms for archers, stone throwers, and slingers were occasionally hoisted half-way up the masts of a war galley.

We do not hear much of the fighting top in the "long ships" of the Danes, Saxons, and Vikings, which were (like the ancient war galleys) narrow, oar-propelled vessels, but as in the progress of naval evolution they approached more nearly to the "round ship," or short, broad-beamed sailing vessel of the Middle Ages, the top reappeared. The first "round ships" were merchantmen, and, as in classical times, these were converted into fighting vessels by the addition of "top-castles." Fore and after "castles" were also built upon them by a special class of skilled workmen. These converted merchantmen formed the fighting fleets of the thirteenth and fourteenth centuries. In the battle with Eustace the Monk in the Straits of Dover in 1217 the English threw down sacks of unslaked lime which, as they had been careful to keep to windward, smothered and blinded the Frenchmen and contributed not a little to their defeat. The top-castles of this period were of various forms—some square and embattled, some round, some built round the mast, others fastened either before or abaft it. We see by the illustrations in medieval manuscripts that the tops were frequently elaborately carved or dec-



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orated in brilliant colors and gilding. But on the other hand many were merely rough basket-work affairs, or in some cases merely barrels like the crow's nest in a modern whaler. At the famous battle of Sluys in 1340 the French ships hoisted small boats filled with stones up to the tops, so that the men stationed aloft should not run short of ammunition. Ten years later, when King Edward III defeated the Spaniards at the battle known as "Espagnols sur Mer," Froissart relates that the king ordered his ship to be run aboard the first of the enemy they came up with. This was a huge ship towering high above the Englishman, and the crash as they met was so violent that "from the concussion the top on the mast of King Edward's ship came in contact with that of the enemy and carried away his mast, and all who were in the top were drowned."

As time went on the number of masts was increased to two and even three, the ships themselves became bigger, and their tops invariably circular and of much larger circumference than before. In some cases—probably in the Mediterranean only—a tower was built round the mast to within a short distance of the top, so that fire could be maintained from two platforms, one above the other. This revival of the Greek and Roman "turres" or "towers" is said to have been originated as far back as the tenth century by the Emperor Leo of Byzantium, who used them in his "dromons," which were the biggest Mediterranean battleships. Small cannon and "hand-gonnes" began to make their appearance aloft. A Dutch engraving toward the end of the fifteenth century depicts a three-masted carrack, each of whose masts is terminated by a huge round overhanging top. Round the two foremost are ranged the big "viretons" or darts that could be hurled so effectively from a height; but in the mizzen top is a small swivel gun, with a shoulder piece which seems to be pivoted on

the mast itself. At this period it was customary to stretch strong netting over the decks and castles of a fighting ship, which sloped steeply down to the bulwarks. This was not only for the discomfiture of an enemy's boarders but to break the fall of the debris and spars from aloft, and to protect the crew from the larger kinds of missiles thrown from his fighting tops, which in their turn were also protected by a bell-shaped netting overhead. In the sixteenth century the tops were bigger and apparently shallower than formerly, and in addition to being decorated with ornamental shields and carving were provided with "top armor." Strange to say, this "armor" had no protective qualities, as it consisted merely of red, white, yellow, and green kersey cloths lined with canvas which were hung round on special occasions, when, as we should say, it was necessary to "dress ship." A multiplicity of tops was for a little time quite the vogue. The "Grande Françoise" of 1527 had no less than five masts. One of these alone carried four tops, one above the other, the last "so high that a man standing in it did not look bigger than a chicken to those below." In a description of the great "Santa Anna" built at Nice for the Knights of Malta in 1530, and armored all over with numerous leaden plates fastened by brass bolts, so that "it was impossible to sink her although all the artillery of a fleet were fired against her," we are told that she had three tops, one above another, topmast above topmast, and constructed not merely for the convenience of setting the sails, but also to mount small pieces of artillery, which she always carried. The round-top such as those carried in Tudor times lasted till well into the eighteenth century, but it became less and less a platform for guns and more and more important with regard to the rigging and navigation of the ship. Thus in Falconer's Dictionary (1771) we find that "the principal intention of the top is to extend the top-mast shrouds, so as to form a greater angle with the mast, and thereby give additional support to the latter." By this time the top had become more square than round, only the forward part being semicircular or having rounded corners. It was entirely open at the sides, but on the after end was provided with a rail about 3 feet high, to which was still hung, at times, the decorative "top-armor," now of red baize or red painted canvas. But it still served as a fighting platform. "In ships of war," says Falconer, "it is used as a kind of redoubt, and is accordingly fortified for attack or defense, being furnished with swivels, musketry, and other

firearms, and guarded by a thick fence of corded hammocks." But before very long the use of small cannon and even musketry in the tops fell somewhat into abeyance. Nelson, it is said, would never allow this form of fighting, which, in his opinion, only killed a number of men without affecting the issue of a battle. The top of Nelson's day remained practically the same, at any rate until the total abolition of sail power in battleships toward the end of the last century, the only difference being that the swivel gun was replaced by the machine gun, Nordenfeldt, Gardner, Hotchkiss, or Gatling. The French, who had always paid particular attention to their armament, made the first steps toward the fighting top proper by surrounding the ordinary tops of some of their ships of war with steel breastworks. In the British navy low open fighting tops were carried by the "Infexible," "Thunderer," "Glatton" and other early turret ships. But the fully rigged broadside battleship still remained faithful to the flat, open variety. France in the meanwhile began to build veritable castles, with top piled on top, on board her warships, so that in some cases their stability was affected and some of them had to be removed. The German navy at one time seemed inclined to abandon the light open top for the French type of fighting mast, but the fashion was but short-lived, and where fitted the tops were removed and replaced by the type which now seems to be the accepted pattern in that navy, and which seems to have a good deal to recommend it. The lower portion is rather like a low tower surmounted by a round top with a roof, but above are only comparatively light masts for signaling purposes and for carrying an electric projector. Of late years the British navy has in its newest battleships and cruisers again abandoned the practice of carrying an armament aloft and their tops are utilized as fire control platforms. It seems not improbable that

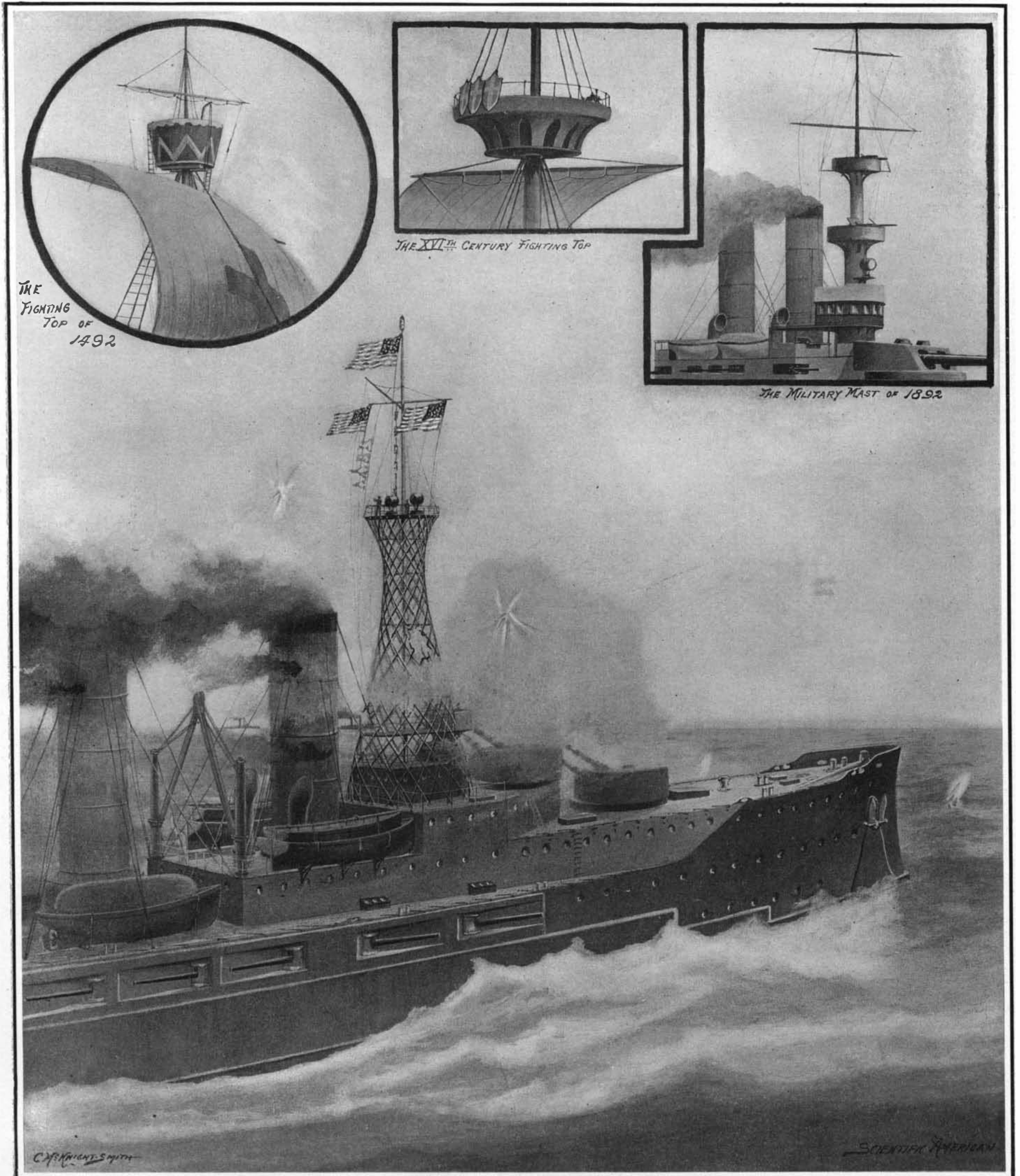
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During the past four hundred years the fighting top has developed from a large armored position carrying cannon and many fighting men to the simple observation platform at the top of a spiral tube mast.

FIGHTING TOPS PAST AND PRESENT.—[See page 336.]