

TESTS OF MAGAZINE SMALL ARMS.

During the past three weeks a board of army officers, composed of Lieutenant-Colonel Robert H. Hall, 6th Infantry, president; Major George W. McKee, Ordnance Department; Major Henry B. Freeman, 16th Infantry; Captain Stanhope E. Blunt, Ordnance Department, recorder; and Captain George S. Anderson, 6th Cavalry, have been in daily session at Governor's Island, in this harbor, testing a number of magazine guns.

The Board was constituted last winter, and is required to recommend to the War Department of the army a suitable breech action and magazine system for rifles and carbines. Before ordering the Board, the department had decided upon the caliber of the proposed rifle, fixing it at 0.30 inch, instead of 0.45 inch, the old standard. It had also settled upon the length of barrel, the twist of the rifling, the number and form of the grooves, and the dimensions of the chamber, corresponding, of course, to the cartridge which had been adopted, leaving for the determination of the board only the selection of the best magazine and breech system adapted to the selected barrel and cartridge. This cartridge, which is illustrated in the accompanying engraving, has a bottle-necked shell, and, when loaded, is 3.09 inches long. The bullet is 0.309 inch in greatest diameter, about the same as an ordinary lead pencil, and has three grooves or cannulures for the lubricant; this method of carrying the lubricant, usual in the 0.45 or larger calibers, was abandoned by all foreign services in their new small caliber guns, but has been retained in our experimental army cartridge, and with very successful results.

The new bullet is a compound one, hardened lead incased in a jacket of copper. The substitution of this for the old lead bullet is rendered necessary by the vastly increased velocity now given to the ball and the rapid twist, one turn in nine and one-half inches of the rifling. A lead bullet would be driven through the bore, stripping without taking the grooves; the jacketed bullet takes them steadily. Foreign countries have selected for jackets not only copper, but nickel, German silver, and soft steel, which will be finally adopted in this country cannot now be answered. The copper jackets fulfill all the requirements desired for these present tests, but may not, ultimately, be deemed best for war. The bullet weighs 230 grains. The charge is 36 grains of smokeless powder, which gives nearly 2,000 feet muzzle velocity, a flat trajectory, vastly increased dangerous space, or interval covered completely by the bullet in its path through the air, and an extreme range of about 4,000 yards.

The object of the use of smokeless powder has been frequently misunderstood. The absence of smoke, the characteristic appealing most forcibly to the observer, has been popularly supposed to be the end for which military men were striving, while in fact it is only a consequence, not at first contemplated, resulting from their efforts in other directions. Briefly, these may be summarized as primarily a desire to give the soldier a lighter cartridge. Hence first came a reduction from the 11 mm. (0.433 inch) so general abroad to 8 mm. (0.315 inch) or even to 0.295 inch for the caliber, thereby giving the soldier 175 rounds of ammunition with no greater burden than 100 rounds of the 0.45 caliber service Springfield.

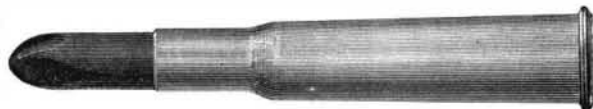
When gunpowder was used in these small bores, it was discovered that the fouling soon became excessive, impairing the accuracy of fire to an impermissible extent. The nitrate powders were then resorted to, where the products of combustion are entirely or mainly gaseous, the solid or unconsumed residue being very small. These overcame the objectionable fouling, gave a much superior velocity, and are almost without smoke, only a slight puff being noticeable, and that dissipates almost immediately. They give, however, a formidable chamber pressure which requires an increased strength, not only in the barrel, but in the breech action of any gun using them.

The smokeless powder used by the Magazine Gun Board comes from Wetteren, Belgium, and the cartridges are loaded at Frankford Arsenal, Philadelphia; the powder is sufficiently near the desired standard to suffice for the tests of the Board, but its use now cannot be considered as a definite adoption into our service.

The Board first met last December and adopted the rules to govern their tests, under which they have since operated. These tests are applied in the endeavor to discover the relative performance of the breech action and magazine system of various guns, under such conditions as might arise in service in the vastly diversified circumstances throughout our great extent of country, and under both slow, rapid, and also prolonged firing. No trials of the accuracy of

the guns are made, as accuracy is mainly influenced by the barrel and the cartridge, elements already decided upon, and not within the province of the Board for discussion or experiment.

Guns are brought before the Board by the inventor or his representative and their action exhibited by him, after a safety test of ten rounds fired by the exhibitor. The gun is then turned over to the Board, and they only conduct the further trials. The first of the regular tests is that for rapidity with accuracy, exemplified by our sketch made of the work as it was in progress. The range is but 100 feet, the condition of accuracy being only so far introduced as to require the operator to bring the piece to the shoulder after loading. The test is in three parts, first using 20 cartridges;

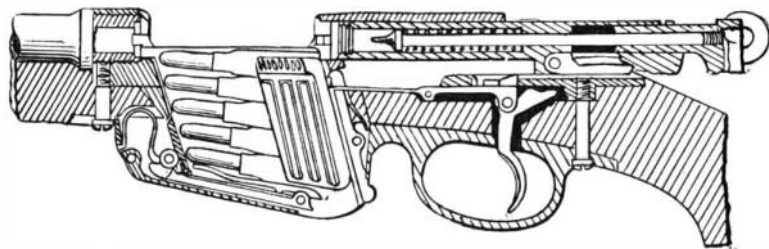


THE NEW AMERICAN CARTRIDGE (ACTUAL SIZE).

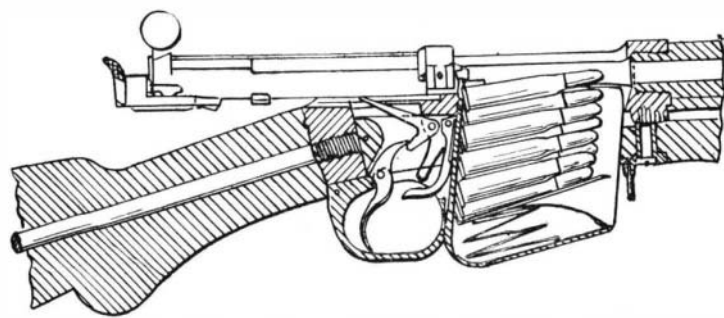
the magazine having been filled with the cartridges it will hold, the balance of the 20 are fired from the gun as a single loader, then the magazine brought into action and its cartridges fired; both the time and the number of hits are entered on the record. The second part of the test is the rapidity of fire for two minutes as a single loader; the third part, the rapidity of fire, that is the number of shots for two minutes as a magazine arm only.

The second test is for rapidity at will; it is similar to the preceding, except that the piece is fired from the hip without aim at a stop butt at short range. These rapidity tests are, of course, somewhat influenced by the dexterity of the individual manipulating the piece. For this purpose the Board makes use of the often tried services of Mr. R. T. Hare, of the National Armory, Springfield, and of its recorder, also stationed at the armory, and who is well known throughout the army and militia as the author of the manual on rifle practice governing in the army and in the National Guard of many States as well. Men more expert than these two in the handling and use of small arms it would be difficult to find.

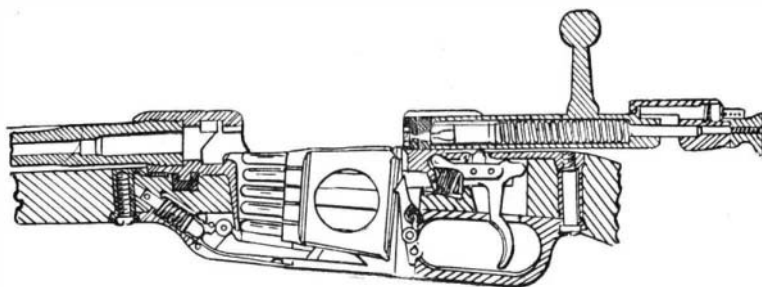
Following the rapidity tests come those for endurance—500 rounds without cleaning as a magazine gun and 100 as a single loader, keeping the magazine loaded during the latter firing and examining at its conclusion



THE AUSTRIAN (MANNLICHER) MAGAZINE RIFLE.



THE NEW ENGLISH MAGAZINE RIFLE.



THE GERMAN MAGAZINE RIFLE—MODEL OF 1888.

the effect upon the cartridges thus held in reserve. In the endurance test, to relieve the manipulator of the gun, it is fired from a fixed rest in which it is securely held, but the breech action is operated by the firer and the comparative ease of movement noted. Every fifty shots the piece is removed from the rest and the barrel cooled by running a stream of water through the bore, care being exercised not to get any water upon the bolt or into the magazine.

Then comes the dust test. This is intended to subject the piece to the same dusting it would receive if

carried by the soldier in a march across the alkali deserts of Arizona or Utah or the sage brush prairies of Montana or Wyoming. Members of the Board told our correspondent they had frequently been compelled to tramp for hours through such clouds of dust that the heads of the leaders of a six-mule team could be but vaguely seen from the wagons, and that the dust was so fine and penetrating that the soldiers' guns and every garment soon became coated with it. The artificial production of a similar experience for an arm that might be adopted for military service in our country is manifestly a very pertinent trial, and one necessary for the formation of a trustworthy judgment of the arm. This is accomplished by placing the rifle on a shelf of the closed box shown in our engraving, so that the breech mechanism, which is closed, shall be opposite the mouth of the bellows; fine sand is then permitted to fall slowly across the blast of air, which thereby, in two minutes, the time of the test, drives the sand into any open joints, or into the depth of the mechanism if it is much exposed.

The gun is then removed and wiped carefully with the bare hand only, also blown into and cleaned just as a soldier, who suddenly goes into action, would do with a gun he had carried on a dusty march. The piece is then fired 20 shots. This test is then repeated, the magazine being charged before exposing the gun to the dust; the cartridges and the gun are then wiped as before and the gun again fired 20 rounds. The dust test, while certainly a fair one, is a severe trial to many guns. Any little pockets hold the dust and prevent smooth action of the mechanism, even in some cases that have come before the Board so completely clogging the action as to temporarily disable the gun and make necessary its entire dismounting at leisure.

The next test is that for defective cartridges. This is devised to exhibit the effect on the breech and magazine system of the blowing off of a cartridge head, an accident which, while not frequent, is by no means unknown. The cartridge head is first given two cross cuts on the head to nearly the thickness of the metal and the cartridge so placed in the chamber that the cuts shall fall near or under the extractor. One engraving shows this test in prosecution, the gun being on the fixed rest and fired by a lanyard—a wise precaution, as the bolt is sometimes violently opened, or parts broken. A second defective cartridge is also fired which has been cut at intervals around the rim. The effect is very similar to that of the first.

Rifles that pass successfully through these trials are subjected to the supplementary tests, the first a combination of the dust and defective cartridge trials and the second the rust test. The first page engraving shows the latter, the operator being in the act of placing the gun, which has first been carefully and thoroughly cleaned of all oil or fouling with a bath of sal-ammoniac. It is then removed, left for two days in a warm dry atmosphere, when the condition of the mechanism is examined and the gun fired twenty shots. This test is intended to produce artificially the condition to which a gun might be brought that had been inadvertently left outside the soldiers' tent during an all-night rain.

Other tests are also applied, especially to guns with tubular magazines, and to any other guns whenever the Board deems it necessary to aid in forming their judgment.

Shortly after it was convened the Board instituted steps to procure from abroad samples of the magazine guns which had recently been adopted in foreign armies. These have been presented to our government, and the new weapons of England, Denmark, Germany, Austria, Belgium, and Portugal have already been thoroughly tested by the Board, while those of Switzerland, Japan, Russia, and Italy will soon be subjected to trial. France was unwilling to have her gun subjected to trial.

As yet but few guns of our own inventors have been brought forward, though from the extensive correspondence of the Board, some are anticipated at an early day. The radical reduction of bore, the use of a long and slender cartridge and the increased strength of breech action necessitated by the employment of smokeless powder have all operated to so complicate the problem as

to require more time than first imagined for its solution. The Board, acting under instructions of the War Department, have assured all inventors that they will be granted ample time and their work carefully examined, even if its production is delayed. The Ordnance Department, too, sells inventors caliber 30 barrels for guns and smokeless powder caliber 30 cartridges for their preliminary trials, or if they prefer it caliber 30 bullets and primed shells. A number have availed themselves of these opportunities, and presumably will, at a later date, bring forward guns for trial.

Of those foreign guns already tested by the Board, cuts are herewith shown of the Lee-Speed of England, the infantry rifle of Germany and the Mannlicher of Austria. The first of these, the Lee-Speed, is a modification of the Lee of this country. It was sent to our government with a supply of cartridges for its use. The caliber of the gun is 0.303 inch; the bullet is of lead, nickel jacketed, and weighs 216 grains. It is thus of slightly greater diameter but of less length and weight than the new American bullet. The powder charge is intended to be Maxim's smokeless cordite, from which a velocity of 2,250 feet is anticipated. The drawing shows the magazine—which when full holds eight cartridges—partly emptied and a cartridge ready to be pushed by the bolt into the chamber. The magazine is of sheet metal and is of the semi-detachable type, being secured to the lower band by a chain. It can only be charged with single cartridges, an operation which requires some time, but holding the large number of eight, permits of a very rapid fire for that number of shots. In modifying the Lee the English introduced many little refinements which promised well on paper, but, which use in the field in the soldier's hands has not justified. A second sample, returning, it is understood, more nearly to the simplicity of the Lee itself, is now being prepared by the English authorities. In this country the Lees themselves are, it is believed, adapting two of their guns to the American 30 caliber cartridge, and these guns will soon come before the Board, which is anxious to study and try them.

The German infantry rifle, termed model of 1888, is of 0.311 caliber and has a fixed magazine. The cartridges are carried by the soldier in light metal chargers, which are introduced bodily into the magazine and form an essential feature of its mechanism. Each holds five cartridges, and after they are fired falls to the ground through a cut in the magazine box, permitting the introduction of a second charger with its lot of five cartridges. Unlike the Lee, which can be used either as a single loader or magazine gun, or as the former with eight cartridges in the magazine in reserve, the German weapon, having no cut-off, is a magazine arm pure and simple, being only intended for that class of fire. Fortunately the magazine can be quickly recharged, yet the soldier cannot tell when he will be compelled to perform that operation, nor whether he has five cartridges or only one immediately on hand for rapid fire.*

Both the Lee-Speed and the German weapons are bolt guns, the bolt having a forward and back motion, and also one of rotation by which it is locked in position, but the new Austrian arm, the Mannlicher, † possesses the peculiarity of direct action only, a falling block locking the gun when the bolt is pushed forward. This feature, which eliminates one motion of the loading, also permits fire for the contents of the magazine to be maintained directly from the shoulder without lowering the piece during the operation of loading. A very rapid fire for these cartridges therefore results.

The inventors of the Krag-Jorgensen gun, adopted by Denmark, are preparing an arm of 0.30 caliber arranged for the American cartridge. As the results of the trial of the Denmark gun itself at Springfield last spring were quite encouraging, much is anticipated in this expected weapon. Several other guns are also in course of elaboration abroad, which will soon come before the Board. But the Board looks mainly to the well known ingenuity of American inventors, and hopes before winter to be testing the product of their labors, and to discover thereby a weapon superior to those of all foreign armies. Both the Board and the Ordnance Department of the army express the greatest desire to aid as far as practicable native talent, and inventors can freely turn to the Board for suggestions or information concerning the pending work and the prospects for a successful termination of their joint labors.

Trials of guns on hand were completed last week, and the Board has adjourned to meet at the Army Building in this city, on September 15, when tests will be resumed. In the interval, any correspondence should be addressed to the Recorder, at the National Armory, Springfield, Mass.

Superstition.

Superstition, like prejudice, is impervious to logic, and no argument addressed to the reason has any effect upon its power or prevalence. Why is thirteen an unlucky number? What possible connection has the assemblage of thirteen persons at dinner with the death of any one of them during the ensuing year? If fourteen dined together, there is certainly a greater chance that one of them would pass away within the twelvemonth than if one less sat at the table, and yet this is not the common estimate. There is not a house-keeper in this city who would seat thirteen at her table without a feeling of regret, and the great majority

* This gun is fully described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 783, January 3, 1891.

† This gun is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 798, April 18, 1891. The English, French and German rifles were illustrated in SCIENTIFIC AMERICAN, November 22, 1890.

would not entertain a company composed of that number for any consideration whatever.

We recall an instance where a family given to a liberal hospitality had a dining table which seated six on either side and one at each end. Once every week a dinner was given to which twelve guests were invited, the host and hostess occupying the other seats. If one of the persons invited sent a regret a substitute was sought for and secured if possible. But failing in this, a young woman, a poor relative with pleasant manners, living in the family, took the vacant chair, and was supported in the house for no other purpose than to meet this possible need. There have been "Thirteen Clubs" organized to relieve the number of its reputation, but they have utterly failed of their object. We cannot find that those who thus braved the common superstition were cut short in their days on this account. But people cannot insure themselves against the fatal blow, even by a display of unusual courage, and the ranks of the thirteen were broken sooner or later by the assault which none can successfully resist.

There are scores of superstitions connected with the moon and its phases. The effect of the "changes" on the weather is a matter of almost universal belief, although the most renowned of our scientists have agreed with Dr. Ick and the celebrated Dr. Lardner that "there is not the slightest observable dependence between them." There is probably not a person in the country who would not, if he had his choice, prefer to catch the first glimpse of the new satellite over his right shoulder, while large numbers are rendered quite miserable if they happen to see the narrow crescent on its first appearance over their sinister side. The prevalent impression that Friday is an unlucky day regulates in many respects the business of the world. Those who are ready to assert that they have no feeling whatever on the subject are very careful in solicitation of patronage for any new enterprise, or in choosing the date for an entertainment or a marriage, not to run counter to this popular fallacy.

Some years ago an English shipowner, finding that none of his vessels could get off to sea on Friday, owing to the feeling among the sailors, determined to cure the madness if he could. He therefore laid the keel of a vessel on Friday, made every contract concerning the construction on Friday, and launched the craft on the unlucky day. He christened the ship with this name, and found an old sea captain called Friday whom he made master for her first voyage. She was loaded for an East India port, and after great difficulty in securing a crew she sailed on a given Friday for her destination. She was never spoken or heard from after the pilot left her. The presumption is that when she encountered her first storm, the sailors, who are proverbially superstitious, became apprehensive and took to the boats, leaving the ill-fated craft to founder in midocean and to perish themselves in like manner. It is singular how one such incident will deepen a prejudice already existing and establish in the minds of many, who are otherwise sensible, a connection between two events that can have no possible relation to each other.

Two years ago, it is said, a woman afflicted with catarrh visited the Manhattan Eye and Ear Hospital, to be treated for her illness. Dr. Johnson, who at that time had charge of Cabinet D, treated the case, and two days afterward he suddenly died. The patient was relieved by the treatment, but six months from the first date, on a return of the malady, she again sought the institution. Dr. Pond, then in charge, attended her, and in two days after he died of heart failure, as the record states. A week or so ago she again applied for treatment, and Dr. David Phillips prescribed for her. He dined the same day with a friend, went home not feeling very well, and was found dead in his bed the next day. Whereupon the story is published far and wide, and the poor woman is set down as "The Fatal Patient," whom it is dangerous for any physician to treat. Any yet no person of ordinary intelligence would see anything very remarkable in the coincidence described.

The original "weather prophet" (Mr. E. Merriam) used to print his "cycles" and "heated terms" and "perturbations the sure sign of earthquakes" in this journal during the administration of Gerard Hallock, nearly fifty years ago, and the present editor-in-chief, too young then to be very patient with people of such vast pretensions, was disposed to make fun of the predictions. One day, to establish the truth of his prognostications, the "Brooklyn Sage," as he was often called, produced a book in which he had recorded as in a diary his presages of the weather, including predictions of storms, earthquakes, and special atmospheric disturbances. Mr. Hallock had kept in a drawer the clippings descriptive of all such phenomena, and he was challenged to produce them, and see if they had not been foretold and the account anticipated in this daily record. There were no telegraphs and ocean cables to give instant notice of such occurrences, and if the writer in Brooklyn put down under date of March 4, "perturbation—probable earthquake in South America," or "signs of a hurricane in the China

seas," and the slow mail a month or two later brought an account of such upheavals or disaster, the skill of the observer was firmly established. Sure enough, the volume stood the test in a most remarkable manner. Out of twenty-three actual "shakes" in some part of the world, twenty were predicted in the book at the corresponding date. Out of seventeen fierce storms, notable for the damage they had caused on land or sea, fifteen had been predicted. The old man closed his book with an air of triumph, and the veteran editor uttered his mild rebuke of our incredulity.

We remembered the saying of an old scientist who ridiculed the faith in dreams, and was asked if none of his ever came true. He answered that in a long life he had waked with the remembrance of over 30,000 dreams. Of these only five came true, and the connection therefore failed for want of evidence. It occurred to us to test the book on its other side, and see how many predictions had been made that had no counterpart in history. So we seized the volume, and fortifying ourselves behind a desk, we turned its pages. Our suspicions were fully verified. There was hardly a day in the whole year in which some atmospheric disturbance was not plainly predicted, so that a disaster could hardly come amiss to the plethoric volume. If twenty of the twenty-three actual earthquakes found a heralding in the book, there were at least 300 heraldings that had no actual following. If fifteen of the seventeen storms were of previous record, there were ten times that number bespoken in the book that put in no appearance. The credit of the prophet went down to zero under that exposure. It is the exceptional coincidences that give birth to the prevalent superstitions and keep them alive in the popular faith.—*American Analyst*.

The Codfishing Banks of Bristol Bay, Alaska.

From the preliminary report of Lieutenant-Commander Z. L. Tanner, U.S.N., given in the Bulletin of the United States Fish Commission, we learn that the codfish banks of Bristol Bay extend from Unimak Pass, along the Bering Sea shores of the island of that name and the Alaska Peninsula, to Cape Chichagof, and thence to the Kulukak Ground and the vicinity of Cape Newenham.

Slime Bank extends from Northwest Cape of Unimak to the vicinity of Amak Island, embracing depths from 20 to 50 fathoms. It is about 85 miles in length, 17 in average width, and covers an area of 1,445 square miles.

The bank received its name from the fishermen on account of the number of medusæ or jelly fishes found on it. Codfish of fair size and good quality were very plentiful over the whole bank, and scattering specimens of small halibut were taken.

Baird Bank has been named by the writer in honor of the late Prof. Spencer F. Baird, the first U. S. Commissioner of Fish and Fisheries, through whose untiring efforts the great scheme of deep sea fishery investigation was inaugurated. This bank is the largest and most valuable of the fishing grounds yet discovered in Bering Sea. Commencing in the vicinity of Unimak Island, it stretches along the coast of the peninsula to Cape Chichagof, 230 miles, with an average width of 40 miles, and thus covers an area of 9,200 square miles.

Well equipped fishing vessels can anchor anywhere on Baird Bank and lay out such winds as they would be likely to encounter during the summer months.

We found codfish in great abundance and of good quality over the whole bank, but the best fishing ground is without doubt in depths between 25 and 40 fathoms, and the Port Moller region is the most prolific.

Codfish have their enemies in Bering Sea as well as in other parts of the world. Many wounded fish are seen, particularly in spring and fall, after the passage of the seals into and out of the sea. This phenomenon is observed more noticeably near the passes between the Aleutian Islands. Bering Sea also suffers, in common with other prolific grounds that are not much fished upon, in that numbers of fish are left to die of old age or other natural causes. At a certain age the fish become weak and more liable to be infested with parasites, all of which is soon apparent from the general condition of the victims. This is a trouble which decreases, however, as a bank becomes more generally fished.

Scattering specimens of small halibut of fine quality were found on Baird Bank. Flounders of several species, some of them excellent fish, were also taken in the beam trawl wherever it was lowered in Bering Sea.

Seasoning of Timber.

Oak timber loses about one-fifth of its weight in seasoning, and about one-third its weight in becoming dry. Gradual drying and seasoning are considered the most favorable to the durability and strength of timber. Kiln drying is particularly serviceable for boards and pieces of small dimensions, and unless performed slowly is apt to cause cracks and impair the strength of the wood. If timber of large dimensions be immersed in water for some weeks, it is improved, and is less liable to warp and crack in seasoning.

SCIENTIFIC AMERICAN

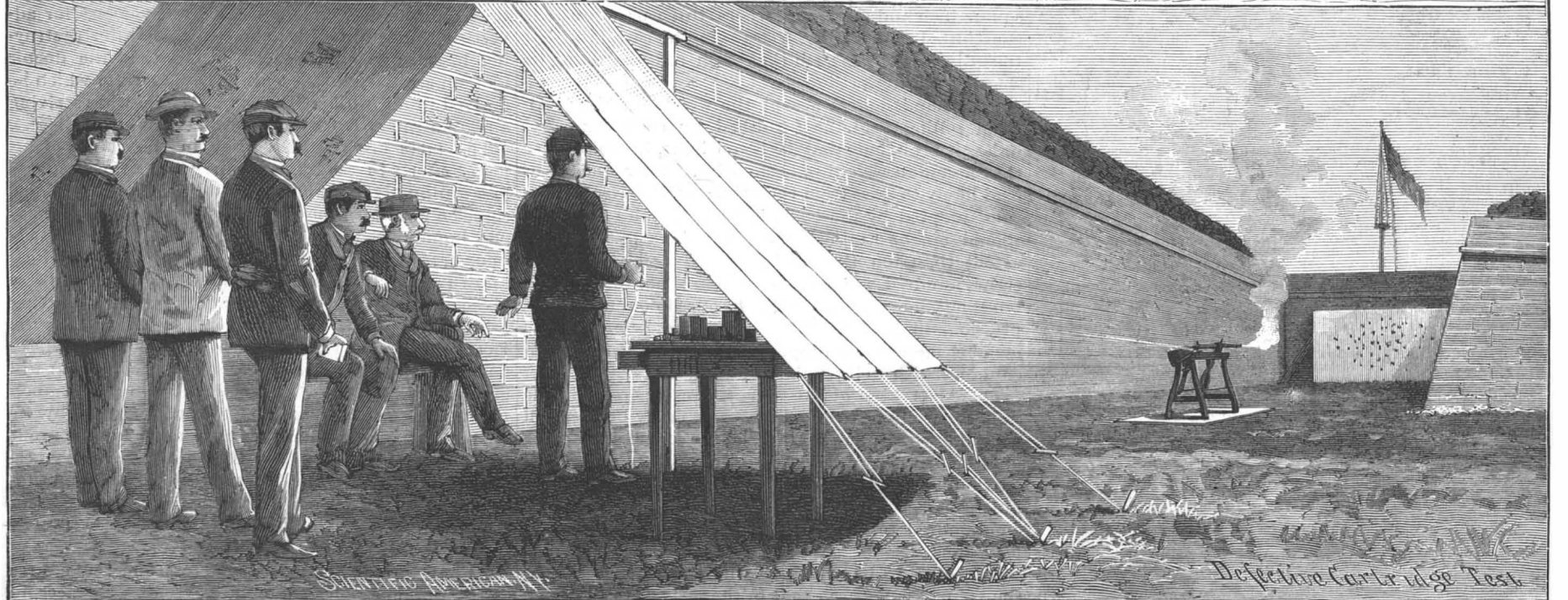
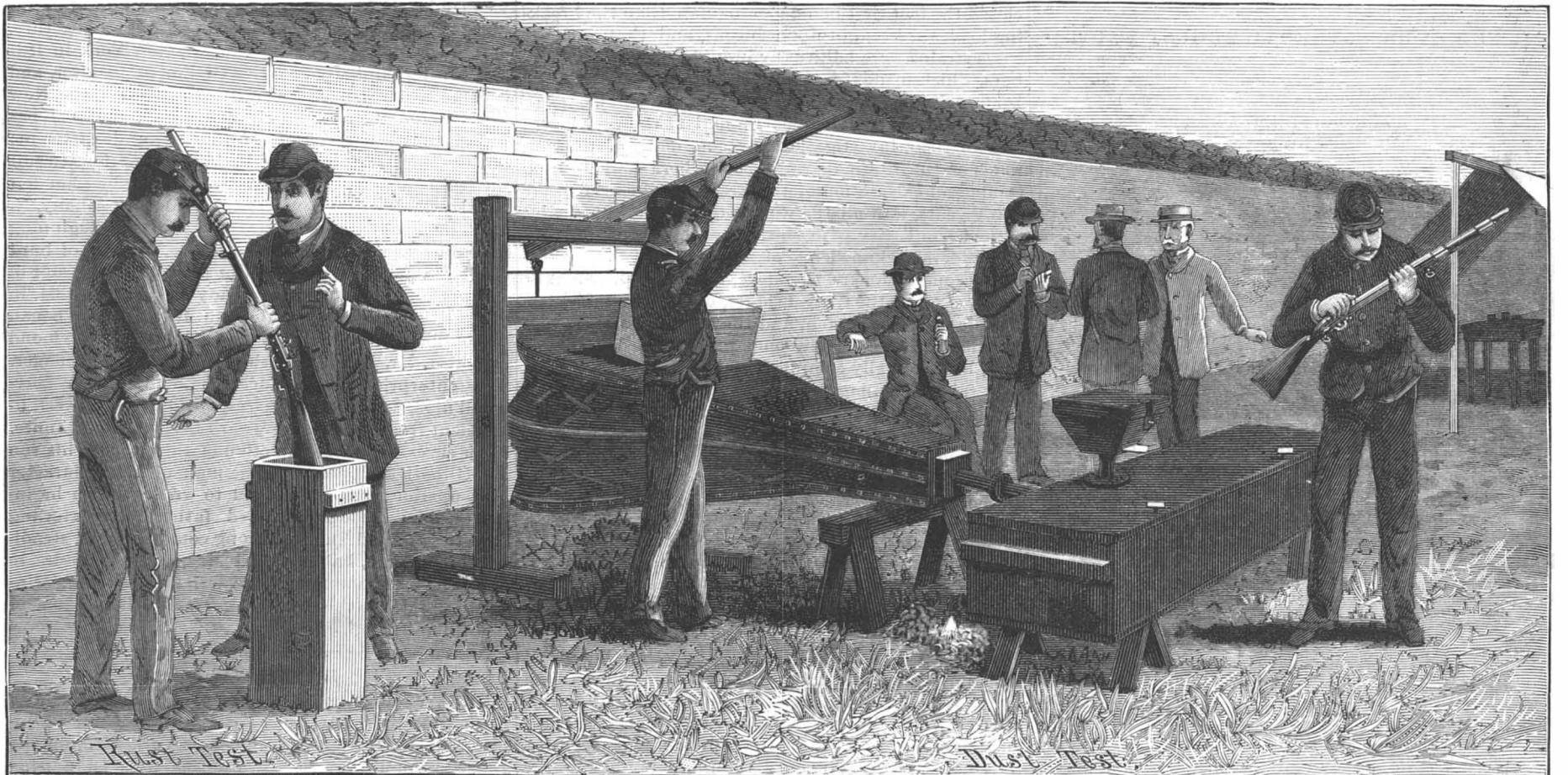
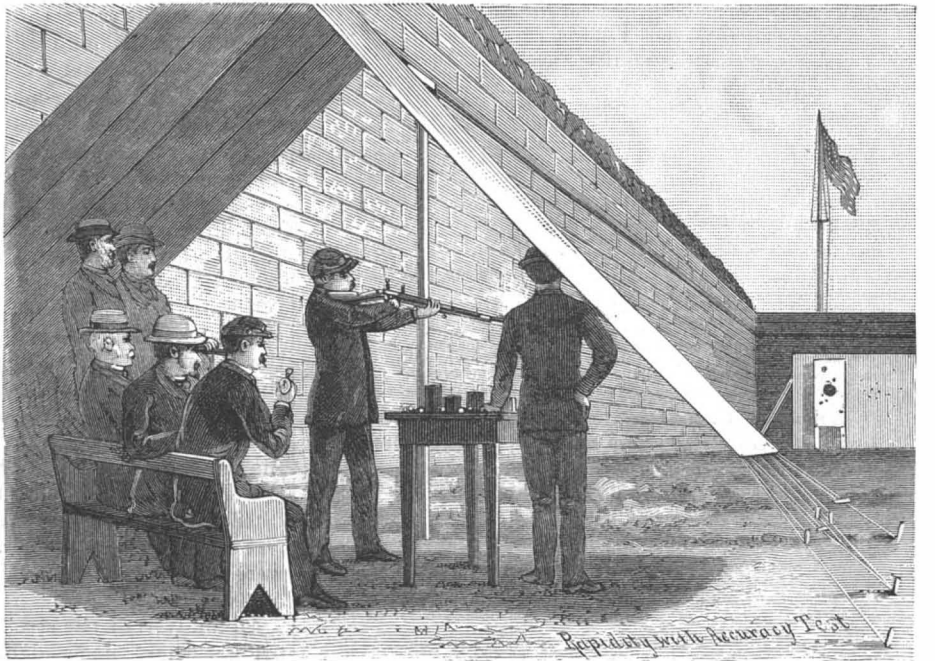
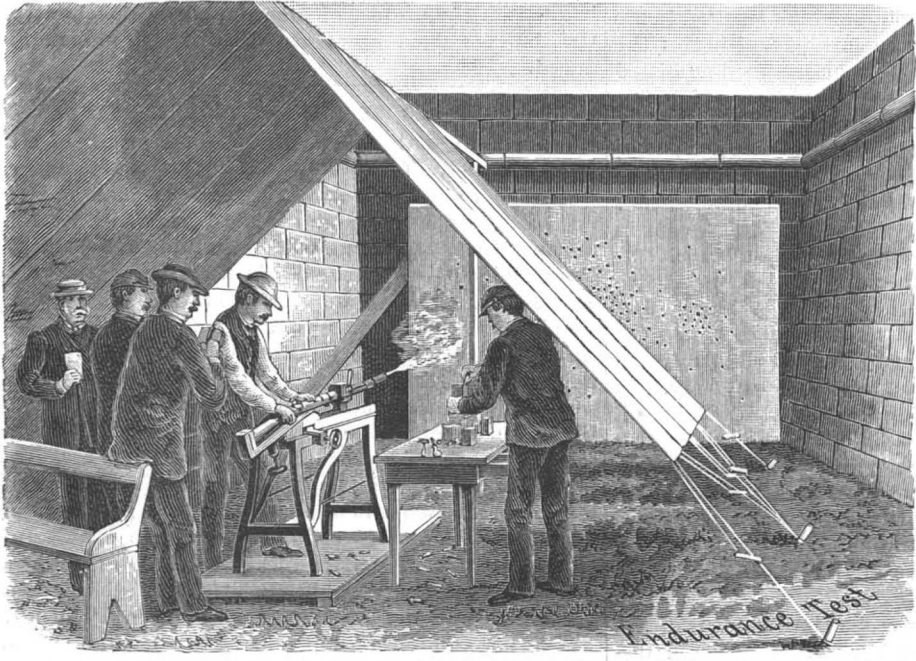
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TRIALS OF MAGAZINE RIFLES MADE BY THE WAR DEPARTMENT, AT GOVERNOR'S ISLAND, N. Y.—[See page 116.]