RIFLE

ARMS AND THE MAN

NATIONAL RIFLE ASSOCIATION OF AMERICA

THE 1919 AMMUNITION AND RIFLE TESTS

TNT AS A BLASTING EXPLOSIVE
Part 2

LITTLE TALKS ABOUT THE NATIONAL MATCHES

EDITORIALS and

THE LATEST NEWS OF RIFLE, REVOLVER AND SHOTGUN; THE ARMY, NAVY AND THE NATIONAL GUARD

VOL. LXVI, No. 18

NRA

JULY 26, 1919

The Marines Made These Targets

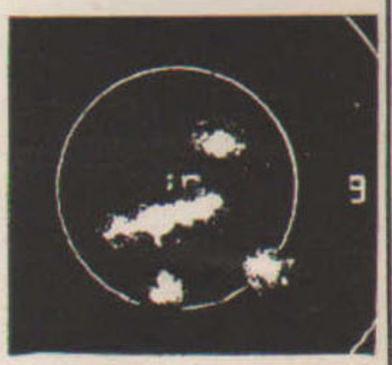
with

.22 N. R. A.
Long Rifle Cartridges

25 Yards—10 Shots, ½-inch bull, by Marine Gunner J. L. Renew, U. S. M. C.

25 Yards—10 Shots, ½-inch bull, by Gunnery Sergeant Peter Lund, U. S. M. C.

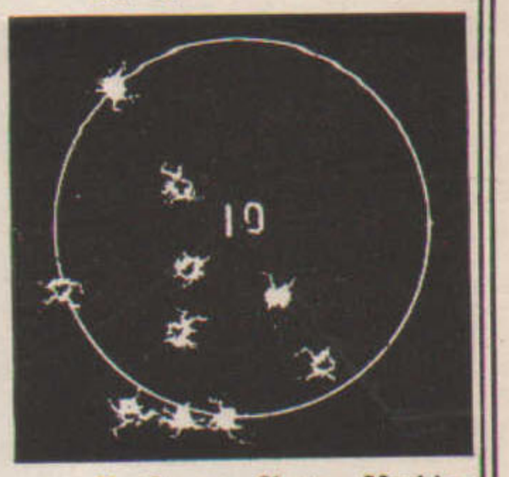
50 Yards—9 Shots, 1-inch bull, by Marine Gunner J. L. Renew, U. S. M. C.



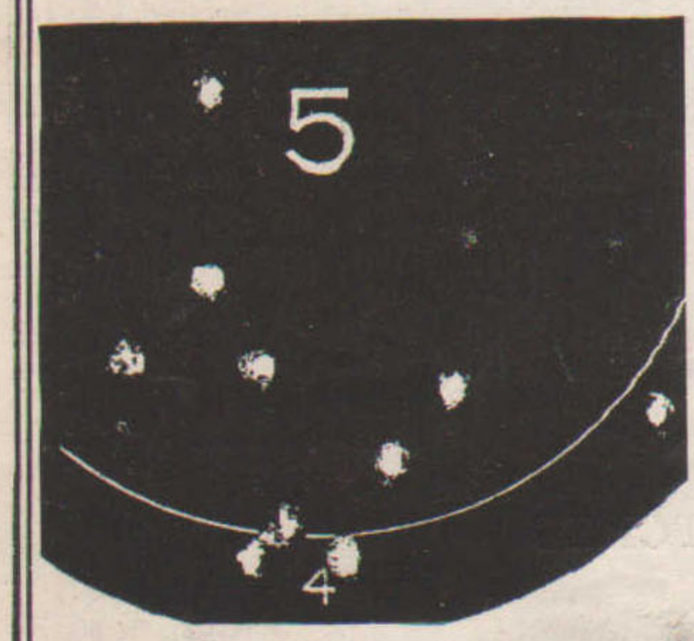
50 Yards—10 Shots, 1-inch bull, by Marine Gunner John J. Andrews, U. S. M. C.

100 Yards—10 Shots, 4-inch bull, by Marine Gunner J. J. Andrews, U. S. M. C.

You will want to use this record-breaking cartridge if you enter the small bore events at Caldwell Following are the ballistics of the N. R. A. cartridge with solid lead bullet.



100 Yards—10 Shots, Machine Rest. Group, 1.85″; Mean H. D., .65″; Mean V. D., .55″ Mean R. D., .56.



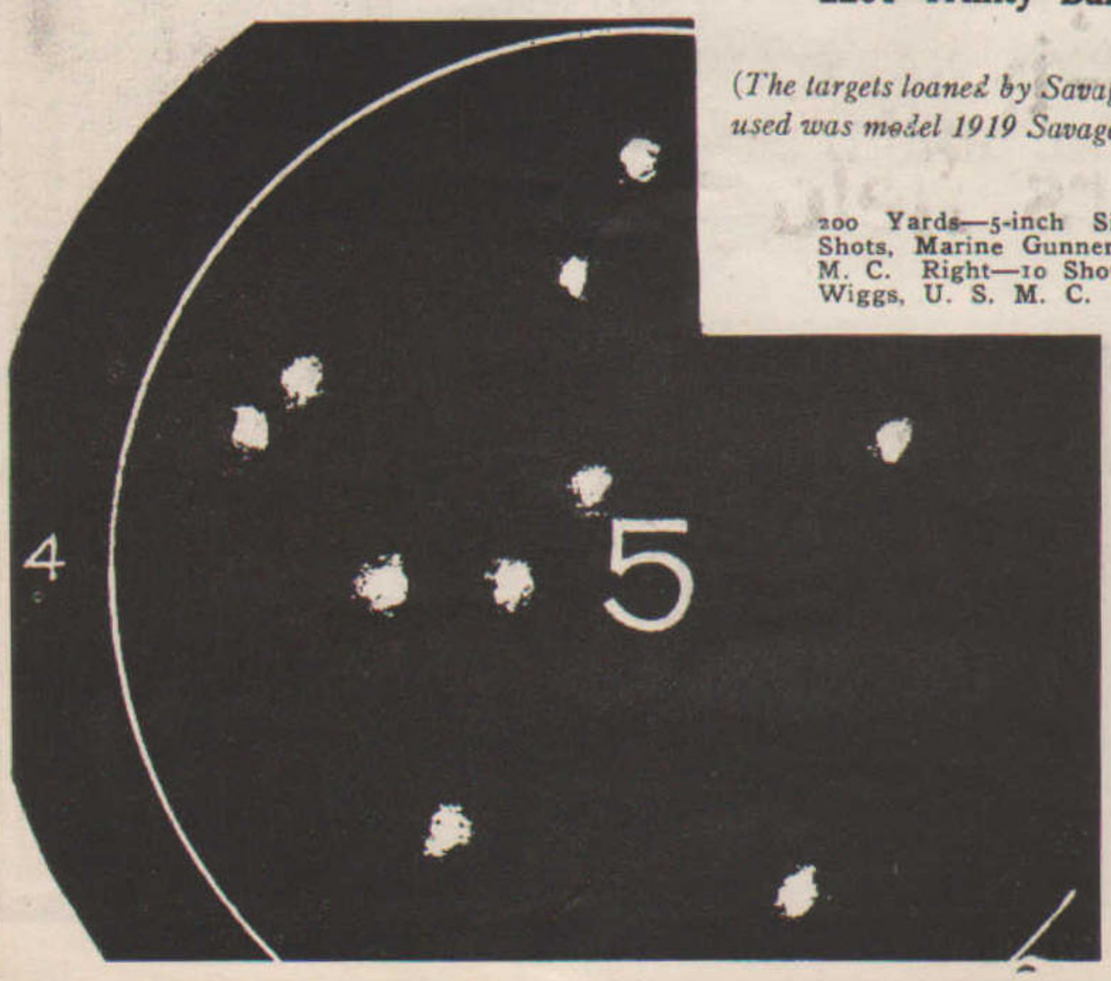
150 Yards—10 Shots, 4-inch bull Marine Gunner J. J. Andrews, U. S. M. C.

Distance in Yards	Remaining Velocity in ft. sec.	Striking Energy in ft. lbs.	Accuracy Radius Inches	Height Trajectory in Inches
0	1050	98.		
50	986.7	86.3	.43	..0
75	958	81.4	.62	2.4
100	931	76.8	.75	4.5
150	881	68.7	1.30	10.2
200	836	62.0	2.20	18.6
250	794	55.9	2.60	31.8

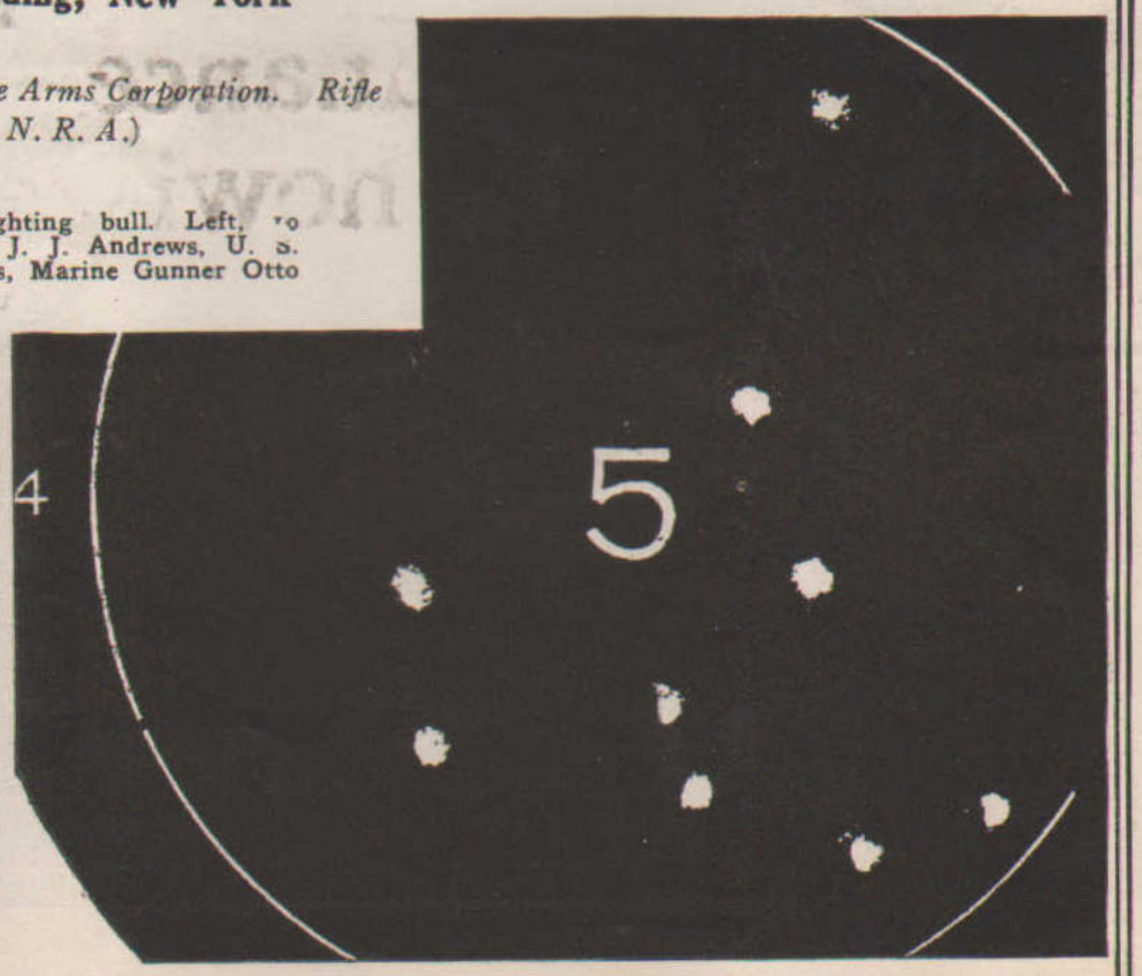
150 Yards—10 Shots, 4-inch bull, Capt. E. L. Mullaly, U. S. M. C.

UNITED STATES CARTRIDGE COMPANY
2201 Trinity Building, New York

(The targets loaned by Savage Arms Corporation. Rifle used was model 1919 Savage N. R. A.)



200 Yards—5-inch Sighting bull. Left, 10 Shots, Marine Gunner J. J. Andrews, U. S. M. C. Right—10 Shots, Marine Gunner Otto Wiggs, U. S. M. C.



ARMS AND THE MAN

The Official Organ of the National Rifle Association of America

Volume LXVI, No. 18 | WASHINGTON, D. C., July 26, 1919 | $3.00 a Year. 10 Cents a Copy

The 1919 Ammunition and Rifle Tests

By Captain Edward C. Crossman, U.S.A.

(Recorder of the Testing Board)

IN DAYS gone by there came a time each year when ink-slinging, and the claims of rival "missionaries" for ammunition companies came to naught in the matter of settling the relative merits of ammunition for the service rifle and pistol of our Uncle Sam. For eleven months of the year each company made much better ammunition than all the other companies; yea, it put it over them by the length of more than a parasang—on the printed page. The Government's pet arsenal didn't have an advertising appropriation, wherefore it maintained a dignified, ominous silence that were more eloquent than mere words. You could see that it thought its own thoughts, and they were not complimentary ones.

Then—Oh then, brothers—there came the month of months when the minions of the various companies and of the arsenal sought in fear and trembling the shrine of the great and heathen god "Show-me," and put their cases in his hands, upon a shrine of concrete and steel on the green range of Sea Girt.

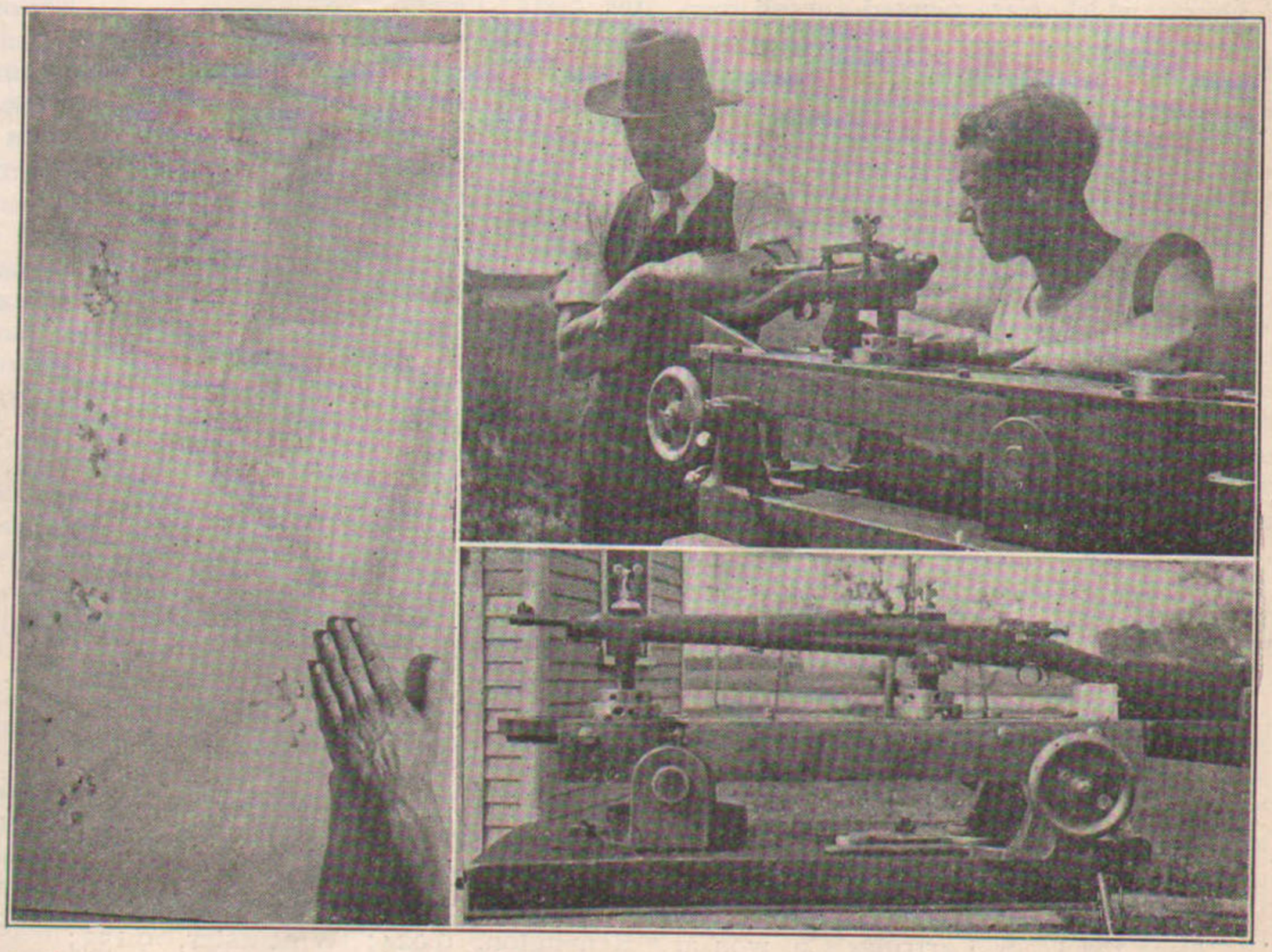
Came away from that fearsome spot but one winner each year, strange as it may seem, and naught but the winner had a word to say, excepting of course the strange and relieving burbles known as alibis, to which no man pays heed when it is all over.

As a matter of plain fact, the difference in ammunition shown by these show-down parties at Sea Girt, didn't amount to the well-known word of the irritable tinker, but psychologically the effect was great. The rifleman to attend the matches knew that he would shoot the ammunition that was the best made. The makers of the ammunition proved to the satisfaction of all hands and the cook that because it made Government ammunition which, at the end of three gruelling days of test at long range, had an eighth-inch the better of the argument in average mean radius, it therefore made much better shotgun shells, .22 Long rifle, C. B. caps, and felt wads. Of course, what could be more reasonable? So everybody was happy except the chaps who lost.

The testing course was nearly always the two ranges of 600 and 1,000 yards, rifles picked M-1903, machine rests of the Frankford type, mounted on the concrete piers at Sea Girt, which were built for a future race of ammunition experts nine feet high. Each company made a million or more rounds on contract with the Government, delivered it, and then sat around, hoping that the chap who dug it out would grab a bandoleer which would show up well.

In turn the ammunition testing board opened a case of each lot made by the private companies and took out a bandoleer, until it had a sample of each lot made by each maker; these went to the

"Old Timer" Doc Hudson was on hand to see the performance



Left, some pistol groups at 25 yards; Upper right, the device for testing pistol ammunition; Lower right, the machine rest for trying out rifle ammunition.

machine rest test as a fair sample of the run of that ammunition.

Excepting when some poor maker absent-mindedly sat down on a tack, there was rarely more than mere paper difference between the best and the worst ammunition submitted. In 1913, for example, at the end of all the thousand-yard firing of 32 strings of ten shots of each sort of ammunition, the winner had a mean radius of 8.7 inches, next maker 9.024, third 9.15, and tail-ender 9.617, or in other words a difference in mean radius in 320 shots of each, of just .917-inch.

The unhappy arsenal of Frankford, which during the year religiously turned out ammunition of the finest quality from every standpont, usually managed to turn out a wormy lot just in time for the test, and once in a while slipped badly when it came to special stuff for match shooting. One year a leading commercial company sought strange gods in the form of a new bullet and a new powder, later turning out several new naughty words when the final results came in, but these slips on the part of anybody, were rare.

The tests were more as incentives for the development of fine service ammunition and to assure National Match competitors the finest possible ammunition—not to mention confidence in it.

Comparisons are said by the low-browed punster to be "odorous," but for the sake of giving some basis of comparison for the 1919 special National Match ammunition it is necessary to delve into history, and reprint some test figures which were printed for all men to read at that time, and which therefore can do no harm in being dusted off and again inspected.

In 1908 the *piece of resistance* was metal fouling, and in those days it was serious. The kumity also evolved the totally left-handed and apparently uncalled for 17-shot string instead of the present 10-shot unit. It also discriminated between slow-fire and rapid-fire, where all present machine-rest fire is very rapid fire, most strings of five going down in ten seconds or less.

That year the U. S. Co. won, with a record of .90-inch mean vertical at 200 yards for the 17-shot strings, slow fire, 2.58 inches at 600 yards, slow fire, and 6.28 inches at 1,000 yards, slow fire. This slow fire meant 60 seconds between shots. Of course this let in the influence of a changing wind, but only the mean vertical measurement was taken. Place, Congress Heights, Washington.

In 1909 they went to Sea Girt. This was the first year in which the companies made a considerable quantity of ammunition on contract, and the first year of a systematized testing program.

Here the U. S. Cartridge Co. won at the 1,000-yard range rapid fire, the parallel of the present system of testing, with the mean radius of 8.36 inches, Winchester coming next with 8.68, Frankford 11.69, and UMC with 13.64. Remember that this was ten years ago, and the first trial of the system of letting each company make a large quantity and selecting samples of the lots. Evidently even in those days, two of our companies had found out a lot about making ammunition.

At 600 yards rapid fire, the U. S. Co. scored 4.80 inches mean radius, Winchester 5.39, UMC 5.66, and Frankford 6.57 inches.

In 1910, the first year of real service ammunition with metal fouling left out, the Winchester Co. won, the 600-yard record being: Winchester, 4.93; Frankford, 4.95; U. S. C. Co., 5.167; UMC Co., 6.17.

At 1,000 yards, the results were:

Winchester, 9.7; Frankford, 9.864; U. S. C. Co., 10,399; UMC Co., 12.730.

The test of .38-calibre revolver ammunition gave as follows: for comparison with the .45-calibre automatic pistol cartridge made in 1919:

Fifty yards: Frankford, 1.43; Winchester, 1.684; Western, 1.719; Peters, 2.02; UMC Co., 2.09.

Seventy-five yards: Frankford, 2.018; Winchester, 2.440; Western, 2.596; Peters, 2.859; UMC Co., 3.231.

Again in 1911 they staged their hair-pulling contest at Sea Girt, and when the last man was pulled out and his clothes brushed off, the results stood like this:

At 600 yards, mean radius, Remington, 4.881; Frankford, 5.089; Winchester, 5.415; Peters, 7.287.

At 1,000 yards: Winchester, 8.829; Frankford, 9.768; Remington–UMC, 10.245; Peters, 13.296.

Revolver ammunition, 50 yards: Western, 1.241; Winchester, 1.426; Peters, 1.448; Frankford, 1.456; Remington, UMC, 1.458.

In this and the year previous developed the fact that the cannelured bullet—our present projectile—didn't give the accuracy of the smooth bullet.

In 1913, the year of the great Pan-American, International, and Palma team match at Camp Perry, old man Metal Fouling was once more with us, and it played a big part in the fact that our Pan-American team lost to the Argentinos.

In the test held May 20, 1913, at Sea Girt, the final dope chart read like this when they quit running their little measuring devices up and down the perforated papers and read out the glad tidings.

At 600 yards: Remington–UMC, 4.828; U. S. C. Co., 4.931; Frankford, 5.128; Winchester, 5.254.

At 1,000 yards: U. S. C. Co., 8.7; Remington, 9.024; Winchester, 9.153; Frankford, 9.617.

We have quoted to this stage only the figures for the 150 gr. service cartridge, but for the sake of comparison of the best of this stuff with the match ammunition prepared by the factories for the big shoots, and for sale at their exhibits, consider the following figures for the 180 gr. ammunition of 1913.

At 1,000 yards: U. S. C. Co., 6.154; Remington, 6.803; Winchester, 7.065; Frankford, 12.88 (special 150 gr. bullet, not 180 gr.)

The pistol ammunition that year performed thusly:

At 150 yards: Winchester, 1.101; Western, 1.133; U. S. C. Co., 1.195; Remington, 1.408; Frankford, 1.576. Inches mean radius.

Thus, having duly looked over the family album, let's go on with the story of this year of 1919.

The National Board early in the year bashfully and coyly suggested to the ammunition companies, who were then crawling out of the wreck and looking around to see where the cyclone had gone, after the Ordnance Department had gotten through cancelling war contracts, that they make some ammunition for the tests of 1919, and that they go the limit of the 1903 chamber in their ammunition specification, anything permitted that would let the rifle continue to fire bullets of any weight, shape or religion, powder likewise.

Immediately thereafter the said Board got the regrets of every company it had invited, on the grounds of having a previous engagement trying to find a lost, strayed or stolen commercial business, last seen heading west in the early part of 1917. Not discouraged, the suggestion was then made that the companies submit the number or numbers of the lots of war ammunition they had made, and that they considered the best, and let them be submitted to the machine rest ordeal as the representative product of each company.

The shriek of horror that went up made the windows rattle. There were, according to the candid statements of all hands concerned, no lots of war ammunition that could be considered target grade.

So finally the test was boiled down to poor Frankford, which couldn't decline because it was a Government Arsenal, and which was therefore elected to be "it" all the time, instead of having somebody to take turns so far as the test of 1919 was concerned.

So a cruel and stony-hearted president of the ammunition testing board, one Lt. Col. Townsend Whelen, sent out orders to the board to convene July 1st, at Sea Girt, to test the Frankford product for 1919, and each member took a long and despairing look at the box of fireworks under the bed against the glorious Fourth, and trekked for Sea Girt.

THE 1919 BOARD

President, Lt. Col. Townsend Whelen,

General Staff, Army; Lt. Col. Julian S. Hatcher, Ordnance Dept., Army; Col. William Libbey, Army; K. K. V. Casey, and Capt. Edward C. Crossman, recorder.

Though the famous names of tests gone by were marked absent, the test of 1919 took in more territory than previous tests. It was to test the picked product of the Rock Island and Springfield Arsenals in the way of special rifles for the National Match, and to decide on which make was to be used. Then it was to test the pistol ammunition, and finally the 150 gr. ammunition specially developed for the National Matches of 1919—some 2,000,000 rounds in all.

From Frankford there came rolling a 3-ton giant covered truck and Frankford type of machine rests. The 10 picked rifles of each arsenal, and finally some picked rifles that Frankford had selected by a star-guaging and shooting, and with which the arsenal had made some fine groups in the early tests. For the pistol test they brought down a queer cross-breed gun, a Springfield receiver fitted with a .45-calibre barrel, with Springfield bolt, a grip to house the magazine, and a regular Springfield butt stock and guard. It was by no stretch of the imagination a pistol, and while it might have been convenient for taking pressures and velocities, it certainly didn't simulate the .45-calibre automatic pistol in firing conditions.

A picked crew of 17 men came down from the arsenal as the personnel for the test, as efficient a crowd of target handlers and machine-rest artists as Sea Girt has ever seen.

Also, far-off black specks resolved themselves gradually into the old members of the clan, who couldn't stay away from a machine rest test if nothing but air rifles were concerned.

When the test got to running full blast the roster of the aids, assistants and advisers—volunteer, but none the less welcome—read like this:

Mr. C. I. B. Henning, Ballistic Engineer in charge of the DuPont Powder Company Experimental Station. Mr. J. J. Hessian and two others of the Remington, UMC cohorts, Tom Davis, of Winchester, with Mrs. Davis and Miss Davis; P. E. Littlehale, also of Winchester; General Bird W. Spencer, of New Jersey; and Mr. E. Newitt, of the Ordnance New York branch. For several hours we had been receiving wireless bulletins announcing the position of one Dr. Hudson and his craft, the S. S. Singer, and finally he came into harbor. The old-time shark, one of the most formidable off-hand men in the country, but none the less efficient at the long range guessing contest between shooter and zephyr, carries a portable wireless outfit in his Singer car, and has no ear for the yelps of the festive newsboy. So

The Testing Board. Left to right: K. K. V. Casey, Lt. Col. Julian S. Hatcher, Lt. Col. Townsend Whelen, Col. William Libbey and Capt. E. C. Crossman

at Sea Girt he annexed a lead of telephone drop, hitched his aerial connection to it, put the box of go-devils and whirligigs on a table beside him, lit a stogie, clamped on a head-set and proceeded to listen in on the latest gossip of the A. P. sent to steamers out at sea, and the talk of the wireless between the ships themselves.

The hombre who sticks up Doc and his car on a lonely road, wants to make sure that he takes along the wireless when he departs, else Doc will have the news spread to the limits of that county in something less than sixty seconds after the fuss is over.

So, with the congregation all present and duly seated, we proceeded with the services.

It is meet to pause here and consider the plot of the piece.

In the first place the members of the Board, with Major Casey as the chap to put the discontent into voice, didn't cotton to the mean radius thing, chiefly because it didn't mean anything to the average rifleman, second because it took in wind influence, and so encouraged the machine rest users to shoot too fast in the effort to "beat the wind," and so introduce a new and foreign element into the matter of testing ammunition for accuracy.

As practically all ammunition variation is vertical, the Board decided to set a new system of measurement, which was followed in part by the test of 1908. This, the Board decided, should consist of, first: the old mean radius figures for the sake of comparison; second, the mean vertical; third, the extreme vertical; and fourth, the group diameter, which latter means something to the ordinary rifleman who doesn't care to go into ammunition technicalities.

To make the system plain before carrying on, remember that the mean radius is arrived at by first ascertaining the center of impact, then by measuring the distance from this spot to every shot of the ten in the string, adding them all up and dividing by 10, which gives the average distance of each shot from the center of impact. The center of impact, as explained in past articles, is arrived at by first drawing a horizontal line through the lowest shot of the group, and measuring the distance from this line to each shot, a tenth of the grand total giving the average vertical distance of each shot from the line. Then the process is repeated from a line drawn vertically through either the left or right shot of the group, giving the average horizontal distance of each shot from the vertical line. Then if you measure off from the horizontal line a distance equal to the mean distance of the ten shots therefrom, and measure off from the vertical line in the same way, the intersection of the two lines is the center of impact.

Naturally the mean radius is influenced by wind inasmuch as it includes the horizontal distance of the shots from the center of impact.

The Board believes that the inclusion of the additional figures will make the results of ammunition tests much more interesting to the rifleman, and will let him see graphically what the ammunition will do toward keeping in the appointed black spot. A mean radius of 9.65 inches at 1,000 yards may not mean much to the hunter of bull's-eyes, but if you also say that the average group diameter was 30.32 inches and he knows that the 1,000-yard bull is but 36 inches across, then he may sit up and take notice. These happen to be the final figures for the National Match ammunition of 1919.

Likewise the pistol man may gaze unmoved on the thrilling information that the mean radius of his pistol food is 1.81 inches at 50 yards, but if you add the statement that the average group size is 5.59 inches, where the bull of the L target is 5 inches, then he may come to life with a start. Again I quote figures for the ammunition of 1919, for the pistol. Happily there is no 50-yard distance in the pistol matches, and the

ammunition uses up but 2.77 inches of the 5 inches of black, at the 25-yard range.

The pistol ammunition was to be tested at 25 and 50 yards, the second distance being merely a screen placed in the line of fire of the 25-yard screen, and being thus a record of the bullets that first made the 25-yard group.

The rifle ammunition, as usual, was to be tested at the old distances of 600 and 1,000 yards.

Thirteen boxes of various lots made up in 1919 for the National Matches, were sent down from the Frankford Arsenal together with the ten before-specified rifles of Rock Island, and ten of Springfield make. At 1,000 yards the program called for the firing of five strings of 10 shots from each of the ten Rock Island and the ten Springfield rifles, a Rock Island and a Spirngfield rifle being fired simultaneously from each of the two rests in operation.

Between each series of five strings the rifles were changed around to equalize any difference that might—and actually did—exist in the machine rests. After each series of five groups the ammunition was changed, a different lot number bieng tried.

The rests brought down by the Frankford people differed from those of past years in that a powerful spiral spring was placed below the slide to return it "to battery" each time recoil moved it back, and the result being merely another slam to aid in making the work of the rest questionable. In previous rests the shooter merely returned it to place by leaning against it, his more or less elastic "tummy" acting as the spring as he leaned gently against the back end of the slide. In the rest put in for the experimental officer at Perry, which said office was filled by the writer, the pier was the right height to permit this by the good advice of Captains Richards and Chesley, who did much in years gone by to put Winchester first under the wire in machine rest tests.

Also Frankford had another peculiar scheme of taking off the upper band and the handguard, and putting in shims of emery paper to stop all play between barrel and stock, then replacing the parts. The argument is that as the rest grips the hand-guard and forestock and not the barrel, then the barrel ought to be held rigidly in said stock. The same argument does not apply when shooting from the shoulder, as the shooter then aligns the barrel each time by the sights.

From the arsenal came Major W. B. Doe, one of the famous family of ammunition makers; Capt. H. L. Wilkins, and Col. Wallace L. Clay, now the commandant at the arsenal and the officer who, during the war, developed our armor-piercer, tracer and incendiary bullets, in his great work in the experimental department. He may not be the youngest Lieutenant Colonel in the Army, but he looks it, and he is assuredly the youngest C. O. the grave old arsenal ever had directing its affairs.

George Schnerring, proof-master of the arsenal, and one of the land-marks of machine rest tests, bossed the job for the arsenal. In the pit went the experts, Messrs. Springler and Wilson, to hold down a job that is both mean and offers a fine chance for mistakes that would cause gnashing of teeth and tearing of hair. There were none of said mistakes.

One of the rests was handled by the old-timer, Gus Schnable, who has made many a group in the ammunition test game, while Mr. F. Johnson, with the DuPont Company during the war, and a skilled ballistic engineer, shot the other one.

One of the most important jobs in such tests is the measuring and recording of the targets as they pile in, each target requiring something like forty measurements and figures. To do this they make use of a little wheel running on a finely threaded axle, and moving along laterally as it is turned, so registering the inches it has run, *a la* odometer. This is known by the jaw-breaking name of opisometer. This work was done by the trained crew of experts from the arsenal, Messrs. R. Croll, Robinson, Halliwell and Battersby.

The meeting opened with the testing of the pistol ammunition and the queer half-rifle affairs with the .45-calibre barrels were clamped into the rests and laid on the temporary screens rigged up at the 25-yard distance. The pistol ammunition was loaded in May and June, 1919, and contained Bull's-eye—not any of the newly developed and much advertised pistol powders.

A number of groups were to be shot on each screen, the gun being moved a trifle to avoid super-imposing them.

So, in the middle of the pleasant afternoon, with the gentle sea breeze just enough to give a hint of the Atlantic 1,200 yards away, but not enough to interfere with ammunition tests, the first half-breed .45 cracked, and the bystanders moved farther back and began to reach for the cotton to cut down the voice of that loud-mouthed cartridge, the .45 automatic.

Early in the game, as the pistol groups went in, it became evident that the gentlemen from Frankford were not satisfied with the work of the ".45 caliber Springfield," one of them not shooting up to the form of the other, and being a new and untried gun.

It was the feeling of the Board that the tests were better carried out either with the .45 pistol in a machine rest, which is not so easily done as said because of the recoiling parts, or else with one of the Colt or Smith & Wesson Model 1917 revolvers for the automatic cartridge, but there was no objection to the apparatus sent down from the Frankford Arsensal, if that was what the arsensal desired to use to prove its own ammunition.

Presently, when a sufficient number of papers had been accumulated with the generous-sized holes in them, the Board decided that it was a day, and called the next case.

Possibly due to the extraordinary apparatus used for firing it became evident early in the game that the pot-bellied, square-headed brutal .45 caliber missiles were not herding together in a manner equal to the performance of the .38 caliber revolver ammunition in days gone by. In said days they used .38 caliber revolvers clamped in revolver machine rests.

When the returns were in, the cold and fishy-eyed figures stated that the mean radius for 25 yards of all the groups fired, stood at .88 inches, the average group size 2.77 inches, the largest group 4.10 inches, the smallest 1.50 inches.

Back at 50, used merely for "odious comparison," in view of the fact that 50 is not used in this years pistol matches, the figures turned out to be 1.81 inches for the mean radius, 5.59 inches for the group size, smallest group 3.70 inches, largest 7.10.

Word has just been received from the commanding officer, Frankford Arsenal, that a test of the National Match pistol ammunition conducted at the arsenal, subsequent to the Sea Girt test, and with a .45-calibre gun of known accuracy, gave a mean radius at 50 yards of .91 of an inch instead of 1.81 obtained at Sea Girt. This indicates that the fault lay with the gun instead of with the ammunition.

In 1911, Western won with a mean radius at 50 yards for .38 calibre revolver stuff, of 1.24.

In 1913 Winchester won, with a mean radius at 50 yards, .38 calibre revolver, ammunition of 1.101, the low "man" being Frankford with 1.576.

Wherefore, either the calibre .45 ball cartridge for the automatic pistol is less accurate in itself, or Frankford stubbed its toe this year, or else the apparatus used for firing the ammunition didn't develop its full virtues.

Here are a few of the figures, for the lots, and the group sizes, range 25 yards:

Lot 241, 2.32; 241, 2.61; 236, 3.45; 226, 2.83; 238, 2.48 inches.

Departing then from this piffling popgun sort of game, the Board sat upon the question of what could be done with a real firearm at the elongated ranges of 600 and 1,000 yards.

The first stage of the performance brought tears to the eyes of the most hardened. The Frankford minions had made up the clamps of their machine rests by the infallible measurement of

(*Continued on page* 351)

TNT As a Blasting Explosive

By CHARLES E. MUNROE and SPENCER P. HOWELL

Part 2

AS shown by tests with the Pendulum Friction Device all the three grades of TNT are less sensitive to friction than 40 per cent straight dynamite, gelatin dynamite or picric acid, and as shown by tests with the Large Impact Machine all are less sensitive to percussion than 40 per cent straight dynamite, ammonia dynamite and nitrostarch powders. It may be set on fire, when it will burn, but this burning may change to a detonation. Hence TNT must be protected from fire and causes of fire, such as sparks, flame, heated bodies, friction, percussion and the like as all explosives should be at all times.

In tests made at the Pittsburgh Experiment Station by detonating TNT, Grade I, and collecting the gases it was found that 545 grams (one pound) of the explosive gave 506.5 liters of gases having the following compositions:

Table 1, Gases from detonation of Grade I, TNT.

	Per cent by volume	Volume in liters
Carbon dioxide..	4.9	24.8
Oxygen	2.5	12.7
Carbon monoxide	46.6	236.0
Hydrogen	24.6	124.6
Methane	2.6	13.2
Nitrogen	18.8	95.2
	100.0	506.5

from which it appears that there was produced 46.6 per cent, or 236 liters of a poisonous gas (CO) and 73.8 per cent, or 373.8 liters of combustible gases (CO, H and CH_4). The tests of other grades of TNT gave similar, though not identical results, but all indicate it to be unsafe to use TNT in close places, such as underground workings and particularly coal mines. These results emphasize the importance of remaining away from the face of the blast after the explosion until assured that the gases produced have been blown or have diffused away from the interstices of the debris. The safe waiting time will, of course, vary with the quantity of explosive fired, the location, such as a pocket or valley or plain, and the atmospheric conditions, particularly that of the force and direction of the wind. These precautions are such as should be taken with all explosives.

In determining the relative efficiencies of explosives in use, the Bureau of Mines has long employed the "unit deflective charge" and the "rate of detonation" as criteria. The unit deflective charge is ascertained by exploding a known weight of the explosive in the Ballistic Pendulum and this term "unit deflective charge" is defined as "that weight of an explosive which will swing the ballistic pendulum the same distance as one-half pound of 40 per cent straight nitroglycerin dynamite." It appears that the less the unit deflective charge, the greater the propulsive capacity of the explosive; hence, this is considered a measure of the ability of an explosive to dislodge and bring down material in which it is exploded.

The unit deflective charge, in grams, of 40 per cent dynamite and of Grades I, II and III of TNT, with their corresponding percentage figures, using 40 per cent dynamite as the basis of 100 per cent are given, in the following tabulation:

Table 2, Unit deflective charge of four explosives.

Explosive	Dynamite 40 per cent	TNT I	TNT II	TNT III
Unit Deflective Charge (grams)	227	201	190	209
Unit Deflective Charge (per cent)	100	113	114	109

From the above, it will be seen that each and every grade of TNT is stronger when so measured than 40 per cent straight nitroglycerin dynamite.

The method of determining the rate of detonation is to charge the explosive in a file 1¼ inches in diameter and 42 inches long at normal density (that is, no unusual effort is made to get the explosive to a high density) and to fire the charge with a No. 8 electric detonator.

The "rate of detonation" is considered a measure of the ability of an explosive to disrupt and shatter material in which it is exploded.

The results of such tests are given in the following tabulation:

Table III, rate of detonation of four explosives.

Explosive	Dynamite 40 per cent	TNT I	TNT II	TNT III
Apparent specific gravity	1.24	0.91	0.88	0.86
Rate of detonation (Meters per second)	4772	4747	4852	4482
Rate of detonation (per cent)	100	99	102	94

It should be carefully noted that the comparisons made in the unit deflective charge table are by weight and in the rate of detonation table by volume. When either of the three grades of TNT are packed in cartridge cases or in bore holes under ordinary tamping pressures, the apparent specific gravity of the charges vary from 0.81 to 0.95, while when 40 per cent straight dynamite is so packed, the apparent specific gravity of its charges are from 1.15 to 1.34. It is evident, therefore, that for equal weights the TNT cartridges will be more bulky than the dynamite cartridges. As a consequence of this, larger bore holes must be used for TNT charges than for dynamite charges of equal weight. This presents an advantage for the dynamite over the TNT but on the other hand, it has been observed that as the apparent specific gravity of the TNT approaches the lower limit given above, its resistance to wetting, when the cartridges are immersed in water, increases. Hence, it is recommended that except in assuredly dry holes, or in big blasts, where full boxes of the explosive may be fired in chambers, the TNT be packed for use in cartridges and that, as the No. III Grade is the most water resistant of them all, it be packed at a low pressure and reserved for use in the especially wet work. To particularly distinguish the cartridges of Grade III, the wrappers may be of a specially chosen color or, better yet, they may be packed in paraffin coated wrappers and after the charge has been packed in these wrappers and the ends folded in, the ends should be redipped in the molten paraffin to completely seal them. For emergency use, newspaper may be employed for wrappers, being made up into cylinders of the desired dimensions by rolling about a pick handle or other convenient tool, but where considerable quantities are to be packed, it will be better to make a regular job of the operation, and to pack the explosive in the standard manilla wrappers, made by means of a cartridge machine.

It is only in large scale operations of crushing and repacking TNT into cartridges that there is much likelihood of any one becoming poisoned, for as a rule, it requires continued contact with it through some period of time to produce this result. In handling TNT the following rules should be observed:

1. Only persons in good health should be employed.

2. Special clothing should be provided to be used only during working hours. Gauntletted gloves may be worn, but this is not necessary.

3. The hands and face should be washed before meals and before leaving the factory.

4. Care should be taken that none of the TNT comes in contact with the mucous membrane, such as that of the mouth, nose, eyes, etc. Workers should, therefore, be cautioned against touching these parts with their hands, or taking a chew of tobacco.

Cases of TNT poisoning which have

(*Continued on page* 353)

ARMS AND THE MAN

1111 Woodward Building, Washington, D. C.

EVERY SATURDAY

Editor

BRIG. GEN. FRED H. PHILLIPS, Jr., Secretary N. R. A.

Associate Editor
KENDRICK SCOFIELD

Entered as second-class matter, April 1, 1908, at the post office at Washington, D. C., under the Act of Congress of March 3, 1879.

That the man shall serve his country in time of war is noble, brave and patriotic; but that a man shall properly prepare himself in time of peace to serve in war is all of these things and more. It is noble with a nobility which is real, not ideal. It is brave with a bravery which assumes in time of unemotional peace many burdens, among them that of bearing the lack of appreciation of those who do not consider military preparation or training necessary.

PLAY THE GAME

WITHIN another week delegations of riflemen from practically every State will be traveling toward the Navy Range, Caldwell, N. J.

When they board the train at their homes, they will present government transportation. When they reach Caldwell, they will be fed and sheltered at government expense. The government will furnish rifles and ammunition used during the shoot, and when they return after practically a month's outing, they will again travel on government money. In short, except for such non-essential expenditures as each team member may feel financially able to make, and a few ridiculously low squadding fees, each participant at the National Matches, when a member of a State or a service team, will be the guest of Uncle Sam.

Yet if the big shooting camp does not measure up in every particular to each individual's idea of what a shooting camp should be; if the sleeping accommodations are a bit sketchy, even though comfortable; if the "chow" is a bit below standard once in a while, then "stand by" for the wail of the disgruntled ones. While the members of civilian rifle clubs attending the National Matches in the past have in the main shown themselves to be good sports on the firing line, and have by their performances in the competitions demonstrated that the government made no mistake in including them in those entitled to participate in the big competitions, the spirit of good sportsmanship exhibited by most citizen shots during the firing on the range has not always been carried by them back into camp. Men who would never be guilty of criticizing a man in whose house they were guests, thoughtlessly "cuss out" the government even while sitting at Uncle Sam's table, sleeping in Uncle Sam's camp and traveling on Uncle Sam's pocketbook.

That no National Match at which all arrangements were perfect and where none of the competitors suffered minor discomforts—discomforts which should be expected—has ever been held, and that there are many ways in which even the most successful of the government competitions might have been improved, goes without saying. Yet the fact remains that the greatest aid the civilian club member can give in accomplishing these improvements is to convince the government that it is worth while to put forth every effort to insure successful matches, and this can only be done by keeping alive enthusiasm in their home states, in periods between the matches, thereby insuring the attendance of good teams, and by showing appreciation of the government's generosity during the matches. All this, totally aside from the fact that it savors of bad taste to accept an invitation and then belittle the accomodations afforded and the arrangements made to provide entertainment for the guests.

Both in respect to the National Matches and to the free issue or rifles and ammunition made under the direction of the National Board for the Promotion of Rifle Practice, citizen riflemen are prone to look their gift horses in the mouths. And having much more from government sources than those of any other nation, they apparently fail to realize how fortunate is their lot, and with the same blindness, proceed to pick flaws with what is already at their disposal. It is true that the average rifle club member would much rather pay outright for his rifle and own it, than hold it under a kind of lease from the government. But the time is not yet—although it may be in the near future, which is also a fact worthy of considering—when this can be followed out in each individual case. Wherefore, pending the dawning of such a millennium for riflemen, the day may be hastened if every civilian shot were educated to properly appreciate his blessings.

Let us consider for a moment the British rifleman, in some respects far more advanced in his own particular field of target shooting than we are, and yet not one-half so fortunately situated in respect to government aid. Instead of having all of his expenses paid to the big rifle shoot each year at Bisley, our British brother travels at his own expense, and none who attend the "meeting" can do so at an expenditure of less than from thirty to forty pounds. Then too each has his rifle and his ammunition to purchase and to pay entrance fees which are far greater than our nominal "squadding fees." The income of the average Englishman is no greater than that of our own young men, yet in the absence of governmental gratuities the shooting game goes merrily along, supported by every man who participates.

Let us also consider the trapshooting game as followed by thousands of Americans, purchasing their own scatterguns at prices far in advance of what the best of military rifles and many good grades of target rifles cost, and feeding them shells as expensive as rifle cartridges. When the time for the Grand American Handicap arrives the scattergun enthusiasts foot all of their own expenses and are glad of the opportunity to do so.

Aside from a very considerable nucleus of "old timers" who played the game out of their own pockets before the days of "free issue," the shooting game in the United States is made up largely of men who have come into it since the time when rifles and ammunition were made the subject of free distribution. These men should realize that the generosity of the War Department is for the purpose of "promoting" rifle practice, of interesting tyros in marksmanship by placing equipment at their disposal, but that the ultimate object of establishing rifle practice as a sport cannot be accomplished until every rifle club member is willing to make personal efforts to bring this about.

Little Talks About The National Matches

By CAPTAIN E. C. CROSSMAN

COLONEL G. SEVIER, General Staff, drove over to the Caldwell Navy Rifle Range Sunday, July 20, to complete the arrangements with Colonel Harllee for the biggest exhibition of war material this country has ever seen. When this is installed, it will be worth the trip across the country, even though there were no matches scheduled.

Seven hundred feet of railway siding at Mountain View, the nearest railway line, will be crowded with the giant railway-mount guns, with their attendant cars, repair shops, ammunition stores, etc., with other material too heavy to be moved off the rails.

Seven buildings 100 feet long are being rushed to completion at the range, and will house the smaller and perishable portion of the great Government display.

The open space near the buildings, which are near the thousand-yard firing point, will be crowded with the big guns of the west front, from the little 37-mm. anti-machine-gun cannon, which is carried forward by its crew and is said to shoot like a Springfield, clear up to the giant 240-mm. howitzers. The French 75, the 155 mm. which ran second to the 75 in point of numbers on the front, the 8-inch howitzer, and the 240 mm., will be part of this collection.

The Ordnance Department is sending down from the very complete museum at the Springfield Armory the collection of military rifles from the fusee of the days of the Revolution to the latest experiment in the self-loading rifle of the present day, and the rifleman will have the opportunity to trace out the development that led to his pet brown Model of 1903 Springfield.

In addition to this will be the exhibit of rifles of different nations, captured German and Austrian arms, odd ammunition such as the tracer, incendiary, armor-piercer and spot-light bullets, with the various stages of their manufacture, and most everything pertaining to the subject of small arms that has developed since the war.

They will show the Stokes and other trench mortars, the shells with the charge of powder in the shotgun case attached to the Stokes, rifle grenades with their tromblons. By direction of Lieut. Col. Whelen, sample groups made at 1,000 yards from machine rest will be exhibited, photographed actual size.

The other army departments, the Engineers, the Signal Corps, the Medical Corps and the Quartermaster, will all exhibit the latest devices for war, much of which was confidential and was not discussed in print during hostilities. For one item, the Engineers will put on more than 5,000 feet of movie film showing the work of the Engineers in the field.

Four tanks are being sent to Caldwell, two of the large type, presumably Mark 8, and two of the Renault or baby type, and these will put on daily exhibitions of their climbing abilities and will fire their guns while traveling.

Across the road, the aviation exhibit will show their interesting machinery and do stunts.

There will be actual firing of the Stokes mortars and rifle grenades and demonstrations of the work of the sniper school from Camp Benning. Several million rounds of ammunition is piled up near the aviation camp, so the aviation gentlemen evidently intend to demonstrate aerial machine-gun work.

This is the first, and doubtless the largest, exhibition of war material this country will ever see, as it costs from ten to thirty thousand dollars merely to gather it together and transport it, and with the limit of these figures much had to be left out.

There will be little spare time to hang heavily on the rifleman's hands at the Caldwell range, between the evening entertainments by the various bands stationed at the camp, visiting bands and orchestras, movies, vaudeville, community singing, and the chance to roam through this great war display in the seven Navy buildings now being rushed to completion. The match of 1919 will be the match of matches, and it is doubtful if ever so great a show—or as crude a rifle range—will be seen again in this country. Once more the courage, and the imagination, and the energy of Colonel Harllee have won in spite of the doubt of most of us associated with him, and realizing the size of the task.

* * *

Idaho shoots back the word that it is sending a civilian team. The State has a live N. R. A. secretary, and can turn out a fine civilian team.

* * *

The Adjutant General of California, J. J. Borree, wants to see California again the top-notcher team in the civilian ranks. He staged two open tryouts in the two ends of the State—which is, by the way, 1,000 miles long—and then wired to the officials an inspiring message to the competitors to get on their toes and bring back the civilian bacon. In the two shoots in which California competed, her civilian team got first one year and second the next, in the civilian ranks, the loss in 1918 being due to a lot of senseless squabbling and poor handling rather than to any inferior shooting material. Changing the M. 1917 front sight at the last minute and general lack of leading ability in a rifle shoot put the men from the Golden State out of first place. The aggregation for 1919 is a go-getter, and I have several ducats to wager that California lands in the first four places in the civilian ranks.

* * *

A cable has just been received from Walter Winans, the famous rifle and pistol shot, that he will be glad to represent the United States at the shoot of the British Small-Bore Team on the Cleesthorpe range the early part of August, and accepts the appointment offered him.

* * *

Lieutenant Colonel Whelen, to his disappointment, can not get away from Washington during the matches, except one day or so a week, and has therefore regretfully resigned the position of team captain to which he was appointed, leading the American Small-Bore Team to fire against England. Colonel Whelen designated Capt. E. C. Crossman as his successor, in which General Phillips and Colonel Harllee concur, but Colonel Whelen will take the job of team coach, and endeavor to shoot on the team when the fuss comes off, about August 20.

* * *

Major W. Dulty Smith, of the Marines, has changed his mind as to the National Match course being a snap of the lead-pipe variety. He writes to Colonel Harllee, concerning the Marine Corps team at Wakefield:

"We are plugging along and working hard. When I first read the National Match course I must confess I thought it was rather easy, with the exception of the 20 shots at 1,000 yards; but having shouldered a rifle and gone to it day after day, I have changed my mind. I think you have doped out the ideal course. It starts off at 200, begins to take the bumps at 500, and you get the final punch at 1,000 yards. This seems to size up the situation."

If a hard-boiled Marine of years of experience at National Matches decides thusly, then the match course is *not* a cinch.

* * *

On the other hand—but possibly not in disagreement with the general findings of Major Smith—Commander Osborn, of the Navy team, says that his plotting of the work of the team demonstrated absolutely that the match is a thousand-yard match. That is, the final total of the man firing corresponds almost exactly to the 1,000-yard total—low 1,000, low total; high 1,000, high total—and it follows the variation within a point or so. Inasmuch as there are 200 points possible before reaching the 1,000, Osburn argues that nearly all men shoot close together at the two preliminary

ranges, and the match will absolutely not be more than started when the 1,000-yard range is reached. The plotted curves of his team bear this out.

* * *

At the present writing it has rained cats and dogs for about one week on the Caldwell range, and she's fairly afloat. It is the most serious handicap that has threatened, as there is much work to be done, and it is pretty tough to have old Jup. Pluv. go to piling ties on the track when the King has so much trouble keeping off those of human origin. Only the person who has watched the work can appreciate the wonderful effort the range has cost its great crew of Blue Jackets and Marines. The past two weeks have seen an effort and a result in range building that would take two months under ordinary conditions, and you can salaam to those salt-water boys who have worked so hard to make the 1919 shoot possible, and to the mainspring behind it all, Colonel Harllee. The 200-yard range is finished, and has the targets in. A month ago it was a clearing through a jungle, with some logs laid in the water. The great 100-target midrange butt is finished to within the last 150 feet, when the rain stopped the work, and the targets kept up on the inside with the steam shovel throwing dirt on the outside. It is ready for firing as far as the dirt extends along its great yellow length. The thousand-yard firing point is finished, and a steam shovel is starting on the 500. Riflemen must expect to see a very crude range, because it will be old only a matter of weeks when they arrive, and it was built in the face of huge difficulties, from a shortage of men promised to its builder to every other damnable thing that could pop up to take the soul out of any man with a yellow streak in him. This builder of this range—the builders, rather—haven't any.

As compensation for the crudities and rawness of this range are the facts that on it is installed the greatest war material show human eye ever rested upon, and it is but 20 miles from the great city instead of being just 20 miles from the jumping-off place, which accurately describes the Jacksonville and Perry ranges.

* * *

Commercial row is taking form. The Winchester building is a most pretentious affair, with broad porches for loafing, a repairman to take care of gun troubles, showers, chairs, a fine exhibit, and in general a most inviting aspect. The Savage building is up, Paddy O'Hare has his tent up, and Remington starts work next week.

* * *

Many queries have been received *re* the ladies and the accommodations for them.

First, there is no limit to their attendance during the day and the provisions made for their comfort—during the day. The National Catholic War Council has put up a splendid building of two stories, called the Visitors' House, for the accommodation of the ladies, and they can obtain their meals at this house, together with rest rooms, comfortable chairs, a big porch, and all. No lady need feel that she will not be entirely comfortable when she visits the range. However, there is *no provision* for the lady to live in the camp, and team members bringing their wives will have to obtain rooms at Caldwell, Essex Fells, Verona, Mountain View or other neighboring hamlet—which, by the way, in this case means an attractive and up-to-date suburb. Mr. F. P. Collins, Bloomfield Ave., Caldwell, N. J., has a printed list of all the available rooms in the vicinity, and the competitor can obtain the latest dope from him.

* * *

From Harry B. Smith, the Adjutant General of Indiana: "I believe in the shooting game, and will do everything I can to help it along." All of which is a confession of faith that might come gracefully from one or two chair-warmers who are occupying the Adjutant General job in certain States.

* * *

As a little light on the subject of what the other chap is doing, one service team last week averaged 269 per man over the match course.

* * *

A letter from Le Mans, France, to Ensign Norman T. Bolles, Assistant Adjutant, at Caldwell, gives some interesting dope on the handling of the great 200-target butt during the interallied competition.

They built a narrow-gauge road right up to the camp to transport supplies, ammunition, etc., this being no stunt to the chaps who used to string them along the front to move shells, etc. This road runs right up to the butts. They used a lieutenant in the pit for every two targets, a non-com to each target, and one poor private who did the pasting up.

The crews filing into the butts at the start each day picked up their targets and supplies, placed the targets in the carriers when they got to their numbers, and then sat down, as a sign that everything was ready. The butts commander then knew that everything was ready when he had a clear view from one end to the other. In rapid fire, they worked by bell signals, the target went up, and then the crew sat down. At the second preliminary bell, every man got up and took hold of the target, ready to pull it when the signal came.

N. B.—Ensign Bolles' correspondent says that the French cannot understand any nation having or needing prohibition. Chorus: the French have nothing on us.

* * *

Thirteen Marine majors got into Caldwell range at 3 G. M. the other night in a driving rain. The range is shy of officers, having not quite enough to man either the 50- or the 100-yard butt as markers. At the present rate, you'll have to be careful who you "cuss out" for putting a spotter in the four ring and turning the white disc. He may be a brigadier general or something.

* * *

Rock Island sent down 3,000 picked rifles the other day for National Match use.

* * *

Society Note.—Major De Carre is so rushed by his official duties that he hasn't left camp for several days.

* * *

They turned over another truck from the Navy range the other day. Since the Army drivers were discharged the salt-water contingent have taken over the transport—and they are some drivers. Most of them are experienced—they drove a car yesterday, and what could be fairer than that? Apparently they think a car is like a steamboat; as soon as you're out of port, you open up the throttle full extent, then get a paper and sit down and read in peace. I for one have permanent porcupining of the hair since I rode down a nice, steep, slippery hill at 35 per with a couple of wild-eyed Marines who didn't know that the restless attempt of the back end of the car to travel up along with the front end was anything out of the ordinary. A sergeant offered protest the other night over the high speed of a truck on which he was riding, and the sea-going person driving told him he could get out and walk if he didn't like it. A couple of hundred yards farther on he did get out—so did all the rest of them—and they are discussing how it happened, up in the sick-bay.

Lt. Col. "Billy" B. Martin, one of the landmarks of the rifle-shooting game in New Jersey, now getting a bit silvered under his hat, is to bring up an additional rifle team from New Jersey, to be called the New Jersey Associated Rifle Clubs Team. This is an additional team to those sent from the State by authority of the A. G. O., but if its members shoot up to the standard of its great team captain, it will be "the team" from Jersey.

* * *

Here is the Navy Rifle Team's "respectable line," which indicates the scores that are satisfactory to its team captain, Cy Osborn, who came over in the *Mayflower*:

200 kneeling	48
200 sitting	49
500 prone	48
500 kneeling-sitting	45
1,000 prone	92

P. S.—Lest this worry you, note that there are several scores on the Navy dope sheet that are below these figures.

(*Continued on page* 355)

1919 AMMUNITION TESTS

(*Continued from page* 346)

the eye, as regards the dimensions of the rifle—and the eye hadn't been tested for strabismus. The clamps turned out to be too narrow in the beam, and so every rifle of the picked lot had to be cut down a bit about the forward stock screw under the receiver, and the stocks of course defaced, to get the rifles into the machine rest.

The picked arms from Rock Island and Springfield had polished bolts, somewhat adjusted trigger pulls, and usually good barrels. Rock Island didn't have a star gauge when I was at the arsenal in March, nor did they send down any star-gauge cards, but maybe they've accumulated one, and merely forgot to put in the cards. A wail from one of the service teams on the same grounds indicates either that the star-gauge is missing, or else they again forgot to put in the cards.

Both sorts of rifles had the new bent bolt handle, in which Colonel Hatcher, one of the few real small arms experts in the grand and great Ordnance Department, had a considerable hand. The handle is not bent back so much as that of the Model 1917, but it is bent back enough to put the bolt knob at least a half inch nearer to the butt plate, making the bolt easier to operate, and leaving the hand nearer the trigger. The Rock Island version was much the handsomer and more workman-like of the two, the lever being bent back, then the knob extending straight down, while the Springfield handle looked as if it had been bent backward by the blow of a sledge, and time does not rid the beholder of the impression that the bolt had been in an accident. The Rock Island also handles better in operating the bolt rapidly.

On the other hand Springfield nicely milled the runways in the receiver for the bolt, polishing the surface, and leaving a smooth, glistening path for the bolt, which Rock Island overlooked. Also the details of the Springfield rifles were better attended to, the front sights not loose, the stocking correct, the rear sights usually correctedly adjusted so they were free to move under the thrust of the spring and so take up lost motion. Some of the lack of attention to this detail on the Rock Island rifles was unpardonable, the sight jamming so firmly that it could not be moved with the wind-gauge screw, and sticking where it happened to be, when pushed over with the fingers. Riflemen know full well what happens with such a sight. I would suggest that the next time an arsenal doing this sort of careless work, takes on the job of making "selected rifles for the National Matches," it hire just one rifleman who knows something about rifle shooting, to inspect for such errors.

However, this is but a detail, and the rifleman can correct it by judicious use of an oil stone to free the sight sufficiently to let it follow the thrust of the spring coiled about the wind-gauge screw. In the matter of accuracy, as the figures will show, there was nothing whatever to choose.

At the end of the test I purchased what I considered the best rifle of the lot—and it is a Rock Island, with a record of a maximum group of all shot, of 30 inches, which is the average of all the firing done at 1,000 with all rifles, and with a minimum group of 13.20

inches, the record group of all the firing at 1,000 yards.

So with a Rock Island rifle in one rest, and a Springfield in the other, Messrs. Johnson and Schnable proceeded to cut loose a couple of whizzing bullets of the famous "Pride of Frankford" brand, on their way for the far-off tiny white squares down in the eye of the sun. It was a bully morning, with just enough breeze to keep things cool, bright, and clear, with the Sea Girt weather making up for the many times it had soaked the show in years gone by.

Presently they were sighted in, record targets were run up, and the Jess Willard sized lieutenant colonel with the brown moustache and the "four eyes" gave the command to commence firing.

Both strings went down in less than ten seconds, and this gait was adhered to in most of the firing. The first clip was put into the magazine, fired as rapidly as the bolt could be worked, the second clip loaded, and sent after the first. As it takes 1.86 seconds for the bullet to make the trip to 1,000, two bullets were in the air at once from the same gun. This high speed of fire is a relic of the days when nothing counted but mean radius, and when a vagrant zephyr or a sudden calm in the middle of a string, lost a machine rest test. No longer is it necessary or advisable with only the verticals counting.

A second string from each rifle went down the range. Then came back the news from the pit. Mean radius of the Springfield, two groups, estimated 12 and 11 inches, Rock Island 12.5, and 11. Evidently the rifles hadn't found themselves as this was larger than it should have been, and not within the 36-inch black.

Most of the day the rifles in the two rests chattered out their stunts of ten-shot strings, with occasional pauses to pour water through them. They were, of course, continually changed for new rifles to ascertain which lot showed up the best of the two arsenals.

Thursday found the test boiled down to the 5 best rifles of each make, and the ammunition test started.

As per the report of the Board, there was not enough difference found in the two makes of service rifle to justify any choice from the standpoint of accuracy. Accurate star-gauging of the picked rifles would have been interesting, as Frankford insisted that no good accuracy can be obtained from a rifle which is the least oval bore—that is measuring, for instance, .308 across one side, and .3082 or .3083 across the other side, and they based their selection of their own picked rifles on this belief. The star gauge cards sent out with rifles do not give this measurement, but merely the land and groove diameter across one way—for instance we might say across the horizontal diameter of a barrel laid on the bench in front of one, but not across the vertical diameter. And of course, a star-gauge card reading the same for every inch is merely a well-known joke; rifles do not run this way.

The final summing up of the two makes of rifles follows:

Springfield

	200	600	1,000
Mean radius	1.74	5.07	9.70
Mean vertical	1.10	3.39	6.88
Extreme vertical ...	4.78	14.60	28.73
Vertical error	2.94	8.99	17.80
Group measure	5.65	16.64	30.08

Rock Island

	200	600	1,000
Mean radius	1.54	5.31	9.80
Mean vertical	.98	3.43	7.10
Extreme vertical ...	4.06	14.20	27.69
Vertical error	2.52	8.32	17.39
Group measure	5.08	17.13	30.64

The terms used are probably clear to the reader, but I might repeat the meaning to make sure. The mean vertical is the average variation of the shots of the 10-shot groups in a vertical direction—not with any horizontal business considered. The vertical error is the combination of the extreme vertical and the mean vertical. The extreme vertical is the distance between high and lot shot of the group. The group size is the distance between the two wide shots.

I reprint from the Board report the figures on the 1,000 yard firing, using 5 picked rifles of each make.

Here are a few lot numbers and the groups they made at 1,000 yards. The figures are the mean of five groups of 10 shots each.

Lot No.	*Mean Radius*	*Group Size*
512	10.12	29.06
511	10.52	33.17
554	8.48	24.96
555	8.23	24.92
507	7.18	24.48

The following are the first ten groups in the report, each figure being for the one group, not the mean of five:

Rifle No.	*Lot No.*	*Mean Radius*	*Group Size*
RI 386543	512	11.77	29.80
		10.78	34.70
		11.21	29.70
		10 61	30.00
		6.26	21.10
Sp. 1094311	511	8.66	24.05
		11.02	33.13
		9.70	29.00
		10 91	42.00
		12.29	37.70

The detailed figures speak for themselves, but it might be well to note that the smallest group at 1,000 measured 13.20 inches, largest—that kept on the paper—measured 48 inches, while in the series of 100 strings of 10 shots each at 1,000 yards, three groups showed but eight or nine shots on the paper. In one case this was due to the group being placed too near the edge of the paper. In the 100 strings of 10 shots, there were 48 groups that were larger than 30 inches—the 1,000 yard bull's-eye being 36 inches, you'll remember—and therefore nearly half going larger than 30 inches. Also there were 21 groups that were larger than the bull's-eye at 1,000 yards, or 21 per cent of those fired.

Mean radius, you note, is a nice neat way of talking groups, but when one desires to converse in plain English, group size is much more elucidating.

The average of all the strings or groups fired at 1,000 was 30.32, extreme vertical deviation 28.21 inches.

The answer is that the rifleman must take nearly as much care to hold elevation at this range, as to judge wind, because while the ammunition is not using up much of the bull sideways, it is using up most of it vertically.

The actual ammunition issued at Caldwell won't be quite so large in its grouping as these results indicate, because the poorer lots will be issued for rapid fire stages alone.

Ideal weather conditions also held during the 600-yard firing. Here once more the ammunition demonstrated that it wanted most of the bull in which to play. Largest group in the 50 strings, 26 inches, smallest 10 inches, average 16.89, or in other words, about 17 inches, or with a margin of 1½ inches between centrally placed group and the 20-inch black.

Here are the first 10 targets—groups, fired at 600-yard range:

Rifle No.	*Lot No.*	*Mean Radius*	*Group*
374653 RI	507	6.07	22.50
		5.03	18.70
		4.83	18.95
		5.12	15.70
		5.65	21.90
1094418 Spr	554	5.48	16.30
		6.05	17.65
		4 72	12.40
		5.25	21.30
		4.97	18.55

FINAL RESULTS

50 *Strings of* 10 *Shots, 600 Yards*

Mean radius	average	5.19 inches
Mean vertical ...	"	3.41 "
Extreme vertical	"	14.40 "
Vertical error ...	"	8.90 "
Group measure ..	"	16.89 "

A few strings were shot at 200 yards to afford a basis of comparison between group size and the 8-inch black we use.

Largest group of the 20 strings shot, 6.80 inches; smallest, 3.30 inches; average, 5.37 inches.

Now that the cold figures are down, and the comparison between groups and size of bull, plain before us, let no man make the mistake of thinking this poor

ammunition. It is not, it is good ammunition, and the Frankford gentlemen, while a bit disappointed in what they hoped it would show, can be proud of returning to such efficiency after the rush of war production and upset of the old methods.

The prize winning stuff in 1913 gave 8.70 inches, this year gives 9.65 inches. The difference is not worth considering.

But, while this is true of quantity production 150 gr. stuff, it is also true that match 180 gr. stuff, built in small lots gives but 6.15″ at 1,000 yards. The answer is therefore—180 gr. special stuff at 1,000, if one desires to have an even break.

Without doubt there is much room for improvement in the 150 gr. service cartridge, when it uses up 30 inches out of the 36-inch bull. It is to bring this home to the riflemen of the country that the misleading mean radius figures have been pushed aside and group size used instead.

The misleading impression gained by mean radius, for instance, is shown by two typical comparisons. A group measuring 48.65 inches, showed a mean radius of but 12.80 inches. Another group measuring but 38.70 showed a mean radius of 13.63 inches.

The report of the Board was written by that clear-thinking and long-headed officer, Lieut. Col. Townsend Whelen, and it contains various recommendations that ought to be of interest to the rifleman. It is hoped that the report in full will be printed in pamphlet form, with all the figures, and if so, no person interested in the shooting game ought to fail to add a copy to his library. The Board was a typical gun-crank board, looking at the matter from that angle alone, and the report will probably change machine rest test procedure and methods of proclaiming the results to the shooting world at large.

Possibly the board for 1920 will test out boat-shape bullets of 180-grain weight. The days of the 150-grain service bullet are numbered.

TNT

(*Continued from page* 347)

occurred in considerable numbers in the factories operated under war conditions, appear to have resulted from neglecting to observe all the foregoing rules.

This poisoning is usually first evidenced by the appearance of a rash on the hands, neck or face. When this occurs, the case should receive prompt medical attention, and it would be desirable to transfer the person to other work. In this way, a worker who is easily susceptible to TNT poisoning will not be exposed to further danger. In factories where the opportunities for TNT poisoning are great, the effects are not usually evidenced until after five weeks of work.

TNT should be charged into bore holes primed, tamped and stemmed in the manner customarily followed in the use of high explosives in blasting, special care being taken in charging wet holes, not to tear or break the cartridge case or wrapper, while loading it into the hole and tamping it. It may be used in chambering holes, for subsequent charging with black blasting powder, just as dynamite is used. When TNT shots are fired, if the detonation is complete, there will be

produced large volumes of dense black smoke.

The practical value of TNT, Grade III, for general blasting purposes has been demonstrated by a number of field tests, such as adobe shots on boulders and concrete piers, blasting out oak stumps, splitting oak logs and shooting under water. In all the tests described herein, the TNT was loaded in extemporized wrappers, made from newspapers, and detonated by a No. 8 electric detonator. A brief description of these tests made at the Explosives Experiment Station by A. B. Coates, J. E. Tiffany and W. J. Montgomery are as follows:

Test No. 1. Adobe—A 1½ pound charge of Grade III TNT was mudcapped with wet clay and fired on a sandstone boulder, six feet long, three feet wide, and one and one-half feet thick. The largest piece obtained was two feet by two feet by one foot. 40 per cent of the boulder was broken into fragments two inches or less.

Test No. 2. Adobe—In removing two concrete piers ten feet long, 7 feet high, 1½ feet thick at top and 3½ feet thick at bottom, an opportunity was given to compare TNT directly with 40 per cent straight nitroglycerin dynamite. All shots fired were adobe shots mudcapped with moistened clay. In 6 blasts, using a total weight of 10.7 pounds of TNT, 159.5 cubic feet of concrete were removed, or 14.9 cubic feet per pound of TNT, while in 5 blasts, using a total weight of 9.6 pounds of 40 per cent straight nitroglycerin dynamite, 135 cubic feet were removed or 14.1 cubic feet per pound of 40 per cent dynamite.

Test No. 3. Stump Blasting—A solid oak stump 3 feet in diameter, rooted in clay, was removed by the use of six 1¼-pound charges of TNT, one charge being inserted under each lateral root and one under the tap root. The stump was broken into two about equal sized pieces which were thrown 35 and 65 feet respectively from their original position. A crater 12 feet in diameter and 4 feet deep was formed. This shot was evidently overloaded.

Test No. 4. Stump Blasting—An oak stump 3 feet in diameter rooted in clay and sandstone fragments was removed by the use of eight ¾-pound charges, 6 being placed under the lateral roots and 2 under the center. The stump was broken into 4 pieces, 2 large and 2 small. The large pieces were overturned at the edge of the crater.

In connection with this test, it is important to call attention to the fact that the charges were loaded in wet holes for a period of 1½ hours.

Test No. 5. Stump Blasting—An oak stump 18 inches in diameter, rooted in clay was removed by a single 2 pound charge of Grade III TNT placed under the center of the stump. The stump was broken into two pieces and overturned at the edge of the crater.

Test No. 6. Stump Blasting—A solid oak stump 3 feet in diameter, rooted in clay was removed by four 1¾-pound charges placed under the lateral roots. The stump was split into 3 large pieces which were lifted about 10 feet in the air and fell back into the crater.

Test No. 7. Log Splitting—A solid oak log 6 feet long, and 39 inches diameter was split into two separate pieces of practically the same size by 4 ounces of Grade III TNT loaded in a 2-inch hole located midway between the ends and about 2 inches beyond the center of the log.

Test No. 8. Log Splitting—A solid oak log, 6 feet long and 44 inches diameter at one end and 40 inches at the other, was split into two separate pieces of the same size by 5 ounces of Grade III TNT loaded as in Test 7.

Test No. 9. Wet Boreholes—As the ability to use an explosive under water in very wet boreholes is of great importance, the following test was carried out.

A borehole 1½-inches in diameter and 42 inches in depth was drilled vertically in the floor of a coal mine, through coal, limestone and fireclay. The top of the borehole was 4 inches under water. As the maximum effect was sought, the borehole was overloaded with 2 pounds of grade III TNT, the explosive being pressed in sufficiently hard to break up the cartridges. No tamping was used. After a wait of 15 minutes, the charge was fired. A crater 4 feet in diameter and 42 inches deep was formed and considerable other material about the crater was so loosened as to be easily removed by a pick.

Conclusions: 1. Grade III TNT can be successfully used for adobe shots of boulders, for removing stumps, and for splitting logs.

2. Grade III TNT has shown itself to give results the equal of 40 per cent straight nitroglycerin dynamite.

3. Grade III TNT detonates completely with a No. 8 electric detonator.

4. The evidences of black smoke is not to be taken as an incomplete detonation.

5. Grade III TNT detonates completely under water.

6. Grade III TNT detonates completely after moderate immersion in wet holes.

Since some blasting must be done in damp or very wet holes, it is desirable to know the water resisting properties of the different grades of TNT when compared with such well-known commercial explosives as 40 per cent "straight" nitroglycerin dynamite and 40 per cent strength ammonia dynamite. One and one-fourth by 8-inch cartridges of Grade I, Grade II and Grade III TNT and the two dynamites were submerged in thoroughly wet sand in pans at room temperature for definite periods of time and attempt made to detonate each cartridge when confined in sand in a borehole. No. 6 electric detonators were used with the TNT and the dynamites. If complete detonation occurred in each of three trials, the explosive was considered as having sufficiently resisted the water.

The dynamites were tested as received and also after the wrapper was punctured with 16 small holes to simulate a broken cartridge. The ammonia dynamite had the appearance of being redipped by immersion in paraffin while it appeared that the "straight" dynamite had the machine crimped end (the one last closed) sprayed with paraffin. Each grade of TNT was tested in three types of cartridges—newspaper, paraffined paper with one end redipped, and paraffined paper with both ends redipped. The TNT cartridges were tested with and without the puncturing and packed both hard and easy into the cartridges. The tests were made at the Explosives Experiment Station of the bureau.

When both ends of cartridges of all grades of TNT are redipped and not punctured, they withstand water fully as well as the dynamites when tested as received. This shows the efficacy of this type of cartridge and is independent of the nature of the explosive within the cartridge.

Grade III TNT in cartridges resists water for 1 to 72 or more hours, the time depending upon the density at which packed and the nature of the cartridge. In all cases with Grade III TNT, the cartridges which were packed easily withstood the water better than those which were packed hard. Grade III TNT has very much better water resisting properties than either of the other grades of TNT, and especially so, when packed easily and compare very favorably with the dynamites tested.

Of the three grades of TNT, the only one recommended for use in wet holes in cartridge form is the Grade III. The others may be used for wet work if packed in completely redipped paraffined cartridges, provided they can be charged without breaking.

Recent experiments at the Explosives Experiment Station of the Bureau have shown the minimum percentage of certain desensitizing materials, when thoroughly mixed, required to prevent detonation of (by No. 8 electric detonator or TNT booster) and the propagation of combustion through Grade I TNT as follows:

Material	To prevent detonation	To prevent continuous combustion
Water	14	2
Kieselguhr	16	52
Solium chloride	96	

LITTLE TALKS

(*Continued from page* 350)

Loud wails from the Marines up at Wakefield. Their 1,000-yard totals, it is reported, are fine as 15-shot scores, but not much for 20 shots.

* * *

Major General Charles T. Menoher has announced that the Aviation Corps will stage elaborate shows in the aviation meet to be held down at the Navy Rifle Range. At least six planes will be sent down, and the crowds of visitors and the shooters on the range will be shown the latest methods of aerial photography, machine-gun work from the air, synchronizing the guns to shoot between the propeller blades, drop bombs, and other pleasant means of reducing the population of your political opponents.

The most wonderful sight in this sort of work is the small pursuit type of plane, such as the Spad, Nieuport, and others, really stunning. So fast and small are these little bugs that they make the heavy and slow De Haviland standard type of plane look like the elephant trying to tag a kitten. No slow and ponderous loops for these little planes; they turn summersaults and dive and swoop like a king bird after a crow. It is to be hoped that this sort of stunt will be a part of the regular show.

* * *

Maj. Harry N. Strider, Signal Corps, is assigned to the Caldwell range as assistant to the Signal Officer.

* * *

Second Lieuts. Clarence E. Crumrine and John C. Hall have been ordered from Florida to duty with the airplane detachment of the Army at Caldwell.

* * *

Arkansas is sending up strategic support for her Civilian Rifle Team in the form of a State National Guard Team as well. The idea is to put in the guard team to run the others off their feet, and then let the civilians go in and clean up the last quarter mile. Major Eugene B. Jett, of Little Rock, is the team captain.

* * *

Utah is another State to send on two teams, the National Guard Team having been just announced, with Major Fred Jorgenson, the Adjutant General of the State, being the team captain. All of which goes to prove that Emigration Canyon lets them out of the city as well as in. Persons of ribald disposition or warped senses of humor are hereby cautioned that there can be nothing new in the joke line as to number of wives sprung on a man from Utah, and attempts to put over new ones may result in a foot race.

* * *

Four aggregations of rifle pointers, the P. R. R. Keystone Rifle Club of Harrisburg, the Harrisburg Rifle Club, the Fort Pitt, and the Reading Club, are shooting it out in a four-way league to see who is make the State Civilian Rifle Team to go to the National Matches this year. This ought to add a soupcon more of the desirable commodity known as pep to such a contest. Mr. Cassius A. Dunn, of Harrisburg, Pa., is the team captain, while the coach is none other than Major Blaine Aiken, well known to all frequenters of the National Matches, captain of the Pan-American Individual Team in 1913, and an officer of the Pennsylvania Guard Team in 1916. Of course, being prejudiced, our money is on a certain wonderful State out on the Pacific Coast, and just south of Oregon, to top all the civilians this year; but we may be prejudiced, as before mentioned.

* * *

West Virginia announces that a Civilian Rifle Team will be sent, team captain to be announced later.

CHART FOR CRUISING AROUND THE CALDWELL RIFLE RANGE

Transportation.—The Range is located 4 miles west of Caldwell and 4 miles southwest of Mountain View, N. J., about 14 miles from Park Place, Newark, and about 20 miles from the City Hall, New York City. It may be reached as follows:

Lackawanna Railway main line to Mountain View. Fare, round trip, $1.30; ten-trip ticket, $4.73. Best trains leaving Hoboken: 8:15 A. M. and 1:15 P. M. Time: 50 minutes, including ferry.

Erie Railroad (Greenwood Lake Division) to Caldwell, N. J. Fare, round-trip ticket, $1.47; ten-trip ticket, $5.01. At both Mountain View and Caldwell there is a permanent station, with ticket agent. Time to Caldwell: 65 minutes, including tubes or ferry.

The Jersey City terminus of the Erie is reached via two ferries, from New York, one starting from Chambers Street, and one from 23rd Street. Time: 15 minutes, also by the Hudson Tubes, 25 minutes from 32nd Street and 6th.

Hudson Tubes.—The Hudson Tubes give 24 hour service from Hudson Terminal, West Broadway and Cortland, to Park Place, Newark, running a ten minute scehdule from 6:40 A. M. to 8 P. M., and 15 minute service from 8 P. M. to midnight; otherwise one-half hour service balance of night. Fare one way, $.27; round trip $.33.

Hudson Tubes also connect by transfer at the Grove Street Station to uptown lines running under 6th Avenue up to 32nd Street.

Trolley Service.—From Newark to Caldwell. This railroad company is known as the Public Service Corporation. Schedule time from Newark to Caldwell is fifty minutes; from 6 A. M. to 10 P. M., service every 10 minutes; from 10 P. M. to midnight, 15 minute service. Fare from Newark to Caldwell is $.14. The Caldwell cars pass right by the Park Place Station, that is, the Newark terminal of the Hudson Tubes. Cars are marked "Bloomfield" on end and "Caldwell" on side window. Passengers arriving at Pennsylvania R. R., Market Street Station, should take a car marked "Newark," or "Iron Bound," and transfer at the trolley terminal to the Caldwell cars.

At both Mountain View and Caldwell there is a permanent station, with ticket agent.

The Rifle Range will operate a motor bus service from Caldwell and Mountain View to the Range, connecting with the railroad stations and trolley terminus.

There are excellent highways for automobiles.

Teams from the West should route via Erie to Caldwell, or via Lackawanna (D. L. & W.) to Mountain View.

Latest time tables at the Information Bureau, Caldwell Range.

SHOOTING NEWS AND COMMENT

"G. A. H." Altered

WITH only one handicap event, the Grand American, from which the tournament takes its name, a championship for boys, the 16- and 18-yard championships being decided on 200 targets, class shooting, and a team race between the best shots of the East and West, the Grand American Handicap Trapshooting tournament of 1919 will differ greatly from the tournaments of the past.

It is our firm conviction that the program will appeal to more trapshooters than ever before. That 1,000-entry mark still looks to be in the distance, but it would not be surprising to see the number of entrants in the Grand American in the neighborhood of 800. Any event that will attract that many contestants must have something fascinating about it.

This year's tournament will be held at the South Shore Country Club, Chicago, Ill., the same place it has been held the past two years. There isn't a better place to hold the shoot in the United States. In three years we have heard but one objection to holding the shoot at the South Shore Club, and that objection would hold against a number of clubs. This shooter didn't think the targets should be thrown over water. It was his opinion that the glare injured the scores. The shooting will begin August 11 and conclude August 15.

Trapshooting tournaments as a rule are featureless, but this one will not be if it is possible to make it otherwise. Thousands of persons come to the Grand American tournament who do not shoot, but who feel that they would like to after watching the hundreds of trapshots smash the clay targets. It will be possible for these people to try their skill this year. There will be two traps set aside for novices where, under capable instructors, the fundamentals of trapshooting will be taught. This is the right idea.

Wind Indicator Suggested

Editor, ARMS AND THE MAN:

I have always been interested in rifle practice, and while instructing the men it occurred to me that a signal board—for want of a better name—showing the direction which the wind was blowing from and its velocity not only from the shooting point, but, for say, each 100 yards between the shooting point and the target would be a great advantage.

To explain further. Assuming that all ranges are in use to and including 1,000 yards, at the 200, 300, 500, 600, 800 and 1,000-yard position, I could install an indicator board, electrically operated, which would show what direction the wind was blowing from and its velocity, at all of the rifle ranges.

Assuming that the firing was from 1,000 yards, the indicator board would show the direction and velocity at 200, 300, 500, 600 and 800, and would change as the change takes place at the different stations.

If it was wanted to show the direction or velocity at the 300-yard point of the wind at 200, 100, and at the target, it could as easily be done. Further, if it was wanted to show the direction and velocity at 100-yard intervals up to the 1,000-yard mark, it would simply mean establishing recording stations —ten of them—and the indicator board at a thousand yards would indicate for the 10 stations. As I stated before, the changes of direction and velocity will show on the indicator board the instant they occur at the station at which the change takes place.

The necessary instruments to install would be rather simple. Small anemometers and ordinary wind-vanes which, as they move, will record at other stations by a rheostat principle. Storage batteries would furnish sufficient operating current if 110 voltage was not at hand, but the probability is that 110 voltage will be available at almost any target range in this country.

The cost of equipment and installation would probably be in the neighborhood of $2,000 if 10 recording stations would be wanted. This is approximate only, for naturally I have not gone into the matter deeply from the cost standpoint.

J. F. BERGESCH,
1st Lieut. Engrs., U. S. A.
Fort Douglas, Utah.

Wants to Arrange Matches

Editor, ARMS AND THE MAN:

We should like to secure several matches in the course of the next month or two, but letters sent out to the surrounding clubs have brought no responses. The territory from which the match is secured is no object to us, as we should like to conduct the match by mail. Will you kindly publish a notice to that effect in one or two issues of your paper? Of course we do not want to go up against anything too stiff just yet, as our club is just getting into trim. Our range has firing lines up to 500 yards at the present time.

Thanking you in advance for this courtesy, I remain,

Sincerely yours,
E. L. A. BRUGER, *President,*
Ladysmith, Wis., Rifle Club.

California Clubs in League

The Southern California Rifle League has been formed, taking in clubs from San Diego to Santa Barbara. W. D. Murphy, Los Angeles, is president, and F. W. Moore, vice-president. The first shoot resulted in a victory for Los Angeles on a score of 844 (6 man); San Diego, 628 (without promised handicap.) Redlands also ran. High man Thomson, of the Los Angeles club, 145 (200 R. F.—500—600 slow.) High among the San Diego shots were Hall and Webster (Sergt. of artillery) 140, Schroeder 137, Bellon 139.

W. R. JACKSON.

Fort Pitt Wins Second Match

The second match of the Pennsylvania League was shot during the last two weeks in June. Fort Pitt easily won this match.

Each club increased their teams' scores by an average of about 10 points over those of the first match.

A peculiar thing about the second match was that each team practically reversed itself, as the team leaders in the first match nearly all shot their way onto the wrong end of the team and the tail enders took advantage of this to win a place in the hall of fame.

P. H. Dillman was the star of the shoot by scoring 145, having a possible at 200 yards rapid-fire and a total of 95 on the slow fire. Dr. Waugaman of Fort Pitt also scored a possible at 200.

Dillman led for Fort Pitt with 145, Unger for Harrisburg with 137, Essick for Reading with 136, and Espenshade for P. R. R.-Keystone with 135.

The scores based on a course of fire calling for 10 shots each range, 200 yards rapid fire, 300 yards slow fire and 500 yards slow fire, are:

Fort Pitt Rifle Club

Name	Total
P. H. Dillman	145
Dr. E. A. Waugaman	141
F. B. Fisher	141
J. O. Rolshouse	138
Granvill Teter	137
Dr. D. A. Atkinson	135
	837

Harrisburg Rifle Club

Name	Total
F. F. Unger	137
J. R. Mattern	135
S. T. Durborow	131
F. A. Godcharles	128
C. S. Landis	127
G. W. Thompson	126
	784

P. R. R.-Keystone Rifle Club

Name	Total
L. R. Espenshade	135
C. H. Obreiter	134
H. H. Appleton	131
N. N. Greiner	128
B. F. Dickinson	127
H. S. Flowers	127
	782

University Rifle Club of Reading

Name	Total
C. R. Essick	136
W. Miller	135
H. Eck	130
H. H. Barr	129
S. Rapp	122
R. Tyack	118
	770

C. S. LANDIS.

What Competition Means

In the revised trapshooting rules the word "competition" appears in a number of places, and there has been some question as to the proper interpretation of the word—whether it referred to a single event, one day of a tournament lasting several days, or the entire program, no matter what its length.

An illustration of this may be found in Rule 10, Section 2, of the new rules. This reads: "A protest concerning a score or scores must be made before or immediately after the close of the competition to which it or they relate."

In order that there might be no misunderstanding as to the interpretation of the word, Edward Banks, of Wilmington, Del., chairman of the Rules Revision Committee, announces this definition:

"Wheresoever the word "competition" may be used in these rules, said word is to be understood to refer to either a single event on a program, to an entire one day's program, or to the program for any one tournament, and must at all times be so construed by the management to whose charge the carrying out of such 'competition' has been entrusted."

WANTS AND FOR SALE

Each subscriber of ARMS AND THE MAN is entitled when his subscription is paid up for one year, to one free insertion of a half-inch want ad in this column.

All he needs to do is to send in the advertisement for insertion at the same time calling attention to the date when his subscription was paid.

PERFECTION SCORE BOOK

By

Colonel Morton C. Mumma, U. S. Cavalry

Specially designed for Model 1903 Rifle and for the National Match course of 1919, but also meets the requirements of any course at any range. 112 pages of plotting sheets, each page for twenty shots; all short range, mid range and rapid fire pages contain two plotting targets. Valuable information contained in other pages.

Price 50 cents, postpaid on receipt of price. 10 per cent discount on dozen lots. 15 per cent off in lots of 100.

Address Colonel Morton C. Mumma,
Iowa City, Iowa

FIREARMS AND ANTIQUES—Buy, sell, exchange old time and modern firearms. Antiques wanted. Stephen Van Rensselaer, 805 Madison Ave., New York City.

FOR SALE—Several brand new Smith and Wesson revolvers, caliber .45, price, $25.00 each. Send cash or money order. M. M. Krakowka, P. O. Box 301, Great Bend, N. Y.

FOR SALE—Winchester S. S. .22 caliber musket, chambered for long rifle cartridge, Lyman disk rear, Winchester aperture windgage front, with military leather sling, barrel perfect inside, excellent condition outside, $16.00. Floyd D. Palmer, Earlville, N. Y.

FOR SALE—.44-40 Colt Bisley 7½-inch, factory shape, $20.00; .22 Savage 1911 repeater, barrel new, stock fine, $10.00. C. H. Goddard, 1860 Columbia Road, Washington, D. C.

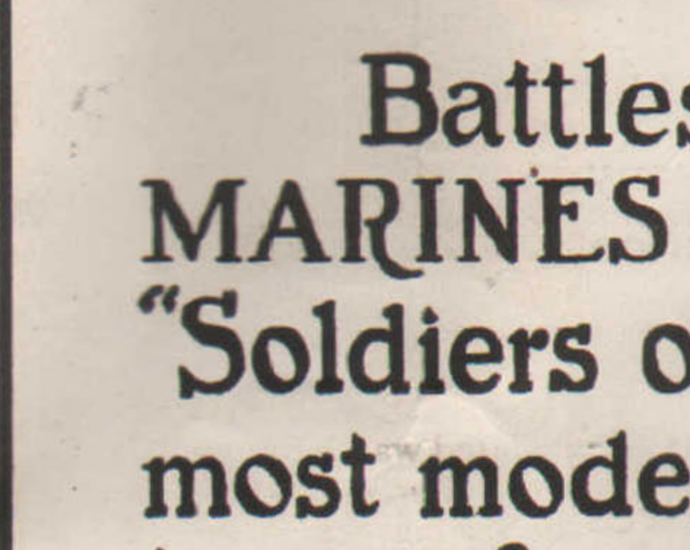
WANTED—Springfield .30/06, good condition; Winchester M/95 for .30/06 solid frame; and .44 S. & W. Special Military Model Revolver. T. C. Barrier, Box 52, Statesville, N. C.

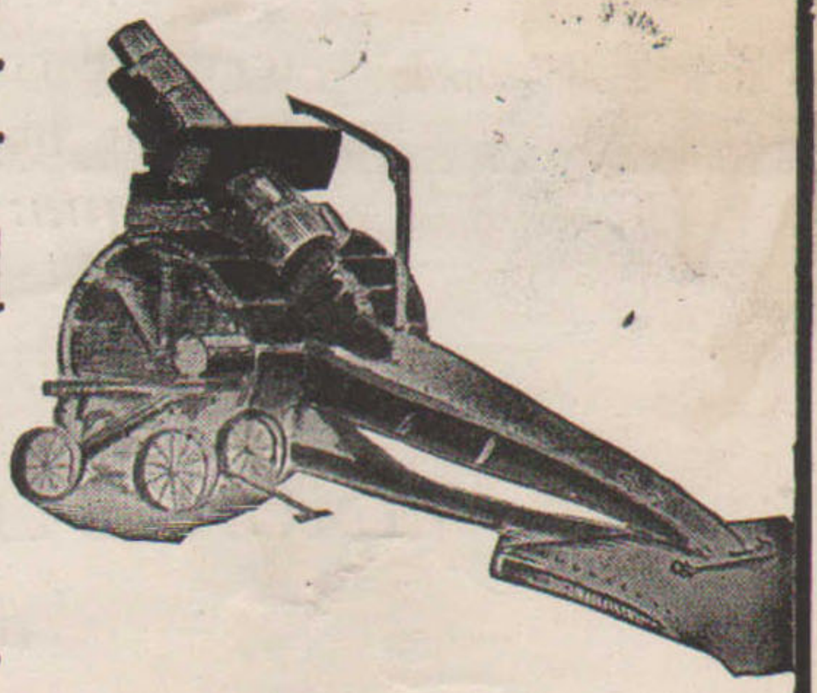
U.S. MARINES

"READY TO GET OFF THE BOATS SHOOTING"

(Major General Barnett before House Committee)

Battleships cover the landing of MARINES from their transports – These "Soldiers of the Navy" employ ashore the most modern and approved type of ordnance – – heavy howitzers, field artillery, Lewis Machine guns and small arms.





CRACK SHOTS – – – EVERY ONE!

U.S. MARINE RECRUITING STATIONS – ALL LARGE CITIES.

WRITE FOR BOOKLET

PW

TO ALL THOSE WHO ATTEND THE RIFLE MATCHES IN CALDWELL

An Invitation

THOSE who attend the Caldwell, N. J. shooting tournament are cordially invited to make ***Winchester Headquarters*** their headquarters.

Winchester Headquarters will be a delightful place to visit. It is comfortably equipped with lounging rooms, showers, correspondence facilities, pleasant verandas and everything conducive to the convenience and comfort of its guests.

Experienced men will be present during the shoot to assist in rifle repairs and to give any advice and suggestions on guns, ammunition and shooting that may be desired.

All service is absolutely free and all who attend are cordially invited to make themselves fully at home at any time at ***Winchester Headquarters.***

WINCHESTER REPEATING ARMS CO.

DEPT. 1566. NEW HAVEN,

CONNECTICUT, U. S. A.

CAPITAL PUBLISHERS, INC., WASHINGTON, D. C.