THE SUB-TARGET GUN MACHINE.

A most interesting exhibit at the recent meeting of the National Rifle Association, at Sea Girt, N. J., was the sub-target gun machine, an illustration of which appears herewith.

This machine is designed, primarily, to instruct recruits in the art of rifle shooting, although, as a matter of fact, it is in daily use by expert riflemen, who find it of great advantage in keeping in practice without the necessity of frequent visits to outdoor ranges. No ammunition is required, and the machine may be operated in the armory or at home.

By reference to the illustration, it will be noted that the apparatus consists of a sub-base or stand; a carriage base adjustable by locked vertical and horizontal screws; a ground-steel carriage rod, having at the target end a steel scoring-needle accurately spring-balanced on ground-steel ball-joints; a sub-target holder, which is released electro-magnetically by the trigger when the gun is fired, driving the sub-target against the scoring-needle, thus giving an absolute record of the aim or hold of the gun; a gun-holder proper, so designed and constructed that it is absolutely impossible to secure a point of rest with which to steady the gun when aiming, the complete holder so counterbalanced that only the weight of the firearm is supported by the marksman. The entire apparatus is scientifically correct and absolutely accurate. The machine may be quickly changed from the standing to either kneeling or prone position, as may be desired by the marksman.

These machines are in daily use at United States army posts and in State guard armories, where they are proving invaluable in the training of recruits and, incidentally, the affording of otherwise unobtainable practice for qualified marksmen, and have already raised the standard of marksmanship in the United States and other countries, wherever used.

In one instance thirty men who had never had any rifle practice, were selected and divided into three teams of ten men each. The first team was put on an outdoor range with service rifles and ammunition; the second on a miniature range with miniature ammunition, and the third in the armory with the sub-target gun machine. After several weeks' practice, as above, the three teams were pitted against each other on an outdoor range, and the sub-target gun team, the members of which had had no practice with loaded rifles, defeated both the other teams. This was a natural consequence, because with this machine the recruit becomes thoroughly familiar with the holding, sighting, and firing of the rifle before he can acquire the gun-shyness usually accompanying the use of loaded firearms by beginners.

Referring to the use of the sub-target gun machine, the inspector of small arms practice of the 71st Regiment, N. G., N. Y., writes: "By personal observation and instruction, I practised and qualified nearly 650 men. The result of that indoor practice demonstrated itself when the regiment was ordered down to Creedmoor for actual work. We qualified as marksmen 538 men out of a total of 539 turnout. The elimination of ammunition for this past winter has been a saving of several hundred dollars, which was principally brought about through the use of the sub-target gun machine."

At the International Rifle Meeting recently held at Bisley, England, the machine attracted great attention and was daily used by members of the American team, which won and brought back to the United States the Palma trophy.

At this time, when every military power finds itself with very powerful rifles, but with a very small percentage of men who can effectually use them, the advent of these machines is very timely, as by their use any number of men may be rapidly qualified as marksmen.

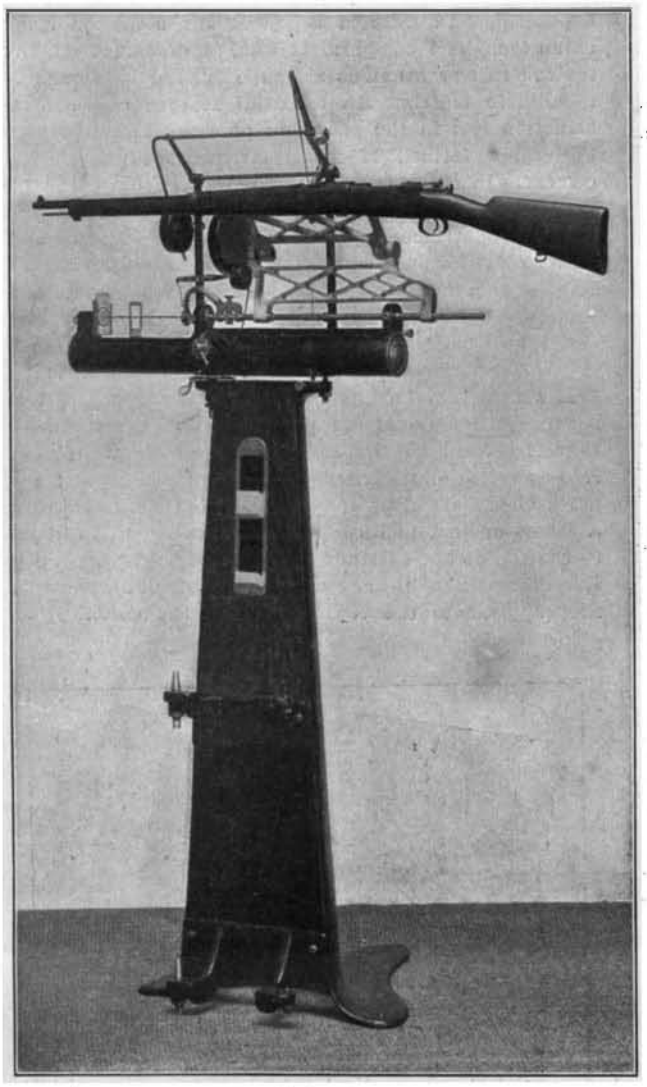
Becquerel Rays and Water.

In a paper recently read before the German Physical Society Mr. F. Kohlrausch resumes some interesting observations relative to the influence exerted by Becquerel rays on water. Having passed the rays given off from a mixture of radium and barium bromides through an aluminium plate 0.1 mm. in thickness, and a layer of water of about 18 mm., the author failed to note any immediate effects of the radiation. Under the influence, however, of a prolonged radiation, Mr. Kohlrausch noticed a considerable acceleration in the increase of the electrical conductivity.

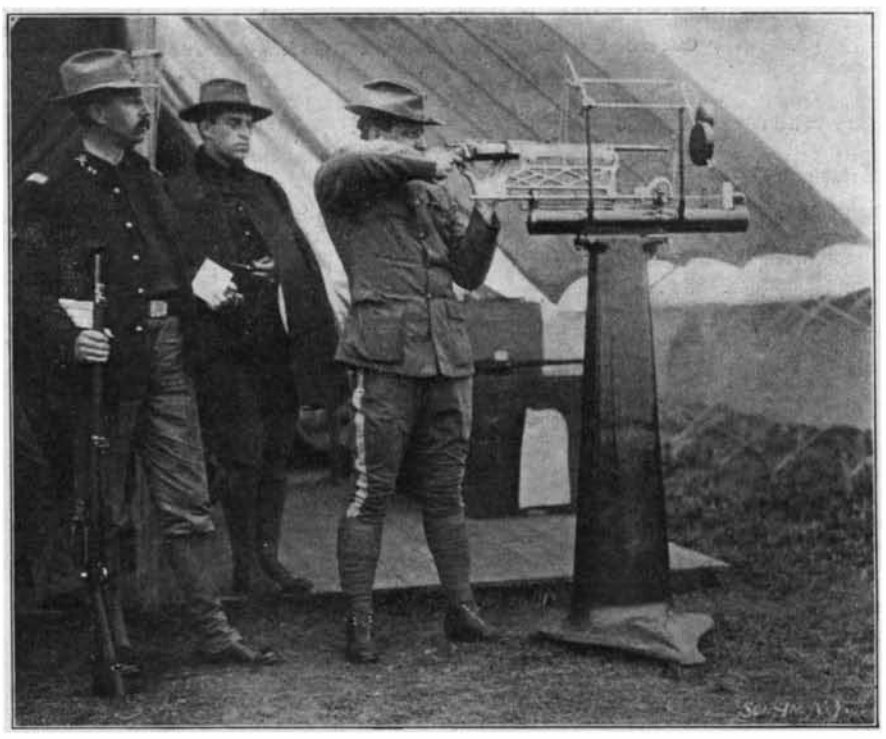
As regards the interpretation of the above phenomenon, the author is not able to decide between two hypotheses, viz., that of a direct development of ions in the water, and that of an accelerated disaggregation of the walls of the glass tube. As to a third equally admissible hypothesis, i. e., that the surrounding air should have absorbed some substance, such as, for instance, bromine, introduced besides the stopper, the author does not think it to be true, as a special experiment made with a view to confirm it has given negative results. With this experiment an air current having passed through the radio-active substance was led through water provided with electrodes.

The Bactericidal Effect of the Arc Light.

The bactericidal effects of the arc light are much superior to those of sunlight, says M. K. Walsham, in Röntgen Ray Archives; the very rapid ultraviolet is absorbed by the atmosphere. A rapid oscillation high-tension arc, particularly between iron points, gives off an abundance of ultraviolet rays of extremely small wave length, with a fair proportion of lower refrangibility; to these ultraviolet rays quartz is transparent, transmitting 60 per cent through 4.4 millimeters, gelatine is quite opaque, ice is as transparent as air, and a film of iron oxide quite opaque. For use, as blood is opaque to the rays, they are passed through ice made to press upon the region affected, so as to make it anæmic.



THE SUB-TARGET GUN MACHINE.



TARGET PRACTICE WITHOUT AMMUNITION.

Abraham Lincoln's genius as an inventor will be exploited at the World's Fair. His famous device for lifting steamboats off the shoals will be shown in the transportation department.

THE TRANSPORTATION OF LUMBER.

BY WALDON FAWCETT.

Few industries can compare with lumbering operations in the variety of the methods of transportation employed to convey the product to market. From the time the woodland monarch is felled in the heart of the forest until the material has passed from the sawmill into one of the various avenues of utilization open to it, the problem of speedy and economical transportation is well-nigh a foremost consideration, and is accomplished by means of a variety of facilities, prominent among which are steam railroads, natural and artificial waterways, and ice-paved highways. The transportation phase of the industry may almost be said to be in a state of transition. The latest approved practice can scarcely be designated as the perfect practice, inasmuch as improvements are being made constantly.

Nowhere, however, has recent progress been more remarkable than in the methods attending the first stages of lumbering. Logging by steam is now an accomplished fact. The first steam log-skidding system was devised in 1886, and was introduced in the pine forests of Michigan. By gradual and almost continuous improvement there has been evolved from this nucleus the steam skidder of the present day. This consists of a main cable suspended from two trees about 750 feet apart, upon which the skidding engine travels, and also a short cable used for loading the logs, which is attached to a third tree. The carriage supports a hoisting rope, to the end of which are attached one or more pair of tongs for grappling the logs. In operation the tongs are fixed to the ends of one or more logs, which are hoisted well into the air, and then the hoisting rope is drawn in, the logs being thereby dragged or skidded to the end of the cableway and deposited ready for loading.

A loading cable spans the railroad track, the block being located directly over the track, and carries the loading line, to the end of which is fastened a pair of tongs. When the tongs have been attached to a log, it is dragged from under the main cable up to the car, and then hoisted clear and landed on the car. The two operations of skidding and loading are carried on at the same time. In localities where, as in the swampy districts of the South, logs find their outlet to market through canals in which they are towed by tugboats, a steam skidder is often installed on a scow, where are located the engine, boiler, mast, and rigging. Skidders of this type handle logs six feet in diameter and weighing six tons each.

In the cypress swamps of Louisiana there are employed what are known as pull-boats, an evolution from the plan of placing a hoisting engine upon a scow and snaking the logs out of the swamp. By this plan the logs, which are drawn in at the rate of 600 feet a minute, are capped with steel cones, which prevent them from imbedding in the soft ground or catching against obstructions. The endless-rope pull-boat engines have 44-inch winding drums, and each weighs 33,000 pounds. Another up-to-date apparatus is the log gatherer, which is similar in construction and operation to the steam skidder previously described, but which is designed for lighter work than the skidder, being especially applicable to conditions in the low flat pine regions upon the Atlantic coast.

On the Pacific coast log-hauling engines with cylinders 10 by 12 inches and drums capable of holding 3,000 feet of wire rope are in use and in mountainous districts there are utilized what are known as mountain loggers. The logging railroad is run up the valley or cove between the ridges, and the logs are gathered by means of conveying cableways, and, clearing the rocks and creek in the bottom of the gorge, are deposited along the railroad, where they can be loaded upon cars by a steam loader, or even by the same engine which has moved them to the loading point. This system is in extensive use in the pine regions of Maine and the hemlock regions of Pennsylvania as well as on the Pacific slope. In the northern lumber districts, embracing all sections of the country from the Adirondacks to the extreme Northwest, where logs must be taken out during protracted periods of cold weather *via* ordinary highways, remarkable achievements have been made in the operation of ice logging-roads. Such a road is laid out and graded in the autumn, and upon the advent of cold weather is flooded by any one of a variety of methods. In many localities the water is hauled in eighty-barrel tanks mounted on sleds, and with an arrangement of pipes which directs the flow over the roadway as the sled progresses. During the season of activity many teams must be kept busy hauling water night and day, in order to keep the roads in condition. A rut-cutting