

A SWIMMING SCHOOL FOR CAVALRY HORSES.

BY W. G. FITZ-GERALD.

No amount of improvements in artillery and small arms has done away with the cavalry arm in modern warfare; and the question of getting horses for this branch of the service is a very serious one. Now horses, it may not be generally known, display almost as much individuality as human beings; and this remark as to the diversity of their natures applies with special force to military chargers, which must of necessity be recruited in all parts of the world, from Hungary to Buenos Ayres.

The army of every great power has a veterinary department, whose officers and men are charged, not only with the maintenance and care of many thousands of war horses, but are also responsible for their purchase in the first instance, and likewise their education, which is almost as important as that of their rider.

Just consider how mixed a few "bunches" of cavalry horses may be that have just been received in Paris, Berlin, Vienna, Rome, or London. Some have been bought on the Siberian steppes; others among the hills of Bohemia; others, again, in our own Western or Southern States; some in Ireland; and so on.

All of them have been differently brought up, amid surroundings as varying as those of their human masters, and now their military education must begin. Some of them may not even be broken to the saddle. They are all pretty much of one age, but their health may vary, and their temper certainly does.

One of the first things to be done with the equine recruit is to accustom him to the sound of drums and military bands as well as sharp trumpet calls, volleys of musketry; and last of all the trembling beast has to face and stand by roaring and thundering artillery.

You would have thought all these more or less severe tests, but alas! there is one more coming for the poor horse, that must make him wonder—if horses wonder at all—whether life is worth living. This is his swimming exercise, which is so vitally necessary a part of his training, in order that in a time of need, when an enemy may have blown up and destroyed existing bridges, he may readily cross flooded rivers, taking his fully-equipped rider with him, and even hauling boats, laden with stores, provisions, and ammunition, from one bank to another.

Most of the horse recruits have a more deep-seated aversion from water than has even the workhouse tramp. It is almost pitiful to see them tremble on the brink, and strive to get away from the unstable element. Many of the great powers of Europe set apart special sections of a river, lake, or reservoir for the compulsory training of cavalry chargers in this manner.

As the system obtaining in most armies is identical, it will be enough if we consider that practised at Aldershot, the great military camp of England. Hither are drafted horses from most of the other military camps, such as Hunslow, York, Winchester, Colchester, etc.,

with men and stores and towed to deep water by more proficient pupils. The horse is permitted simply to look at the water at first, and then he is patted and coaxed in, first up to his fetlocks, and then to his knees. Beyond this he will rarely go at the first lesson. He is kept at this depth for some little time, and then taken for a little run on land.

He is brought back again, however, and coaxed in a little deeper, and if he show any sign of pluck and readiness to take the plunge into deep water, the cavalryman attending him divests himself of the scant clothing he carries, and prepares to swim by the horse's side to encourage him with voice and hand, and probably take him back again after he has made one trip.

Sometimes heroic measures of a violent nature are resorted to, and a timid or trembling pupil is hauled or thrown into deep water without further ceremony. Sometimes this has the desired effect, and the animal finds that after all the experience is not so very terrible; indeed, he may well find it most refreshing on a sweltering August day on the Hampshire Downs, where there is little or no shade from the burning sun. On the other hand, such a

course may give a horse a fright of which it may be difficult or even impossible to cure him. Some of the horses indeed—more particularly those from Asiatic Russia, where the rivers are frozen to a depth of several feet for the greater part of the year—have an unconquerable aversion to entering the water to any depth; and if they are found

to be quite hopeless, they are drafted into other branches of the service. At the same time, commissariat horses and mules, as well as artillery teams, are educated in this way, besides the chargers of the cavalrymen. The men chosen for this work are all veterinary officers, commissioned and non-commissioned, and as a rule they are patient and kindly men, with an extensive knowledge of the leading peculiarities of all the horses of the world.

A SIMPLE RIM FOR DETACHABLE TIRES.

The latest improvement in the method of fastening a double-tube pneumatic tire to the rim of a wheel in such a way as to make it readily detachable, has just been brought out by the Bryant Steel Wheel and Rim Company, of Columbus, Ohio. The new rim is the invention of Mr. Richard S. Bryant, of this company, and it is the simplest device we have seen for securing an ordinary clincher tire.

The construction of this new rim can be readily seen from the cross-sectional cut, Fig. 1, while the ease with which a tire can be detached when mounted on such a rim, is apparent from the photographs.

Referring first to the cross-section, the reader will



Assembling the Boats.



Swimming Across a River.



Packing Up the Collapsible Boats.

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for this is their swimming "university." In the nature of things, the "professors" are not overburdened with clothing, and it is to be feared no gentle measures are used with recalcitrant pupils.

At first coaxing is the order of the day. The animal is well fed with barley on the morning of his first lesson, and then he is led forth casually, as though for a little ordinary exercise, by the military stableman in whose charge he is. He is led down to the river's edge, where are assembled a number of specially-made collapsible boats of canvas and ash framework. These may be used to compel and tow the reluctant equine swimmers; or on the other hand, they may be filled

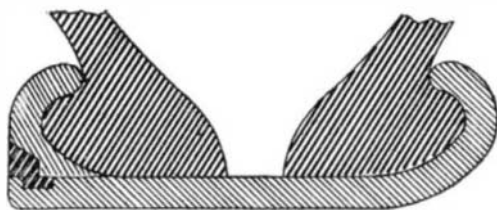


Fig. 1. Full-Size Cross-Section of Rim, Showing Clincher and Locking Rings on the Left.



Fig. 2.—Removing the Small Locking Ring.

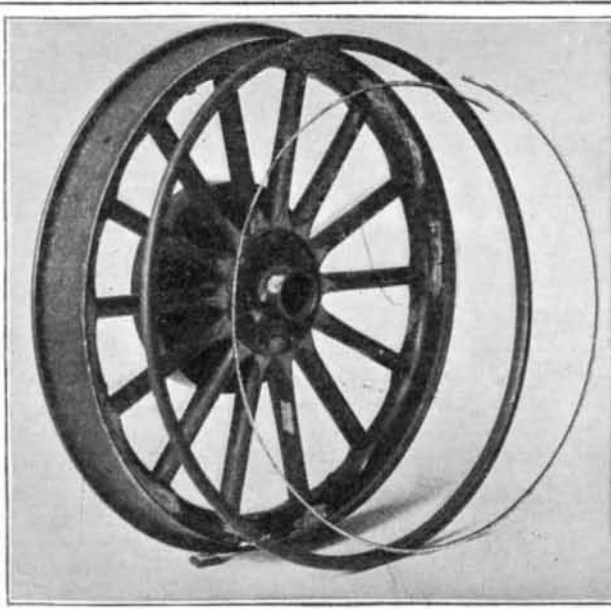


Fig. 3.—The Rim with Clincher and Locking Rings.

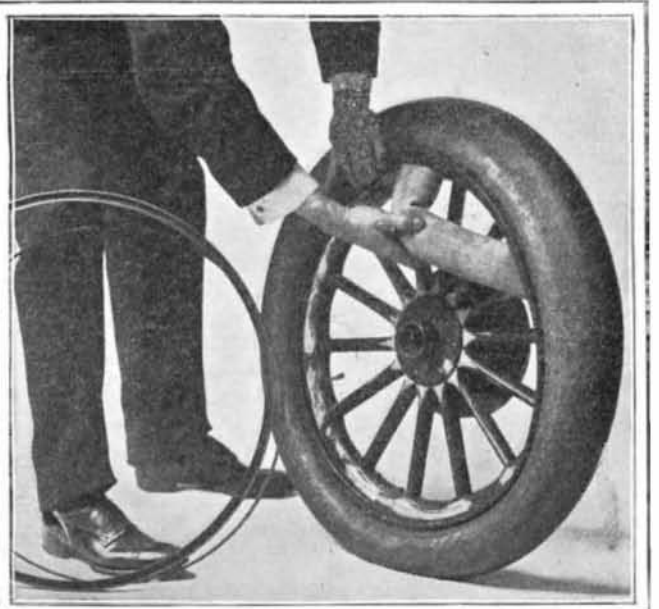


Fig. 4.—Removing an Inner Tube.

A NOVEL RIM, MAKING POSSIBLE THE REMOVAL OF A DETACHABLE TIRE WITHOUT THE USE OF TOOLS.

note that the tire is mounted on what appears to be the usual steel clincher rim. As far as the bottom and inside edge of the rim is concerned, this is correct, though the flat face of the rim has a small groove in it near its outside edge. The outside clincher ring is entirely separate from the rim, and it too contains a groove on its outer edge that matches the groove in the rim, being nearly opposite it when the tire and clincher ring are in place. As soon as this is accomplished, all that is necessary to secure the tire is to crowd it against the inner clincher ring sufficiently to allow of inserting the light locking ring in the rim (see Fig. 2). This ring is of the special cross-section shown in Fig. 1, and when the tire is inflated, it takes all the side pressure exerted by the inner tube and casing upon the outer clincher ring. If the tire is deflated, the weight upon it will, it is claimed, still keep the ring in place. The outer surface of the locking ring is flush with that of the clincher ring, there being no projections to come in contact with the curb, nor any crevices or openings through which dirt or water can penetrate. Rims of this type can be fitted to any wood wheel and can also be adapted to any style of clincher tire. Besides being extremely simple in construction, this form of attachment offers the great additional advantage that no tools whatever are required to remove an inner tube. This of course can be done in a minimum of time and with practically no exertion, by pressing in on the deflated tire and removing the split locking ring (Fig. 2), whereupon the clincher ring will come off and the tube can be removed (Fig. 4) or the complete tire be taken off (Fig. 3) if necessary.

The new rim has been tested by the inventor on a heavy touring car throughout the past year, and has been found to work satisfactorily. That it will be a boon to automobilists, to whom the repair of tires by the roadside is one of the greatest drawbacks of the new locomotion, is obvious to all.

THE PROGRESS OF AVIATION SINCE 1891.

(Continued from page 260.)

Hundreds of "gliding experiments" were made without accident in 1896-7, the longest flight being 109 meters with a descent of 10 deg. The equilibrium was so nearly automatic that the aviator never had to move more than 60 millimeters.

In 1900, on the dunes of Kittyhawk, N. C., the brothers Orville and Wilbur Wright began their experiments with a Chanute or two-surface aeroplane, but replaced the long and awkward tail by a horizontal rudder at the bow,* and lay on their faces to lessen air resistance. Two assistants ran with the apparatus against the wind unless the latter exceeded 8 meters per second, when a standing start could be made. The machine rose, recoiled a little, then, answering the helm, set itself parallel to the slope and glided forward. On reaching the bottom of the dune it rose slightly in obedience to the rudder and, its speed being thus checked, alighted like a bird. In 1901-2 the Wrights made hundreds of flights, some of 300 meters. In 1902 they added a vertical rudder at the stern and flew in curves. Finally, in 1903 they succeeded in hovering over one spot by rising with a brisk and variable wind, gliding forward when it lulled and drifting backward and upward with each gust. They hovered for 72 seconds without advancing more than 30 meters.

This result rehabilitates the scattered minority that for forty years has contended that certain birds remain aloft without exertion. It is now certain that this occurs with ascending air currents. Such currents are common in the mountains, and so are soaring birds, but neither is found on the plains. There is a certain analogy between a sailing vessel and an aeroplane. The former tends to approach a definite vertical, the latter a horizontal plane. These skillful experimenters sailed within 6 deg. of the horizontal—going almost as well as vultures—and they hold in their hands prompt and complete realization of flight.

In December, 1903, they began to experiment with a machine of 50 square meters surface and 12 meters breadth, weighing 338 kilogrammes and having astern two screws driven by a 16-horse-power motor. Starting on level ground from an inclined monorail they made four flights, the longest of 59 seconds at a speed of 16 kilometers per hour relatively to the ground. December 17, 1903, marks the date of the first real flight of a manned flying machine and the honor of this memorable achievement belongs to the Wrights.

The French newspapers having spoken of Lillenthal's apparatus as a "parachute," it was not until 1898 that I learned its real nature from an old copy of the *Illustrirte Zeitung*. Convinced that Lillenthal had discovered, if not the art of perfect flight, at least the way to learn to fly, I determined to follow his method. My first model, whose length exceeded its breadth,†

* Birds use their heads as rudders for small and sudden changes, their tails for large ones only.

† Experience proves that a rectangle moving parallel to its shorter side has more sustaining power than a square of the same area, probably because it meets a greater number of fluid filaments. The rear element of the surface seems to have little effect except to increase friction.

was dashed to pieces at the first trial. The second, flown as a kite, proved unstable. No. 3, with 15 square meters surface, 7 meters wide, and weighing 30 kilogrammes, proved unable to sustain my weight. No. 4, of the same weight and area, but 8 meters wide, was launched in 1901 from a scaffold 5 meters high. It landed gently after a flight of 15 meters, which occupied two seconds. Similar results were obtained from further experiments, but the stability was still unsatisfactory.

Then I entered into communication with Mr. Chanute and finally adopted his two surfaces, chiefly because they double the sail area for a given weight and allow the frame to be stiffened like a truss bridge.

My aeroplane No. 5 was of the Chanute-Wright type (weight 50 kilogrammes, width 9.5 meters, length 1.8 meters, sail area 33 square meters). Its first flight, in 1902, was 25 meters, its second 50 meters. Its chief defects, marked lateral deviation and sudden landing due to insufficiency of the rudder, were avoided in 1903 in a slightly smaller machine with two lateral horizontal rudders acting as a keel. This machine, when flown as a kite, exerted a horizontal pull of 20 kilogrammes, whence it was inferred that a screw traction of this amount would keep it afloat.

Then I bought the lightest motor then obtainable, a 6-horse-power Buchet, weighing 39 kilogrammes alone and 90 kilogrammes with its accessories and the twin screws—the last made necessary by the dangerous torque introduced by a single screw. To favor equilibrium by increasing moment of inertia I put all the machinery at the bow and balanced it by the weight of the aviator at the stern. At the rate of 1 horse-power for 50 kilogrammes,* which has been found sufficient for the Chanute type, my motor should drive an aeroplane weighing 300 kilogrammes which, again, should have a sail area of 50 square meters to agree with the ratio of surface to weight observed in large birds. This area was divided into two surfaces 10 meters broad, 25 meters long, and 2.5 meters apart. The total weight of the aeroplane (No. 6), allowing 75 kilogrammes for the aviator, was 230 kilogrammes.

Though this marks a record of lightness it is still too great for the methods of starting previously employed. Every aviator has been confronted by this problem of starting. Lillenthal used an artificial hill 15 meters high, Pilcher a kite cord, Langley a catapult, Eiffel proposes to stretch an inclined wire from the first story of his tower, Goupil suggests a circular railway, Bazin has patented an aerial merry-go-round. Though the last introduces centrifugal force, it permits the safe study of continued flight.

So I constructed a 30-meter cantilever pivoted on a pillar 18 meters high and hung the aeroplane over it by a cable having a counterpoise at the other end. I found the maximum traction of the screws, 20 kilogrammes, insufficient for flotation, but military duties postponed the construction of new screws until 1904.

Prof. Langley is not of the school of Lillenthal. After some remarkable experiments on air resistance he proceeded at once, like Maxim and Ader, to construct a complete aeroplane. In 1896 he made the record for unpiloted models with a flight of three quarters of a mile (1,200 meters).†

In 1903 he built a machine large enough to sustain a man's weight which, with Prof. Manley aboard, was projected by springs from a barge and fell into the Potomac after a flight of 30 meters. According to the *SCIENTIFIC AMERICAN* this failure was caused by starting at a wrong angle owing to a defect in the catapult. But why did not the machine right itself? Either because the rudders were insufficient or because Prof. Manley, untrained by previous experience, did not operate them promptly. Here again we see the genius of Lillenthal in mastering equilibrium before attempting propulsion. But the failure is only temporary. Prof. Langley, aided by the government, will correct defects. Prof. Manley will acquire dexterity, and the aeroplane will fly.

In conclusion, I will mention the machine recently constructed at Chalais-Meudon for M. Archdeacon. It is of the Wright type with planes 7.5 meters broad, 1.44 meters long, and 1.4 meters apart, a total surface of 22 square meters, and a weight of 34 kilogrammes. It has a horizontal rudder in front and a vertical one behind. Experiments made with it on the aerodrome by M. Voisin and myself are herewith illustrated.—Abstract of a paper by Capt. F. Ferber in the *Revue d'Artillerie*.

Several minerals contain thoria. The mineral supposed to be uraninite or pitch-blende proves on complete analysis to be a new mineral, which it is proposed to name thorianite. This mineral is one of the richest known in the rare earth thoria, of which it contains more than 75 per cent, uncombined with silica, and is of very considerable value and commercial importance.

* Wright has increased this to 75 kilogrammes. This is a good sign.
† In the same year MM. Latin and Richet launched, near London, a very remarkable model driven by steam which made a flight of 200 meters.

Correspondence.

Some Weather Observations.

To the Editor of the *SCIENTIFIC AMERICAN*:

The article "Grandfather's Barometer," in issue of March 4 contains much truth.

These signs and omens originated when the people lived in the country; their observations covered great distances and it was almost obligatory on them to watch the weather. Those who live in the city are unable to note these signs and are therefore inclined to ridicule them.

Having left the city for the country many years ago, I have observed closely the weather and have noted the following. No. 1 I have found almost always correct, and were one situated so as to be hourly cognizant of the temperature and the force and direction of the wind over a large territory, as is the Washington weather bureau, I believe it would prove invariably so. It applies in this locality from about October 1 to May 1.

1. Double the hours or days from the clearing of a storm to the next calm period; the result will enable one to foretell very closely the coming of the next storm. The sooner the calm, the sooner the storm.

2. When the sun sets between dark banks of clouds with a yellowish red cast, and appearing (to me) like an evil eye, there will be a heavy southeast storm the following day.

3. The same general appearance when the sun rises, but with a reddish yellow cast, is shortly followed by a heavy easterly storm.

4. Long and narrow clouds in the west late in the day, having the appearance of condensed fog and below dark banks of clouds, is an almost sure sign of storm the following day.

5. When the electric lights of the city, viewed from an elevation in the suburbs, scintillate with a peculiar diamond-like brilliancy, a storm shortly follows.

There are other indefinable signs, whereby, like a sixth sense, one can foretell the approach of a storm or the clearing away of a present storm.

I trust these observations will be of value. L.
Worcester, Mass., March 8, 1905.

Astronomical Anomalies.

To the Editor of the *SCIENTIFIC AMERICAN*:

In the *English Mechanic* of Nov. 4, 1904, under the heading "Astronomical Anomalies," Mr. Fred G. Taylor (letter 345, page 299) presents four queries, with the request that he be helped in his "difficulties"; and as I now have in preparation a book to be entitled "Facts and Fallacies of Astronomy," containing numerous questions for astronomers to answer, and illustrating the errors to be found in various textbooks on the subject, I was much interested in his communication, having given considerable attention to the "contradictions" mentioned by him. Well may we exclaim with the late and lamented Prof. Proctor: "It may well be questioned how far it is just that those who have still so much to learn should undertake to write textbooks of science."

The exact time of the earth's rotation as given in Lockyer's "Elements of Astronomy," to which the above-named writer refers, is of course wrong, and should be 23 hours, 56 minutes, 4.09 seconds. But Lockyer's book, a copy of which I have had in my library for many years, contains other errors equally glaring and surprising, coming as they do from one who is supposed to be an authority on the subject, and in my forthcoming volume I refer to many of his statements which I have corrected and explained. All the queries included by the writer mentioned are important and deserving of attention, but I was particularly interested in query No. 4, in which he says: "Sir Robert Ball, in 'Starland' and elsewhere, says that by locking up a vertical shaft—that of a coal pit for example—the stars may be seen during the day. Maunier, in 'Astronomy Without a Telescope,' chapter 8, treats the statement as an unproved tradition. Again, which is correct? The above are samples of the contradictions frequently met with. If astronomy be an exact science, why in the books mentioned do we find such contradictory statements?"

The belief seems to be widespread, and generally accepted by the public, that the stars may be seen in the daytime from a deep well, shaft, or pit, and it is mentioned as a fact by many popular writers, while others equally well known and eminent treat the belief as a fallacy. In many textbooks and other writings on astronomy the statement is made that stars are visible even at midday from such localities, some going so far as to claim that they may be seen in the tube of any large telescope from which the lenses or mirrors have been removed. As I have never had an opportunity to view the heavens under the conditions mentioned, I am not able to verify the statements from personal observation, and cannot, so far as my own knowledge is concerned, say whether they are true or