A MULTIPLE CYCLE FOR THE BLIND.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

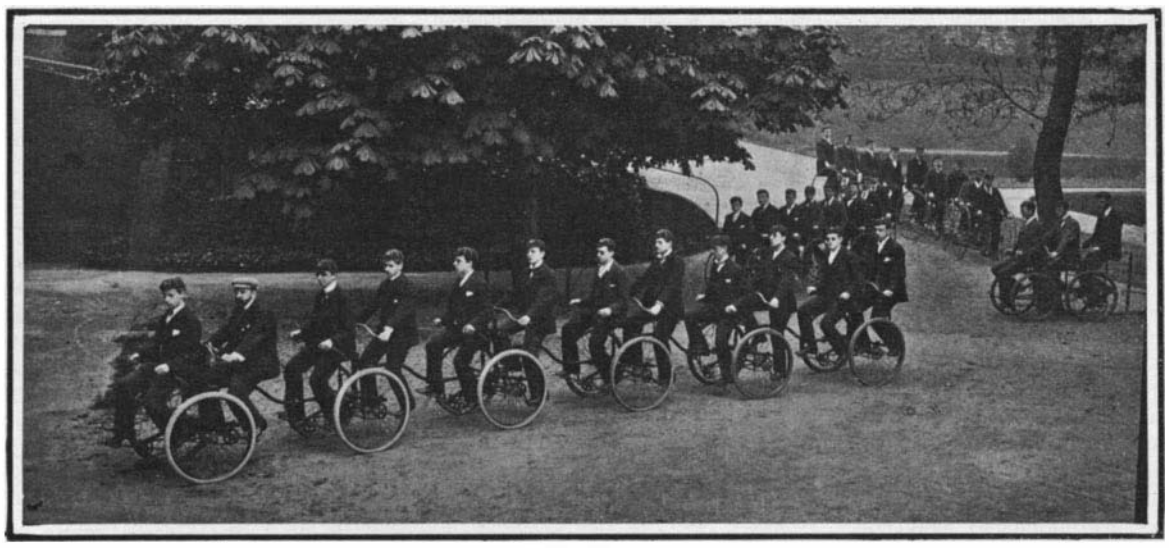
The possibility of cycling becoming a pastime in which the sightless would be able to participate would appear impossible, but a visit to the Royal Normal College and Academy of Music for the Blind at Upper Norwood, London, would serve to dispel this illusion. Among the various recreations provided for 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.



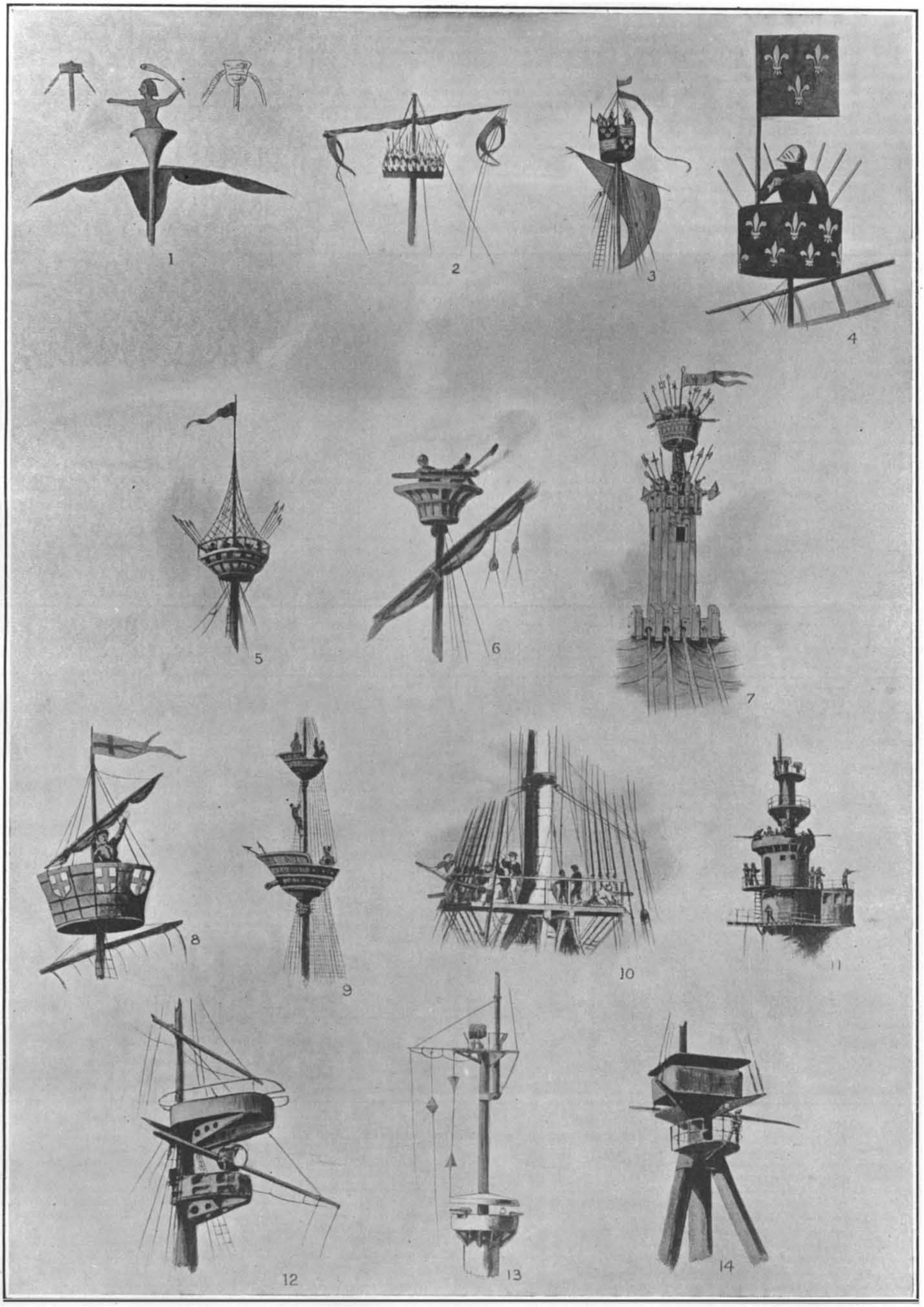
A MULTICYCLE FOR THE BLIND.

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 (*carachesium*). 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 decorated 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 patforms, 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 "Inflexible," "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



1. Three old fighting tops; the first from Nimrud, the second from Khorsabad, and the third from Thebes. 2. Temporary fighting top in an ancient galley. From "La Marine," Paris, 1844. 3. Top of the "Thomas," King Edward III's ship at Sluys. From Froissart, 1340. 4. French top, 1390. From Froissart. 5. Fifteenth century fighting top with overhead netting. 6. Fighting top with cannon. From a fifteenth century woodcut. 7. Fighting top and tower. From Valturius. 8. Foretop H. M. S. "Regent," 1512. 9. Tops on mainmast of H. M. S. "Ark Royal," 1588. 10. Top of a French man-of-war with swivel guns, 1844. From "La Marine," Paris, 1844. 11. Fighting top of the French battleship "Carnot," 1896. 12. Control platform of a British battleship, 1905. 13. German regulation fighting top and mast of 1907. 14. Maintop of H. M. S. "Dreadnought," 1907.

THE EVOLUTION OF THE MILITARY MAST.

we are now entering upon a period of almost mastless fighting ships. Some turn in the evolution of the perfect man-of-war may possibly cause history to repeat itself, as it has a way of doing, in which case we may again see, as in the days of yore, the fighting top pouring its missiles upon the decks of an opponent.

In our illustrations there are shown several types of fighting tops, which illustrate the developments from the earliest times to the present. It will be noted that in the case of the very latest military mast, as used on the later ships built for our navy, not only has the fighting top entirely disappeared, its place being taken by a simple platform for the fire-control officers, but the structure and appearance of the mast has been totally changed. Up to the time of the appearance of the British "Dreadnought," modern military masts consisted of a single vertical, hollow cylinder of steel of greater or less diameter, according to the fashion of the particular navy to which the vessel belonged. The masts of the "Dreadnought" consist each of three masts formed into a tripod, this form being used as a protection against the complete wrecking of the mast by a single shell, something that might readily happen to a single mast. The Bureau of Construction of our own navy have improved upon the masting of the "Dreadnought," by using the type shown in our engraving, which consists of a series of intersecting steel tubes, rising in spirals from deck to platform, 120 feet above the sea. One-half of the tubes have a twist from left to right and one-half from right to left. The basket-like structure thus formed offers great resistance to complete destruction by gun-fire, for several of the tubes might be cut through without endangering the stability of the whole mast. Unfortunately these good qualities are obtained at the expense of ship-shape appearance—for anything less nautical than these gigantic baskets it would be hard to imagine.

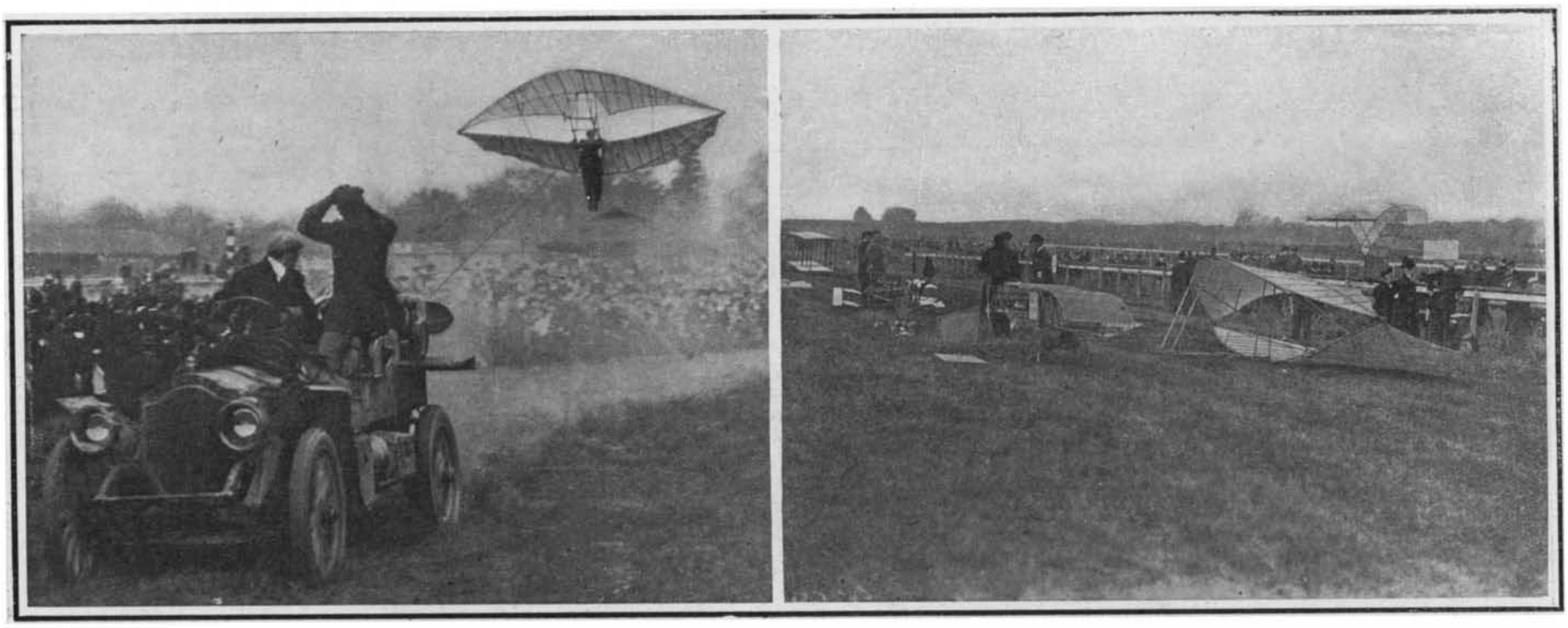
THE AERONAUTIC SOCIETY'S FIRST EXHIBITION.

On Election Day, Morris Park, which has been the scene of many horse and automobile races, was opened as an aeronautic ground by the Aeronautic Society. The society's first exhibition was held in the afternoon in conjunction with the championship motorcycle races of the Federation of American Motorcyclists, and while nothing especially novel happened in the aeronautical line, there were some very fast motorcycle races and some interesting experiments with gliders.

A considerable number of inventors were present with models of their apparatus. They were invited to place their models upon the lawn in front of the grand stand, where they could be inspected by the spectators. One of our photographs shows some of the apparatus as it was displayed upon the lawn. In the foreground is seen the double-surface glider of Laurence J. Lesh, the sixteen-year-old Canadian, who made sensational flights during the past summer above the St. Lawrence River, when his glider was towed by a motor boat. This glider is an improved apparatus designed by Mr. Lesh after numerous experiments and consultations with Mr. Octave Chanute, with whom he has collaborated.

The general appearance of the Lesh glider is similar to that of the "June Bug" aeroplane, but the glider is distinctly novel, in that the upper surface is placed considerably in advance of the lower one, which does away with nearly all interference. The machine has 120 square feet of supporting surface, and it carries 1½ pounds per square foot. At the first trial Lesh made a successful glide and alighted safely, but the second time he rose sharply to a height of about 40 feet, and then, losing his equilibrium, plunged downward to the ground at a sharp angle, breaking his leg just above the ankle in alighting. The accident was caused by lack of experience with the glider, which was not fitted with rudders as the previous ones had been.

The lower pair of photographs which we reproduce illustrate an improved type of aeroplane, which was invented some three years ago by Gustave Whitehead, of Bridgeport, Conn., and which has since been patented both in the United States and abroad. This machine, owing to its long triangular body with a bow at the forward end and a tail at the rear, is far more stable when in the air than is the Chanute double-surface machine. The foldable wings resemble those used by Lilienthal, with whom Whitehead at one time experimented in Germany. The main feature of the machine is the central body portion. A glider of this type can be made to lift a man when it is towed by another man against a fifteen or twenty-mile wind, and once it is well up in the air, the rope can be cut, and the machine will always alight on a level keel. Should it start to plunge downward, it will immediately right itself automatically. The aviator does not have to balance it by kicking out his legs, and it is possible to tow one of these machines behind an automobile with perfect safety to the man hanging from it.

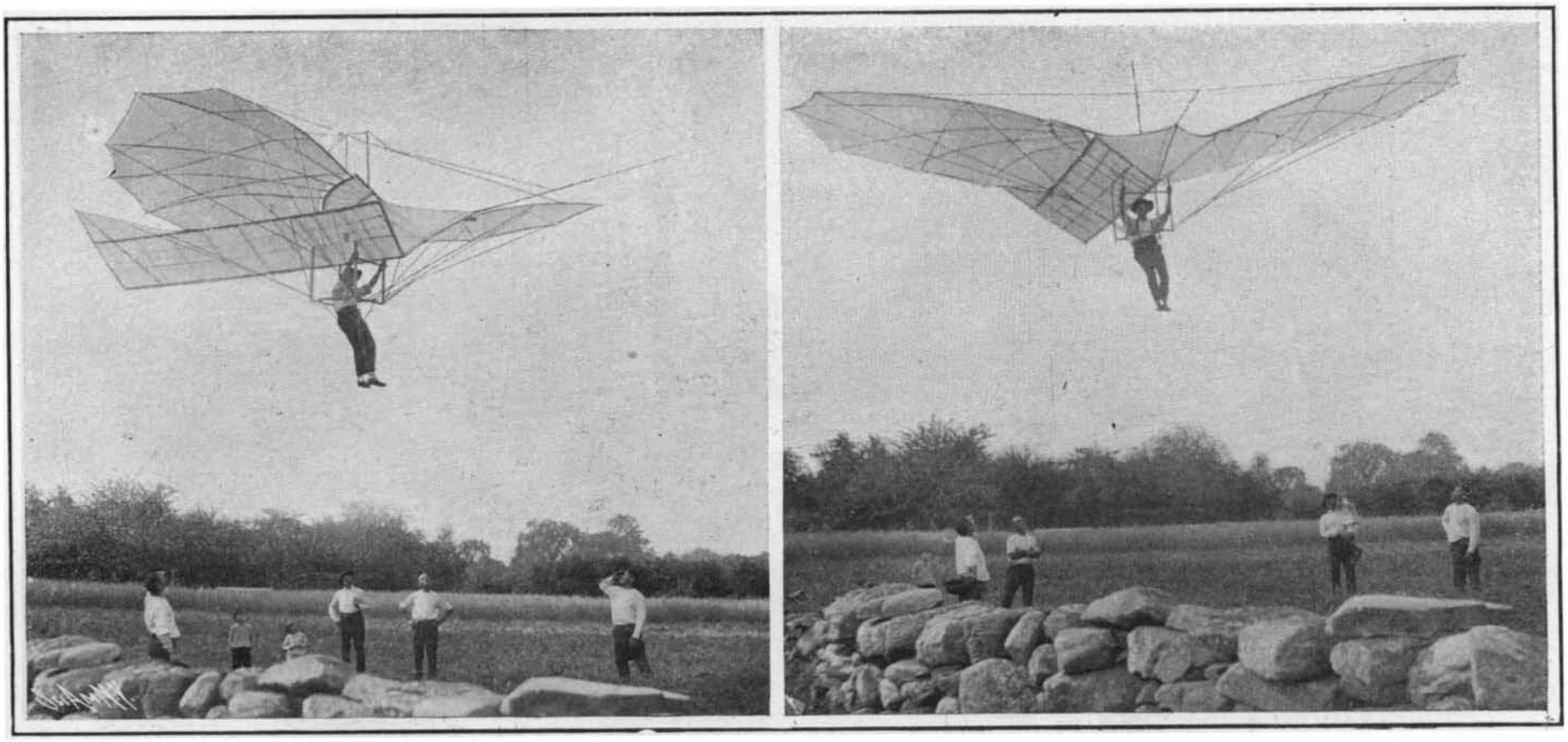


The 'Round-the-World Thomas car towing Laurence J. Lesh in his glider.

This was the first time Mr. Lesh had been raised by an automobile, though last summer he was towed 10 miles above the St. Lawrence River by a fast motor boat.

Gliders and models exhibited on the lawn.

Ordinary 2-surface glider. Farman type model of Percy Pierce. Model aeroplane of Miss E. L. Todd. Lesh's glider. Large model aeroplane of Arthur Mitchell.



Side view of Whitehead glider in free flight.

Front view of Whitehead aeroplane making a glide.

THE FIRST OPEN-AIR EXHIBITION OF THE AERONAUTIC SOCIETY.