

SCIENTIFIC EXPLANATION OF THE CAMOUFLAGE ART

Expert Writes of the Real Reasons for the Weird Things Being Done on Land and Sea in These Days with the Intent to Deceive—Why a Steamship Is Queerly Striped and Why She Is Difficult to Locate When Thus Painted

By AUSTIN C. LESCABOURA
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A PRESENT-DAY high velocity gun of 14-inch bore fires a shell weighing 3,400 pounds a distance of 27½ miles. The shell, which weighs as much as a five-passenger automobile, is capable of penetrating 12 inches of battle ship armor at all ranges; or it will penetrate a wall made up of 40 inches of compound steel armor, 16 inches of wrought iron, 40 feet of oak timbers, 10 feet of granite, 20 feet of concrete, and 12 feet of brick wall, making a total of 27 feet.

What chance has a fort in these days of powerful artillery? To attempt to resist siege artillery is now hopeless, as is attested by the fate of such first-class fortresses as Lodz and Antwerp, which gun-fire converted into shapeless, chaotic masses of broken stone and twisted steel. How can one establish a defense in the face of such formidable weapons of offense?

The one chance that is left is that the shell will not find its mark. And to prevent it from finding its mark is the strategy of all warfare of the present. No longer is a target in the shape of a powerful fortress flaunted before the enemy, for if it were it would not last very long in the face of his guns.

In Nature the soldier finds a striking analogy of the present state of things. There are animals which have not been provided with proper means of defense, and when once discovered are easy prey for those who feed upon them. There are caterpillars and butterflies, for instance, which have absolutely no power to resist the onslaught of the titmouse of birds; lizards which have neither sufficient rapidity of movement nor strength to prevent their becoming an appetizing meal for a larger animal; and giraffes—these ungainly animals which are too docile to even think of fighting.

Yet Nature has provided for all of these. Knowing their inherent weakness, she has provided each with means whereby it becomes more or less concealed from its enemies. Thus caterpillars and butterflies are dressed in variegated hues which tend to confuse the birds which live on them; indeed, in some instances, these insects are formed and colored so as to resemble leaves. Certain lizards have protective color schemes which cause them to blend with the backgrounds of their habitat, and in some instances, particularly in that of the chameleon, the reptile can momentarily change its color to conform with its surroundings. The giraffe is provided with a quaint diamond pattern which blends with the flickering lights among the acacia trees on which it feeds.

Quite logically the soldier took a page from Nature's handbook. If animals are incapable of withstanding the enemy's onslaught sought protection by practicing deception and concealment, why couldn't the same principle be applied to foiling the dominating artillery of battle?

The practice of deception, concealment, making-up or whatever you please to call it, gained rapidly with both sides in the present conflict. It was at about the same time of the battle of the Somme, during the summer of 1916, that the art assumed gigantic proportions and the term "camouflage," borrowed from the French, became a universal expression. The British and French armies, and most likely the German, Austrian and other enemy armies, set aside a certain number of men for the practice of camouflage. Artists, scene painters, carpenters and mechanics were impressed into the camouflage service, and in short order became expert "camoufleurs." Since then wonders have been accomplished in this direction; but, as in the case of so many other phases of this war, must remain a deep secret until the struggle comes to be written in its entirety—and without the censor.

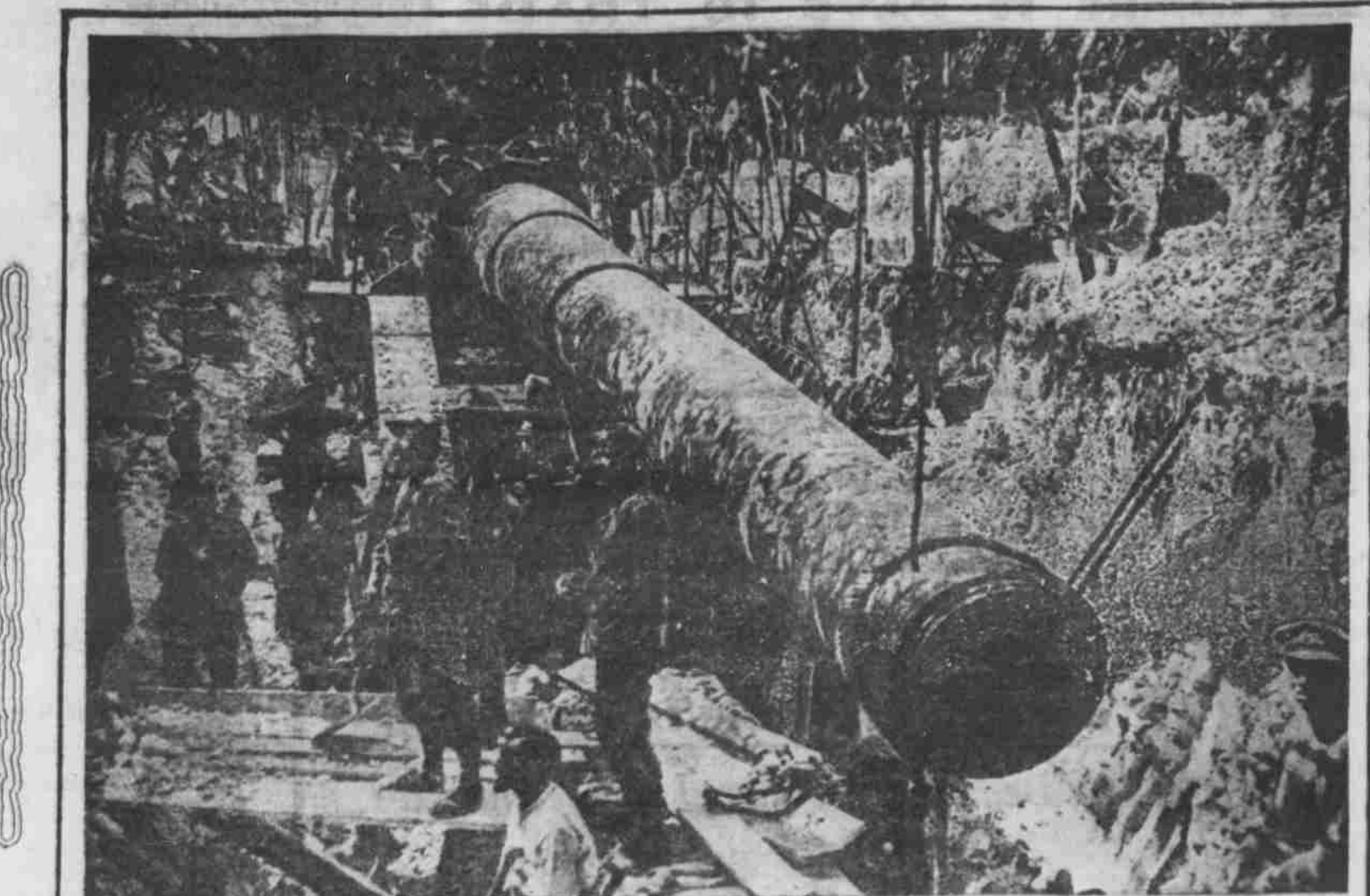
Nothing has been of greater assistance in the all-powerful artillery than the airplane. Greater combination this, to be sure; the steel monster, belching fire and hurling thousands of pounds of steel and high explosive, works hand in hand with the frail wood and iron airplane which goes about its work in the most graceful of manners. Yet, carrying the observer over enemy territory, the airplane enables the aiming of long-range artillery with a remarkable degree of accuracy. By means of wireless telegraph, the aerial observer can signal back to his artillery chief the exact position of the target; and as the shells come over and strike he can signal back whether they are falling too long or too short, and how far to either side, until after a number of rounds the shells register on the target.

It is the eagle-eyed air scout against whom camouflage must be employed. For from his lofty perch, everything is open to him, and he is a visitor at an expedition every detail of a tactical landscape is sharply delineated. The landscape seems to appear in the form of a relief map, with variegated patches indicating different kinds of terrain such as marshes, fields, woods, lakes and hills. Trenches plainly show as dark or light, while roads appear as ribbons of gray or yellow.

But camouflage fools the airplane. Batteries are covered with branches and with trees and shrubs until they blend with the surrounding fields or woods. Ammunition dumps are covered with canvas painted to simulate brown soil or the green of the field. Tents which stand out so plainly with a patchwork design which breaks up the outlines so that they blend with the surrounding landscape. Trenches are provided with light screens as to eliminate sharp shadows, and in some cases are covered over with reeds and foliage. Roads are spanned by reed or canvas screens which prevent the airplane from seeing the tracks of the wheels of a thousand wheels are done to fool the airplane, until he has at last accepted the word of the multitude. "The enemy can tell!"

In order to make trenches less conspicuous particular attention is paid to shadows. What makes aerial observation so effective is the oblique lighting of shadows or sunsets; for then the sun's rays cast long and sharp shadows which accentuate all objects which, with overhead lighting, would hardly be noticed. Oblique lighting makes for high relief, and consequently more effective observation. To this end it is now common practice to make use of screens for eliminating shadows. These screens generally consist of narrow strips of camouflaged cloth supported on wooden stakes in front of the trenches, so that the direct rays of the sun cannot fall on the trenches and thus make for high relief. Instead, only a diffused, shadowless light strikes the earthwork. The camouflaged screen, in turn, is of such color and size as to be unnoticeable.

Buildings may have to be guarded against shadows. What would be excellent camouflage of surfaces is totally ineffective at noon and at sunset, for that camouflage is a surface to attract attention. Generally, unless the camouflaged object is of paramount importance and is receiving undue attention on



The part of the enemy, a happy medium is decided upon and the camouflage is an average one for the entire day. Such eyes as lightning dark sides of buildings and darkening light sides, in order to average up, distribute more or less evenly the light on all sides, is a common feature of camouflage. The use of reeds and foliage to partition the most conspicuous features of battlefields is almost universal. Almost everything can be protected by a layer of well arranged reeds or foliage or, and the majority of guns are protected in this manner. The camouflaged gun is not only hidden from the enemy's eyes, but its location is also hidden from the enemy's ears. The thousands of shells are left in the open, behind the lines, a bomb dropped by an airplane would cause them to blow up in one terrible explosion; but a suitable covering of reeds or foliage or painted canvas prevents the sound from discovering the ammunition dump.

Spotlight camouflage is quite effective in breaking up the outlines of any object. For instance, in the case of large guns mounted on railroad railroads, the usual railroads consist of a single line of rails. Variegated splatters of paint break up the straight line of the gun so that at a distance it looks like a patch of ground, or at least appears as a mere shadow. The same principle is applied to the camouflage of buildings. The spotted form of camouflage is mostly employed where other means are unavailable, and simple as it may seem it is quite effective, according to experts. Furthermore, it is not for the aerial camera, camou-

flage would be a simple matter to so far as the airplane is concerned. But by degrees the airplane has perfected its photographic apparatus to a point where it tells him exactly things which would escape his notice if he depended solely on his eyes.

Aerial cameras now make perfect photographic of the ground below them even when flying at altitudes of 10,000 feet and more. The photographs, when developed and printed, are carefully studied by "camoufleurs" looking for weaknesses, and there is very little that escapes the eagle eye of these highly trained specialists. A little while ago would have been considered through the hands of the average man is considered by the "camoufleur" as a mere child's play. A single shadow in front of a house of French indicates a number of guns for a camouflaged position, and there is very little that escapes the eagle eye of these highly trained specialists. A little while ago would have been considered through the hands of the average man is considered by the "camoufleur" as a mere child's play. A single shadow in front of a house of French indicates a number of guns for a camouflaged position, and there is very little that escapes the eagle eye of these highly trained specialists.

Now camouflaging is, of rather less, and is not so simple as it once was. The camouflaged gun is not only hidden from the enemy's eyes, but its location is also hidden from the enemy's ears. The thousands of shells are left in the open, behind the lines, a bomb dropped by an airplane would cause them to blow up in one terrible explosion; but a suitable covering of reeds or foliage or painted canvas prevents the sound from discovering the ammunition dump.

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It is the only one for whom camouflage is intended. The enemy on the ground, and in observation balloons must also be deceived, and this is done by the use of camouflage. The camouflaged gun is not only hidden from the enemy's eyes, but its location is also hidden from the enemy's ears. The thousands of shells are left in the open, behind the lines, a bomb dropped by an airplane would cause them to blow up in one terrible explosion; but a suitable covering of reeds or foliage or painted canvas prevents the sound from discovering the ammunition dump.

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machine gun points somewhere in the distance.

It has therefore come to pass that an army will only attack after all the machine guns in front of it have been accounted for. If a single machine gun is known to be in working order, every cannon within range is turned in its direction in order to destroy it. It is a commander today does not hesitate to turn his twelve-inch guns on a solitary machine gun post in order to blast it from the face of the earth.

So the machine gun, which forms the backbone of any defense, must be protected, and since steel and concrete are of little avail, the only protection lies in camouflage. Some of the cleverest camouflages are to be found in the concealment of machine guns.

Camouflage has a two-fold function: first, and as already discussed, to protect certain military works through concealment; second, to fool the enemy and draw his fire to false targets. In the latter case the enemy is made to waste his ammunition and at the same time the real targets are left untouched.

The most spectacular feats of camouflage have been those in the false target line. Every army, at some time or another, has had false trenches and has constructed with fire batteries of false guns so as to draw enemy fire. At a height of 5,000 or more feet the air scout can be readily deceived; a barrel, a pair of discarded wagon wheels, a few pieces of wood and a few charges of black powder will make the most realistic howitzer, and a trench two feet in depth, manned with dum-dums, will convince the airmen above that an attack is forming. Thousands of shells are rained on such targets by enemy guns—thousands of wasted rounds—while the real targets are untouched. It would be very interesting to know just how much ammunition has been wasted in this manner since the beginning of the war, but that is another fact which must forever remain behind the self-pride of all belligerents. At any rate, the aerial camera and the "picture reader" are making this form of camouflage increasingly difficult.

Camouflage is not a land war art exclusively; it has its application to marine warfare. As in the case of military camouflage, the naval branch has two broad objects: first, to decrease visibility; second, to confuse or fool the enemy.

By way of decreasing the visibility of vessels numerous schemes have been tried, but as yet the art is in its infancy. Indeed, in American ports there are to be seen large numbers of transatlantic steamships no two of which have the same kind of camouflage. One system intended to lower the visibility contemplates the use of the primary colors in varied proportions, areas and shapes of areas. This arrangement makes for a gray at a distance; a gray, it is said, that is far more effective than the flat gray formerly employed on battleships. Another system contemplates the reduction or elimination of lights and shadows so that the lightest parts of the ship are lightened and the darkest parts are darkened, so as to produce a better blend with the sky and water. Still another system calls for a wave like painting of green, blue and white, so that the outlines of the hull will be lost in those of the surrounding water.

All of these systems have been tried, and since they continue to be employed it is safe to say they all have merit. But since, through the use of proper color screens or ray filters, the U-boat observers might be upon a plan that would make the camouflaged ship stand out more prominently than if they were not so decorated, playing right into their hands, as it were, it is advisable that any specific details given out at this time are only apt to furnish the desired information to the ingenious Hun and in this way increase the toll which he is exacting.

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The submarine freighter idea has repeatedly come up in considering ways and means of combating the U-boat, and beyond doubt, despite some mechanical obstacles, this type of transport would prove most efficacious. In truth, the British are employing submerged barges which are towed by small ocean-going tugs, with excellent results, and after all, there are nothing more than the submarine freighter idea.

Fooling the U-boat commander is accomplished by all manner of weird devices. One scheme is to confuse the U-boat's range finder by aerials and curves in the main and funnel. It would seem that the U-boat ship of present would one without masts and funnels, and making use of anathematic coal and forced draught while in danger of being sunk a vessel would be invisible to the lurking U-boat even a few miles away, and it is quite conceivable that the U-boat would have to come across the inconceivable steaming more or less through accident.

Then there is the matter of determining a vessel's speed. In order to aim a torpedo the U-boat commander must know the approximate speed of his victim and its direction of travel, so that he can aim his torpedo some distance ahead and cause it to arrive at a predetermined point at the same time as the target. False bow waves give the slow moving freighter the appearance of a fast moving vessel.

Captain Fritz of the U-38, through the "eyes" of his slippery craft, estimates the speed of a vessel by the distance it travels in a given time. The U-boat commander is fooled by the false bow waves, and the U-boat is fooled by the false bow waves.

Marine camouflage depends entirely on keeping the U-boat beneath the waves. Just as long as the allied submarine chasers and torpedo boat destroyers remain on the sea in large numbers and as long as the merchant ships are armed the U-boat must needs seek the shelter of the waves and shoot at its intended victim by the aid of its periscope. And it is far easier to fool the periscope than it is the human eye at the present stage of the campaign.

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"Yanks" Teeth a Surprise

One thing about the American soldiers and sailors most strikes English people when they see these gallant fighters, and that is the swiftness and general whiteness of their teeth, writes C. Douglas Klossack in the London Daily Mail.

It is all the more striking in that it is such a contrast to the teeth of the British soldier. The "Yank" was at one time laughed at for his hygienic theories, but most of us now realize that there is a great deal in them.

From childhood the "Yank" is taught to take care of his teeth. He has "tooth drill" three times a day and visits the dentist at fixed periods, say every three or four months. If by chance a tooth does decay, the rot is at once arrested by gold or platinum filling. American dentists rarely extract a tooth. No matter how badly decayed it may be, they save the molar by "crowning" it with gold. The result of all this is that our United States troops, leading added to their appearance, gain in health by having good, clean teeth, and when the war came very few men were turned down by the American military authorities for having decayed teeth. So daily we see them, their faces tanned, smilingly exhibiting perfect sets of teeth. It is a distinctive mark of the American—no distinctive as his uniform or his slang.