ANNUAL REPORT OF THE CHIEF OF ORDNANCE, 1907

APPENDIX

# REPORT OF BOARD ON TESTS OF REVOLVERS AND AUTOMATIC PISTOLS

NINE PLATES

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

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Published as reference material 1969
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# APPENDIX.

## *REPORT OF BOARD ON TESTS OF REVOLVERS AND AUTOMATIC PISTOLS.*

(9 plates.)

SPRINGFIELD ARMORY,
*Springfield, Mass., March 28, 1907.*

Proceedings of board of officers convened by the following order:

SPECIAL ORDERS, No. 305.

WAR DEPARTMENT,
*Washington, December 28, 1906.*

[Extract.]

* * * * * * *

12. A board of officers, to consist of—
Col. Philip Reade, Twenty-third Infantry,
Maj. Joseph T. Dickman, Thirteenth Cavalry,
Capt. Guy H. Preston, Thirteenth Cavalry,
Capt. Ernest D. Scott, Artillery Corps,
Capt. John H. Rice, Ordnance Department,
is appointed to meet at 10 o'clock a. m., Tuesday, January 15, 1907, or as soon thereafter as practicable, at Springfield Armory, Springfield, Mass., for the purpose of testing such revolvers and automatic pistols as may be referred to the board by the Chief of Ordnance.

Captain Rice will act as recorder of the board.

A programme of tests will be drawn up and the trial conducted and expedited in the most practical manner for the purpose of ascertaining a design of automatic pistol or revolver best adapted to fulfill the requirements of the military service.

The board will report as to whether, in its opinion, the design selected is a sufficient improvement upon the service caliber .38 revolver to justify its adoption.

Upon the completion of the programme the board will submit a report of the tests with recommendations to The Military Secretary of the Army, and upon the adjournment of the board the members thereof will return to their proper stations.

The travel directed is necessary in the military service.

By order of the Secretary of War:

THOMAS H. BARRY,
*Brigadier-General, Acting Chief of Staff.*

Official:
HENRY P. MCCAIN,
*Military Secretary.*

1. The board met pursuant to the foregoing order at 2.20 o'clock p. m., on January 15, 1907, all the members being present. Meetings were held twice daily, Sundays excepted, until January 26, when ad-

journment was taken in accordance with telegraphic authority from The Military Secretary, and the members of the board proceeded to their proper stations, pending instructions to reconvene.

2. The board reconvened at 9.30 a. m., March 20, 1907, in accordance with the following order:

SPECIAL ORDERS, No. 62. } WAR DEPARTMENT, *Washington, March 15, 1907.*

[Extract.]

* * * * * * *

23. Capt. William M. Cruikshank, Artillery Corps, is detailed as a member of the board of officers appointed by paragraph 12, Special Orders, No. 305, December 28, 1906, War Department, for the purpose of testing such revolvers and automatic pistols as may be referred to the board by the Chief of Ordnance, vice Capt. Ernest D. Scott, Artillery Corps, who is hereby relieved. The board, as now constituted, consisting of Col. Philip Reade, Twenty-third Infantry; Maj. Joseph T. Dickman, Thirteenth Cavalry; Capt. Guy H. Preston, Thirteenth Cavalry; Capt. William M. Cruikshank, Artillery Corps, and Capt. John H. Rice, Ordnance Department, will reassemble at the Springfield Armory, Springfield, Mass., at 10 o'clock a. m., March 19, 1907, or as soon thereafter as practicable, for the purpose of resuming the tests, and upon the adjournment of the board the members thereof will return to their proper stations. The travel directed is necessary in the military service.

* * * * * * *

By order of the Secretary of War:

J. FRANKLIN BELL,
*Major-General, Chief of Staff.*

Official:
HENRY P. MCCAIN, *Adjutant-General.*

All the members were present. Meetings were held twice daily thereafter, Sundays excepted, until March 28, 1907, when adjournment was taken in accordance with the above order.

3. The weapons referred to the board by the Chief of Ordnance, with their weights when empty, were as follows:

*Automatic pistols, caliber .45.*

[Weight, including magazine.]

| | Lbs. | oz. |
|---|---|---|
| The Colt | 2 | 2½ |
| The Luger | 2 | 8 |
| The Savage | 2 | 3 |
| The Knoble single action | 2 | 11½ |
| The Knoble double action | 2 | 10½ |
| The Bergmann | 2 | 3½ |
| The White-Merrill | 2 | 6½ |

*Double-action revolvers, caliber .45.*

[Weight.]

| | | |
|---|---|---|
| The Colt | 2 | 7 |
| The Smith & Wesson | 2 | 6 |

*Automatic revolver, caliber .45.*

| | | |
|---|---|---|
| The Webley-Fosbery | 2 | 10 |

Ten rounds of ammunition weighs for the pistols 0.483 pound, and for the revolver 0.5 pound.

4. Programmes of test were adopted, copies of which are inclosed. These programmes were departed from in certain minor particulars, which may be noted in the reports of tests, also inclosed herewith.



5. The following specifications for automatic pistols for mounted service embody the views of the board:

(1) Caliber not less than .45.
(2) The magazine to hold not less than 6 cartridges.
(3) Weight of bullet not less than 230 grains.
(4) Initial velocity not less than 800 feet per second.
(5) Trigger pull, measured at center of contact of finger with trigger, not less than 6 pounds.
(6) A simple and durable mechanism with as few parts as possible, capable of being readily dismounted and assembled, using as few tools as practicable. The number of springs, screws, and pins should be reduced to a minimum, particularly in the case of flat springs.
(7) As compact mechanism as possible and a shape adapted to carrying in a holster.
(8) Adapted for use as a short-range weapon, not as a carbine.
(9) The breech to be closed and locked before the firing pin can reach the primer.
(10) An automatic safety, such that the arm may be carried cocked and with a cartridge in the bore without danger and be ready for the first shot without any other action than pulling the trigger.
(11) Vertical in preference to side ejection of cartridge case.
(12) Reasonable certainty of action in automatic loading and ejection.
(13) Comparatively easy action in ejecting by hand in case of misfire or jam.
(14) Automatic indication that the arm is loaded.
(15) Automatic indication that the last cartridge has been fired from the arm.
(16) Good balance and a shape of grip adapted to the hand.
(17) A form of magazine catch that can easily be operated by the pistol hand and which allows the magazine to drop out.

The following features are desirable:

(1) No special tools for dismounting or assembling.
(2) Such design and relation of parts that each may be readily replaced if required. Parts riveted together or permanently joined are objectionable.
(3) Loading by box magazine, and not by clip.
(4) An automatic indication of the number of cartridges in the magazine, the mechanism to be so arranged as to prevent the entrance of dust, etc.
(5) A position of the center of gravity as near as practicable to the axis of the bore.

The following features are preferable:

(1) A bolt securely locked to the barrel until the bullet has left the bore.
(2) A bolt in one piece rather than one with a separate head.
(3) A loading mechanism which will permit the use of nonjacketed bullets.

6. The requirements for revolvers are too well known to need insertion in this report.

7. The board does not recommend for the military service the Webley-Fosbery automatic revolver, the Knoble automatic pistols, the Bergmann automatic pistol, or the White-Merrill automatic pistol for the reasons stated in the reports of tests of those arms.

8. This leaves for further consideration the Luger, Colt, and Savage automatic pistols, and the Colt and Smith & Wesson revolvers.

9. In the opinion of the board, the advantages of automatic pistols are as follows:

(1) Reduced shock of recoil, increasing accuracy and reducing tendency to flinch.

(2) Facility of recharging, especially in cold weather or when mounted.

(3) Greater number of rounds in magazine than is carried in any revolver cylinder.

(4) Great rapidity of fire.

(5) Trigger has but one function—that of releasing striker.

(6) Relatively short total length, increasing ease of carrying and drawing.

(7) Superior accuracy and ballistic qualities.

(8) Reduced chance of misfire.

(9) Favorable location of center of gravity.

(10) Desirable balance and grip.

(11) Comparative ease of putting arm into action after severe rusting.

10. The principal disadvantages of automatic pistols are considered to be as follows:

(1) In case of misfire the use of two hands is necessary to deliver the next shot.

(2) Undemonstrated reliability of functioning under service conditions.

(3) Ammunition in good condition and manufactured with special care is required.

(4) Accuracy of construction and delicate adjustment of parts are required.

(5) Comparative unfamiliarity with the weapon on the part of those eligible for military service.

(6) Impracticability of firing blank cartridges for instruction and at maneuvers.

11. The principal advantages of double-action revolvers are, in the opinion of the board, as follows:

(1) In case of misfire but one hand is required to deliver the next shot.

(2) Demonstrated reliability in service.

(3) Practical certainty of firing contents of cylinder.

(4) Ammunition of wide divergence in characteristics, including blanks, may be used.

(5) Widespread familiarity with revolver on the part of those eligible for military service.

(6) Ease of cleaning.

12. The principal disadvantages of double-action revolvers are considered to be as follows:

(1) Extreme shock of recoil with large calibers, impairing accuracy and tending to produce flinching.

(2) Practical impossibility of reloading in combat, when mounted, in cold weather, or when wearing gloves.

(3) Difficulty of partial reloading.



(4) Double function of trigger, causing derangement of aim.

(5) Relatively great total length, causing difficulty in carrying and drawing.

(6) Inferior accuracy and ballistic qualities.

13. The advantages of the automatic pistol and the disadvantages of the double-action revolver, especially those enumerated under subheads 1, 2, and 3, in each case are deemed by the board of such importance that it desires to state its conviction that the principle of the automatic hand firearm should be adopted for the military service, and that the adoption of a specific arm should be contingent only upon the question of whether it is mechanically satisfactory in service.

14. The distinguishing characteristics of the Luger automatic pistol are as follows:

(1) The shape of the grip conforms to the anatomical features of the hand.

(2) The center of gravity is well to the rear. There are two points of support as the arm lies naturally in the hand.

(3) An automatic and a mechanical safety are provided.

(4) There is an automatic indication that the chamber is loaded, visible to the eye, and sensible to the touch.

(5) The empty magazine may be expelled with the pistol hand.

(6) The parts are easily accessible.

(7) The arm has vertical ejection.

(8) The final seating of the cartridge is mainly dependent upon remaining momentum and not upon spring action.

(9) The retraction of the breech mechanism by hand is difficult.

(10) The magazine holds seven cartridges.

15. The distinguishing characteristics of the Colt automatic pistol are as follows:

(1) No automatic safety is provided.

(2) The firing mechanism includes a flying firing pin and a hammer with notches and sear.

(3) There is no automatic indication that the chamber is loaded.

(4) Both hands are required to withdraw the magazine.

(5) Some of the parts are difficult to dismount and assemble.

(6) The arm has side ejection.

(7) The arm is noticeably flat, neat, compact, and portable.

(8) The total length is short compared with the length of the barrel.

(9) The retraction of the breech mechanism by hand is not difficult.

(10) The magazine holds seven cartridges.

16. The distinguishing characteristics of the Savage automatic pistol are as follows:

(1) The center of gravity is well to the rear. There are two points of support, as the arm lies naturally in the hand.

(2) A mechanical safety only is provided.

(3) There is no automatic indication that the chamber is loaded.

(4) The empty magazine may be expelled with the pistol hand.

(5) The parts are accessible.

(6) There are no pins, screws, or flat springs.

(7) There is great simplicity, with small number of parts.

(8) The arm has side ejection.

(9) The barrel is free to rotate within limits, and is locked to the breech mechanism by the friction due to the bullet taking the rifling.

(10) The retraction of the breech mechanism by hand is not difficult.

(11) The grip is noticeably thick and is provided with corrugated metal side plates.

(12) The cartridges are staggered in the magazine.

(13) The magazine holds eight cartridges.

17. The distinguishing characteristics of the Smith & Wesson double-action revolver are as follows:

(1) There is a sliding block safety device for holding the hammer on rebound.

(2) A front cylinder lock maintains the barrel and cylinder in alignment.

(3) The cylinder latch operates forward.

(4) The barrel is pinned to the frame to prevent rotation.

(5) The grip and trigger-guard are too small.

(6) The shoulder of the frame, against which the hand rests, is vertical and narrow.

(7) The cylinder may be revolved by manipulating the trigger and without cocking the hammer.

(8) The cylinder rotates to the left and swings out to the left.

(9) The barrel of the weapon tested was 6½ inches in length.

18. The distinguishing characteristics of the Colt double-action revolver are as follows:

(1) There is a positive safety device interposed under the hammer on rebound.

(2) The cylinder latch operates to the rear.

(3) The barrel is not pinned to the frame.

(4) The shoulder of the frame, against which the hand rests, is rounded and broad.

(5) The cylinder may be revolved by manipulating the trigger and without cocking the hammer.

(6) The cylinder rotates to the right and swings out to the left.

(7) The cylinder rod nut is apt to be lost.

(8) The barrel of the weapon tested was 5½ inches in length.

19. The following table gives the results of tests made, excluding the rust and dust tests. The term "malfunction" includes all failures due merely to the improper working of the mechanism, and excludes all failures due to jamming of cartridge or empty case.

| Weapon. | Number of shots. | Malfunctions. | Misfires. | Jams. | Ammunition. |
|---|---|---|---|---|---|
| Automatics: | | | | | |
| Luger | 225 | 8 | 4 | 17 | Frankford Arsenal. |
| Do | 746 | 4 | ..... | 14 | Luger. |
| Savage | 631 | 12 | 22 | 9 | Frankford Arsenal. |
| Do | 250 | [a] 6 | 2 | ..... | Commercial. |
| Colt | 604 | ..... | 1 | 24 | Frankford Arsenal. |
| Do | 300 | 2 | ..... | 3 | Commercial. |
| Revolvers: | | | | | |
| Colt | 1,056 | ..... | 18 | ..... | Frankford Arsenal. |
| Smith & Wesson | 1,136 | ..... | 6 | ..... | Do. |

[a] Failures to eject last cartridge case of series; corrected with one hand by spilling.



20. After the dust test, the three automatic pistols under consideration all operated with comparatively little difficulty. The contents of one magazine were fired from the Colt in 1 minute and 56 seconds when the magazine was loaded after the arm had been subjected to dust, and in 1 minute and 53 seconds when the arm was subjected to dust with a loaded magazine inserted. The corresponding times for the Savage automatic, under similar conditions, were 51⅗ seconds and 53 seconds, and for the Luger 2 minutes and 50 seconds, and 2 minutes and 32 seconds. The Luger did not operate as satisfactorily as the other two.

21. In the rust test, the contents of the magazine were fired from the Colt in 1 minute and 8 seconds; from the Savage in 2 minutes, and from the Luger in 3 minutes and 20 seconds. The first two mentioned operated successfully as self-loaders, while the Luger was operated by hand.

22. From a careful consideration of the characteristics of each weapon and of the tests made by the board, it is of the opinion that the Savage and the Colt automatic pistols possess sufficient merit to warrant their being given a further test under service conditions. With commercial ammunition especially adapted to the arm each has shown promising certainty of action. Among the most desirable features of the Savage pistol are its simplicity and small number of parts and their accessibility, the lack of screws or flat springs, the number of cartridges (eight) held by the magazine, the position of the center of gravity, the way the pistol lies in the hand, the expulsion of the magazine by the pistol hand, and the ease with which the breech mechanism may be retracted. Among the most desirable features of the Colt pistol are its flatness, compactness, neatness, and ease of carrying, the comparatively short total length, and the ease with which the breech mechanism may be retracted.

23. It is, however, desired to emphasize the view of the board that both these pistols should be changed in certain particulars for the military service, and that these changes should be required of the manufacturer before either is considered for final adoption. Both weapons are defective in having side ejection, no automatic indication that the chamber is loaded, and no automatic safety. The grip of the Savage should be made, if possible, more convenient for the hand, and the corrugated metal plates of the grip should be replaced by wooden plates securely fastened on. The retention of the mechanical safety in the locked position should be made more positive. The front sight should be moved slightly to the rear and should be more securely attached. The trigger stirrup of the Colt should be strengthened and its pin made longer. The hammer should be of a modified type exhibited to the board, which facilitates cocking by the thumb of the pistol hand and should not be of the type ordinarily furnished. A location of the magazine catch that will permit of expulsion of the magazine by the pistol hand is preferred.

24. The Luger automatic pistol, although it possesses manifest advantages in many particulars, is not recommended for a service test because its certainty of action, even with Luger ammunition, is not considered satisfactory, because the final seating of the cartridge is not by positive spring action, and because the powder stated by Mr. Luger to be necessary for its satisfactory use is not now obtainable in this country.

25. The results obtained in these tests of automatic pistols with special commercial ammunition and with Frankford Arsenal ammunition do not furnish a sufficient basis for ascertaining the degree of reliability of these weapons in actual service. While the conditions will not often be as severe as in the dust and rust tests, yet in the hands of troops the arms and the ammunition would be exposed to a variety of usage and climate which can not be foreseen and reproduced in tests. The most vital question to be determined concerning automatic pistols in their present state of development is that of reliability of function, which should be equal to or closely approximate that of the revolver. For this purpose, it is believed that the pistols and ammunition should be actually issued to a limited number of units, in substitution for and to the exclusion of their revolvers, with instructions to use them, carry them, and conduct target practice with them precisely in the manner previously prescribed for revolvers. In the target practice course a complete record should be kept of all malfunctions, misfires, and jams, and of the repairs necessary to keep the weapons in serviceable condition; a similar record should be kept by some troops at the same posts equipped with caliber .45 revolvers. If the troop commanders designated to conduct these service tests be selected with care, a comparison of reports should show whether automatic pistols of the best type are sufficiently reliable for general adoption, the decision being based upon data which have not previously been developed in our own or other armies so far as known.

26. On account of the well-recognized and urgent necessity for a caliber not less than .45 for active service, in view of the fact that in the opinion of the board service tests of automatic pistols covering a considerable period of time are necessary, and because a satisfactory caliber .45 revolver can be obtained, the board considers that a sufficient number of these revolvers should be issued as soon as practicable to arm the troops serving in the Philippine Islands.

27. The tests show that both of the revolvers submitted are desirable weapons, but the board prefers the Colt for the following reasons:

(1) Less shock to the user, due to the broader and more rounded shoulder against which the hand rests.

(2) The better shape and size of grip and trigger guard.

(3) The greater simplicity and fewer parts.

(4) The present familiarity of the troops with the Colt revolver.

This revolver should, however, have the barrel pinned to the frame to prevent rotation, and should have the parts adjusted so as to prevent the rotation of the cylinder by pressure on the trigger which does not cock the hammer.

28. As a result of careful consideration of the tests made and as a result of the views hereinbefore presented the board recommends as follows:

(1) That sufficient Colt double-action revolvers, caliber .45, be issued to arm the troops in the Philippines as soon as practicable.

(2) That sufficient Colt automatic pistols, caliber .45, to completely arm three troops of cavalry be obtained and issued for a service test of not less than one year.



(3) That sufficient Savage automatic pistols, caliber .45, to arm completely three troops of cavalry be obtained and issued for a service test of not less than one year.

(4) That one troop of cavalry stationed at each of the posts to which the automatic pistols may be assigned be armed completely with Colt double-action revolvers, caliber .45, for a period of not less than one year.

(5) That the pistols and revolvers so issued be used to the exclusion of the present weapons, which should be turned in.

(6) That the troop commanders to whose organizations the pistols and revolvers referred to above may be issued be carefully chosen for their interest in the selection of a proper weapon.

(7) That these pistols and revolvers be used in all respects as are the present revolvers in drills, target practice, maneuvers, etc., and that a complete and detailed record be kept of all misfires, malfunctions, and jams, and of the repairs necessary to keep the arms in a serviceable condition.

(8) That at the end of one year after date of issue complete and detailed reports be submitted by the respective troop commanders to the Adjutant-General.

29. Attached hereto will be found photographs of all the arms submitted to the board for test.

PHILIP READE,
*Colonel, Twenty-third Infantry, U. S. Army, President of Board.*
J. T. DICKMAN,
*Major, Thirteenth Cavalry, U. S. Army.*
GUY H. PRESTON,
*Captain, Thirteenth Cavalry, U. S. Army.*
WM. M. CRUIKSHANK,
*Captain, Artillery Corps, U. S. Army.*
J. H. RICE,
*Captain, Ordnance Department, U. S. Army, Recorder.*

[First indorsement.]

To the Chief of Ordnance. A. G. O., April 2, 1907.

[Second indorsement.]

OFFICE OF THE CHIEF OF ORDNANCE,
*Washington, April 23, 1907.*

1. Respectfully returned to The Adjutant-General.

2. The board considers that an increase of caliber of the pistol to .45 of an inch is necessary, and recommends that the troops in the Philippines be armed with Colt double-action revolvers of this caliber. This Department has not on hand any double-action revolvers of caliber .45, and to purchase the number required for arming the troops in the Philippines would cost in the neighborhood of $40,000. The board is rather of the opinion that the use of these revolvers would be temporary only, and that they might be superseded later by automatic pistols. Under these circumstances and because of the expense involved it is recommended that this purchase and issue be not made unless it is apprehended that there will be serious military operations in the Philippines during the next year.

3. The board has found much promise from the automatic pistol, but it has not considered that it has reached such a stage of perfection as to justify its present adoption and issue to troops as a service weapon. The recommendation that a sufficient number of Colt and Savage automatic pistols, caliber .45, to arm three troops of cavalry with each be obtained and issued for a service test of a year, is rather a process to secure a service development of the pistol than a service test of it; the use under service conditions of peace time being expected to develop imperfections and the methods of curing them. This recommendation is approved.

4. The recommendation that a troop of cavalry stationed at each of the posts to which automatic pistols may be issued be armed with the Colt double-action revolvers, caliber .45, is apparently for the purpose of securing a comparative test of these revolvers and the automatic pistols. The revolvers if issued would be used under peace-time conditions, when they would secure the care and attention which soldiers in garrison are required to give their weapons and would not be subject to the hard usage of campaign conditions which, when had without field service, must be artificially produced. It is believed that the competitive test of the board itself, with the rough treatment specially inflicted upon the weapons, constitutes a better comparative test than one which would be secured in the service; and it is thought that the care and attention which the board has given to the study and examination of the weapons is more painstaking than that which could be expected from officers commanding troops in the service, and diverted by other duties, and that the conclusions and recommendations of the board should command more confidence than those of troop commanders submitted under the conditions suggested. It is therefore recommended that issue of Colt double-action revolvers to troops in the United States be not made.

5. The recommendation that the automatic pistols be used in all respects as are the service revolvers, to the exclusion of revolvers in the troops which have them, and that a record be kept of all imperfect action and report made thereof to the Adjutant-General, is concurred in.

(Signed) WILLIAM CROZIER,
*Brigadier-General, Chief of Ordnance.*

[Third indorsement.]

13092–780. WAR DEPARTMENT,
THE ADJUTANT-GENERAL'S OFFICE,
*Washington, May 3, 1906.*

Respectfully returned to the Chief of Ordnance, inviting attention to the inclosed approved memorandum of the Assistant to the Chief of Staff.

It is desired that these papers be returned to this office at the earliest practicable date with information as to when the Savage and Colt automatic pistols will be shipped to the officers mentioned in the memorandum, in order that proper instructions may be issued to those officers with regard to submitting a report of the test of the pistol.



Attention is invited to the inclosed copy of letter of this date to the president of the board of officers convened for the purpose of testing revolvers and automatic pistols.

By order of the Secretary of War.

(Signed) HENRY P. MCCAIN,
*Adjutant-General.*

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MEMORANDUM FOR THE ASSISTANT SECRETARY OF WAR.

Subject: Proceedings of a board of officers for the purpose of testing such revolvers and automatic pistols as may be referred to it by the Chief of Ordnance.

The following weapons were referred to the Board:

*Automatic pistols, caliber .45.*

1. The Colt.
2. The Luger.
3. The Savage.
4. The Knoble single action.
5. The Knoble double action.
6. The Bergmann.
7. The White-Merrill.

*Double-action revolvers, caliber .45.*

1. The Colt.
2. The Smith & Wesson.

*Automatic revolver, caliber .45.*

The Webley-Fosbery.

The board adopted a programme of tests and also a number of specifications for automatic pistols for mounted service and state that the requirements for revolvers are too well known to need insertion in the report.

The board eliminates the Webley-Fosbery automatic revolver, the Knoble automatic pistols, the Bergmann automatic pistol, and the White-Merrill automatic pistol for reasons given in the reports of tests of those arms.

The board then enumerates:

1. The advantages of automatic pistols.
2. The disadvantages of automatic pistols.
3. The advantages of double-action revolvers.
4. The disadvantages of double-action revolvers.

After consideration of these four statements, the board remarks that—

> The advantages of the automatic pistol and the disadvantages of the double-action revolver, especially those enumerated under subheads 1, 2, and 3 in each case, are deemed by the board of such importance that it desires to state its conviction that the principle of the automatic hand firearm should be adopted for the military service, and that the adoption of a specific arm should be contingent only upon the question of whether it is mechanically satisfactory in service.

The distinguishing characteristics of the different automatic pistols and double-action revolvers under consideration are classified.

The three automatic pistols under consideration, viz, the Luger, Colt, and Savage, were given the dust and rust tests.

The board then remarks—

From a careful consideration of the characteristics of each weapon and of the tests made by the board, it is of the opinion that the Savage and Colt automatic pistols possess sufficient merit to warrant their being given a further test under service conditions. With commercial ammunition especially adapted to the arm, each has shown promising certainty of action. Among the most desirable features of the Savage pistol are its simplicity and small number of parts and their accessibility, the lack of screws or flat springs, the number of cartridges (eight) held by the magazine, the position of the center of gravity and the way the pistol lies in the hand, the expulsion of the magazine by the pistol hand, and the ease with which the breech mechanism may be withdrawn. Among the most desirable features of the Colt pistol are its flatness, compactness, neatness, and ease of carrying, the comparatively short total length, and the ease with which the breech mechanism may be withdrawn.

It is, however, desired to emphasize the view of the board that both these pistols should be changed in certain particulars for the military service, and that these changes should be required of the manufacturer before either is considered for final adoption. Both weapons are defective in having side ejection, no automatic indication that the chamber is loaded, and no automatic safety. The grip of the Savage should be made, if possible, more convenient for the hand, and the corrugated metal plates of the grip should be replaced by wooden plates securely fastened on. The retention of the mechanical safety in the locked position should be made more positive. The front sight should be moved slightly to the rear and should be more securely attached. The trigger stirrup of the Colt should be strengthened and its pin made longer. The hammer should be of a modified type exhibited to the board, which facilitates cocking by the thumb of the pistol hand, and should not be of the type ordinarily furnished. A location of the magazine catch that will permit of expulsion of the magazine by the pistol hand is preferred.

The Luger automatic pistol, although it possesses manifest advantages in many particulars, is not recommended for a service test because its certainty of action, even with Luger ammunition, is not considered satisfactory, because the final seating of the cartridge is not by positive spring action, and because the powder stated by Mr. Luger to be necessary for its satisfactory use is not now obtainable in this country.

The results obtained in these tests of automatic pistols with special commercial ammunition and with Frankford Arsenal ammunition do not furnish a sufficient basis for ascertaining the degree of reliability of these weapons in actual service. While the conditions will not often be as severe as in the dust and rust tests, yet in the hands of troops the arms and the ammunition would be exposed to a variety of usage and climate which can not be foreseen and reproduced in tests. The most vital question to be determined concerning automatic pistols in their present state of development is that of reliability of function, which should be equal to or closely approximate that of the revolver. For this purpose it is believed that the pistols and ammunition should be actually issued to a limited number of units, in substitution for and to the exclusion of their revolvers, with instructions to use them, carry them, and conduct target practice with them precisely in the manner previously prescribed for revolvers. In the target practice course a complete record should be kept of all malfunctions, misfires, and jams, and of the repairs necessary to keep the weapon in serviceable condition; a similar record should be kept by some troops at the same posts equipped with caliber .45 revolvers. If the troop commanders designated to conduct these service tests be selected with care, a comparison of reports should show whether automatic pistols of the best type are sufficiently reliable for general adoption, the decision being based upon data which have not previously been developed in our own or other armies so far as known.

On account of the well-recognized and urgent necessity for a caliber not less than .45 for active service, in view of the fact that in the opinion of the board service tests of automatic pistols covering a considerable period of time are necessary, and because satisfactory caliber .45 revolver can be obtained, the board considers that a sufficient number of these revolvers should be issued as soon as practicable to arm the troops serving in the Philippine Islands.

The board states that it prefers the Colt revolver, and gives four reasons for this decision, but recommends certain changes in its construction. After giving the tests careful consideration and "as a result of the views heretofore expressed," the board recommends:



1. That sufficient Colt double-action revolvers, caliber .45, be issued to arm the troops in the Philippines as soon as practicable.
2. That sufficient Colt automatic pistols, caliber .45, to arm completely three troops of cavalry be obtained and issued for a service test of not less than one year.
3. That sufficient Savage automatic pistols, caliber .45, to arm completely three troops of cavalry be obtained and issued for a service test of not less than one year.
4. That one troop of cavalry stationed at each of the posts to which the automatic pistols may be assigned be armed completely with Colt double-action revolvers, caliber .45, for a period of not less than one year.
5. That the pistols and revolvers so issued be used to the exclusion of the present weapon, which should be turned in.
6. That the troop commanders to whose organizations the pistols and revolvers referred to above may be issued be carefully chosen for their interest in the selection of a proper weapon.
7. That these pistols and revolvers be used in all respects as are the present revolvers in drills, target practice, maneuvers, etc., and that a complete and detailed record be kept of all misfires, malfunctions, and jams, and of the repairs necessary to keep the arms in a serviceable condition.
8. That at the end of one year after date of issue complete and detailed reports be submitted by the respective troop commanders to The Adjutant-General.

The Chief of Ordnance in his indorsement on the proceedings of the board, remarks that:

2. The board considers that an increase of caliber of the pistol to .45 of an inch is necessary, and recommends that the troops in the Philippines be armed with Colt double-action revolvers of this caliber. This Department has not on hand any double-action revolvers of caliber .45, and to purchase the number required for arming the troops in the Philippines would cost in the neighborhood of $40,000. The board is rather of the opinion that the use of these revolvers would be temporary only, and that they might be superseded later by automatic pistols. Under these circumstances, and because of the expense involved, it is recommended that this purchase and issue be not made unless it is apprehended that there will be serious military operations in the Philippines during the next year.

3. The board has found much promise from the automatic pistol, but it has not considered that it has reached such a stage of perfection as to justify its present adoption and issue to troops as a service weapon. The recommendation that a sufficient number of Colt and Savage automatic pistols, caliber .45, to arm three troops of cavalry with each be obtained and issued for a service test of a year, is rather a process to secure a service development of the pistol than a service test of it; the use under service conditions of peace time being expected to develop imperfections, and the methods of curing them. This recommendation is approved.

4. The recommendation that a troop of cavalry stationed at each of the posts to which automatic pistols may be issued be armed with the Colt double-action revolvers, caliber .45, is apparently for the purpose of securing a comparative test of these revolvers and the automatic pistols. The revolvers, if issued, would be used under peace-time conditions, when they would secure the care and attention which soldiers in garrison are required to give their weapons, and would not be subject to the hard usage of campaign conditions which, when had without field service, must be artificially produced. It is believed that the competitive test of the board itself, with the rough treatment specially inflicted upon the weapons, constitutes a better comparative test than one which would be secured in the service; and it is thought that the care and attention which the board has given to the study and examination of the weapons is more painstaking than that which could be expected from officers commanding troops in the service, and diverted by other duties, and that the conclusions and recommendations of the board should command more confidence than those of troop commanders submitted under the conditions suggested. It is therefore recommended that issue of Colt's double-action revolvers to troops in the United States be not made.

5. The recommendation that the automatic pistols be used in all respects as are the service revolvers, to the exclusion of revolvers in the troops which have them, and that a record be kept of all imperfect action and report made thereof to The Adjutant-General, is concurred in.

*Recommendation No. 1.*—The board recommends that the troops in the Philippines be armed with the Colt revolver, caliber .45.

In view of the facts, as set forth by the Chief of Ordnance, that there are no caliber .45 revolvers on hand, that it would cost in the neighborhood of $40,000 to arm the troops in the Philippines, and that these pistols might be superseded later by automatic pistols, it is recommended that this recommendation of the board be not approved, and that paragraph 2 of the indorsement of the Chief of Ordnance be concurred in.

*Recommendations Nos. 2 and 3.*—The results of the tests of the board show much promise for the automatic pistol, and they recommend that three troops of cavalry be completely armed with the Colt automatic .45, and three troops with the Savage automatic .45. These recommendations are concurred in by the Chief of Ordnance, and it is recommended that they be approved.

*Recommendation No. 4.*—The board recommends that one troop of cavalry at each of the posts to which the automatic pistol may be assigned, be armed with Colt double-action revolver for a period of not less than one year.

The Chief of Ordnance states in substance that this recommendation is apparently for the purpose of securing a comparative test, that the revolvers would be used under peace conditions and receive garrison care, that he believes that the competitive test of the board with the rough treatment specially inflicted constitutes a better test than one which could be secured in the service, and that the recommendations of the board should command more confidence than those of troop commanders submitted under the conditions suggested.

It is plain that the board is satisfied that the revolver or pistol should be caliber .45. They state in their report, paragraph 6, page 4 [page 85 of this publication], that "the requirements for revolvers are too well known to need insertion in this report."

This is especially true of the Colt double-action revolver. It is not seen, therefore, what advantage a special comparative test as recommended by the board would have.

The reasons given by the Chief of Ordnance for not concurring in this recommendation of the board are deemed good, and it is therefore recommended that this recommendation be not approved.

Recommendations 5, 6, 7, and 8 are concurred in by the Chief of Ordnance, and their approval is recommended.

It is also recommended that the Chief of Ordnance be informed in substance as above and directed to have sufficient Savage and Colt automatic pistols, caliber .45, to completely arm three troops of cavalry with each, shipped to following troop commanders for test and report, in accordance with the recommendations of the board:

1. Capt. James A. Cole, Sixth Cavalry.
2. Capt. Frank Tompkins, Eleventh Cavalry. } Savage.
3. Capt. H. A. Sievert, Ninth Cavalry.

4. Capt. H. LaT. Cavenaugh, Tenth Cavalry.
5. Capt. Charles A. Romeyn, Second Cavalry. } Colt.
6. Capt. R. A. Brown, Fourth Cavalry.



If for any reason the above-named officers are detached from command of their troops during the test, the test will be continued and reported on by the troop commander.

It is further recommended that the president of the board be informed in substance as above.

Very respectfully,

(Signed) WM. P. DUVALL,
*Brigadier-General, General Staff,*
*Assistant to the Chief of Staff.*

13092–829.] WASHINGTON, *May 18, 1907.*

THE ADJUTANT-GENERAL, U. S. ARMY,
*Washington, D. C.*

SIR: 1. Referring to O. O. 13092–780 (M. S. 1181296), report of the board recently in session at Springfield Armory for the test of revolvers and automatic pistols, and to the third indorsement thereon, I have the honor to inform you that circular advertisements were issued for 200 Colt automatic pistols and 200 Savage automatic pistols.

2. The Colt's Patent Fire-Arms Manufacturing Company quoted a delivery of ten months, so that these arms can not be issued to the service in less than ten months.

The Savage Arms Company stated that they were unwilling to accept an order for the number of pistols specified, and consequently no Savage automatics can be furnished. It is therefore proposed to purchase 200 Luger automatic pistols in lieu thereof, and information is desired as to whether they should be issued to the troops already designated for test of the Savage pistols. The date of delivery of the Luger pistols can not be given at this time, but it will probably be about the same as for the Colt.

Very respectfully,

(Signed) WILLIAM CROZIER,
*Brigadier-General, Chief of Ordnance.*

13092–829.] (M. S. 1181296.)

[First indorsement.]

WAR DEPARTMENT,
THE ADJUTANT-GENERAL'S OFFICE,
*Washington, May 28, 1907.*

Respectfully returned to the Chief of Ordnance, who will purchase a sufficient number of Luger automatic pistols, caliber .45, to completely equip the three troops of cavalry that were to have been supplied with the Savage automatic pistol, as indicated in memorandum from the assistant to the Chief of Staff, which was sent to the Chief of Ordnance as an inclosure of indorsement from this office of the 3d instant.

By order of the Secretary of War:

(Signed) HENRY P. MCCAIN,
*Adjutant-General.*

NOTE.—The Savage Arms Company has, since the date of the above correspondence, accepted an order for 200 Savage automatic pistols.

PROGRAMME FOR TESTS OF REVOLVERS.

1. Examination of revolver as to design, appearance, balance, etc.
2. Special examination will be made as to safety features.
3. Dismounting and assembling. The times required to totally dismount and assemble, except removal of the barrel.
4. The number of—
(*a*) Pins and screws.
(*b*) Small springs.
(*c*) Other parts.
5. The number and kind of tools required to dismount and assemble.
6. Twenty rounds (10 single and 10 double action) to be fired into butt to observe working of revolver.

The above tests will be made with the revolver in the hands of, and operated by, the inventor or his representative, if present.

7. Velocity at 25 feet, mean of 5 shots.
8. Accuracy and penetration at 75 feet; 10 shots for accuracy, 5 for penetration.
9. Rapidity with accuracy; target 6 by 2 feet, range 100 feet. The number of shots fired to be 18. Revolver fired from hand. Time and number of hits to be noted in each case.

To be conducted by representative of the inventor, if present. Firing to begin with chamber and cylinder empty, and cartridges arranged as desired by the firer.

10. Rapidity at will. Same as preceding test, except that the revolver will be fired without aim into a butt at short range, and hits will not be considered.
11. Endurance. Revolver will then be fired deliberately 500 rounds, cooling after each 50 shots.
12. Velocity. Same as paragraph 7, above.
13. Excessive charges. Revolver to be fired 5 times with cartridges, in which the charge of powder is increased to produce a pressure in the chamber 25 per cent greater than the regular pressure.
14. Pierced primers. Revolver will be fired once with a cartridge in which the primer has been thinned so as to insure piercing. Two rounds will then be fired to observe action.
15. Dust. Both ends of barrel will be tightly corked and the revolver will be exposed, in a box prepared for that purpose, to a blast of fine sand for one minute. The surplus sand may then be removed by blowing thereon, jarring of the piece, or wiping with the bare hand only.

The cylinder should be—
(*a*) Empty when exposed to dust.
(*b*) Loaded when exposed to dust.

In "*b*" the cartridges may be removed and wiped, then reloaded.

16. Rust. The mechanism will be thoroughly cleaned of grease by boiling in a solution of soda, both ends of the barrel tightly corked; the revolver then placed in a saturate solution of sal-ammoniac for five minutes. After being hung up indoors for twenty-two hours, five shots will be fired into a sand butt.
17. Supplementary tests. Any piece which successfully passes the foregoing tests may be subjected to such supplementary tests, or repetitions of previous ones, to further determine its endurance or other qualities as may be prescribed by the Chief of Ordnance or by the board.



*General remarks.*—During the above tests the revolver will be entirely in the hands of the board, except when specially stated otherwise, and no alterations or repairs other than those possible on the ground will be allowed, except by special permission of the board. If the revolver fails in any test, the remainder of the programme may be discontinued in the discretion of the board.

In case of misfires cartridges will be opened to determine the cause, and if due to ammunition the test will be repeated.

PROGRAMME OF TESTS OF AUTOMATIC PISTOLS.

1. Examination of pistol as to design, appearance, balance, suitability for mounted troops, etc.
2. Special examination will be made as to safety features.
3. Dismounting and assembling. The times required for each of the following operations:
(*a*) To dismount the breech and magazine mechanism, with the exception of the magazine catch.
(*b*) To complete dismounting.
(*c*) To assemble, except the breech and magazine mechanism.
(*d*) To complete assembling.
4. The number of—
(*a*) Pins and screw.
(*b*) Small springs.
(*c*) Other parts.
5. The number and kind of tools required to dismount and assemble.
6. Twenty rounds to be fired into butt to observe working of pistol.

The above tests will be made with the pistol in the hands of and operated by the inventor or his representative, if present.

7. Velocity at 25 feet, mean of 5 shots.
8. Accuracy and penetration at 75 feet; 10 shots for accuracy, 5 for penetration.
9. Rapidity with accuracy; target 6 by 2 feet, range 100 feet. Number of shots fired to be three times the capacity of clip. Pistol fired from hand. Time and number of hits to be noted in each case. To be conducted by representative of company, if present. Firing to begin with chamber and magazine empty, and clips or holders arranged as desired by firer.
10. Rapidity at will. Same as preceding test, except that the pistol will be fired without aim into a butt at short range, and hits will not be considered.
11. Endurance. Pistol will then be fired deliberately 500 rounds as a self-loader, cooling after each 50 rounds.
12. Velocity. Same as paragraph 7, above.
13. Decreased charges. Pistol to be fired 12 rounds as a self-loader with cartridge in which the powder charge has been decreased so that the first four will give pressure of 25 per cent less, the second four 15 per cent less, and the last four 10 per cent less than the service pressure.

14. Excessive charges. Pistol to be fired 5 times as a single loader, with cartridges in which the charge of powder is increased to produce a pressure in the chamber 25 per cent greater than the regular pressure.

15. Pierced primers. Pistol will be fired once with a cartridge in which the primer has been thinned so as to insure piercing. Two rounds will then be fired to observe action.

16. Dust. With the mechanism closed and both ends of the barrel tightly corked pistol will be exposed, in a box prepared for that purpose, to a blast of fine sand for one minute. The surplus sand may then be removed by blowing thereon, jarring of the piece, or wiping with the bare hand only.

The magazine should be—

(*a*) Empty when exposed to dust.

(*b*) Loaded when exposed to dust.

In both cases pistol should be used as a self-loader, and in the second the cartridge may be removed and wiped, then reloaded. In case of self-loading, failures to work in either case the piece will be tried by operating by hand.

17. Rust. The mechanism will be thoroughly cleansed of grease by boiling in a solution of soda, the ends of the barrel tightly corked, and the pistol then placed in a saturated solution of sal-ammoniac for five minutes. After being hung up indoors for twenty-two hours, five shots will be fired into a sand butt, using pistol as a self-loader. In case the self-loading mechanism fails to work, the pistol will then be tried by operating by hand.

18. Supplementary tests. Any piece which successfully passes the foregoing tests may be subjected to such supplementary tests, or repetitions of previous ones, to further determine its endurance or other qualities as may be prescribed by the Chief of Ordnance or by the board.

*General remarks.*—During the above tests the pistol will be entirely in the hands of the board, except when specifically stated otherwise, and no alterations or repairs other than those possible on the ground will be allowed, except by special permission of the board. If the pistol fails in any test the remainder of the programme may be discontinued in the discretion of the board.

In case of misfires the cartridges will be opened to determine cause, and if due to the ammunition the test will be repeated.

### TEST OF COLT AUTOMATIC PISTOL, CALIBER .45.

1. A representative of the company dismounted the breech and magazine mechanism, with the exception of the magazine catch, in $4\frac{1}{5}$ seconds, and completed the dismounting in 2 minutes and 50 seconds, making a total time of 2 minutes $54\frac{1}{5}$ seconds. He then assembled the arm, except the breech and magazine mechanism, in 5 minutes and 31 seconds, and completed the assembling in $8\frac{3}{5}$ seconds, making the total time 5 minutes $39\frac{3}{5}$ seconds. Two links which are secured to the barrel by rivets were not dismounted. Four drifts, 1 double-end drift, 1 hammer, and 1 screw-driver were used in the work.



2. The parts consist of—

| | |
|---|---|
| Nonriveted pins | 7 |
| Riveted pins | 2 |
| Small screws | 6 |
| Flat springs | 2 |
| Small spiral springs | 1 |
| Large spiral springs | 2 |
| Other parts | 23 |
| Total | 43 |

3. The following rounds were fired, using Frankford Arsenal ammunition:

(*a*) Twenty rounds into sand butt to observe action of mechanism.

(*b*) Six rounds, 1 of which missed the target, for velocity at 25 feet from the muzzle, giving a maximum of 833 feet per second, a minimum of 767 feet per second, and an average of 793.8 feet per second.

(*c*) Ten rounds for accuracy at 75 feet; mean absolute deviation, 2.4 inches.

(*d*) Seven rounds, 2 preliminary and 5 for penetration, in soft pine, giving an average of $5\frac{1}{8}$ inches for the 5 shots.

(*e*) Twenty-one rounds for rapidity with accuracy, fired by a representative of the company at a target 6 feet by 2 feet, range 100 feet. The loaded magazines were arranged on a table, as desired by the operator, the weapon being empty at the beginning of the test. Time required for 21 shots was 32 seconds; the number of hits was 2.

(*f*) Twenty-one rounds fired into sand butt by a representative of the company for rapidity without accuracy, the loaded magazines being placed in a convenient position and the weapon being empty at the beginning of the test. The time required for the 21 rounds was $8\frac{3}{5}$ seconds.

(*g*) Five hundred rounds for endurance. Jams occurred in the following rounds, due to the cartridge being caught between the chamber and the bolt: 191, 192, 237, 240, 242, 246, 249, 258, 265, 270, 278, 333, 338, 342, 375, 404, 408, 426, 469, and 568. In rounds 277, 350, 355, and 401 the cartridge jammed crosswise of the chamber. Round 355 was a misfire. At the end of this test the link pin was found to have worked loose.

(*h*) Seven rounds, 2 lost and 5 for velocity, at 25 feet from the muzzle, giving a maximum of 814 feet per second, a minimum of 714 feet per second, and an average of 775 feet per second.

(*i*) Twelve rounds with reduced charges; 4 cartridges giving a decreased pressure of 25 per cent, 4 cartridges giving a decreased pressure of 15 per cent, and 4 cartridges giving a decreased pressure of 10 per cent. The action was normal.

(*j*) Five rounds with cartridges, giving an excess pressure of 25 per cent. The action was normal.

(*k*) One round with pierced primer. The action was normal.

(*l*) Both ends of the barrel were tightly corked and the pistol was exposed for one minute, in a box prepared for the purpose, to a blast of fine sand, the magazine being empty. A representative of the company removed the surplus sand by blowing, jarring, and wiping the piece with the bare hand only. Time required to fire 7 shots

was 1 minute and 56 seconds, using the arm as a self-loader. Seven more shots were then similarly fired.

(*m*) The above test was then repeated, except that the arm contained a loaded magazine when exposed to dust. Time required to fire 7 shots was 53 seconds, using the arm as a self-loader. Seven more shots were then similarly fired.

NOTE.—After this test part of the sear was found broken and a new sear was inserted.

(*n*) The pistol was thoroughly cleaned and both ends of the barrel tightly corked; it was then placed in a saturate solution of sal-ammoniac for 5 minutes, after which it was hung up indoors and allowed to remain thus for about 22 hours. A representative of the company prepared the arm for firing in 1 minute and 5 seconds. The firing of 7 shots, using the arm as a self-loader, required 3 seconds after the magazine was loaded. Seven more shots were similarly fired, except that in round 641 the slide failed to go entirely home, which was corrected by striking with the hand. The pistol was then oiled without dismounting and 7 more shots were similarly fired, the slide failing to go home fully on round 642, correction being made as before. In preparing for firing a wooden rod was used to manipulate the mainspring, as well as to release the slide catch. The slide was worked rapidly back and forth and the hammer was snapped several times.

(*o*) Two hundred and fifty rounds fired from a Colt automatic pistol not previously used in these tests and with the commercial ammunition sold for this weapon, for observation of action. The pistol had a modified hammer. Round 232 jammed, the nose of the bullet being caught in the receiver by the bolt, the point below horizontal. In round 238 the hammer followed the slide, but caught at the safety, apparently due to springing of the trigger stirrup.

(*p*) A primed cartridge case was inserted in the arm and the primer was discharged, with the hammer fully forward, by striking the muzzle on the floor. It was also found that if the magazine be partly withdrawn it was possible to fire by pressing the bottom of the magazine forward, drawing the top rear portion against the trigger stirrup.

(*q*) Fifty rounds fired for observation of action, using the same pistol as in test (*o*) and Colt ammunition. In rounds 252 and 293 the cartridge was caught by the bolt, nose pointing downward against the rear of the receiver. The difficulty was corrected by slightly withdrawing the bolt. Round 259 did not reload, the slide moving forward without seating the cartridge.

The total number of rounds fired was 959.

### TEST OF LUGER AUTOMATIC PISTOL, CALIBER .45.

1. The inventor of the pistol dismounted the breech and magazine mechanism with the exception of the magazine catch, in $7\frac{2}{5}$ seconds and completed the dismounting in 3 minutes and 17 seconds, making a total time of 3 minutes and $24\frac{2}{5}$ seconds. He then assembled the arm, except the breech and magazine mechanism, in 3 minutes and 55 seconds, and completed the assembling in $18\frac{1}{5}$ seconds, making a total of 4 minutes and $13\frac{1}{5}$ seconds. The following parts were not



dismounted, as they were either riveted together or so joined as to make dismounting impracticable except in a machine shop: Breech-block, forward and rear link of toggle joint, and recoil spring; trigger plate and lever; trigger-plate lever and pin; cartridge carrier and pressure knob. Two drifts and 1 screw-driver were used in the work.

2. The parts consist of—

| | |
|---|---|
| Small flat springs | 4 |
| Small spiral springs | 2 |
| Larger spiral springs | 3 |
| Screws | 2 |
| Nonriveted pins | 6 |
| Riveted pins | 2 |
| Bended pins | 1 |
| Other parts | 28 |
| Total | 48 |

3. The following rounds were fired, using Luger ammunition except where specifically stated otherwise:

(*a*) One preliminary and 20 rounds for velocity at 25 feet from the muzzle; 10 with F. A. ammunition and 10 with Luger ammunition. The results were as follows:

| | Ammunition. | |
|---|---|---|
| | F. A. (feet per second.) | Luger (feet per second.) |
| Maximum | 835 | 790 |
| Minimum | 802 | 729 |
| Average | 808.9 | 762.6 |

(*b*) Thirty rounds fired with F. A. ammunition into sand butt to observe general working of the arm. Cartridge not fully seated in 45th round; corrected by striking breechblock.

(*c*) Thirteen rounds, 3 preliminary and 10 for accuracy at 75 feet. Mean absolute deviation 1.3 inches.

(*d*) Twenty-one rounds for rapidity with accuracy fired by inventor at a target 6 feet by 2 feet, range 100 feet. The loaded magazines were arranged on a table as desired by the operator, the weapon being empty at the beginning of the test. Time required for the 21 shots was 1 minute and $3\frac{2}{5}$ seconds, and the number of hits was 14. In rounds 81 and 83 the mechanism jammed, and was released without removing the magazine.

(*e*) Twenty-one rounds fired into sand butt by the inventor for rapidity without accuracy, the loaded magazines being placed in convenient position and the weapon being empty at the beginning of the test. Time required for the 21 rounds was 32 seconds. Rounds 88 and 89 jammed.

(*f*) Five hundred and six rounds fired for endurance. The mechanism jammed on the following rounds and was corrected by striking the link: 125, 175, 231, 398, 446, and 451. The case was not extracted in the 416th round. In the 477th and 569th rounds one cartridge nearly left the receiver and the next partially entered the chamber, causing a jam.

(*g*) Seven rounds—2 preliminary and 5 for penetration in soft pine. The average for 5 shots was $4\frac{2}{5}$ inches.

(*h*) Five rounds for velocity at 25 feet from the muzzle, giving a maximum of 766 feet per second, a minimum of 730 feet per second, and an average of 750.4 feet per second.

(*i*) Twelve rounds with Frankford Arsenal ammunition, reduced charges; 4 cartridges giving a decreased pressure of 25 per cent, 4 cartridges giving a decreased pressure of 15 per cent, and 4 cartridges giving a decreased pressure of 10 per cent. The action was normal.

(*j*) Five rounds with Frankford Arsenal cartridges, giving an excess pressure of 25 per cent. The action was normal.

(*k*) Both ends of the barrel were tightly corked and the pistol was exposed for one minute, in a box prepared for the purpose, to a blast of fine sand, the magazine being empty. The inventor removed the surplus sand by blowing, jarring, and wiping the piece with the bare hand only. Time required to fire 7 shots was 2 minutes and 50 seconds. The 646th round jammed and the cartridge had to be ejected. In the 647th round the cartridge did not fully seat, which was corrected by striking the link; otherwise the arm operated as a self-loader. Seven more shots were fired at the request of the inventor. Jamming occurred on the 651st and 652d rounds, which was corrected by releasing the magazine and reseating it.

(*l*) The above test was then repeated, except that the arm contained a loaded magazine when exposed to dust. Time required to fire 7 shots was 2 minutes and 32 seconds. The cartridge did not fully seat in rounds 657, 658, 659, and 662, which was corrected by striking the link; otherwise the arm operated as a self-loader. Seven more rounds were fired at the request of the inventor. The cartridge did not fully seat on the 668th round, which was corrected by striking the link.

(*m*) The pistol was thoroughly cleaned and both ends of the barrel tightly corked. It was then placed in a saturate solution of sal ammoniac for 5 minutes, after which it was hung up indoors and allowed to remain thus for about 22 hours. Total time required to prepare for firing was 3 minutes. The firing of 7 rounds required 20 seconds after the magazine was loaded. Seven more rounds were fired at the request of the inventor, using a clean magazine. All 14 of these rounds were fired by hand, it being necessary to withdraw the bolt and force it home after each shot. At the request of the operator the arm was then oiled, without dismounting, and 7 more rounds were fired, using the rusted magazine. The action was normal.

(*n*) One round fired with pierced primer and 2 to observe action of mechanism thereafter. The action was normal.

(*o*) Ninety-eight rounds to observe action. In rounds 704 and 786 the mechanism jammed, the cartridge being caught between the rear face of the chamber and the bolt, point upward; the bullet was appreciably forced inward. The difficulty was corrected by removing the magazine and withdrawing the bolt.

(*p*) Fifty-six rounds to observe action of the mechanism with Frankford Arsenal ammunition. Rounds 796, 830, 833, and 838 jammed, the cartridge being caught between the bolt and the receiver, bullet directly upward. In round 803 the cartridge was not fully seated. Rounds 817 and 824 misfired, the cartridges exploding on second trial. In round 810 the cartridge failed to fully seat, was withdrawn and reinserted.



(*q*) Fifty-six rounds with Luger ammunition to observe action of the mechanism. In round 855 the arm failed to load; in round 865 the cartridge partially upended and was caught between the bolt and receiver.

(*r*) Fifty-six rounds with F. A. ammunition to observe action of mechanism. In rounds 907, 928, 933, 935, 938, and 949 the cartridge was caught between the receiver and the bolt, the bullet pointing directly upward. In round 922 the cartridge was not fully seated, which was corrected by withdrawing the link. In round 929 the cartridge misfired, but exploded on a second trial. In round 956 the loaded cartridge was ejected onto the floor without entering the chamber.

(*s*) One coil of the magazine mainspring was removed and 35 rounds fired with F. A. ammunition to observe action. In round 970 cartridge was not fully inserted, which was accomplished by withdrawing and releasing the bolt. In rounds 971, 985, and 992 the cartridge was caught between the chamber and the bolt, the bullet inclining upward. Round 982 misfired, the cartridge exploding on second trial.

(*t*) Another coil of the magazine spring was removed and 14 rounds of F. A. ammunition fired to observe action of the mechanism. In round 998 the loaded cartridge was completely ejected instead of being inserted in the chamber. In rounds 1,000 and 1,006 the cartridge was caught between the receiver and the bolt, the bullet inclining upward. After round 1,003 the arm was cleaned and oiled.

(*u*) Another coil was removed from the magazine spring and 7 rounds of F. A. ammunition fired to observe action of the mechanism. Round 1,012, cartridge was caught between the chamber and the bolt, the bullet pointing directly upward. In round 1,015 the bullet was caught between the chamber and the bolt, the bullet inclining upward.

(*v*) Seven rounds with the same magazine as above and with Luger ammunition to observe working of mechanism. In round 1,021 the cartridge was not fully seated, which was corrected by striking the link.

The total number of rounds fired was 1,022.

### TEST OF SAVAGE AUTOMATIC PISTOL, CALIBER .45.

1. A representative of the company dismounted the breech and magazine mechanism, with the exception of the magazine catch, in $6\frac{1}{5}$ seconds, and completed the dismounting in 2 minutes and 30 seconds more, making total time 2 minutes and $36\frac{1}{5}$ seconds. He then assembled the arm, except the breech and magazine mechanism, in 3 minutes and 35 seconds, and completed the assembling in 18 seconds more, making the total time 3 minutes and 53 seconds. One hammer and 2 drifts were used in the work.

2. The parts consist of—

| | |
|---|---|
| Nonriveted pins | 3 |
| Small spiral springs | 5 |
| Larger spiral springs | 3 |
| Other parts | 23 |
| Total | 34 |

3. The following rounds were fired, using Frankford Arsenal ammunition:

(*a*) Twenty rounds to observe general working of the arm fired into sand butt. On the 18th round the empty case was caught by the bolt, causing a jam, which was released by retracting the bolt.

(*b*) Five rounds fired for velocity at 25 feet from the muzzle. The results were:

| | Feet per second. |
|---|---|
| Maximum | 854 |
| Minimum | 769 |
| Average | 815 |

(*c*) Six rounds fired for penetration in white pine, one of which was a miss. The average for 5 shots was 6.2 inches. In rounds 27, 28, and 31 the empty case was not ejected. On the completion of round 31 a new extractor was inserted.

(*d*) Thirteen rounds, 3 preliminary and 10 for accuracy. Mean absolute deviation, 1.9 inches. At the 36th round the ejected case struck the operator in the face. The cartridge case was not ejected in round 43. Range, 75 feet.

(*e*) Four rounds fired by a member of the board to observe working of the weapon.

(*f*) Twenty-four rounds for rapidity with accuracy fired by a representative of the company at a target 6 feet by 2 feet, range 100 feet. The loaded magazines were arranged on a table as desired by the operator, the weapon being empty at the beginning of the test. The time required for the 24 shots was 1 minute and 24 seconds; the number of hits was 13. At the 65th round the pistol jammed, but the cause could not be determined, as a time record was being taken.

(*g*) Twenty-four rounds fired into a butt by a representative of the company for rapidity without accuracy, the loaded magazines being placed in convenient position and the weapon being empty at the beginning of the test. The time required for the 24 rounds was $25\frac{3}{5}$ seconds. Three of these rounds were misfires, which exploded on the second trial, cocking being done by hand. The company was then permitted to replace the mainspring, which had taken a permanent set.

(*h*) Five hundred rounds fired for endurance. The following rounds misfired, but the cartridges exploded on second trials: 112, 113, 133, 148. Round 122 misfired, but was not tried a second time, and round 116 misfired on two trials. After round 151 a new mainspring was assembled. Rounds 203, 257, 347, 370, 376, 382, 400, 429, 435, 487, 561, and 576 were misfires which discharged on second trials. In the following rounds the cartridge case was not ejected, but remained in the receiver: 338, 362, 402, 474, 522, 538, 561, and 594. In the following rounds the mechanism jammed, due to the point of the bullet rising too high and being held between the rear face of the chamber and the front of the bolt. In these cases the magazine was removed and the bolt retracted, allowing the cartridge to drop out: 151, 195, 309, 453, and 587. In round 322 a jam occurred as above, the cartridge being held between the rear face of the chamber and the bolt, and this was corrected by withdrawing the bolt, taking out the magazine and forcing the cartridge completely in. Round 388 jammed as above, the cartridge being entered by retracting the bolt and allowing it to move forward.



(*i*) Seven rounds, 2 preliminary and 5 for velocity at 25 feet from the muzzle, giving a maximum of 835 feet per second, minimum of 787 feet per second; average 803.8 feet per second. After this test the ejector stud was found to be broken and was replaced.

(*j*) Eight rounds were fired to test the working of the ejector stud.

(*k*) Twelve rounds with reduced charges, 4 cartridges giving a decreased pressure of 25 per cent, 4 cartridges giving a decreased pressure of 15 per cent, and 4 cartridges giving a decreased pressure of 10 per cent. The action was normal.

(*l*) Five rounds fired with cartridges giving an excess pressure of 25 per cent. The action was normal.

(*m*) Three rounds, 1 with pierced primer and 2 afterwards to observe working of the arm, which was normal. The 630th round misfired, but the cartridge exploded on second trial.

(*n*) Both ends of the barrel were tightly corked and the pistol was exposed for 1 minute, in a box prepared for the purpose, to a blast of fine sand, the magazine being empty. A representative of the company removed the surplus sand by blowing, jarring, and wiping the piece with the bare hand only. Time required to fire 3 shots was $51\frac{3}{5}$ seconds, the operation as a self-loader being satisfactory.

(*o*) The above test was then repeated, except that the arm was exposed to dust with a loaded magazine. Time required to fire 8 rounds was 53 seconds. The 639th, 643d, and 644th rounds misfired, but the cartridges exploded on second trial. The 644th round jammed, the fired cartridge case not having been entirely ejected and being caught by the bolt.

(*p*) The arm was thoroughly cleaned and both ends of the barrel tightly corked. The pistol was then placed in a saturate solution of sal ammoniac for 5 minutes, after which it was hung up indoors and allowed to remain thus for about 22 hours. Total time required to prepare for firing, 1 minute and 52 seconds. The firing of 8 rounds required 11 seconds after the magazine was loaded. The arm was then oiled without dismounting and 8 more shots were fired without difficulty. In preparing the arm for firing, the parts were operated by striking on a bench and manipulating by hand. The magazine spring was operated by using a metal rod to force back and forth. The arm operated as a self-loader during the above rounds.

(*q*) Two hundred and fifty rounds fired for observation of action with a new barrel chambered for commercial ammunition, which was used in the test. Rounds 144 and 152 jammed. Rounds 2, 48, 64, 88, 152, 208, 249, and 250 failed to eject. These were final rounds of series, and correction was made by turning the arm sidewise and allowing the cartridge case to fall out.

The total number of rounds fired was 913.

### TEST OF KNOBLE'S AUTOMATIC PISTOLS, CALIBER .45.

1. Two models were submitted by Mr. W. B. Knoble of Tacoma, Wash., one a single action and the other a double action.

2. No representative of the inventor was present, and the weapons were taken down and put together by an expert employee of the Springfield Armory. The time required to dismount the breech and magazine mechanism, with the exception of the magazine catch, was 1 minute and 3 seconds. The time required to complete the dis-

mounting was 1 minute and 35 seconds, making a total of 3 minutes and 5 seconds, not including the magazine. The time required for assembling was 5 minutes and 12 seconds.

3. The parts consist of—

| | |
|---|---|
| Small screws | 4 |
| Larger screws | 3 |
| Nonriveted pins | 1 |
| Small spiral springs | 4 |
| Larger spiral springs | 1 |
| Large flat springs | 3 |
| Medium-size flat springs | 1 |
| Riveted pins | 12 |
| Other parts | 30 |
| Total | 59 |

Of these parts 9 are riveted together to form the frame. Two screw-drivers, 2 drifts, and 1 hammer were used in dismounting and assembling.

4. A careful examination and several efforts to fire these weapons showed that they were so crudely manufactured as to render any test without value, smooth working being impossible. It was therefore decided that these arms would be given no further consideration by the board.

### TEST OF BERGMANN AUTOMATIC PISTOL, CALIBER .45.

1. This arm was dismounted in 2 minutes and 2 seconds and assembled in 3 minutes and 40 seconds by an expert mechanic from Springfield Armory, no representative of the weapon being present. The magazine stop and ejector, being riveted to the frame, were not dismounted. One hammer, 1 screw-driver, 1 drift, and 1 wooden block were used in the work.

2. The parts consist of—

| | |
|---|---|
| Riveted pins | 3 |
| Nonriveted pins | 2 |
| Screws | 2 |
| Small spiral springs | 5 |
| Larger spiral springs | 2 |
| Flat springs | 3 |
| Other parts | 23 |
| Total | 40 |

3. An attempt was then made to fire 20 rounds to observe the working of the pistol, but it was found that the blow of the hammer was not sufficient to discharge the cartridges, and the test was discontinued.

4. The magazine is located forward of the trigger, which gives a heavy muzzle preponderance and disturbs the balance; it would also interfere with carrying the arm conveniently in a holster. The cartridge carrier in the magazine acts as a stop to retain the bolt in retracted position when the last cartridge has been fired, which makes it difficult to extract the magazine without further retracting the bolt by hand. The arrangement of the hammer, sear, trigger, and trigger strut is not considered desirable. The design of the arm is not favored by the board.



### TEST OF WHITE-MERRILL AUTOMATIC PISTOL, CALIBER .45.

1. One of the inventors dismounted the breech magazine mechanism, with the exception of the magazine catch, in $5\frac{3}{5}$ seconds and completed the dismounting in 7 minutes $22\frac{1}{5}$ seconds. He then assembled the arm, except the breech and magazine mechanism, in 10 minutes $15\frac{1}{5}$ seconds and completed the assembling in 9 seconds.

2. The parts consist of—

| | |
|---|---|
| Small spiral springs | 7 |
| Larger spiral springs | 1 |
| Flat springs | 2 |
| Split flat springs | 2 |
| Small S wire springs | 2 |
| Small nut | 1 |
| Small screws | 10 |
| Larger screws | 4 |
| Nonriveted pins | 3 |
| Riveted pins | 2 |
| Magazine spring | 1 |
| Small studs | 5 |
| Other parts | 22 |
| Total | 62 |

In dismounting and assembling one tool comprising a drift and two screw-driver blades was used.

NOTE.—The left side plate of grip was riveted to metal part, and the right side plate was screwed on. The loading lever consists of three parts riveted together and was not dismounted. In addition to the above a clip is supplied.

3. The following rounds were fired:

(*a*) Twenty rounds to observe action fired into sand butt. The following rounds jammed: 4th, 6th, 9th, 10th and 18th. The 8th round misfired, but exploded on second trial.

(*b*) Seven rounds—2 preliminary and 5 for velocity at 25 feet from the muzzle, giving a maximum of 864 feet per second, a minimum of 813 feet per second, and an average of 835 feet per second.

(c) Fourteen rounds—4 preliminary and 10 for accuracy at 75 feet from the muzzle. Mean absolute deviation, 1.7 inches. Rounds 30, 31, 34, 36, and 41 misfired, but exploded on second trial.

(*d*) Thirty rounds for rapidity with accuracy fired at request of inventor by an expert employee of the Springfield Armory at a target 6 feet by 2 feet, range 100 feet. The loaded magazines were arranged on a table as desired by the operator, the weapon being empty at the beginning of the test. Time required for the 30 shots was 2 minutes, $4\frac{2}{5}$ seconds. The number of hits was 25. Rounds 49 and 65 misfired, but exploded on second trial. Rounds 51 and 68 jammed. Round 28 did not load at first trial. The hand of the firer was cut by screws and corrugations on the side of the frame. The slide was removed and various screws were tightened.

(*e*) Thirty rounds fired into a butt by one of the inventors for rapidity without accuracy, the loaded magazines being placed in convenient position and the weapon being empty at the beginning of the test. The time required for the 30 rounds was 1 minute $21\frac{4}{5}$ seconds. The 78th and 89th rounds jammed. The 79th round misfired, but exploded on a second trial. In the 90th round the arm failed to reload. In the 95th and 96th rounds the loaded cartridge was ejected.

(*f*) One hundred and ten rounds fired for endurance. On attempting to fire, it was found that the trigger could not be pulled, due to loosening of the trigger screw. Hammer and trigger screws were tightened. The following rounds jammed: 107, 109, 116, 120, 128, 130, 144, 150, 188, 196. The following rounds misfired, but exploded on second trial: 105, 107, 122, 125, 131, 132, 137, 138, 140, 145, 147, 158, 159, 171, 174, 187, 203. The magazine failed to feed in the following rounds: 119, 139, 160, 171, 174, 178, 187, 199, 209. Cartridges were not fully seated in the following rounds: 113, 211. Round 168 misfired and did not explode on second trial. Rounds 169 and 191 failed to eject. The trigger and hammer screws were constantly watched and frequently tightened up.

4. This arm is experimental and its functioning was so unsatisfactory that the test was discontinued. The conception of a loading lever which permits loading by the pistol hand is commended, but its practical application was not entirely satisfactory.

The total number of rounds fired was 211.

### TEST OF COLT NEW DOUBLE-ACTION REVOLVER, CALIBER .45.

1. The time required by a representative of the company to dismount the arm was 3 minutes and 50 seconds; the time required to assemble the revolver was 6 minutes and 25 seconds. The firing pin, hammer strut, and hammer stirrup were riveted to the hammer and were not dismounted. One hammer, 1 box wrench, 2 screw-drivers, 2 drifts, 1 special wrench, and 1 mainspring clamp were used in the work.

2. The parts consist of—

| | |
|---|---|
| Nonriveted pins | 2 |
| Riveted pins | 6 |
| Small screws | 4 |
| Longer screws | 1 |
| Small spiral springs | 2 |
| Larger spiral springs | 1 |
| Small flat springs | 1 |
| Flat mainspring | 1 |
| Other parts | 24 |
| Total | 42 |

3. The following rounds were fired:

(*a*) Twenty rounds into sand butt to observe action of revolver. The 9th round misfired, the cartridge exploding on second trial.

(*b*) Eight rounds, 1 a miss, 2 by mistake, and 5 for velocity at 25 feet from the muzzle, giving a maximum of 992 feet per second, a minimum of 923 feet per second, and an average of 955.6 feet per second.

(*c*) Fourteen rounds, 4 preliminary and 10 for accuracy, at 75 feet. Mean absolute deviation, 1.9 inches. During these firings the light was poor.

(*d*) Five rounds for penetration in soft pine at 75 feet from the muzle; average, 6.3 inches.

(*e*) Eighteen rounds for rapidity with accuracy fired by a representative of the company at a target 6 feet by 2 feet, range 100 feet. The cartridges were arranged on a table as desired by the operator, the weapon being empty at the beginning of the test. The time required for 18 shots was 1 minute and 9 seconds; the number of hits was 10.



(*f*) Eighteen rounds fired into sand butt by a representative of the company for rapidity without accuracy, the cartridges being arranged in a convenient position, and the revolver empty at the beginning of the test. The time required for the 18 shots was 35 seconds.

NOTE.—At the completion of these rounds it was found that the ejector-rod nut had been lost. It was replaced.

(*g*) Five hundred rounds fired into sand butt for endurance. The following rounds misfired, but exploded on second trial: 235, 244, 260, 274, 319, 320, 331, 332, 386, 396, 398, 405, 457, 493, 506, 519, and 531.

(*h*) Five rounds fired for velocity at 25 feet from the muzzle, giving a maximum of 997 feet per second, a minimum of 905 feet per second, and an average of 957.6 feet per second.

(*i*) One round fired with pierced primer. Action normal.

(*j*) Both ends of the revolver were tightly corked and the revolver exposed, in a box prepared for the purpose, with the cylinders empty, to a blast of fine sand for one minute. A representative of the company then removed the surplus dust by blowing, jarring the piece, and wiping with the bare hand only. Six shots were fired by double action in 4 minutes and 36 seconds.

(*k*) The above test was then repeated, except that the revolver was exposed to dust with the cylinders loaded. Four shots were fired in 46 seconds. Rounds 614 and 615 were skipped, owing to haste of the operator, no indentation being found on the primer. These 2 cartridges were afterwards successfully fired. A number of cartridges could not be entered. These were tried after the cylinder was cleaned and no difficulty was found, showing the diameter of the chamber to be somewhat too small; this fact was verified by measurement.

(*l*) Both ends of the barrel were tightly corked and the revolver placed in a saturate solution of sal ammoniac for 5 minutes. It was then hung up indoors for about 22 hours and allowed to rust. The arm was loaded and 5 shots fired by double action in 5 seconds after loading had been accomplished. Round 624 misfired, but the cartridge exploded on a second trial. Six additional rounds were fired by double action. Round 630 misfired, but the cartridge was exploded on a second trial. The revolver was then oiled without dismounting and 6 rounds fired by double action. Round 636 misfired, but cartridge exploded on second trial. Sixteen minutes and 47 seconds were required to prepare the arm for firing, all but 3 minutes of which was consumed in fitting cartridges, of which 15 in all were used. The latch was loosened by striking on a bench. Considerable difficulty was found in manipulating the hammer, some sputum being used to lubricate it. Rust was rubbed out of the chambers by working cartridges in and out, afterwards loading with other cartridges. All the cartridges used had been previously tried in the revolver and found to fit satisfactorily.

(*m*) Five rounds were fired with cartridges giving an excess pressure of 25 per cent. The action was normal.

(*n*) Twelve rounds fired, 6 with single and 6 with double action, to observe working of the arm.

(*o*) Four hundred and fifty rounds fired for endurance. Before beginning this series a stronger mainspring was inserted in the weapon. Eighteen shots, rounds 666 to 684, were fired in 30⅖ seconds by a member of the board, beginning with the revolver loaded and 12 cartridges placed in convenient position. Fifty rounds, 752 to 801, were fired by a member of the board in 2 minutes and 40 seconds, beginning with the revolver loaded and the remainder of the cartridges placed in convenient position. After round 953 it was found that the cylinder did not swing in and out with ease, there being interference between the crane and the under side of the barrel; the latter was found to be unscrewed partly and turned slightly to the left.

(*p*) Thirty rounds for accuracy at 75 feet from the muzzle. Average velocity at 25 feet from the muzzle, 915 feet per second; 3 targets of 10 shots each; mean absolute deviation, 1.5 inches, 1.8 inches, and 1.5 inches; average for the 3 targets, 1.6 inches. The revolver used had a 5½-inch barrel, and was not the one used in previous tests.

(*q*) Thirty rounds for accuracy at 75 feet from the muzzle; 3 targets of 10 shots each; average velocity at 25 feet from the muzzle, 782.8 feet per second; mean absolute deviation, 1.6 inches, 0.9 of an inch, and 1.5 inches; average for the 3 targets, 1.3. The revolver used had a 5½-inch barrel, and was not the one used in tests *a* to *o*.

(*r*) Five shots for velocity at 25 feet from the muzzle, test of ammunition used for the accuracy trial under *p*. Maximum velocity, 950 feet per second; minimum, 892 feet per second; average, 915 feet per second. The revolver used was the same as in test *p* above.

(*s*) Five rounds for velocity at 25 feet from the muzzle, for the accuracy trial of ammunition used for the accuracy test under *q*. Maximum, 816 feet per second; minimum, 761 feet per second; average, 782.8 feet per second. The revolver used was the same as in test *p* above.

The total number of rounds fired was 1,173.

TEST OF SMITH & WESSON DOUBLE-ACTION REVOLVER, CALIBER .45.

1. A representative of the company dismounted the arm in 4 minutes and 15 seconds and assembled it in 8 minutes and 20 seconds. The extractor bushing, center pin, extractor and spring, locking bolt, plunger, and spring were not dismounted, as they were either forced into place or riveted. Three drifts, 2 screw-drivers, 1 pliers, and 1 hammer were used in the work.

2. The parts consist of—

| | |
|---|---|
| Screws | 9 |
| Nonriveted pins | 9 |
| Riveted pins | 9 |
| Small spiral springs | 7 |
| Larger spiral springs | 2 |
| Flat mainspring | 1 |
| Other parts | 27 |
| Total | 64 |

3. The following rounds were fired:

(*a*) Twenty rounds into sand butt to observe action of the weapon.

(*b*) Seven rounds, 2 missing target, and 5 for velocity at 25 feet from the muzzle, giving a maximum of 1,032 feet per second, a minimum of 975 feet per second, and an average of 1,007.2 feet per second.



(*c*) Eighteen rounds, 3 preliminary, 5 by mistake, and 10 for accuracy at 75 feet from the muzzle, giving a mean absolute deviation of 1.6 inches.

(*d*) Five rounds for penetration in soft pine at 75 feet from the muzzle. The average for the 5 shots was 6.8 inches.

(*e*) Eighteen rounds for rapidity with accuracy fired by a representative of the company at a target 6 feet by 2 feet, range 100 feet. The cartridges were arranged on a table as desired by the operator, the arm being empty at the beginning of the test. Time required for the 18 shots was 1 minute and 40 seconds, one of these shots being a misfire. The number of hits was 17 out of 17. The firing was done by single action. The misfire was evidently due to a skip on the part of the firer, as the primer showed no mark of the striker.

(*f*) Eighteen rounds fired into sand butt by a representative of the company for rapidity without accuracy, the cartridges being placed conveniently and the arm empty at the beginning of the test. Time required for the 18 rounds was 36 seconds, double action being used. Rounds 108 and 199 misfired, but cartridges exploded on second trial.

(*g*) Five hundred rounds fired for endurance. Rounds 188 and 199 misfired, but exploded on second trial.

(*h*) Six rounds, 1 of which missed the target, and the remainder for velocity at 25 feet from the muzzle, giving a maximum of 1,006 feet per second, a minimum of 927 feet per second, and an average of 965.8 feet per second.

(*i*) One round fired with pierced primer; action normal.

(*j*) Both ends of the barrel were tightly corked and the revolver was exposed, in a box prepared for the purpose, to a blast of fine sand for one minute, the chambers being empty. A representative of the company then removed the surplus dust by blowing, jarring of the piece, or wiping with the bare hand only. The time required to fire 6 rounds was 1 minute and 7 seconds, using double action.

(*k*) The above test was then repeated, except that the arm was exposed to dust with the chambers loaded instead of empty. Time required to fire 5 rounds, using double action, was 37 seconds. The 6th shot was skipped, there being no mark of the striker on the primer. Three of the cases showed marks of the striker on the face outside of the primer, showing that the hammer had gone home before the cylinder was fully revolved.

(*l*) Both ends of the barrel were tightly corked, the arm was immersed in a saturate solution of sal ammoniac for 5 minutes, hung up indoors for about 22 hours, and allowed to rust. Six shots were fired by double action in 7 seconds after the arm was ready for firing; 6 more shots were also fired by double action. The arm was then oiled without dismounting and 6 more shots were fired by double action. Time required in preparation for firing was 10 minutes and 2 seconds, of which more than half was used in trying to operate the double action. The hammer and striker were finally lubricated with sputum. The catch was released by pushing against the edge of a bench, and the remainder of the parts were manipulated

by hand until they functioned properly. No difficulty was encountered in inserting the cartridges.

(*m*) Five rounds with cartridges giving an excess pressure of 25 per cent; action normal.

(*n*) Twelve rounds fired, 6 by single and 6 by double action, to observe working of revolver.

(*o*) Five hundred and thirty-six rounds fired for endurance. Eighteen rounds, 640 to 658, fired by a member of the board in 36 seconds, beginning with the revolver loaded, the remaining cartridges being conveniently placed. Eighteen rounds, 659 to 676, were similarly fired by another member of the board in 32⅘ seconds. Rounds 707 and 1,062 misfired, but exploded on second trial.

(*p*) Thirty rounds for accuracy at 75 feet from the muzzle; 3 targets of 10 shots each; average velocity at 25 feet from the muzzle, 852.2 feet per second; mean absolute deviations, 1.2 inches, 0.7 of an inch, 0.9 of an inch; average, 0.9.

(*q*) Thirty rounds for accuracy at 75 feet from the muzzle; 3 targets of 10 shots each; average velocity at 25 feet from the muzzle, 991.4 feet per second; mean absolute deviations, 1.2 inches, 1.6 inches, 1.6 inches; average, 1.5.

(*r*) Five rounds for velocity at 25 feet from the muzzle, testing ammunition used in accuracy trial under (*p*). Maximum, 881 feet per second; minimum, 816 feet per second; average, 852.2 feet per second.

(*s*) Five rounds for velocity at 25 feet from the muzzle, testing ammunition used in accuracy trial under (*p*). Maximum, 1,030 feet per second; minimum, 977 feet per second; average, 991.4 feet per second.

NOTE.—A revolver with 5½-inch barrel, and not the one used in earlier tests, was employed in tests (*p*), (*q*), (*r*), and (*s*).

The total number of rounds fired was 1,246.

### TEST OF WEBLEY-FOSBERY AUTOMATIC REVOLVER, CALIBER .45

1. The revolver submitted to the board was not provided with any cartridge loader, the representative stating that the caliber was too large for the satisfactory use of this part, which is furnished with smaller calibers.

2. The time required for dismounting was 4 minutes and 25 seconds, and for assembling 11 minutes and 20 seconds. The following parts were not dismounted: Extractor lever and spring, the hammer swivels, the sear spring, the shield plate. The time required for dismounting and assembling was greater than necessary, as the representative of the arm was not expert in this work.

3. The parts consist of—

| | |
|---|---|
| Screws | 9 |
| Small spiral springs | 3 |
| Larger spiral springs | 1 |
| Flat springs | 2 |
| Small double flat springs | 1 |
| Larger double flat springs | 2 |
| Nonriveted pins | 4 |
| Riveted pins | 5 |
| Other parts | 27 |
| Total | 54 |



One screw-driver, 2 drifts, 1 hammer, and 1 pair of pliers were used in dismounting and assembling.

4. Six hundred and twenty rounds were fired from the weapon, as follows:

(*a*) Twenty rounds fired into sand butt for observation of general working. Round 8 was a misfire, and the cartridge did not explode on the second trial.

(*b*) Six rounds fired for velocity at 25 feet from the muzzle, 1 missing the target. The results were: Maximum 977 feet per second, minimum 896 feet per second; average 925.2 feet per second.

(*c*) Twelve rounds, 2 preliminary and 10 for accuracy, at 75 feet from the muzzle. Mean absolute deviation 1.9 inches. Round 36 misfired, but exploded on second trial.

(*d*) Eighteen rounds for rapidity with accuracy, fired by a representative of the competitor, at a target 6 feet by 2 feet, range 100 feet. The cartridges were arranged on a table, as desired by the operator; the chamber and cylinder were empty at the beginning of the test. The time required for the 18 shots was 1 minute and 5 seconds; the number of hits was 14. There were 2 misfires, so that the number of hits was 14 out of 16.

(*e*) Eighteen shots fired into a butt for rapidity without accuracy, the revolver being empty at the beginning of the test. The time required was 21 seconds. The 60th round misfired, but discharged on the second trial.

(*f*) Five hundred rounds for endurance. The following rounds misfired, but exploded on the second trial: 208, 250, 345, 357, 363, 411, 417, 423, 474, 477, 483, 488, 495, 504, 519, 521, 551, 557; rounds 278 and 339 misfired and did not explode on second trial. The body did not fully recoil on rounds 526, 547, and 568, resulting in failure to cock the hammer and suspending the automatic action, since this cocking had to be done by hand.

(*g*) Five rounds fired for velocity at a distance of 25 feet from the muzzle, giving a maximum of 899 feet per second, minimum 875 feet per second, and an average of 887 feet per second.

(*h*) Five rounds fired into soft pine for penetration, giving an average of 6.3 inches.

(*i*) Five rounds fired with charges giving 25 per cent excess pressure, and one round with a pierced primer; the functioning of the arm was normal.

(*j*) Both ends of the barrel were tightly corked and the revolver exposed in a box, prepared for the purpose, to a blast of fine sand, the chamber being empty. Representative was not present, and the test was conducted by Capt. E. D. Scott, Artillery Corps. Surplus sand was removed by blowing, jarring the piece, or wiping with the bare hand only. The time required to fire 5 shots was 1 minute and 37 seconds, one cartridge having been passed over by the operator. This cartridge was afterwards fired without difficulty. These 5 shots were fired by hand, the recoiling parts failing to function. Six more shots were then fired successfully, using the arm as a self-loader.

The above test was then repeated, except that the arm was exposed to dust while loaded. One minute and 35 seconds were required to discharge 6 shots by hand, the recoiling parts again failing to function.

(*k*) The arm was thoroughly cleaned and both ends of the barrel were tightly corked. The revolver was then placed in a saturate

solution of sal ammoniac for 5 minutes, after which it was hung up indoors and allowed to rust for about 22 hours. Total time required to prepare the arm for firing was 3 minutes and 6 seconds, of which 16 seconds were required to insert the cartridges. The firing of 6 rounds required 10 seconds after the arm was prepared. The mechanism operated satisfactorily, except on round 603, when the body failed to recoil fully, requiring cocking by hand. Six additional shots were then fired without difficulty. The arm was then oiled, without dismounting, and a third series of 6 shots was fired satisfactorily. In preparing the arm for firing no difficulty was encountered in removing the cylinder, but it was necessary to use considerable sputum in connection with the stud that operates the cylinder and the arm that holds the stud. The parts were loosened by working the body back and forth and manipulating the hammer and trigger by hand.

The total number of rounds fired was 620.

5. The introduction of an automatic feature in a revolver is, in the opinion of the board, not desirable for the military service, the only gain of importance being the reduced "kick," due to the more gradual taking up of the recoil. The difficulty in reloading the arm on horseback after 6 shots have been fired is the same as in any other revolver; the introduction of the automatic feature adds to the complication and weight of the weapon, and double action is not present. It is, therefore, necessary either to carry this arm with the hammer cocked and locked by the safety (which is not automatic), to cock by using the thumb on the hammer, or to cock by forcing the body and barrel to the rear by pressure in the case of the first shot, or if the recoiling parts do not move fully to the rear in firing, or in case of misfire, the rotation of the cylinder and the cocking must be done by hand. The weight of the revolver without cartridges is 2 pounds and 10 ounces. In view of the above the board decided to discontinue the tests of this arm.

O

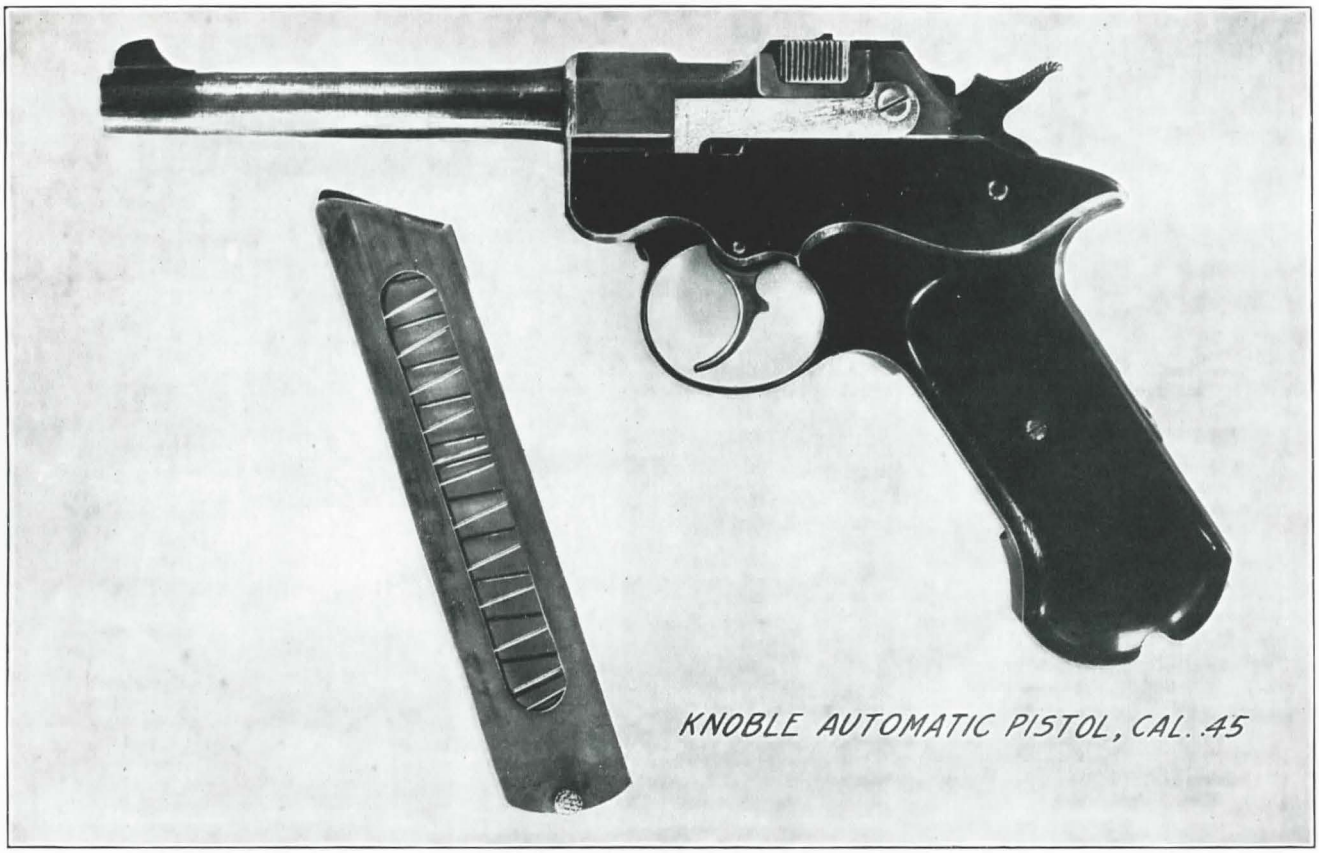
PLATE I.

COLT AUTOMATIC PISTOL, CAL. .45

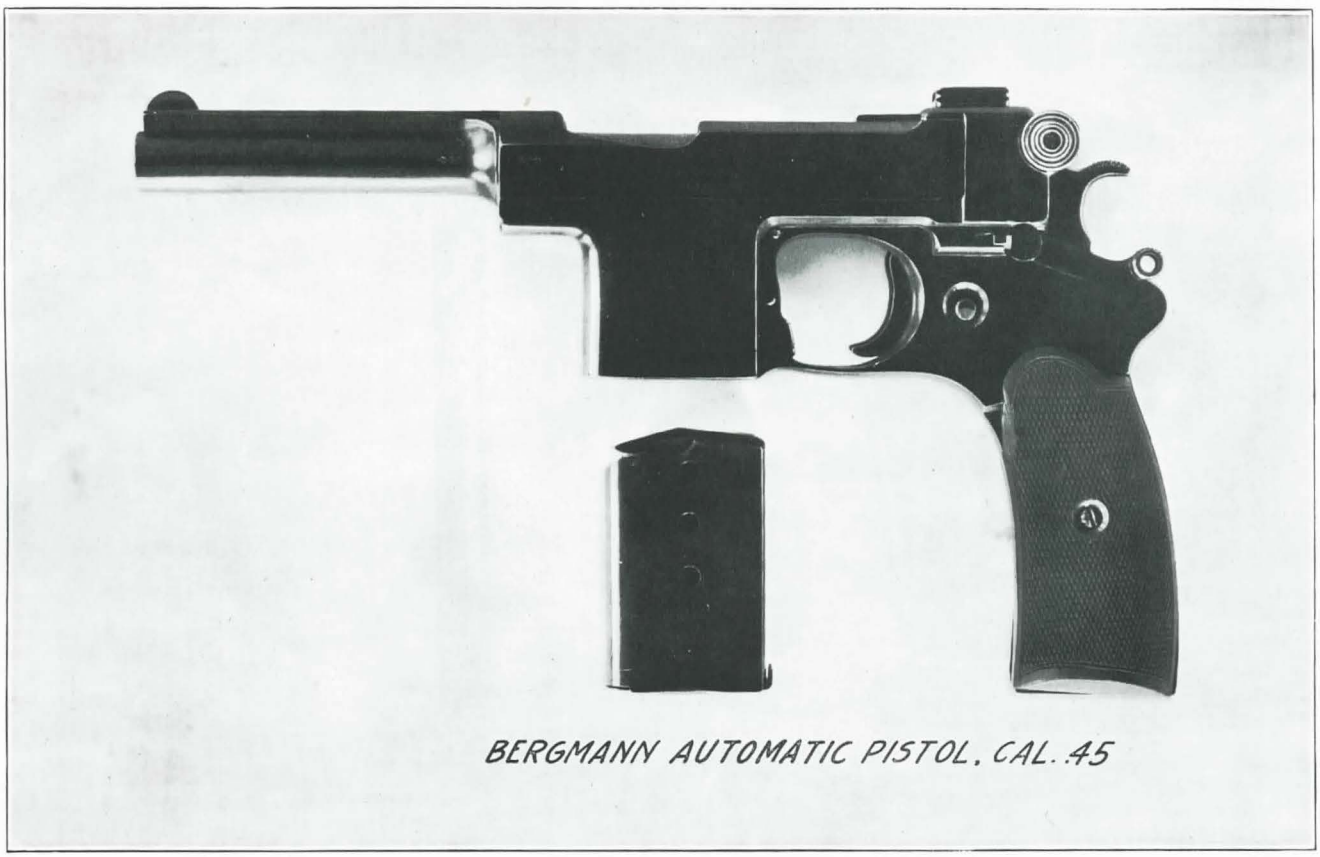
LUGER AUTOMATIC PISTOL, CAL. .45

SAVAGE AUTOMATIC PISTOL, CAL. .45

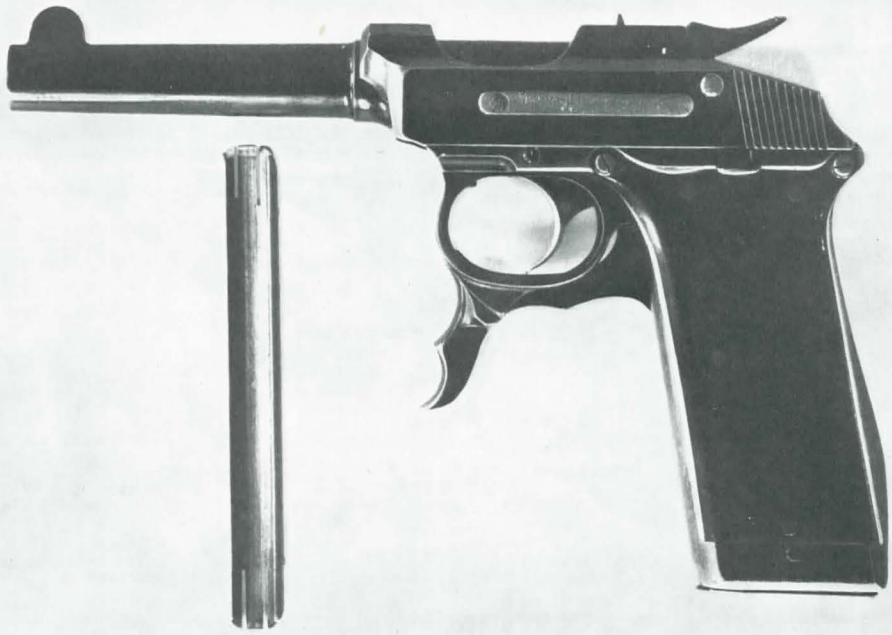
PLATE IV.



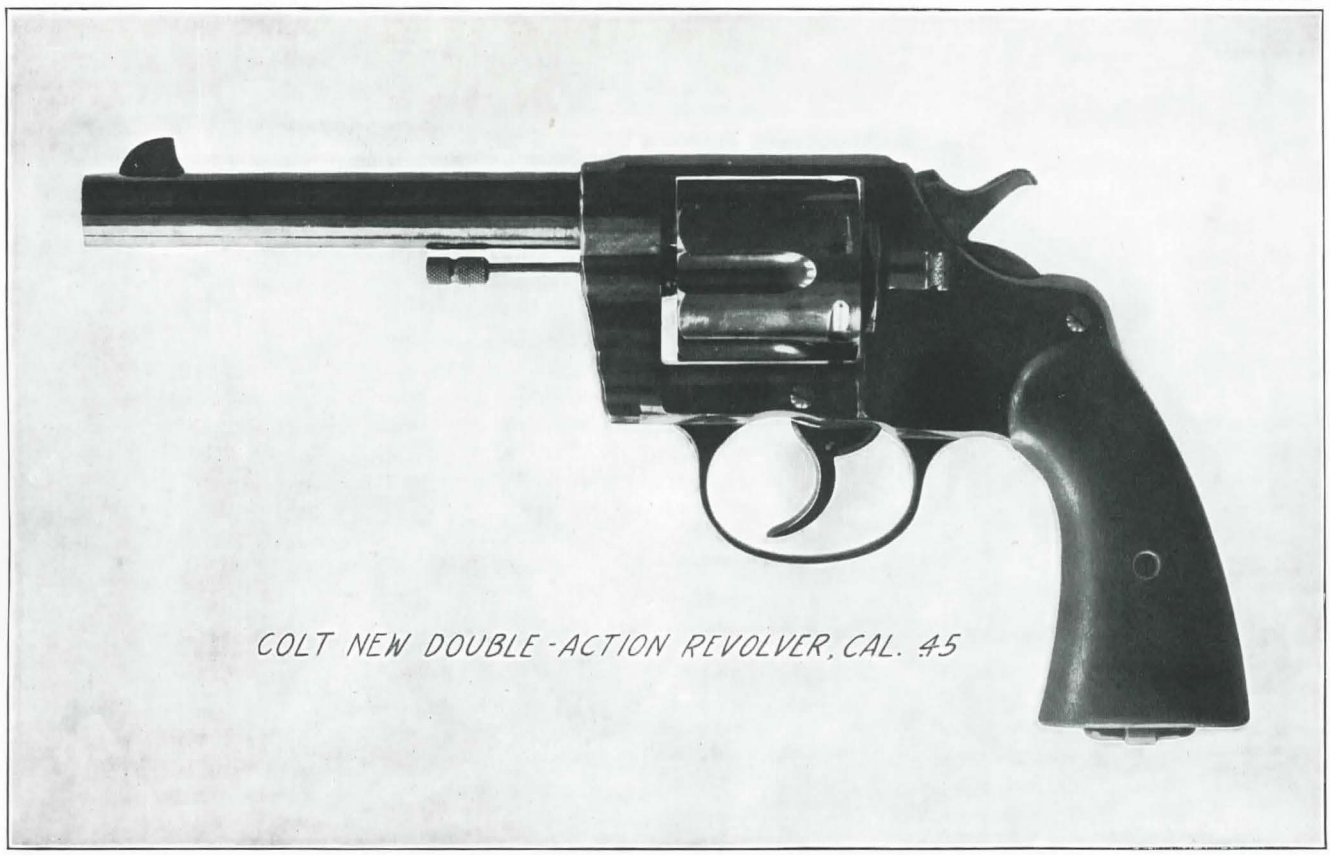
KNOBLE AUTOMATIC PISTOL, CAL. .45



BERGMANN AUTOMATIC PISTOL, CAL. .45



WHITE-MERRILL AUTOMATIC PISTOL, CAL. .45



COLT NEW DOUBLE-ACTION REVOLVER, CAL. .45

SMITH & WESSON DOUBLE ACTION, REVOLVER. CAL. .45

PLATE IX.

WEBLEY-FOSBERRY AUTOMATIC REVOLVER, CAL. .45