816
Taft

~~Confidential~~

NAFMAB

HANDBOOK OF THE 155-MM. FILLOUX GUN MATÉRIEL

WITH INSTRUCTIONS FOR ITS CARE

SIXTEEN PLATES

JANUARY 3, 1918
A REPRINT OF AN A. E. F. EDITION

WAR PLANS DIVISION
MAY, 1918

War Department, Document No. 806
Office of the Adjutant General

WASHINGTON
GOVERNMENT PRINTING OFFICE
1918

208

~~Confidential~~

HANDBOOK OF THE 155-MM. FILLOUX GUN MATÉRIEL

WITH INSTRUCTIONS FOR ITS CARE

SIXTEEN PLATES

JANUARY 3, 1918

A REPRINT OF AN A. E. F. EDITION

WAR PLANS DIVISION

MAY, 1918



War Department, Document No. 806

Office of the Adjutant General

WASHINGTON

GOVERNMENT PRINTING OFFICE

1918

WAR DEPARTMENT.

Document No. 806.

Office of The Adjutant General.

WAR DEPARTMENT,
WASHINGTON, *May 27, 1918.*

The following pamphlet, entitled "Handbook of the 155-mm. Filloux Gun Matériel," a reprint of pamphlet adapted from an official French document at headquarters, American Expeditionary Forces, France, is provisionally adopted for the information and guidance of all units equipped with this matériel.

[062.1 A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

PEYTON C. MARCH,
Major General, Acting Chief of Staff.

OFFICIAL:

H. P. McCAIN,
The Adjutant General.

TABLE OF CONTENTS.

	Page.
List of plates	8
Description of the matériel:	
General information	9
Statistical information	10
Gun	10
Breech mechanism	11
Breech block	11
Carrier	11
Obturator	12
Primer mechanism	12
Percussion mechanism	12
Counterpoise	13
Operation of the breech	13
Safety devices	14
Cradle, recoil, and counter-recoil mechanism	14
Recoil mechanism	15
Counter-recoil mechanism	16
Top carriage	16
Elastic suspension	16
Traversing mechanism	17
Elevating mechanism	17
Chassis	18
Connection with the gun axle	18
Connection with the trails	18
Trails	19
Gun axle	20
Gun-axle spring	20
Gun-axle wheel	20
Wheel brake	20
Caterpillar bands	20
Limber	21
Chassis	21
Axle and wheels	21
Steering gear	21
Accessories—	
Traveling bar	22
Lifting bar	23
Spades	23
Loading tray	23
Sights	24
Sight support	24
Sight	24
Goniometer	24
Mirror-referring rule	25
Fuse setter	26
Battery pump	26
Munitions	27

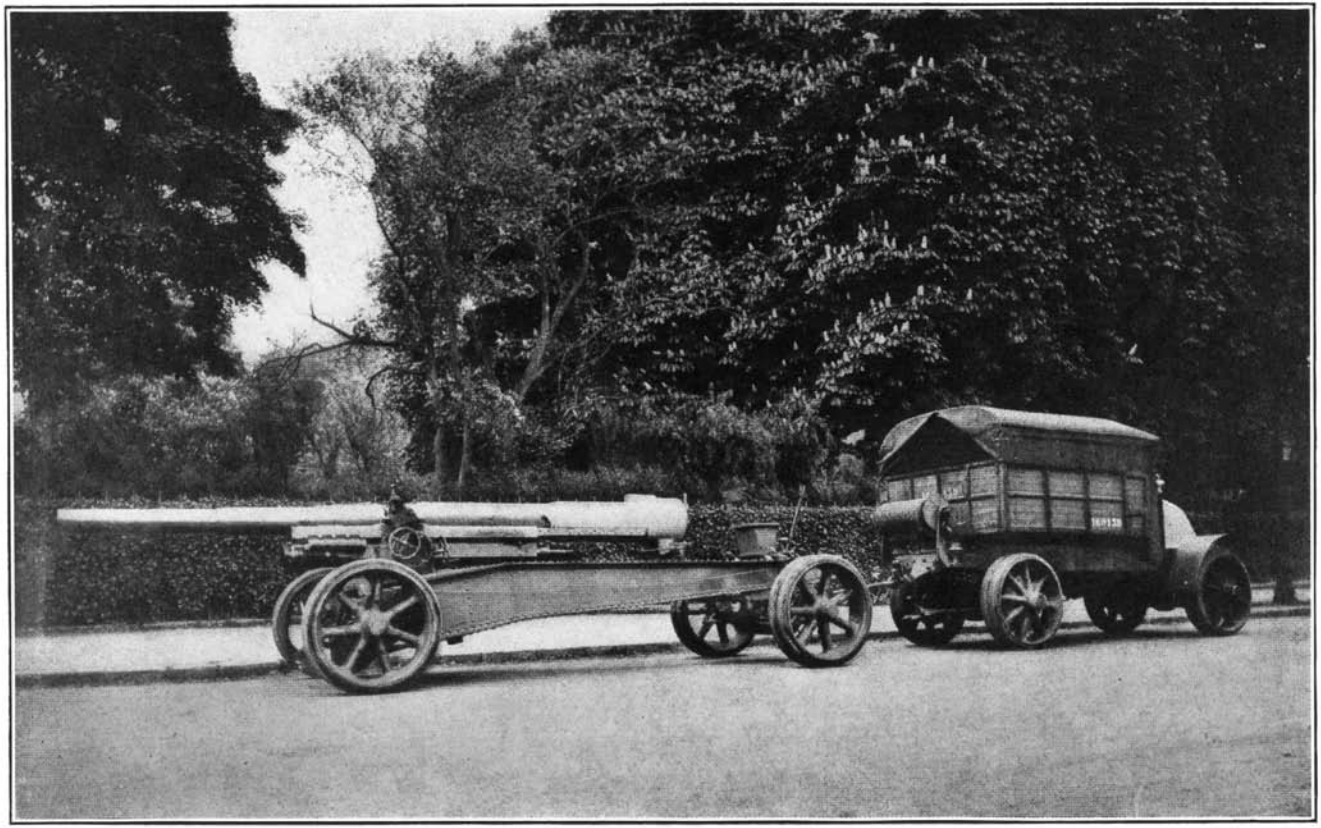
	Page.
Care of the matériel	29
Gun section's duties	29
Chief mechanic's duties	29
Gun section—	
Disassembling and assembling	30
Breech mechanism	30
Percussion mechanism	33
Safety device and primer holder	33
Wheels	33
Caterpillar bands	33
Daily maintenance	34
After traveling	34
After firing	34
Gun	35
Breech mechanism	35
Cradle	35
Sight support	36
Top carriage	36
Traversing and elevating mechanism	36
Chassis	36
Trails	36
Gun axle	37
Wheels	37
Brakes	37
Limber	37
Traveling bar	37
Spades	37
Fuse setter	37
Rapid inspection	38
Traveling position	38
Firing position	39
Accessories	39
Battery mechanic—	
Recoil and counter-recoil systems	39
Filling the recoil cylinder	40
Emptying the automatic filler	40
Emptying the counter-recoil reservoir	40
Filling the counter-recoil reserve	41
Use of the screw filler	41
Disassembling and assembling	41
Counterpoise	41
Gun-axle spring	41
Limber spring	41
Brake drum	41
Fuse setter	42
Complete cleaning and lubrication	42
Nomenclature of oil cups	42
Removing copper deposit	42
Detailed inspection	43
Gun and breechblock	43
Cradle	43
Pointing mechanisms	43
Gun axle	44

Care of the matériel—Continued.
Battery mechanics—Continued.
Detailed inspection—Continued. Page.
Trails 44
Wheels 44
Brake drum 44
Adjustment of the brakes 44
Limber 44
Reports rendered 44
Testing the lines of sight 45
For elevation 45
Calibrating a quadrant 45
For direction 46
General information:
Painting artillery matériel 46
Oils for artillery matériel 47
General suggestions 48
Nomenclature of parts of gun and carriage:
Gun 49
Breech mechanism 49
Cradle 51
Top carriage 52
Chassis 53
Trails 54
Gun axle 55
Limber 56
Sight 58
Accessories 59
Composition of battalion in French artillery matériel:
Articles for the service of the piece—
Tools, equipment, and accessories for the service of the piece 61
Sight chest 62
Section armament chest 62
Section tool and spare part chest 63
Caterpillar band chest 63
Articles for the service of the battery—
Spare equipment and accessories 64
Sight spare part chest 64
Battery mechanics' tool chest 64
Recoil mechanism chest 65
Spare assembly chest 65
Separate spare part chest 65
Tools and accessories—
Artificer's tool chest 66
Wood and iron workers' tools and stores 67
Saddler's tools and stores 69
Construction tools 70
Illuminating matériel 70
Fire control and liaison matériel 71
Composition of battalion in United States matériel 72

LIST OF PLATES.

PLATE.

I. Firing position, side elevation.
II. Traveling position, side elevation.
III. Traveling position, plan.
IV. Gun, longitudinal and transverse sections.
V. Breech, rear elevation.
VI. Breech, right side elevation.
VII. Breech, vertical section.
VIII. Breech, horizontal section.
IX. Breech, safety device.
X. Breech, counterpoise.
XI. Cradle.
XII. Top carriage.
XIII. Sighting gear casing.
XIV. Chassis and top carriage.
XV. Limber.
XVI. Sight.



HANDBOOK OF THE 155-MM. FILLOUX GUN.

DESCRIPTION OF THE MATÉRIEL.

CHAPTER I.

GENERAL INFORMATION.

1. The 155-mm. Filloux gun is a matériel with split trail and variable recoil, firing with full charge from 0° to 35° elevation, and possessing a horizontal field of fire of 60°.

The maximum range reached with the steel shell, model of 1915, type B, is about 16 kilometers.

2. The matériel is composed of the gun, which recoils on the cradle when fired, and which is connected to it by the brake and counter-recoil piston-rods. The length of the recoil varies with the angle of elevation and is automatically controlled.

The gun and cradle, which constitute the oscillating mass, rest on the top carriage by means of the cradle trunnions. The oscillating mass moves in relation to the top carriage when the gun is laid for elevation. The top carriage is supported by the chassis, on which it turns when the gun is laid for direction.

The chassis forms a platform carried by the gun axle and by the two trails. The gun axle is provided with rubber-tired wheels.

3. **Firing position** (Plate I).—The piece fires from the gun axle wheels, which are provided with caterpillar bands.

The open trails are anchored in the ground by means of the spades.

The weight of the chassis rests directly on the gun axle at a single point only, through the agency of the pivot pin; this arrangement permits the axle to follow irregularities of the ground.

4. **Road position** (Plates II and III).—The trails are closed, locked together, and secured on the limber.

The gun is drawn to the rear of the cradle.

The weight of the chassis is supported by the gun axle through the agency of a transverse leaf spring.

The limber steering gear is similar to that utilized in automobile construction.

The limber wheels are the same as those of the gun proper. They are intended to receive caterpillar bands if the nature of the ground makes this necessary.

The rear wheels are provided with brake drums.

STATISTICAL INFORMATION.

GUN.

5. Over-all length of the gun (to the rear of the breech ring)	19 ft. 5 in.
Length of the rifled portion	15 ft. 2 in.
Number of grooves	48
Angle of the grooves (constant)	6°

CRADLE.

Angle of elevation	0° to 35°

CARRIAGE.

Angle of traverse	30° to left. 30° to right.
Tread	7 ft. 5 in.
Over-all width (road position)	8 ft. 10 in.
Over-all length (firing position)	23 ft. 7 in.
Total length of the piece in road position, including draw-bar	28 ft. 6 in.
Wheel base	14 ft. 7 in.
Space required for a half-turn	52 ft. 6 in.

WEIGHTS.

Barrel and breech		8,520 lbs.
Matériel in road position	Weight on the gun axle	16,060 lbs.
	Weight on the limber axle	9,680 lbs.
Total weight of the vehicle without spades or caterpillar bands		25,740 lbs.
Limber		3,190 lbs.
Matériel in firing position with spades		23,660 lbs.
Matériel in firing position with spades and caterpillar bands		24,650 lbs.

SHIP TONNAGE.

Ship tonnage required for gun with limber	40

CHAPTER II.

MATÉRIEL.

ARTICLE 1.

Gun.

6. The gun (Plate IV) is composed of the tube reinforced by the following parts:

Locking hoop.
Hoop 1.
Hoop 2.
Hoop 3.
Clip mounted on hoop 3.
Jacket.
Breech ring.

The clip, hoops 1 and 2, and the jacket carry on each side a guide lug provided with bronze gibs, which are in contact with the corresponding slides of the cradle.

On the jacket is bolted the counterpoise bracket.

The breech ring is screwed cold on the tube and held in place by a set screw. It serves to connect the tube to the brake and counter-recoil rods, and forms for this purpose a lug through which are bored two holes of different diameters provided with two special nuts, which screw on the ends of the two piston rods; these nuts remain in the breech ring even when this is not connected to the recoil and counter-recoil mechanisms.

A T slot in the lower part of the breech ring is used to secure the gun to the traveling bar.

Two ears on the right side of the breech ring are bored to receive the hinge pin.

On the upper part of the breech ring are located the two quadrant seats and on the right side, the breech stop, on which is fixed the back latch catch.

ARTICLE 2.

Breech Mechanism.

(Plates V, VI, VII, VIII, IX, X.)

7. **Description.**—The breech mechanism includes:

1. The breechblock.

2. The carrier and the operating parts which support and guide the breechblock during the opening and the closing of the breech.

3. The obturating system which prevents the escape of gas to the rear.

4. The primer mechanism.

5. The percussion mechanism.

6. The counterpoise (Plate X).

8. **The breechblock** is a steel block bored out to accommodate the obturator spindle and the central portion of the carrier. It has four smooth and four threaded sectors, permitting the closing of the breech by a rotation of one-eighth of a turn. Two smooth sectors are hollowed out to permit the breechblock to swing into the internal threads of the breech ring.

On the rear portion of the breechblock there are:

1. A gear sector which rotates the breechblock when operated by the rack.

2. A threaded portion which engages with the internal threads of the carrier and thus connects these two parts.

9. **The carrier** and the hinge pin are locked together by means of a lock collar mounted on the hexagonal portion of the hinge pin.

The carrier comprises:

The hub, in which is formed the seat for the nut and the spindle spring.

The spindle nut.

On the rear face:

The rack lock with its spring.

On the left side:

The carrier latch and the handle of the operating lever.

The elbow of the carrier incloses the bearings of the hinge pin. On the interior face is a shoulder against which rests the lug of the lock collar.

In the carrier slides the rack, whose teeth engage those of the breechblock. On the rack are situated the slots for the operating lever lug and for the rack lock.

The operating lever is actuated by a handle provided with a spring. Inside the operating lever are found the breech locking lever and, on its lower side, the rack actuating lug.

The hinge pin is retained in the hinge by the hinge-pin collar, locked by a spherical-headed pin.

The upper part of the hinge pin forms a beak, which is connected to the spring rod of the counterpoise.

10. **The obturator** is composed of a gas check pad and an obturator spindle. A filling-in washer is placed between the pad and the breechblock.

The gas check pad is composed of asbestos and tallow, inclosed within metal cloth, and protected by split rings, two in the rear, one in front. The obturator spindle (or mushroom head) transmits to the gas check pad the pressure of the powder gases.

The spindle is pierced by the vent. In front is screwed the vent bushing of copper, while in the rear there is screwed a steel spindle plug with a copper washer, forming the primer seat.

The spindle is connected to the carrier by the spindle nut, into which it is screwed, and which is keyed by means of the spindle nut key provided with a spring.

The spindle is constantly maintained in contact with the gas check pad by the spindle spring, which rests at one end against the breech block by means of the front spring collar, and at the other end against the spindle nut, by means of the rear spring washer.

11. **The primer mechanism** comprises:

1. The primer holder body, on the inner end of which is screwed the primer holder plug in which is cut the recess for holding the rim of the primer. The primer is kept in place by the pressure put upon the firing pin bushing by the firing pin spring.

2. The firing pin, whose motion toward the rear is limited by the firing pin stop.

The complete primer carrier is screwed into the spindle nut by a rotation of 250°.

12. **The percussion mechanism** comprises:

A bronze housing in which moves a rack provided with a spring called the rack spring.

The hammer, which can rotate 90° around its support to permit putting the primer holder in place.

The hammer support, which is provided with a gear sector engaging with the rack, and which rotates around the rack spindle.

A lanyard with wooden handle, which operates the hammer.

13. **The counterpoise** includes a cylinder fastened to the gun by the counterpoise bracket and in which moves the spring rod. At one end of the spring rod there is fastened to it a collar, which presses against a spring surrounding the spring rod in the cylinder. At its other extremity, the spring rod is secured by a disengaging eye to the adjusting nut. The adjusting screw, located in the beak of the hinge pin, regulates the pressure of the counterpoise spring according to the angle of elevation of the gun, through its rotation by hand, which displaces the adjusting nut.

14. **Operation of the breech.**—When the breech is closed the threaded sectors of the breechblock are engaged with the threaded sectors of the breech ring.

In this position the operating lever is locked by its handle, which is held in place by the carrier latch. The lever thus prevents any rotation of the breechblock.

To open the breech one presses down upon the operating lever handle to disengage it from the carrier latch, then swings the lever to the right. During the first part of this movement the operating lever turns freely around the hinge pin, the lug of the lever operating the rack which causes the rotation of the breechblock. The threaded sectors of the block are thus disengaged from the threaded sectors of the breech ring.

As soon as the breechblock is completely disengaged the rack strikes the rack lock and the carrier itself is swung by the rotation of the operating handle. In addition, by means of its shoulder, the carrier rotates with it its lock collar and hinge pin.

While the carrier is swinging open the rack lock, now released, moves upward under the pressure of its spring and enters into its slot in the rack, rendering the rack immovable.

The upper extremity of the hinge pin, connected to the spring rod of the counterpoise, compresses the counterpoise spring during the opening of the breech.

At the end of the movement the back latch catch engages the catch of the operating lever and the breech is locked securely at the right side of the gun.

To close the breech one presses down on the operating lever handle in order to disengage the back latch catch, then swings the lever toward the left and thus brings the carrier to the breech face. This movement is made easier by the counterpoise, for the pressure of its spring tends to turn the hinge pin, and thus move the carrier by

means of the lock collar. The rack lock, whose outer extremity projects from the carrier, strikes the breech face, is pushed down into its socket, and frees the rack. The rotation of the operating lever, which at this moment turns freely around the hinge pin, now actuates the rack, which in turn rotates the block and engages its threaded sectors with the threaded sectors of the breech ring.

At the end of the motion of the operating lever its handle engages with the carrier latch and locks the breech closed.

When a round is fired the pressure produced on the mushroom head of the obturator spindle is transmitted by it to the gas check pad. The gas check pad increases in diameter when compressed and presses against the gas check seat, thus preventing the passage of the powder gases.

15. **Safety devices:** [1]

1. Safety device against firing before closing the breech:

The safety lock (Plate IX) slides in the safety lock housing. In it is screwed an operating finger, the end of which moves in a groove in the breechblock. The operating finger is constantly pressed down by the operating finger spring. The length of the safety lock and the dimensions of the groove in the breechblock are such that—

(*a*) When the breech is closed the safety device can be operated and permits the putting in place of the primer holder.

(*b*) When the primer holder is in place it is not possible to open the breech.

(*c*) When the primer holder is removed the breech can be opened freely.

2. Safety device against firing before completely screwing in the primer holder:

In the rim of the primer holder is cut a notch, which does not permit the hammer to strike the firing pin unless the primer holder is entirely screwed in.

ARTICLE 3.

Cradle, Recoil, and Counter-Recoil Mechanisms.

I. *Cradle.*

16. The cradle is a piece of forged steel which has the following functions:

(*a*) Guiding the gun during recoil.

For this purpose the cradle forms two lateral guides, against which slide the bronze gibs of the gun.

---

[1] Matériels at present in service (January, 1918) do not have safety device 1, but have instead a pin sliding in a seat in the carrier, which prevents the hammer from striking the firing pin until the breechblock threads are completely engaged. At this moment a recess in the rear face of the breechblock is brought opposite the end of the safety pin, permitting it to move freely when struck by the hammer.

(*b*) Connecting the gun to the top carriage and to the elevating and traversing mechanisms by the agency of the two trunnions forged integral with the cradle and of a vertical gear sector fastened on the underside of the cradle. This gear sector communicates to the cradle the motion of the elevating mechanism carried by the top carriage.

(*c*) Encasing the parts of the recoil and counter-recoil mechanisms. For this purpose there are bored through the lower portion of the cradle three cylindrical holes. The largest hole contains the hydraulic brake. The two other holes contain the parts of the counter-recoil mechanism.

In addition, the cradle also carries:

On the left side—

The sight support fastened on the end of the trunnion.

The automatic filler bolted to the forward end of the cradle, integral with which is a mechanism for controlling the length of the recoil, connected by the recoil-regulating arm to a boss on the top carriage.

The orifice through which the recoil cylinder is filled, situated on the side and near the front of the automatic filler.

On the right side—

The orifice through which the counter-recoil reservoir is filled. This orifice is located near the rear end.

On the rear face—

The counter-recoil gauge placed at the rear of and slightly below the axis of the larger counter-recoil cylinder.

The orifice for emptying the reserve of the counter-recoil reservoir placed below the gauge.

On the front face—

The orifice for emptying the oil from the recoil cylinder.

II. *Recoil mechanism.*

17. The recoil mechanism is composed of a rod carrying a piston and of a counter rod. It is filled with a special oil.

The recoil cylinder piston rod, connected to the lug of the breech ring, is movable and recoils with the gun. It is hollow and carries at its front end a piston, through which are bored holes which connect the rear portion of the brake cylinder with the front portion, through the agency of grooves of variable depth, milled along the length of the counter rod.

The counter rod does not move longitudinally but can rotate within the rod. The amount of rotation is a function of the angle of elevation of the gun and is automatically controlled. As the angle of elevation increases, the recoil is shortened by diminishing

the area of the orifices through which, upon firing, the oil is forced. The rear extremity of the counter rod acts as a brake toward the close of counter recoil.

The automatic filler is a device which communicates with the recoil cylinder, and assures its being completely full of oil at all times. It serves as a reservoir to permit the escape from the recoil cylinder of the excess of oil whenever the oil pressure is increased by the heat developed during firing. Its capacity is about 1.7 quarts. A piston, prolonged toward the rear by a spindle, forms a gauge which enables one to ascertain at any time the quantity of oil contained in the automatic filler.

The recoil length is regulated by an arm fixed at one end to the top carriage. This arm operates a cam, which transforms the longitudinal motion which it receives when the gun is elevated into a rotation, which is transmitted to the counter rod of the recoil cylinder by means of two gear sectors.

III. *Counter-recoil mechanism.*

18. The counter-recoil mechanism consists of two cylinders; one contains a piston and a piston rod connected to the lug of the breech ring, while the other contains a mushroom valve and a diaphragm. The diaphragm separates the oil contained in the first cylinder and in a part of the second from the high pressure air which compels the return of the gun to battery after recoil.

Normally, there must always be a small reserve of oil between the diaphragm and the mushroom valve. Under these conditions the counter-recoil gauge projects 5 mm. from the rear face of the cradle. If there is no reserve the gauge does not project and it is necessary to fill the reserve of the counter-recoil reservoir.

ARTICLE 4.

(Plates XII, XIII, XIV.)

Top Carriage—Elevating and Traversing Mechanisms.

19. The cast-steel top carriage carries at its upper extremity the bearings for the trunnions of the cradle and rests on the circular racer of the chassis.

Its principal purpose is to rotate the gun, through the agency of the cradle, in the laying for direction.

For this purpose it is pivoted on the chassis and is guided in its rotation by a circular projection which slides in a corresponding socket in the chassis. The rotation is made easier by an elastic suspension (Plate XIV), composed of two pivots, superposed and separated by a step and Belleville washers, whose pressure can be

adjusted. The elastic suspension decreases the pressure of the top carriage on the racer of the chassis.

There is also found on the top carriage:

On its lower portion, a circular projection which constantly centers it on the chassis.

In front, a circular lug which, by its action on a corresponding circular lug of the chassis, prevents the tipping of the top carriage when the gun is fired.

At the top, two T slots which receive the trunnion bearing caps.

20. **Traversing and elevating mechanisms.**—The gun is traversed by means of a worm located between two ears on the lower front part of the top carriage; this worm engages a fixed gear sector on the inside of the chassis and produces by its rotation the rotation of the entire top carriage. On the top carriage are scribed two indices, which, when brought opposite an index scribed on the chassis, indicate the limits of traverse in both directions. These limits are determined by the condition that the tube must be able to recoil freely without striking the trails.

The horizontal field of fire is 60°.

The gun is elevated by a Hindley worm located within the top carriage and on its longitudinal axis. This worm engages a vertical gear sector bolted to the under side of the cradle, thus effecting the elevation of the piece. This mechanism permits the gun to be laid at elevations from 0° to 35°.

The control of both elevating and traversing mechanisms is centralized in the sighting gear casing (Plate XIII), fastened by three screws to the left side of the top carriage.

The connection between the parts inclosed within this casing and the parts carried by the top carriage and described above is effected by two oblique spindles, provided with ball and socket joints and bevel gears.

The sighting-gear casing incloses the parts which transmit to the oblique spindles the motions of the elevating and traversing handwheels.

Each handwheel operates a pair of helical gears having a reduction of four to one.

The sighting-gear casing is completely inclosed in order to protect perfectly the parts within it. The screws which fasten it to the top carriage, and which are entirely removed when the casing is taken off, pass through cylindrical sleeves, which separate them from the interior of the casing.

A dowel pin facilitates the location of the casing in assembling.

ARTICLE 5.

(Plate XIV.)

Chassis.

21. The chassis is a piece of cast steel which supports the top carriage. It is connected to the gun axle and to either the limber (in road position) or the spades (in firing position) by means of the trails.

22. **Connection with the gun axle.**—This connection differs according as the material is in road or firing position.

A. *Road position.*

The connection is elastic, since it is effected by the agency of the gun axle spring and its shackles. The chassis rests directly on the upper part of the spring, to which it is rigidly connected by four spring plate bolts. The shackles connect the extremities of the spring to the gun axle.

B. *Firing position.*

The connection is rigid, since it is effected by the pivot pin, which passes through corresponding holes of the axle and chassis, and thus connects these parts solidly together.

The arrangement for closing the pivot-pin hole in the chassis has a double purpose:

To keep the pivot pin in place when the gun is being fired by means of an internal stop on the pivot pin cap.

To keep dust and dirt out of the pivot pin socket while the gun is on the road.

Changing from road to firing position or vice versa is done by a lowering or raising of the matériel, during which the gun axle moves along two vertical slides in the forward part of the chassis.

To accomplish these two movements the spring shackles of the gun axle are disconnected. The chassis is now free with respect to the axle, for it is not supported by the spring. Two gun axle centering pins rigidly placed in the chassis and symmetrically located above and in relation to the pivot pin housing insure the centering of the gun axle and facilitate the putting of the pivot pin in position.

23. **Connection with the trails.**—The chassis is connected to the trails by two hinge pins, around which the trails swing in opening and closing during the change from road to firing position and vice versa.

In firing position each trail is kept open by a trail locking bolt tightened by a nut provided with a handle.

The lifting of the entire matériel necessary for putting it into firing position (removal of the limber and putting in the pivot pin), is effected by acting directly on the chassis.

For this purpose there are formed on the chassis—

At the rear, a lug upon which the lifting bar acts.

At the front, two maneuvering lugs under which are placed the jacks.

ARTICLE 6.

Trails.

24. The trails are each composed of two built-up structural flasks, to which are riveted at the end toward the chassis two forged steel trail ends, forming jaws, and at the end toward the spades, the various parts which secure the trails on the limber and which connect them with the spades.

They are further connected in road position by a vertical pin provided with a locking arrangement.

A rack fastened on each trail is employed for putting the gun into firing position. The location of the two racks is such that their axes are parallel when the spades are brought together in road position.

Two traveling bar clips fastened on the trails near the rear end of the racks are used to lock the gun in road position by means of the traveling bar. (See par. 36.)

25. **Securing the trails to the limber.**—This is done by three different arrangements:

(*a*) Vertical support: Two plates riveted to the under side of each trail rest on the side-rails of the limber frame.

(*b*) Longitudinal support: One of the two plates (the nearer to the carriage) has fastened to it an oblique wedge-shaped limber stock which rests against a corresponding surface of the rear spring hanger of the limber. This piece prevents any lateral sliding of the trails.

(*c*) Clamping: A vertical stop, fixed on the top of each trail, forms a seat for the trail clamping transom (Plate XV), which is connected to the limber by two bolts. The tightening of these bolts, accomplished by handles passing through the nuts, clamps the trails and limber solidly together.

On top of the trail clamping transom is a structural steel seat for the brake operator, who has within reach of his hand the brake lever.

26. **Connection between the trails and spades.**—Two spade-clamping transoms riveted on each trail are provided at both ends with sockets in which are locked the nuts of the spade clamp bolts fixed on the spades.

Article 7.

Gun Axle—Wheels—Wheel Brake.

27. The gun axle (Plate XIV) is a piece of forged steel with a steering knuckle at each end.

In firing position it supports the matériel directly by means of the pivot pin, which passes through the middle of the axle. The top surface of the axle above the pivot pin hole is concentric with the hole, and when the chassis is raised by means of jacks the concentric surface comes at the end of the movement into contact with the two gun axle centering pins, and thus centers the axle so that the insertion of the pivot pin will be possible, whatever may be the location of the wheels.

In road position the gun axle is connected to the transverse spring by articulated and adjustable shackles and by removable spring eye pins.

Adjustment of the shackles is accomplished by screwing the shackle adjusting bolts into or from the lower shackle hinge pins, which are so made as to contain a threaded eye which acts as a nut.

Adjustment is satisfactory when the lengths of the adjusting bolts are such that with the wheels resting on horizontal ground the three axes of the two articulated shackles are in line.

28. **Gun axle spring.**—This is a leaf spring secured to the chassis at its middle point.

29. **Gun axle wheel—Wheel brake—Caterpillar bands.**—The cast-steel wheels (Plate XIV) have two rubber tires each. Between the tires is the space necessary to guide the segments of the caterpillar bands. On the inner side of each wheel is mounted a brake drum surrounded by a steel brake band lined with heat-resisting matériel. Tightening of the brake band is effected by the brake rocker actuated through a wire-rope cable by the brake lever on the limber.

The cable connecting the two brake rockers traverses the hollow lever shaft, on which is mounted the brake lever, and passes over two grooved cable rockers carried by the shaft.

The rotation of the hollow shaft swings the cable rockers around it and tightens the brake bands by the action of the cables on the brake rockers.

The brake rocker is constantly pressed to the rear (in road position) by means of a spring.

A brake bracket on the gun axle supports the different parts of the controlling mechanism.

30. **Caterpillar bands.**—In firing position the gun wheels are provided with caterpillar bands. Each band comprises 12 segments and 12 shoes, connected together by special bolts provided with nuts and cotter pins, or by simple pins locked by a bent piece of steel rod.

There are two kinds of segments having different lengths. The common band is composed of 11 short elements and 1 long element. When, in consequence of the wear of the pins, the caterpillar band becomes too loose on the wheel, the long element is replaced by a short one.

ARTICLE 8.

Limber.

(Plate XV.)

31. The limber makes possible the transportation on the road of the matériel as a single vehicle. It is composed of—

A chassis upon which rest the trails.

An axle with its spring.

Two wheels.

The steering gear of the vehicle.

32. The limber chassis is composed of two side rails connected by two transoms. Each one of the side rails is provided at each end with spring hangers. The forward transom is a piece of cast steel in which is formed the socket for the pintle bolt.

The trails rest on the side rails of the limber; directly above these are spring hangers and the rear ends of the forward spring hangers. Bearing plates are riveted to the under side of the trails to form the support.

33. **The axle of the limber** of I section has at both ends steering knuckles, through which pass the vertical steering knuckle pins which form an essential part of the steering gear. On the upper flange of the section are two spring pads which support the two leaf springs of the limber. Two spring clips form the connection between each one of these springs and the axle.

34. **Wheels.**—The wheels are the same as those of the gun axle, except that they do not carry brake drums.

35. **Steering gear.**—The steering gear is similar to that employed in automobile construction. It comprises:

A drawbar, having at one end an eye which engages with the pintle hook of the tractor.

A drawbar tie, connected to the drawbar by a bolt and oscillating around the pintle bolt in the chassis of the limber.

Two symmetrical steering tie rods connected to the rear portion of the drawbar tie and actuating two steering arms which work the steering knuckles.

The drawbar tie, the steering tie rods, and the steering arms are connected by joints having the necessary flexibility for following the oscillations of the springs as well as the irregularities of the road. Two keys, one locking the drawbar tie with respect to the drawbar, the other locking both these parts with relation to the limber chassis, facilitate the maneuver of the limber by hand when it is separated from the rest of the vehicle.

CHAPTER III.

ACCESSORIES.

ARTICLE 1.

Traveling Bar.

36. The traveling bar is employed for carrying the gun from battery to road positions, and vice versa, and for supporting the rear of the gun and locking it during transportation.

The traveling bar is composed of two side rails connected by transoms, the end transoms being of bronze and forming bearings. Each end transom carries an operating pinion whose spindle is square and receives the pawl lever.

(*a*) *Connection between the traveling bar and the gun while the latter is being put into firing position.*

The clamping screw has at its lower end a clamping lever and is mounted in the clamping screw housing of the traveling bar. On the upper end of the clamping screw is a nut having the form of a T. When this nut engages the corresponding T slot in the breech ring, turning the clamping screw connects the gun and the traveling bar rigidly.

The movement of the gun from road to firing position and vice versa is effected by operating the pinions of the traveling bar, which engage the racks carried by the trails. During this motion the bronze end transoms of the traveling bar slide on the upper faces of the racks.

(*b*) *Locking the gun in road position.*

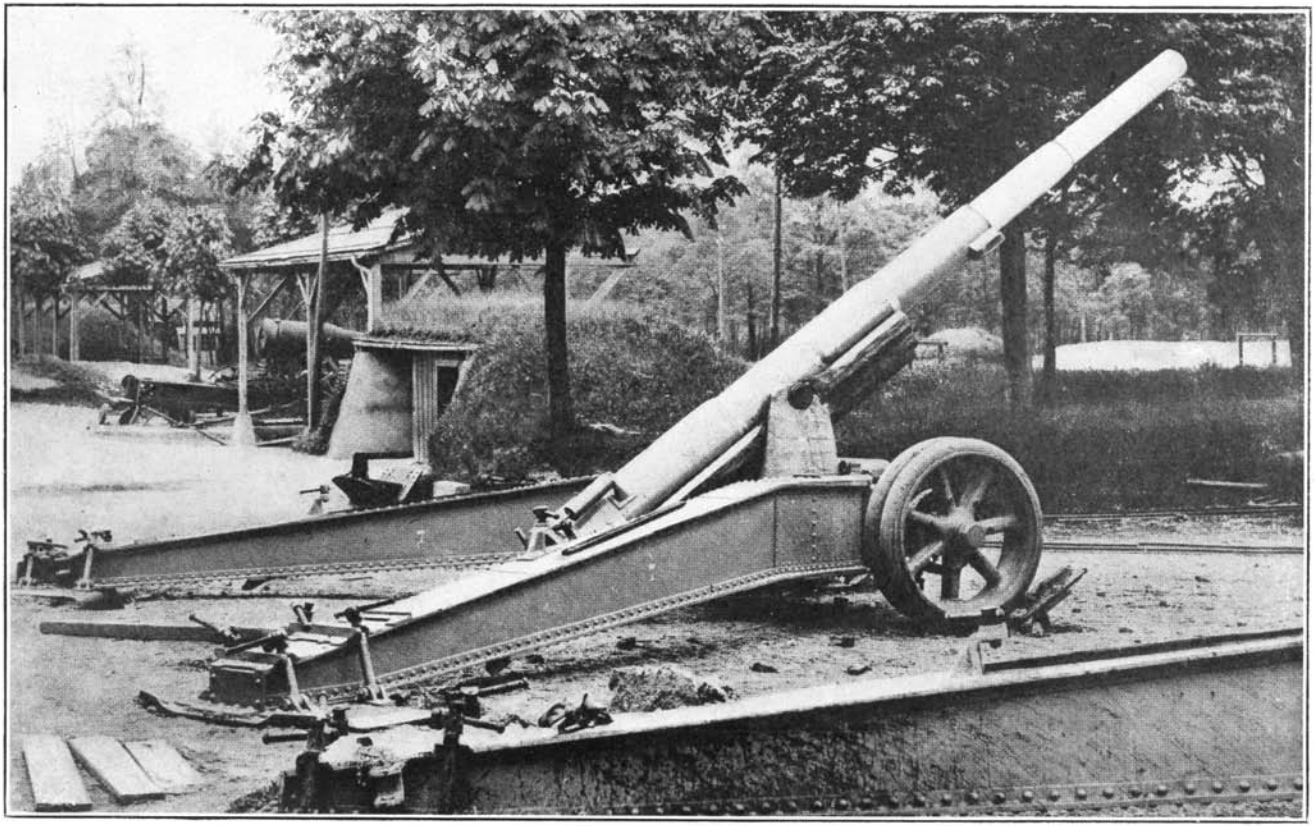
At the end of the rearward motion of the traveling bar the screws of the traveling bar clips fastened on the trails are brought opposite the corresponding sockets in the locking transoms. The tightening of these screws renders the traveling bar immovable and prevents any motion of the gun or traveling bar on the trails during transportation.

(*c*) *Locking device of the traveling bar.*

At the end of the forward motion of the traveling bar the breech ring is connected to the brake by the recoil and counter-recoil piston rod nuts.

A locking device prevents the removal of the traveling bar before the nut of the recoil piston rod is entirely tightened. In addition, the trails can not be separated when the traveling bar is in position, so that it is not possible to put the gun into firing position or to commence firing before having connected the gun to the recoil mechanism.

The locking device consists of a latch, whose finger engages in a groove on the under side of the breech ring. This latch ceases to act when the nut of the recoil piston rod in being tightened presses it down, but does not cease completely to act until the nut is entirely tightened.



Article 2.

Lifting Bar.

37. The lifting bar and the jacks swing the entire matériel around the gun axle as an axis. This operation permits the removal of the limber and, after having spread the trails, the placing of their extremities in the ground, or vice versa. The lifting bar is composed of an I-beam, having at each end an extension under which the jacks are placed.

On top and in the middle there is a lug which fits in the corresponding socket of the rear maneuvering lug of the chassis. A pin keeps the lug of the lifting bar in its socket during the operations of maneuvering.

Article 3.

Spades.

38. The spades are composed of a top plate and a share of structural steel plate, forming an angle of 80° with each other, and stiffened by two braces.

There is found on the top plate:

1. A stop against which the extremity of the trail rests during recoil.

2. An increased thickness of plate, which rests in a corresponding socket of the trail and serves as a stop for the trail at the moment of counter recoil.

3. The front and rear spade clamp bolt hinges, to which are connected the spade clamp bolts, each having a nut provided with an operating handle. The nut can be locked in the corresponding socket of the spade clamping transom, thus connecting the spades securely to the trails.

Article 4.

Loading Tray.

39. **The loading tray** is composed of a cylindrical body of steel plate open on the upper side and provided with two handles. At the rear is placed a stop for the base of the shell.

At the front end is a centering cone of bronze which insures the centering of the loading tray in relation to the interior of the gun, and which serves as a support while the gun is being loaded.

Two lateral bronze guides slide on the sectors of the breech ring threads, guiding the loading tray longitudinally while it is being put in place.

A bronze position lug engaging with a socket in the breech ring prevents the loading tray from slipping to the rear. Two bronze protecting plates on the cylindrical body in front of the handles prevent injury to the breech ring threads.

ARTICLE 5.

Sights.

(Plate XVI.)

40. **Sight support.**—The sight support is fixed on the left trunnion of the cradle. It is composed of:

1. A fixed support, secured to the trunnion by three screws. Three centering pins determine and assure the permanence of the position of the support in relation to the trunnion. The support forms at its center a threaded spindle, and at its side an arm with an adjustable lug.

2. A movable support, connected to the fixed support by a nut which screws on the threaded spindle formed by the fixed support. The movable support can, during adjustment, rotate slightly in relation to the fixed support. It comprises:

The two bearings for the trunnions of the sight and their movable bearing caps, which slide longitudinally to permit the mounting of the sight.

A rocking device with screw and movable nut, which, according as it is in contact with one or the other of the two ears carried by the sight, rocks the sight around the axis of its trunnions.

A yoke, which receives the adjusting lug of the fixed support.

41. **Sight and goniometer.**—The sight, by which the piece is laid for elevation, carries the goniometer by which the piece is laid for direction.

(*a*) *Sight.*—The sight is in reality a level provided with a worm.

The worm is located in the sight housing, which is carried by the sight support by means of two trunnions, whose axis is by construction constantly and accurately parallel to the axis of the gun. A trunnion locking plunger pressed upward by a spring locates the trunnions in respect to the trunnion caps, and insures their staying in this position.

At the top of the sight is the sight column foot socket in which is placed the sight column foot. The socket swings in the sight housing around a pair of hollow trunnions, whose axis is perpendicular to the axis of the trunnions of the sight housing. This socket is connected to an arm in the interior of the housing whose lower extremity engages the threads of the worm. A micrometer drum, divided into 120 minutes, actuates directly the worm; a second drum, graduated in degrees, is operated by a thread on the worm spindle.

(*b*) *Goniometer.*—The goniometer is mounted on the sight column foot, which is held in its socket by the sight latch plunger and the driving lug plunger. It comprises:

The collimator, having a vertical slot, and turning around an axis parallel to this slot. The total amount of this rotation is 10 grades.

The graduated micrometer, which turns the collimator and has 100 divisions numbered by tens. When the micrometer turns one division the collimator turns the hundredth part of 10 grades, or 1 decigrade.

[NOTE I.—At the time of publication (January, 1918), the graduation of all sights in mills was adopted for future manufacture.]

The micrometer wing nut screw, which locks the collimator in any given position.

The collimator bracket, which can be turned by hand around the same axis as the micrometer.

The sight column and the indexing mechanism. By pressing down upon the micrometer the sight column can be turned around its axis. When the pressure is removed the column is locked in position.

The sight column foot, in which the sight column is placed, carries the bronze limb graduated clockwise into 40 equal parts of 100 decigrades each, numbered, 0, 100, 200, 300, etc., up to 3,900.

The elevation level.

The small level perpendicular to the axis of the sight housing trunnions, which serves in connection with the rocking mechanism of the sight housing to correct the error due to a difference in level of the trunnions of the cradle.

Operation.—The large and small levels are in a plane perpendicular to the axis of the sight column. When, therefore, the bubbles of these two levels are simultaneously centered, the axis of the sight column is vertical. The fulfillment of this condition is necessary in laying for direction.

If one operates the elevating micrometer with the goniometer, in place on the sight, the axis of the large level is inclined with respect to the axis of the sight housing trunnions, the angle of inclination being that indicated by the micrometer and drum of the worm.

If one now centers the bubble of the large level by operating the elevating hand-wheel, one gives to the axis of the sight housing trunnions and consequently to the gun itself, which is parallel to it, an elevation equal to the angle indicated by the elevating drum micrometer.

42. **Mirror referring rule.**—The mirror referring rule is composed of a tube having at one end an eye provided with a clamping screw and at the other end a rule head. Through the eye passes a rule bracket, itself having at its other end an eye with a clamping screw, which serves to locate the rule bracket on one of the stakes.

The other extremity of the rule slides in a second rule bracket composed of two eyes whose planes are perpendicular to each other and which are both provided with clamping screws. Through one of these eyes passes the rule and through the other the second stake.

ARTICLE 6.

Fuze Setter.

(Model of 1917.)

43. The fuze setter, Model of 1917, is composed of the following parts:

1. A bronze support having at one side the socket for the blade carrier. The upper part of the support is graduated to show the time of flight of the fuze. This graduation is in seconds and tenths of seconds.

2. A housing having on its lower part threads which engage with the internal threads of the support. This housing can be locked in any position by means of a small lug whose clamping nut of bronze projects from the top of the apparatus.

3. A corrector graduated in 120 divisions. Each one of these divisions corresponds very nearly to one-twentieth of a second for times of flight from 23 to 24 seconds, which are average. Division 60 corresponds to a correction of zero in order that the corrector may conveniently be turned in either direction. For zero correction division 60 is opposite the index scribed on the housing.

The graduation of the support is read by means of an index fastened to the corrector.

A locking screw locks the corrector on the housing.

4. A fuze socket composed of a steel collar having two lugs and a bronze housing. The fuze socket is movable, and is placed or removed at will at the bottom of the housing.

5. A blade carrier provided with a rack which engages a pinion. The blade carrier has an extension acted on by a spring operated plunger. A stop keeps the blade carrier in its socket.

6. A removable operating lever on the spindle of the pinion.

7. A traveling case. The fuze setter is carried in a special traveling case in which it is securely clamped, and which also serves to facilitate its operation during fire. The box is provided with a handle, a semicircular bronze sector and a stop cleat.

One compartment inside receives the operating lever, a clamping nut, a corrector locking screw, and a spare blade carrier spring, wrapped in cloth.

ARTICLE 7.

Battery Pump.

44. The battery pump is used to fill with oil the recoil cylinder and the reserve of the counter-recoil reservoir. It is composed of a body connected to a reservoir having a capacity of about six quarts and completely closed.

The piston of the pump is actuated by a lever which can be pivoted in two positions. This makes the operation easier when it would otherwise become too difficult.

A flexible copper pipe forms the communication between the reservoir and the orifices of the cradle, by means of a special connection. This connection is composed of a threaded part fastened to the end of the pipe and of a movable part which, at one end, screws into the filling orifice of the cradle and at the other end screws on the fixed part.

The reservoir has also a check valve, which prevents the escape of oil in case the pump is upset, and permits the filling of the reservoir. In doing this a funnel with wire mesh filter must be used in order that the brake oil introduced may be absolutely free from all impurities. The operation of filling must be made in a place as free from dust as possible.

The pump is inclosed within a chest, which protects it and holds in addition:

The operating lever spindle.
A spiral pipe.
A funnel with wire mesh filter.
An oil extractor (75-mm. matériel).
A small graduated rule.
A 21 and 35-mm. double-ended wrench.
An operating lever extension.
A screw filler.
A right-angled screw driver.

The oil extractor is screwed into the filling orifices of the cradle when it is desired to empty the brake or the counter-recoil reserve and on the recoil cylinder draining orifice when it is desired to fill the recoil cylinder.

The screw filler is a reserve in case the pump gets out of order.

CHAPTER IV.

MUNITIONS.

45. A. *Projectiles.*

Kind of shell.	Weight of shell.	Weight of explosive.
	Pounds.	*Pounds.*
Semisteelhigh explosive shell, Model of 1917	98.87	9.92
Forged steel high explosive shell, Model of 1915, Type B	95.02	15.70
Elongated forged steel high explosive shell, Model of 1914	95.30	22.49

B. *Powder charges.*

46. The range tables give full information concerning the powder charges.

C. *Primers.*

47. The primer used is the primer V_2. If these can not be obtained the Marine primer, Model of 1906, may be used.

D. *Fuzes.*

48. The following fuzes are used with this matériel:

Detonating percussion fuze 24/31 I.A.L., Model of 1916, giving instantaneous explosion.

Detonating percussion fuze 24/31, Model of 1899–1915, in three forms:

(*a*) Without delay.

(*b*) With short delay.

(*c*) With long delay.

Detonating time and percussion fuze 24/31 L.D., Model of 1917.

All these fuzes are used with relay gaines, Model of 1915, Type A, for the semisteel shell, Model of 1917, and Type C for the steel shells, Model of 1915, Type B, and Model of 1914.

CARE OF MATÉRIEL.

CHAPTER I.

GENERAL RULES.

49. Inspection, care, and repair of the matériel of the 155-mm. Filloux gun are performed by the following:

(*a*) The gun section, under the chief of section.

(*b*) The chief mechanic, under the supervision of the battery commander.

(*c*) The repair shops.

A. *Gun section.*

50. The chief of the gun section is responsible for—

Daily cleaning, lubrication, and inspection of all matériel.

Replacing damaged parts authorized by the present regulations—breech, primer holder, obturator spindle, gas check pad, wheels, caterpillar bands, and brake-operating mechanism.

Making sure that the recoil and counter-recoil reservoirs are full.

For the above operations the spare parts and tools are taken from the gun repair chest.

The instructions concerning the upkeep of matériel and the replacing of damaged parts are given in the present regulations.

The disassembling of parts and the making of repairs not prescribed in these regulations are absolutely prohibited.

The chief of section records all work done and repairs made in his data book.

B. *Chief mechanic.*

51. The chief mechanic under the battery commander is responsible for—

The detailed inspection, cleaning, and lubrication of matériel.

The making of repairs during firing, when the repairs can not be made by the gun section.

The replacing of parts as prescribed in the present regulations.

Filling the recoil and counter-recoil reservoirs.

Testing the lines of sight and the sighting apparatus.

The removal of copper deposits from the bores.

Care of the ropes.

For the above operations, the tools are kept in the battery tool chest, and the repair parts in the battery chests or in the tractors.

The instructions concerning the upkeep of matériel and the replacing of damaged or broken parts, the testing of recoil and counter-recoil mechanisms, and the sights, are given in the present regulations.

It is absolutely forbidden to disassemble any parts or make repairs not prescribed in these regulations.

52. In general, the battery commander is authorized to replace all parts for which he may have spares.

The battery is forbidden to perform any disassembling not authorized by these regulations, or any repairs involving the following operations:

Adjusting the lines of sight.

File work.

Forge work.

53. It is forbidden to polish any parts of the gun or carriage. No cleaning or lubricating matériels may be used except those issued for the purpose, such as hydroline or special recoil mechanism oil, engine oil No. 1, clock oil, slushing oil, kerosene, etc. The use of any similar matériels, or of brick powder, emery, etc., is absolutely prohibited.

CHAPTER II.

GUN SECTION.

ARTICLE 1.

Disassembling and Assembling.

54. No parts of the matériel should be disassembled unless it is necessary.

55. It is forbidden to disassemble any part of the matériel by a method other than that prescribed in these regulations, or to disassemble any part not prescribed in these regulations.

56. The parts of the matériel that may be disassembled by the gun section are the breech mechanism, complete, composed of the breechblock, the carrier, the rack, the obturator spindle, the gas check pad, and the spindle plug, the percussion mechanism, the primer holder, the wheels, the wheel brake mechanism, and the caterpillar bands.

I. *Breech mechanism.*

57. **General directions.**—The different parts of the breech mechanism must be handled with great care. The breechblock or the obturator spindle, if dropped, may be damaged seriously enough to prevent the proper functioning of the mechanism.

The different parts, and especially the gas check pad and the obturator spindle, must be kept free from dirt and always placed on a clean cloth, never on the ground.

Before removing the breechblock from the carrier the obturator spindle must be removed in order that the gas check pad rings may not be injured.

Before assembling the parts they must be carefully cleaned and well oiled.

In case any part of the breech mechanism is found to be burred or to be cutting, call immediately upon the battery chief mechanic to correct the difficulty or to obtain the services of the mobile repair shop. The smooth operation of the breech mechanism depends almost entirely upon the condition of the bearing surfaces.

The use of a file upon the threads of the breechblock or of the breech recess, except by a mechanic of the mobile repair shop, is prohibited.

The use of any emery cloth except crocus cloth upon any part of the breech mechanism, except by a mechanic of the mobile repair shop, is prohibited. Crocus cloth should be used very sparingly and only upon the special authorization of an officer.

(A) Disassembling the breech.

58. (1) Place the gun approximately horizontal. Open the breech. Pull out the spindle nut key as far as possible. (In order to do this, press down the key spring and pry under the heel of the key with a screw driver.)

Unscrew the obturator spindle, using the special wrench provided. In doing this, hold the spindle nut in its socket.

Remove the obturator spindle carefully, with the obturator pad and its washer.

Remove the spindle nut, at the same time pulling back the hammer.

Remove the gas check pad from the obturator spindle.

Unscrew the spindle plug with its washer if it is necessary to change the latter.

(2) Free the locking lever from the back latch catch by pressing the handle down and turn the breech to the left until the first threads of the breechblock are nearly engaged with the threads of the breech ring.

Insert between the shoulder of the counterpoise spring rod and the rear end of the counterpoise cylinder the spacing clip. Then slowly continue the rotation of the breech and disconnect the counterpoise when the adjusting nut is at the center of the spring-rod eye.

(3) Open the breechblock and push the rack lock as far as possible into its seat. By means of the operating lever, rotate the block a quarter of a turn as in opening the breech. When this is done the lever and rack are disconnected. Then turn the block by hand in the direction of opening until the rack is free.

Remove the rack.

Remove the rack lock and its spring.

(4) Support the breechblock by means of a rope, or by a bar passed through it, and unscrew it from the carrier. Remove the spindle spring with the front spring collar, the front spring washer, and the rear spring washer.

(5) Support the carrier by means of a rope or bar. Remove the pin with spherical head which secures the hinge pin collar.

Remove the hinge pin collar and remove the hinge pin.

Remove the operating lever.

Remove the carrier and the lock collar.

(B) Assembling the breech.

59. (1) Insert the lock collar in its seat on the carrier.

(2) Place the carrier parallel to the axis of bore, supporting it by means of a rope or bar.

(3) Insert the operating lever.

(4) Insert the hinge pin in the lock collar in such a way that the counterpoise spring rod may be in the direction of the adjusting beak of the hinge pin. Push the hinge pin completely down.

(5) Put in place the hinge pin collar and secure it by means of the pin.

(6) Place in the carrier the rear spring washer, the spindle spring, and the front spring washer, holding them together with heavy grease. Place the front spring collar in the breechblock. Lift the breechblock by means of a rope or bar. Screw it into the carrier carefully and completely.

(7) Insert the rack lock and spring.

(8) Insert the rack, keeping the lock forced down in its seat, and slightly turning the breechblock so as to permit the rack to pass freely. Bring the block and rack each opposite its index.

(9) Move the operating lever until the lug is in its seat in the rack. Turn the breechblock by hand so as to allow the rack and operating lever to reach the closing position. Release the rack lock spring and bring back the breechblock to the open position by operating the lever without moving the carrier.

(10) Place the spindle nut in its seat. Place the gas check pad on the obturator spindle. Screw the obturator spindle up completely at the same time holding the spindle nut in its seat. (If necessary, screw in the spindle plug with its washer before mounting the obturator spindle.) Push in the spindle nut key when the keyway in the obturator spindle is opposite the keyway in the nut.

(11) Close the breech. Connect the counterpoise spring rod with the adjusting nut in the beak of the hinge pin. Open the breech and remove the spacing clip. Close the breech.

II. *Percussion mechanism.*

60. **To disassemble the percussion mechanism,** push with the special screw driver on the rack-lock bushing, at the same time holding the hammer. Turn the bushing one quarter of a turn so as to free it from the lugs on the end of the rack. Remove the bushing, keeping the spring in place. Remove the spring.

Pull the firing lanyard as far as possible so as to bring the lug of the rack spindle opposite its seat in the upper part of the housing. Remove the rack spindle upward, using a hammer and bronze drift pin, if necessary. Remove the hammer and its support.

To assemble, perform the above operations in the inverse order.

III. *Safety device and primer holder.*

61. **To disassemble the safety device,** press upward on the spring socket with a screw driver, in order to disengage the spring from the operating finger. Turn the operating finger one-quarter of a revolution to the left, remove the spring, and unscrew the operating finger completely. Lift out the safety lock.

To disassemble the primer holder, unscrew the firing pin stop, then remove the firing pin and firing pin spring.

IV. *Wheels.*

62. **To remove a wheel.**—The disassembling of the gun axle wheels is more easily performed when the gun is in traveling position. Block the opposite wheel. Slightly raise the wheel by means of a jack set against the upper part of the rim or the hub. Place blocks and half blocks under the axle. Lower the axle until it rests on the blocks and remove the jacks.

Unscrew the hub cap and remove the grease. Remove the cotter pin and unscrew the lock nut. Rotate the wheel slowly while removing it.

To mount the wheel reverse the operation.

[NOTE.—In removing a gun wheel, first disconnect the brake drum from the brake bracket by removing the adjusting bolt spindle and the connecting pin between the link and lower brake band end. Free the band from the drum.]

V. *Caterpillar bands.*

63. **To remove a shoe from a band.**—Remove the split pins and nuts fastening the pins and remove the pins. Clean and grease the pins before replacing them in their housings.

ARTICLE 2.

Daily Maintenance—Rapid Inspection.

A. *Daily maintenance.*

64. It is essential that the matériel be cared for daily. This does not require skilled mechanics, but can be done by any cannoneer, who should know how to disassemble all authorized parts.

65. (1) *After traveling.*—The matériel must be cleaned immediately upon arrival. After the cleaning is completed the following operations must be performed:

(*a*) Clean and grease the hinge pins of both parts of the draw bar and of the limber steering mechanism.

(*b*) Clean and grease the limber steering knuckles.

(*c*) Clean the spade clamp bolt hooks, the lower ends of the trail locking bolts, the spade clamping transoms, the spade clamp bolts, and the traveling bar locking screws.

(*d*) Clean and grease the ends of the recoil and the counter-recoil piston rods and the bronze gibs of the gun.

(*e*) Clean and grease the elevating gear sector and the recoil regulating arm.

(*f*) Clean and oil the breech mechanism, the percussion mechanism, and the sight support.

(*g*) Clean the wheel brake operating mechanism.

(*h*) Clean the top carriage drain holes.

(*k*) Clean the caterpillar bands.

(2) *After firing.*—The following operations must be performed:

(*a*) Clean and slush the external parts of the gun; wash, dry, and slush the bore, powder chamber, and breech of the gun.

(*b*) Clean and grease the sliding parts of the gun and cradle.

(*c*) Clean and grease the elevating and traversing mechanisms and the sights.

(*d*) Test the quantity of oil in the recoil cylinder and counter-recoil reservoir.

The different parts of the matériel are cleaned and lubricated according to the following directions:

66. **Oil cups.**—An oil cup is placed at the entrance to each oil hole except Nos. 15 and 16.

Raise the milled head and with an oiler pour the necessary amount of oil into the hole slowly so as to allow the oil to circulate. At the same time operate the mechanism that is being oiled so as to allow the oil to reach all its parts. Keep all oil cups and oil holes clean and free at all times. Use only engine oil No. 1 or lubricating oil for this purpose.

67. **The gun.**—The gun being in firing position, the breech opened or removed.

To clean the bore, depress the gun as far as possible and pour water or kerosene into the bore and powder chamber; sponge the bore with the cleaning sponge until the water or kerosene comes out clear. Dry by means of burlap placed on the rammer and slush with the greasing sponge.

Clean the breech recess with a sponge and dry each thread carefully. Oil with a brush. This must be done immediately after firing, when antiflash preparations are used. In this case it may be necessary to remove the residue with hot water or kerosene and then to oil.

Clean and slush very slightly the quadrant seats. If they are rusted, remove the rust, using kerosene and a bit of wood. Never use emery, sand, or similar substances for this purpose. If kerosene will not remove the rust, the regimental repair squad must be called on to clean the quadrant seats, for they must generally be readjusted.

Clean and oil the bronze gibs of the gun.

68. **The breechblock.**—The breechblock should, whenever possible, be disassembled before it is cleaned. Wash the different parts with water or kerosene, dry thoroughly, and oil with a brush. Oil the hinge pin. When cleaning the breechblock, care must be taken not to put any kerosene on the gas-check pad. Clean the pad with a wet sponge and wooden scraper, then coat its circumference slightly with tallow or with special mixtures provided for the purpose.

In order to facilitate the opening of the breech, put a thick coat of a mixture of heavy grease and engine oil, or a special mixture provided for the purpose, on the rear face of the mushroom head and the front part of the obturator spindle; then coat the front face of the mushroom head with a mixture of equal parts of tallow and machine oil.

When firing, the breechblock must be well coated with oil. Do not use grease for this purpose.

To clean the vent, pass a flexible brass wire of $\frac{1}{8}$ inch diameter through it and pull it to and fro.

69. **Percussion mechanism.**—Grease the rack with heavy grease. Put heavy grease on the spring.

70. **Breech counterpoise.**—Clean and oil the adjusting screw and nut.

71. **Cradle.**—Move the gun from firing to traveling position and back to firing position, cleaning and greasing lightly the bronze gibs and sliding parts.

The trunnions must be kept clean and frequently oiled (oil cups Nos. 1 and 3).

Clean and grease slightly with heavy grease the teeth of the elevating gear sector.

Clean the recoil and counter-recoil piston-rod ends. Clean and grease their threads lightly.

Oil the automatic filler (oil cup No. 7). Clean and oil the recoil-regulating arm, the connecting pin, and the bronze guides, at the same time elevating and depressing the gun.

72. **Sight support.**—Remove the sight support cover and see that the support is in good order. Wipe it and oil the rocking screw. Wipe and oil the bearings of the sight trunnions. Replace the cover.

73. **Top carriage-traversing and elevating mechanisms.**—Clean the top carriage and grease the traversing pressure lug. To do this, traverse the gun to the left until it is at right angles to the trails; the latter part of the movement must be made by pushing the muzzle by hand. The caterpillar band must first be removed from the left wheel. Instead of removing the caterpillar band, the pivot pin may be removed and the carriage jacked up. After cleaning, care must be taken in meshing the traversing gears. The traversing handwheel must be moved right and left while the gun is being pushed back into position.

1. Sighting gear casing.—Drop some engine oil into oil cups 3, 4, 5, and 6. Remove the slanting shafts and drop some oil into holes 15 and 16 in the shaft sockets.

2. Elevating mechanism.—Clean and grease the elevating worm with heavy grease. Drop some oil into the oil cup (No. 8) on the worm rear bearing and oil cup No. 9 on the elevating bevel gear box.

3. Traversing mechanism.—After traversing the gun completely to the left, as explained above, fill the bevel-pinion casing with oil.

4. Sights.—Oil the sight column above the limb with clock oil. Turn the limb and micrometer, as well as the elevating micrometer, in order to spread the oil. Clean the trunnions of the sight housing. Avoid spilling oil on the optical parts of the sight, as well as on the glasses of the levels. Clean the glasses of the levels and collimator by breathing on them and wiping with a clean, soft cloth or with lens paper.

74. **Chassis.**—Clean and grease the axle pivot-pin housing. Clean the pivot-pin cap and grease its hinges. Clean and grease the gun axle guides and the racer. Slush the trail hinge pins and trail locking bolt nuts.

75. **Trails.**—Forward ends.—Clean the sockets for the nuts of the trail locking bolts.

Racks.—Clean and slush the translating racks.

Traveling-bar clips.—Clean and oil the screws.

Spade-clamping transoms.—Clean the bolt hooks and slush lightly with a brush.

Counter-recoil stop seat.—Remove all rust and dirt before putting the gun into firing position.

76. **Gun axle.**—Clean the shackles, shackle adjusting bolts, and hinge pins.

When putting the gun into firing position, clean and grease the pivot pin bearings, the spring eye pin bearings, and the shackle hinge pins and their bearings.

77. **Wheels.**—The wheels must be freed from all dirt, special care being taken in cleaning the steering knuckles.

Remove any small stones that may be embedded in the tires. The wheels are to be greased from time to time as circumstances may demand. When this is necessary, the wheels are disassembled, the lock nuts and axle ends cleaned completely, and then greased lightly and the hub cap filled with the wheel grease issued for the purpose. Before lowering the wheel to the ground, rotate it in order to distribute the grease. Before disassembling the wheel, make sure that no dirt can fall on the journal. When traveling, the wheels must be greased frequently.

78. **Brakes.**—Brake drum and bracket.—Clean the different parts and drop oil into cups Nos. 11 and 12. Clean the brake drums carefully, as they must be free from grease and mud in order to function properly; if necessary, wash with kerosene or gasoline.

Brake-operating mechanism.—Clean the parts, oil slightly the moving parts, and grease carefully the operating-lever quadrant.

79. **Limber.**—Oil the knuckle pins (oil cups Nos. 13 and 14). Clean and oil all the pins of the steering-gear connections. Clean the seats of the drawbar keys. Slush the drawbar pin. Clean the pins of the trail-clamping bolts. Clean and oil the threaded parts of the bolts.

Before fastening the trails on the limber, clean the upper part of the frame, especially the oblique ends of the rear spring hangers.

80. **Traveling bar.**—Slush the locking device. Clean and slush the teeth and spindle of the operating pinion. Oil the gun-clamping nut and its housing.

81. **Spades.**—Clean the spades, especially the parts which touch the trails. Slush the spade clamp bolt hinges and the threads of the bolts.

82. **Fuse setter.**—Remove the blade carrier and clean it with an oiled rag. Wipe the support scale, removing any foreign particles from the threads. Make sure that the fuse housing can turn freely in the support and oil it. If it does not function properly, the battery repair squad must disassemble it.

B. *Rapid inspection of matériel.*

83. Before traveling or firing the chief of section, assisted by the gunner, rapidly inspects the matériel for which he is responsible. He tests the rivets and bolts. Any screw or bolt found slightly loose must be tightened at once; any loose rivet is noted and watched until replaced.

84. While traveling, the chief of section directs the cannoneer, seated on the trail, to watch whether the gun is riding well. At each stop the chief of section inspects the matériel quickly, sees that the hubs are not hot, and that the chains, keys, and ropes securing the matériel are in order.

85. After firing, the operations of the regular daily maintenance are performed, and the chief mechanic makes a rapid inspection. All defects noted are reported to the battery commander.

I. *Rapid inspection in traveling position.*

86. Make sure that the gun is secured to the traveling bar by means of the clamping screw and locking device.

87. See that the trunnion caps are well secured by their locking screws. Make sure that the sight bracket has not been damaged.

88. See that the plug of the filling orifice of the counter-recoil reservoir is screwed home and that its collar and thong are in place.

Verify the position of the recoil and counter-recoil gauges. See that there is no leak at the rear packings of the recoil and counter-recoil cylinders. See that the plug of the recoil cylinder filling orifice is tight and that its chain is in place. Make sure that the plugs of the draining orifices of the recoil cylinder and counter-recoil reservoir are tight and that the collars and thongs are in position.

89. Test the tightness of the nuts of the gun axle spring plate and centering bolts. See that the spring-plate bolts do not show any signs of wearing thin or breaking.

Test the tightness of the nuts of the upper and lower shackle hinge pins.

Make sure that the safety clips of the spring-eye pins and adjusting-bolt pins are in their locking position.

Make sure that the pivot pin cap is closed.

Test the tightness of the hub caps.

90. Make sure that the nuts of the spade clamp bolts are tight, and that the trail connecting pin and its two chains are in place.

91. See that the steering gear of the limber wheels is in good order, and that the wheels steer easily. See that the drawbar pins, bolts, nuts, and keys are in good order.

92. See that the wheel brake is in good working order, and loosen it completely.

93. See that no leaf in the gun or limber springs is broken or bent.

94. Test all bolts and rivets. Tighten any loose bolts.

95. See that all implements and accessories are in their chests or in the tractors.

II. *Rapid inspection in firing position.*

96. This inspection includes the same operations as the preceding, so far as parts not intended specially for traveling are concerned. Also perform the following operations:

97. Operate the breech to make sure that all its parts and the counterpoise are in good working order. Examine carefully all parts of the primer mechanism and percussion mechanism. Replace any parts which are not in good serviceable condition.

98. See that the elevating and traversing handwheels can be operated easily and with little lost motion.

99. Make sure that the sight is in good order.

100. See that the recoil and counter-recoil piston rod nuts are screwed home.

101. See that the nuts of the spade clamp bolts are tight.

102. See that the spades are in proper condition and well seated.

III. *Inspection of the accessories.*

103. Make sure that the oil cups are in working order.

See that the pawl levers are in good working order.

Examine the sliding faces and stop of the projectile tray.

Examine the rivets, chain, and pin of the lifting bar. See that the bar is not bent.

Examine the traveling bar. See that it moves properly along the racks, and make sure that the locking device and clamping screw work properly.

Make sure that the fuse setter is in good working order.

CHAPTER III.

CHIEF MECHANIC.

ARTICLE 1.

Recoil and Counter-Recoil Systems.

104. It is absolutely forbidden for any one in the battery or in the mobile repair shop to disassemble any part of the recoil or counter-recoil systems. The following operations only are permitted to the chief mechanic:

A. Filling the recoil cylinder.

B. Emptying the automatic filler.

C. Emptying the reserve from the counter-recoil reservoir.

D. Filling the counter-recoil reservoir with its reserve.

The battery pump is used in performing these operations.

To prepare the pump for use, raise the operating lever, insert the connecting pin in the highest hole of the support, put the extension piece on the lever, and operate the pump until oil flows out of the copper pipe.

A. *Filling the recoil cylinder.*

105. The automatic filler gauge indicates the amount of oil in the recoil cylinder. This is measured by means of a small graduated rule, which indicates in millimeters the position of the gauge. If the gauge is at a distance of more than 200 millimeters from the rear of the cylinder, proceed as follows:

(1) Unscrew the plug of the recoil cylinder drain orifice.

(2) Screw in its place the oil extractor.

(3) Unscrew the plug of the recoil cylinder filling orifice.

(4) Screw in its place the pump connection. Insert in this connection the end of the copper pipe and tighten the nut without forcing it.

(5) Operate the pump until air bubbles cease coming out of the oil extractor.

(6) Remove the oil extractor, screw in the plug, and operate the pump until the gauge is 150 millimeters from the end of the cylinder.

(7) Remove the pipe and connection and replace the filling orifice plug.

[NOTE.—Before screwing in the pump connection, see that it is clean, and the oil flows from the copper pipe when the pump is operated.]

B. *Emptying the automatic filler.*

106. If the gauge projects from the cylinder this indicates that there is too much oil in the cylinder. To avoid excessive pressure in the recoil cylinder the filler must be emptied until the gauge returns to a distance of 100 millimeters or more. To do this, unscrew the plug of the recoil cylinder drain orifice and place a vessel to catch the oil. Screw the oil extractor into the orifice until oil flows out.

C. *Emptying the counter-recoil reservoir.*

107. It is forbidden to pump oil into the counter-recoil reserve until after it has been completely emptied. This operation is performed as for the automatic filler, by screwing the oil extractor into the counter-recoil reservoir filling orifice, the plug of which has been unscrewed by means of the special right-angled screw driver.

D. *Filling the counter-recoil reserve.*

108. The counter-recoil reserve must contain an amount of oil corresponding to 100 strokes of the pump. The reserve being entirely emptied, connect up the pump to the counter-recoil filling orifice, as described above, and pump 100 strokes, without stopping, when the gauge projects 5 millimeters, as it will before the 100 strokes are completed.

109. **Use of the screw filler.**—Remove the leather which protects the threads, unscrew the piston as far as it will go, unscrew the head, and fill the cylinder three-quarters full of oil. Put in the head and give the screw several turns, holding the filling tube elevated, in order to remove all the air contained in the filler.

Screw the filler into the hole, being very careful to keep the filler lined up so as not to injure the threads, and force oil into the reservoir by turning the handle. The amount of oil required to fill the reservoir is about five times the capacity of the screw filler, when filled three-quarters full.

ARTICLE 2.

Disassembling and Assembling.

110. Under supervision of the chief mechanic it is authorized to disassemble and assemble all spare parts contained in the battery spare part chests. For certain parts the following precautions must be observed:

111. **Counterpoise.**—Disconnect the spring rod and the adjusting nut by the use of the spacing clip, as explained under disassembling the breechblock. Remove the pin and the counterpoise bracket collar, keeping the counterpoise horizontal. Remove it by lifting vertically.

112. **Gun axle spring.**—Jack up the front part of the carriage. Remove the adjusting bolt pins, then the spring eye pins. Block up the ends of the spring. Then remove the cotter pins and nuts of the spring plate bolts and centering bolt.

To replace the spring, reverse the operations, regulating the length of the shackle-adjusting bolts if necessary.

113. **Wheel and caterpillar band.**—See paragraphs 62 and 63.

114. **Limber spring.**—This operation is performed with the limber separated from the gun. Remove the cotter pins, nuts, and spring eye pins. Do not remove the pin connecting the shackle to the limber frame. Remove the cotter pins, the nuts, and the spring clips. Then remove the spring. For assembling, reverse the above order.

115. **Removing the brake drum from a spare wheel.**—This is done only when the wheel is dismounted from the matériel. Remove the

cotter pins, unscrew the nuts, and remove the brake drum bolts. Remove the drum.

116. **Fuse setter, model 1917.**—Remove the stop screw on the upper part of the support, then completely unscrew the fuse housing. For assembling, the small lug of the index being engaged in the helical groove, screw down completely, set the corrector at 60, and make sure that the index is opposite the zero of the time graduation. If this is not the case, unscrew the fuse housing and set the lug in a different thread of the support scale. This completed, screw home the stop screw.

ARTICLE 3.

Complete Cleaning and Lubrication of Matériel.

117. This must be done at least once every week. The operations are carried on, under the supervision of an officer, by the battery mechanics. They are assisted, when necessary, by the members of the gun section. The chief of section indicates to the chief mechanic what he has noticed of the functioning of the gun. He records all repairs made, with their dates, in his data book.

118. The complete cleaning and lubricating of the matériel consists of the same operations as the daily maintenance, except that they are performed with greater care. In addition, the copper deposit is removed from the bore.

For these operations the gun is put in firing position.

119. Nomenclature of oil cups.

No.	Location.
1 and 2	Trunnion caps.
3 and 4	Elevating and traversing handwheel spindles (sighting gear casing).
5 and 6	Sighting gear casing.
7	Automatic filler.
8	Elevating worm rear bearing.
9	Elevating bevel pinion housing.
10	Traversing bevel pinion housing.
11 and 12	Brake brackets.
13 and 14	Limber knuckle pins.
15	Socket of oblique elevating spindle.
16	Socket of oblique traversing spindle.

120. **Removing copper deposit.**—The copper deposit commences at the origin of the rifling and extends the entire length of the bore. As it has a great effect on the accuracy of fire and the life of the gun, it is most important to remove this deposit before it becomes heavy, especially since the chemical process gives good results only when the deposit is light. It must be borne in mind that the greasing of the bourrelets and rotating bands of the shells, and of the bore, and frequent cleansing of the latter with kerosene oil, will greatly diminish the amount of deposit. When the deposit is

heavy the removal must be made by scraping, and this can only be done by skilled workmen. The battery is forbidden to attempt to do this.

Chemical process.—To remove the copper deposit either of the two following preparations may be used:

(*a*) Commercial ammonia, to which is added 10 per cent of hydrogen peroxide.

(*b*) A mixture of 6 quarts of water, 4 quarts of ammonia (density 0.88), and 12 ounces of persulphate of ammonia.

The (*b*) solution gives the better results.

Before using these preparations all grease must be removed from the bore by cleaning with soap or gasoline.

Method of use.—Open the breech so as to prevent its copper parts from being attacked by the solution. Cover the copper deposits for 15 minutes with strips of cloth wet with the solution. The solution must be prepared just before using. Wash freely with water and dry.

ARTICLE 4.

Detailed Inspection.

121. This comprises:

1. All operations enumerated for the rapid inspection, these being performed with more care and time.

2. The following additional operations:

122. **Gun and breechblock.**—See that the breech mechanism, primer mechanism, and safety device are in working order. Disassemble the breechblock and its different parts, each part being carefully examined.

Examine the threads of the breech recess, the powder chamber, and the main bore. See that the rifling is not injured, and that there is no copper deposit.

Any burrs, cracks, or imperfections noted necessitate a replacement of the part only when they cause a difficulty in operation, or if they are of such a nature that the defects might become more serious or cause an accident. Action to remove burrs should be taken as soon as they are found.

Move the gun forward and backward along its path from firing to road position so as to observe any difficulties in the movement. At the same time, note the action of the pawl levers.

See that the locking device for the recoil piston rod nut functions properly.

123. **Cradle.**—Inspect the trunnions.

124. **Pointing mechanisms.**—See that the sight and sight support are in order, that the different mechanisms function properly, and that the glass of the levels is not broken or obscured.

See that the elevating and traversing hand wheels are not sprung.

Examine the elevating worm and make sure that the worm spindle rear stop is tightened.

125. **Gun axle.**—Test the adjustment of the spring shackles (Par. 27).

126. **Trails.**—Test all the rivets. Make sure that the parts fixed on the trails (the trail ends, trail clamping transom stops, limber stops, traveling bar clips, translating racks, and trail connecting pieces), have not become loose.

Note the shape of the trails. Note any deformation as exactly as possible.

Bring up the spades to make sure that they can be set in place.

Examine the spade rivets and spade clamp bolts.

127. **Wheels.**—See that the wheels are in good working order, with the axles greased. See that the split pin of the wheel lock nut is in place, and not deformed. This is very important.

128. **Brake drum.**—See that the nuts on the fastening bolts are tight. Examine the brake bands. Adjust the different parts of the brake operating mechanism.

129. **Adjustment of the brakes.**—Set the brake rockers on the gun axles slightly to the rear of the vertical, and the brake lever beside the seat as far forward as possible. In this position adjust the length of the brake cable. Then adjust the cable rockers by loosening the clamping bolts and turning the rockers on the shaft so that the brake begins to tighten when the hand lever is at about the middle point of its movement. As the wheel bands wear down, adjust the brake by means of the brake rocker, or by means of the brake cable.

130. **Limber.**—See that the connecting and steering rods have not been bent and that their pins are in good order.

Finally, see that all nuts are secured by cotter pins, and that the pins themselves are not injured.

131. **Reports rendered.**—Replacement of parts. Repairs. After the detailed inspection, report is made to the battery commander, giving all information of value concerning the defects noticed. According to circumstances, the following measures are taken:

1. Improper functioning caused by poor upkeep.

Immediately clean all parts affected. If by following the directions given by these regulations the defect can not be remedied, proceed as in the third case following.

2. Replacement of the affected part permitted by regulations.

If the spare part is in the possession of the battery, it is made use of, and the damaged part exchanged for a new one.

3. The operations authorized by these regulations do not permit the repair of the defect.



A report is made through proper channels to the mobile repair shop. It is good practice to report all slight defects as soon as possible to the mobile repair shop. By so doing, in most cases, greater damages and more difficult repairs may be avoided.

ARTICLE 5.

Testing the Lines of Sight and Sighting Instruments.

132. It is most important to verify the lines of sight, as the accuracy of the gun depends entirely on the correct adjustment of these lines.

A bad assembling, an occasional accident, or poor upkeep will produce errors which will destroy the calibration of the guns of a battery, or even cause a gun to give different results when sighted under different conditions.

133. This operation does not present any difficulty, but must be done with great care and accuracy, and must be performed frequently, especially when observations made in firing cause suspicions of bad adjustment. The gunner must be trained to perform this operation, but it must be done only in the presence of an officer.

134. The operation consists of the following:

1. See that the bubble of the elevation level is centered when the gun is horizontal, the elevation drum and micrometer are at zero, and the bubble of the transverse level is centered.

2. See that the plane of sight is parallel to the axis of the bore when the deflection micrometer and limb are at zero, and the bubble of the cross level is centered.

The operation is performed as follows, the gun being on nearly level ground:

A. *Elevation.*

135. Set the elevation drum and micrometer at zero and center the bubble of the cross level. Set the axis of the bore horizontal; by construction the quadrant seats on the breech ring are parallel to the axis of the bore. It is, consequently, sufficient to set these horizontal by means of a calibrated quadrant. See if the bubble of the elevation level is centered. If it is not, center it by operating the elevation micrometer. Note the reading of the elevation micrometer, which is the error in elevation of the sight. When firing, the angle of elevation, as given by the battery commander, must be corrected by the angle just determined. This error must not exceed eight minutes.

136. NOTE.—**Calibrating a quadrant:**

1. Set the quadrant at zero and place it on the breech ring seats. Center the bubble by operating the elevating handwheel.

2. Turn the quadrant end for end. If the bubble remains centered the level is correct. If not, center the bubble by moving the

level holder of the quadrant. Read the angle, which is double the error of the quadrant. To set the gun level with this quadrant it will be necessary to set the quadrant at half the angle found and then to center the bubble.

B. *Direction.*

137. Place at the muzzle two cross threads on the indices marked on the face of the muzzle and fasten them in position with wax or heavy grease. The breech being closed, the line of sight marked by the point of intersection of the cross threads and the vent of the breechblock corresponds to the axis of the bore. Lay the gun by means of this line of sight on an aiming point, preferably at medium range. If the aiming point be close, parallax must be taken into consideration.

The bubbles of both levels being centered, and the limb at zero, bring the line of sight on the aiming point by turning the collimator counterclockwise, and record the deflection (which for perfect adjustment would be zero).

Repeat by turning the collimator clockwise, and again record the deflection.

According to French practice the difference between the two deflections obtained must not exceed 4 decigrades, and both deflections must lie between 97 and 3.

Caution.—In getting each of these deflections the motion of the micrometer drum must be in one direction only. If the line of sight is brought past the aiming point, begin over again.

138. Any sight that does not fulfill the above conditions is tested on another gun. If it does not give a satisfactory result it is sent to the mobile repair shop. Any gun which does not prove satisfactory with one sight is tested with a second, and if necessary with a third. If none proves satisfactory, the sight bracket must be considered as out of adjustment, and a report of the fact made to the mobile repair shop.

CHAPTER IV.

GENERAL INFORMATION.

ARTICLE 1.

Painting Artillery Matériel.

139. The paint issued for this purpose is ready for use on both wood and metal parts. If the paint is too thick, turpentine should be used as a thinner, but not to a greater extent than 2 per cent by volume.

All steel and iron nonbearing surfaces, including that portion of the underside of the gun between the gibs, will be painted. Wearing and bearing surfaces must not be painted.

All parts to be painted should be free from dirt and grease. They may be washed in a liquid made by dissolving one-half pound of sal ammoniac, in eight quarts of warm water, then rinsed in clean water and wiped thoroughly dry.

Where the matériel is in fair condition and only marred in spots, the marred places should be primed with paint, second coat, and permitted to dry, then the whole surface should be sandpapered with No. 1½ sandpaper, and a coat of paint applied and allowed to dry thoroughly before use.

Where the matériel is in bad condition all parts should be thoroughly sandpapered with No. 2½ sandpaper, be given a coat of paint, and permitted to dry for at least 24 hours. Then sandpaper with No. 00 sandpaper, apply a finishing coat, and permit the parts to dry thoroughly before use.

140. After repeated painting the paint may become so thick as to scale off in places or give an unsightly appearance. It may then be removed for repainting as follows:

Dissolve 1 pound of concentrated lye, powdered form, in 6 pints of hot water and slake in enough lime to give the solution the consistency of paint. Use the solution freshly mixed and apply to the parts, where paint is to be removed, with a brush or with waste tied to the end of a stick. When the solution begins to dry on the surface, use a scraper to remove the old paint and complete the cleaning of the surface with cloth and water. If one application is not sufficient to loosen the paint, apply a second coat. Before painting, wash the surface with sal ammoniac water, rinse with clean water, and then wipe thoroughly as described above.

ARTICLE 2.

Oils for Artillery Matériel.

141. For the service, cleaning, and preservation of this matériel the Ordnance Department issues hydroline or another special oil for the recoil mechanism, lubricating oil (or engine oil No. 1), clock oil, sperm oil, neat's-foot oil, light slushing oil, and kerosene. Each of these is suited for the particular purpose for which it is issued, as stated below, and care should be taken that it is not used for other purposes.

142. The hydroline or special recoil mechanism oil is for use in the interior of the recoil and counter-recoil mechanisms and for no other purpose.

143. The lubricating oil (or engine oil No. 1), will be used exclusively in all oil holes of the matériel, and in lubricating such parts as breechblocks and threads of breech recesses.

144. Clock oil should be used on the moving parts of the sight and of all fire-control instruments. It should be applied by drop-

ping from the end of the dropper attached to the end of the cork. Only a few drops of clock oil are required for the lubrication. Too much will destroy the efficiency of optical instruments.

145. The sperm oil is a lighter lubricant than the engine oil No. 1, and may be used on the gears of sights, fuse setters, and similar parts. Engine oil No. 1 may also be used on such parts.

146. Kerosene is used by the Ordnance Department for cleaning purposes and for lanterns in the field. Kerosene for general illuminating purposes is furnished by the Quartermaster's Department. Neat's-foot oil is used for the care and preservation of all leather equipment.

147. Light slushing oil is prescribed for use in the protection and preservation of all bright or unpainted surfaces of steel or iron on all parts of the equipment when the matériel is to remain unused for any considerable length of time. Its use as a lubricant is forbidden. Before applying the slushing oil to any surface the parts should be thoroughly cleaned, so as to be free from rust, water, kerosene, or lubricating oil, as their presence will cause rusting under the slushing oil. The slushing oil should then be applied in a thin, uniform coat, since this is all that is necessary to give good protection; except in very cold weather it can be applied by using a paint brush as when painting. In cold weather it should be applied by stippling—that is, lightly tapping the surface with the end of the sash tool, held with bristles perpendicular to the surface to be covered. It can be applied to the bores of guns by means of the greasing sponge issued for the purpose. In cold weather it should be warmed before use for coating the bores of the guns. It may readily be removed by the use of waste or burlap dipped in kerosene.

ARTICLE 3.

General Suggestions.

148. Strain the oil used in filling the recoil and counter-recoil cylinders through a fine, clean cloth, and be sure that the receptacles used in handling the oil are absolutely clean.

All unpainted surfaces should be kept clean and free from rust, but in no case is a polish permitted.

Do not strike any metal part directly with a hammer; interpose a buffer of wood or copper.

Frequently test the adjustment of the sights.

Exercise special care in handling the sights.

Be careful about exposing ammunition unnecessarily to the sun or loading it into a warm gun before time for firing. If this is done erratic results may be expected.

Smokeless powder must not be used for blank cartridges.

NOMENCLATURE OF PARTS OF GUN AND CARRIAGE.

The following nomenclature is complete for the French designs except for nuts, split pins, and rivets, considered standard, and the internal parts of the recoil and counter-recoil mechanism.

The figures in columns A and B refer to the French drawings.

NOTE.—In ordering any part of the matériel give its complete designation—that is, its drawing number and its part number; for example: Operating lever, drawing 81, part 1.

In all requisitions and correspondence the correct name of the part referred to (if known) should be given. If the name of the part is not known, submit a sketch showing the location, shape, matériel, etc., sufficient to establish definitely the identity of the part in question.

The use of the word "complete" in requisitions to signify a combination of parts sometimes leads to misunderstanding of the exact parts wanted. The tables of nomenclature of parts have been arranged to show the parts included under the terms "one trail, complete; one wheel, complete," etc., and should be carefully studied before requisitions are made out, to insure that all parts wanted are included and duplications avoided. If all details are itemized it will avoid mistakes and unnecessary expense.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Gun, including	1	
10	1	Clip gib	2	Bronze.
	2	Front gib	2	Do.
	3	Middle gib	2	Do.
	4	Rear gib	2	Do.
	5	Gib screw	98	Copper.
		Breech mechanism, complete, including	1	
		Counterpoise, complete, including	1	
31	1	Cylinder	1	Machine steel.
	2	Cylinder head, rear	1	Do.
	3	Cylinder head, front	1	Do.
	4	Locking screw	2	Soft steel.
32	1	Spring rod	1	Machine steel.
	2	Spring collar	1	Do.
33		Counterpoise spring	1	Spring steel.
34	1	Adjusting screw	1	Machine steel.
	2	Adjusting nut	1	Do.
	3	Adjusting screw bushing	1	Bronze.
	6	Washer	1	Soft steel.
	8	Guide yoke	1	Machine steel.
35	.....	Counterpoise bracket	1	Cast steel.
36	1	Counterpoise bracket collar	1	Machine steel.
	2	Pin, spherical head	1	Do.
		Counterpoise bracket screw	4	Do.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Breech mechanism, complete, including—Contd.		
		Recoil piston rod nut, complete, including	1	
40	1	Recoil piston rod nut	1	Machine steel.
	2	Locking collar	1	Do.
	3	Set screw	1	Mild steel.
		Counter-recoil piston rod nut, complete, including	1	
41	1	Counter-recoil piston rod nut	1	Machine steel.
	2	Locking collar	1	Do.
	3	Set screw	1	Mild steel.
		Primer mechanism, complete, including	1	
51	1	Spindle nut	1	Machine steel.
	2	Spindle nut key	1	Do.
	3	Key spring	1	Spring steel.
	4	Key spring rivet	1	Mild steel.
	5	Set screw	1	Machine steel.
		The following pieces form the primer holder suppressed upon the addition of the new breech safety device, and replaced by pieces on drawings 7001–7002:		
52	1	Primer holder	1	Machine steel.
	2	Primer holder plug	1	Do.
	3	Firing pin bushing	1	Do.
	4	Firing pin	1	Tool steel.
	5	Firing pin stop	1	Machine steel.
	6	Firing pin spring	1	Spring steel.
	7	Spring key	1	Do.
	8	Adjusting washer	1	Machine steel.
	9	Do	1	Do.
	10	Do	1	Do.
	11	Do	1	Do.
7001	1	Primer holder body	1	Do.
	2	Set screw	1	Do.
	3	Handle ring	1	Mild steel.
7002	1	Primer holder plug	1	Machine steel.
	2	Firing pin bushing	1	Do.
	3	Firing pin	1	Special steel.
	4	Firing pin stop	1	Machine steel.
	5	Firing pin spring	1	Spring steel.
7005	1	Safety lock housing	1	Machine steel.
7006	1	Safety lock	1	Do.
7007	1	Operating finger	1	Do.
	2	Spring socket	1	Do.
	3	Operating finger spring	1	Spring steel.
	4	Housing screw	5	Machine steel.
7008	1	Spindle plug	1	Gun steel.
		Percussion mechanism, complete, including	1	
63	1	Rack housing	1	Bronze.
	2	Rack-housing screw	1	Mild steel.
	2	Do	5	Do.
64	1	Hammer support	1	Machine steel.
	2	Hammer rack	1	Do.
	3	Rack-guide washer	1	Do.
	4	Rack-guide bushing	1	Do.
	5	Rack spindle	1	Do.
	6	Rack spring	1	Spring steel.
	7	Hammer	1	Machine steel.
	8	Hammer catch	1	High-grade steel.
	10	Hammer-catch spring	1	Spring steel.
	11	Lanyard eyebolt	1	Machine steel.
	12	Eyebolt washer	1	Do.
	13	Eyebolt pin	1	Mild steel.
65	1	Lanyard, 9½ inches long	1	Rope.
	2	Lanyard handle	1	Wood.
		Breech ring parts, complete, including:		
73	1	Traveling bar stop	1	Machine steel.
	2	Traveling bar stop screw	1	Mild steel.
		Block and carrier, complete, including	1	
74	1	Breechblock	1	Gun steel.
75	.....	Carrier	1	Machine steel.
76	.....	Hinge pin	1	Do.
77	1	Hinge pin collar	1	Do.
	2	Lock collar	1	Do.
	3	Pin, spherical head	1	Do.
78	.....	Rack	1	Do.
79	1	Rack lock	1	Do.
	2	Rack-lock spring	1	Spring steel.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		The following pieces form the safety device which has been suppressed in new matériels. See footnote to par. 15.		
79	3	Safety pin	1	Machine steel.
	4	Safety pin bushing	1	Bronze.
	5	Safety pin bushing nut	1	Do.
80	1	Carrier latch	1	Machine steel.
	2	Lower front carrier latch screw	1	Mild steel.
	3	Lower rear carrier latch screw	1	Do.
	4	Upper carrier latch screw	2	Do.
81	1	Operating lever	1	Machine steel.
	2	Breech-locking lever guide	1	Do.
	3	Breech-locking lever guide screw	2	Mild steel.
82	1	Breech-locking lever	1	High-grade steel.
	2	Breech-locking lever pin	1	Do.
83	1	Operating handle	1	Steel, case hardened.
	2	Operating-handle socket	1	Bronze.
	3	Operating-handle socket nut	1	High-grade steel.
	4	Operating-handle spring	1	Spring steel.
85	1	Obturator spindle	1	Gun steel.
	2	Spindle plug washer	1	Copper.
	3	Spindle plug	1	Gun steel.
	4	Vent bushing	1	Copper.
		Obturating device, complete, including	1	
86	1	Gas check pad	1	Metallic cloth, asbestos, and tallow.
	2	Filling-in washer	1	Special steel.
	3	Front external split ring	1	Special steel or brass.
	4	Rear external split ring	1	Do
	5	Internal split ring	1	Do.
87	1	Front spring collar	1	Machine steel.
	2	Front spring washer	1	Do.
	3	Rear spring washer	1	Do.
	4	Spindle spring	1	Spring steel.
		Open breech stop, complete, including	1	
88	.....	Breech stop	1	Cast steel.
89	1	Back latch catch	1	Machine steel.
	2	Breech stop plate	1	Bronze.
	3	Back latch catch screw	2	Mild steel.
	4	Breech stop plate screw	4	Do.
	5	Breech stop screw	4	Do.
	6	Shear collar	2	Machine steel.
94	.....	Quadrant seat	2	German silver.
		Cradle, including	1	
100	1	Cradle	1	Gun steel.
		Elevating sector, including	1	
101	1	Elevating sector	1	Machine steel.
	2	Elevating sector screw	10	Do.
102	1	Longitudinal key	1	Do.
	2	Transverse key	1	Do.
	3	Key screw	6	Mild steel.
		Recoil and counter-recoil mechanism, including	1	
120	1	Piston rod yoke	1	Machine steel.
121	1	Recoil piston rod key	1	Do.
140	1	Recoil regulating arm	1	Do.
141	1	Recoil regulating arm spindle	1	Do.
	2	Washer	1	Mild steel.
	5	Slide pin	1	Machine steel.
143	1	Counter-rod gear sector	1	Do.
	2	Cam gear sector	1	Do.
	3	Counter-rod gear sector washer	1	Do.
	4	Cam gear sector washer	1	Do.
	5	Washer screw	2	Do.
146	1	Automatic filler housing	1	Bronze.
	2	Automatic filler housing cover	1	Do.
	3	Automatic filler housing plug	1	Mild steel.
	4	Washer	1	Leather.
115	1	Automatic filler housing screw	12	Mild steel.
	2	Automatic filler housing cover screw	3	Do.
	3	Housing cover bolt nut	3	Do.
	5	Lock washer (Grower), 16 mm	12	Spring steel.
	6	Lock washer (Grower), 12 mm	3	Do.
	14	Thong eyebolt	1	Mild steel.
159	1	Recoil cylinder draining sleeve	1	Machine steel.
	2	Recoil cylinder draining connection	1	Do.
160	1	Recoil cylinder filling orifice plug	1	Do.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Cradle, including—Continued.		
		Recoil and counter-recoil mechanism, including—Continued.		
160	2	Recoil cylinder filling orifice plug collar	1	Mild steel.
	3	Washer	1	Copper.
	4	Recoil cylinder filling orifice valve	1	Machine steel.
	5	Recoil cylinder filling orifice valve spring	1	Nickel steel.
161	1	Thong	1	Chrome leather.
205	1	Counter-recoil filling sleeve	1	Machine steel.
	2	Counter-recoil filling connection	1	Do.
206	1	Counter-recoil filling orifice plug	2	Do.
	2	Counter-recoil filling orifice plug collar	2	Mild steel.
	3	Counter-recoil filling plug washer	2	Copper.
	4	Counter-recoil filling orifice valve	2	Machine steel.
	5	Counter-recoil filling orifice valve spring	2	Nickel steel.
	6	Counter-recoil filling connection lock	1	Machine steel.
	7	Lock screw	2	Mild steel.
204	1	Thong	2	Chrome leather.
172	4	Thong eyebolt	2	Mild steel.
208	1	Packing washer	2	Leather.
	2	Gasket	2	Do.
		Top carriage, complete, including	1	
		Top carriage, including	1	
301	2	Top carriage	1	Cast steel.
302	1	Trunnion bearing cap	2	Machine steel.
	2	Trunnion bearing cap liner	2	Bronze.
	3	Bearing cap screw	2	Machine steel.
	4	Belleville washer	2	Spring steel.
	5	Special oil cup	2	See drawing.
		Sighting-gear casing, complete, including	1	
308	1	Sighting-gear casing	1	Bronze.
309		Sighting-gear casing cover	1	Do.
310	1	Sighting-gear casing bolt	3	Machine steel.
	2	Bolt sleeve	3	Do.
	3	Bolt-sleeve nut	3	Do.
	4	Centering pin	1	Do.
	6	Gland	2	Brass.
	7	Oiling tube, elevating spindle	1	Copper.
	8	Oiling tube, traversing spindle	1	Do.
	9	Leather gasket	2	Leather.
	10	Special oil cup	2	See drawing 801.
	11	Lock washer for centering pin	1	Spring steel.
		Lock washer for sighting gear-casing bolt	4	Do.
	12	Bolt sleeve lock washer	3	Do.
311	1	Elevating gear	1	Mild steel.
	2	Elevating gear spindle	1	Machine steel.
	3	Taper pin, 5 x 4.5 x 50 mm	1	Do.
	4	Helical elevating pinion	1	Mild steel.
	5	Helical elevating pinion spindle	1	Machine steel.
	7	Lock washer	2	Spring steel.
	8	Pinion adjusting washer	1	Machine steel.
	9	Elevating gear and handwheel key (Woodruff, 6 x 22 x 9.7 mm. key).	2	Do.
	10	Helical elevating pinion key (Woodruff, 8 x 19 x 8.55 mm. key).	1	Do.
	11	Special oil cup	1	See drawing 801.
312	1	Helical traversing gear	1	Mild steel.
	2	Helical traversing gear spindle	1	Machine steel.
	3	Taper pin, 5 x 5.5 x 50 mm	1	Do.
	4	Helical traversing pinion	1	Mild steel.
	5	Helical traversing pinion spindle	1	Machine steel.
	7	Lock washer	2	Spring steel.
	8	Pinion adjusting washer	1	Machine steel.
	9	Traversing gear and handwheel key (Woodruff, 62 x 22 x 9.7 mm. key).	2	Do.
	10	Traversing helical pinion key (Woodruff, 8 x 19 x 8.55 mm. key).	1	Do.
	11	Special oil cup	1	See drawing 801.
313	1	Oblique elevating spindle	1	Machine steel.
	2	Oblique traversing spindle	1	Do.
	3	Spring socket	2	Brass.
	4	Oblique spindle spring	2	Spring steel.
314	1	Handwheel	2	Bronze.
	2	Handle spindle	2	Machine steel.
	3	Handle bushing	2	Bronze.
	4	Spindle collar	2	Do.
	5	Handle spindle riveting collar	2	Do.
	7	Lock washer (Grower), 10 mm	2	Spring steel.
	8	Handle	2	Ebonite.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Top carriage, complete, including—Continued.		
		Elevating mechanism, complete, including	1	
315	1	Elevating worm	1	Machine steel.
	2	Front bushing	1	Bronze.
	3	Rear bushing	1	Do.
	4	Elevating worm shaft	1	Machine steel.
	5	Rear stop	1	Bronze.
	6	Rear stop set screw	1	Machine steel.
	7	Special oil cup	1	See drawing 801.
316	1	Elevating spindle bevel pinion	1	Machine steel.
	2	Elevating worm shaft bevel pinion	1	Do.
317	1	Elevating bevel pinion housing	1	Bronze.
	2	Bevel pinion housing stud	1	Mild steel.
	3	Locking pin	1	Do.
	5	Housing locating screw (hex. head, 16 mm. diameter).	1	Do.
	6	Lock washer (Grower), 16 mm	1	Spring steel.
	7	Lock washer (Grower), 10 mm	4	Do.
318	1	Bevel pinion housing cover	1	Bronze.
	2	Bevel pinion housing cover bolt (10 mm. bolts, 33 mm. long, threaded portion 16 mm. long).	5	Mild steel.
	4	Special oil cup	1	See drawing 801.
		Lock washer (Grower), 10 mm	5	Spring steel.
		Traversing mechanism, complete, including	1	
319	1	Traversing worm pinion	1	Machine steel.
	4	Traversing worm	1	Do.
	5	Traversing worm pinion bushing, left	1	Bronze.
	6	Half-liner	2	Do.
	7	Traversing worm pinion bushing, right	1	Do.
	8	Traversing worm pinion washer	1	Mild steel.
	9	Traversing spindle pinion arbor	1	Machine steel.
	10	Traversing spindle pinion	1	Do.
	11	Traversing spindle pinion screw	1	Mild steel.
	12	Locking screw	1	Copper.
320	1	Traversing bevel pinion housing	1	Bronze.
	2	Bevel pinion housing bolt	3	Mild steel.
	4	Lock washer (Grower), 14 mm	3	Spring steel.
	5	Special oil cup	1	See drawing 801.
		Chassis, complete, including	1	
401	1	Chassis	1	Cast steel.
		Elastic suspension, complete, including	1	
406	1	Elastic suspension housing	1	Do.
407	1	Kingbolt	1	Machine steel.
	2	Kingbolt nut	1	Do.
	3	Upper pivot	1	Bronze.
	4	Lower pivot	1	Machine steel.
	5	Lower pivot nut	1	Mild steel.
	6	Step	1	Machine steel.
	7	Locking pin	1	Copper.
408	1	Belleville washer	8	Spring steel.
	2	Adjusting nut	1	Machine steel.
	3	Housing bolt	3	Do.
	4	Washer	3	Mild steel.
	7	Support washer	1	Machine steel.
409	1	Joint cover	1	Waterproof cloth.
	2	Thong	2	Rawhide.
460	1	Adjusting nut locking strap	1	Machine steel.
461	1	Guide pin	1	Mild steel.
	2	Stud	1	Do.
	3	Locking screw	1	Do.
		Traversing sector, complete, including	1	
410	1	Traversing sector	1	Machine steel.
	2	Traversing sector screw	11	Do.
411	1	Traversing sector key	1	Do.
	2	Traversing sector key screw	2	Do.
		Axle centering device, complete, including	1	
412	1	Gun axle centering pin	2	Do.
	2	Set screw	2	Do.
		Axle pivoting mechanism, complete, including	1	
414	1	Hinge ring	1	Cast steel.
	2	Hinge ring screw	6	Mild steel.
415		Pivot pin cap	1	Cast steel.
416		Pivot pin handle	1	Do.
417	1	Axle pivot pin	1	Machine steel.
	2	Locking screw	2	Mild steel.
418	1	Pivot pin cap spindle	1	Do.
	2	Latch bushing	1	Machine steel.
	3	Latch knob	1	Bronze.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Chassis, complete, including—Continued.		
		Axle pivoting mechanism, complete, including—Continued.		
418	4	Locking screw	1	Machine steel.
	5	Pivot pin cap latch	1	Do.
	6	Latch spring	1	Spring steel.
	7	Knob pin	1	Mild steel.
	8	Latch bushing lock	1	Copper.
		Connection of trails and chassis, complete, including.	1	
421	1	Trail hinge pin	2	Machine steel.
	2	Trail hinge pin washer	2	Do.
	3	Trail hinge pin nut	2	Mild steel.
	4	Taper pin	2	Extra mild steel.
422	1	Trail locking bolt	2	Machine steel.
	2	Trail locking bolt nut	2	Do.
	3	Handle	2	Do.
	4	Handle knot	4	Do.
	5	Trail locking bolt stop	2	Do.
	6	Trail locking bolt stop lock	2	Spring steel.
		Trails, complete, including	2	
		Structural assembly, complete, including	2	
430	1	Outside flask	2	5 mm. steel plate.
	2	Inside flask	2	Do.
	3	Top plate	2	Do.
	4	Top stiffening plate A	2	Do.
	5	Top stiffening plate B	2	Do.
	6	Bottom plate	2	Do.
	7	Bottom stiffening plate A	2	Do.
	8	Bottom stiffening plate B	2	Do.
	9	Front flask stiffening plate	2	Do.
	10	Rear flask stiffening plate	4	Do.
	11	End plate, inside	2	Do.
	12	End plate, outside	2	Do.
	13	Diaphragm	2	Do.
	14	Spade seat plate	2	12 mm. steel plate.
	15	Trail clamping transom seat plate	2	8 mm. steel plate.
	16	Limber stop plate	2	10 mm. steel plate.
	17	Limber transom plate	2	Do.
	18	Top flask angle, outside	2	50x50x7 mm. angle.
	19	Top flask angle, inside	2	Do.
	20	Outside bottom flask angle	2	Do.
	21	Inside bottom flask angle	2	Do.
	22	Vertical trail end angle	4	Do.
	23	Vertical diaphragm angle	4	Do.
	24	Horizontal diaphragm angle	4	Do.
	25	Traveling bar clip screw	2	Machine steel.
	26	Rack screw	10	Do.
		Parts mounted on the structural assembly, complete, including:		
431	1	Trail end, left-hand	2	Do.
	2	Trail end, right-hand	2	Do.
433	1	Trail clamping transom stop, right-hand	1	Do.
	2	Trail clamping transom stop, left-hand	1	Do.
434	1	Limber stop, right-hand	1	Cast steel.
	2	Limber stop, left-hand	1	Do.
435	1	Traveling bar clip, right-hand	1	Machine steel.
	2	Traveling bar clip, left-hand	1	Do.
436	1	Traveling bar clip locking screw	2	Do.
	2	Traveling bar clip screw lever	2	Mild steel.
	3	Lever riveting collar	4	Do.
	4	Belleville washer	4	Spring steel.
437	1	Translating rack	2	Machine steel.
	2	Doweling screw	4	Do.
438	1	Trail connecting piece, male	1	Cast steel.
439	1	Trail connecting piece, female	1	Do.
440	1	Trail connecting pin	1	Machine steel.
	2	Chain ring	1	Mild steel.
	3	Eye-bolt	1	Machine steel
	4	Trail connecting pin attaching chain	1	Mild steel.
	5	Trail connecting pin safety chain	1	Do.
	6	Chain ring	3	Do.
	7	Safety chain T	1	Do.
443	.....	Spade clamping transom	4	Machine steel.
		Spades, complete, including	2	
441	1	Share	2	High-grade steel plate.
	2	Share brace	4	Do.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Trails, complete, including—Continued.		
		Spades, complete, including—Continued.		
441	3	Horizontal brace angle	8	Structural steel.
	4	Vertical brace angle	8	Do.
	5	Top plate	2	High-grade steel plate.
	6	Counter-recoil stop	2	Do.
	7	Recoil stop	2	Machine steel.
444	1	Spade clamp bolt hinge, front right-hand	2	Do.
	2	Spade clamp bolt hinge, front left-hand	2	Do.
445	1	Spade clamp bolt hinge, rear right-hand	2	Do.
	2	Spade clamp bolt hinge, rear left-hand	2	Do.
446	1	Spade clamp bolt, front	4	Do.
	2	Spade clamp bolt, rear	4	Do.
	3	Lock nut	8	Do.
	4	Lock collar	8	Mild steel.
	5	Lock collar pin	8	Do.
	6	Clamping lever	8	Do.
	7	Clamping lever riveting collar	16	Do.
	8	Spade clamp bolt pin	8	Machine steel.
	9	Spade clamp bolt pin nut	8	Do.
449	1	Spade ring	4	Mild steel.
	2	Eye rivet	4	Do.
	3	Washer	4	Machine steel.
		Gun axle, complete, including	1	
502	1	Gun axle	1	2 per cent nickel steel.
		Connection to spring, complete, including	1	
503	1	Upper spring shackle	4	Machine steel.
	2	Lower spring shackle	4	Do.
	3	Upper shackle hinge pin	2	Do.
	4	Lower shackle hinge pin (with screw eye)	2	Do.
	5	Hinge pin nut	6	Do.
	7	Upper spring shackle bushing	4	Phosphor bronze.
	8	Hinge pin nut washer	6	Machine steel.
505	1	Shackle adjusting bolt	2	Do.
	2	Shackle adjusting bolt safety clip	2	Do.
	3	Shackle adjusting bolt pin	2	Do.
	4	Safety clip spindle	2	Do.
	5	Safety clip lock	2	Steel, case hardened.
	6	Safety clip spring	2	Spring steel.
	7	Locking screw	2	Machine steel.
	8	Pin lock	2	Do.
507	1	Spring eye pin	2	Mild steel.
	2	Spring eye pin safety clip	2	Machine steel.
	3	Safety clip spindle	2	Do.
	4	Spring eye pin lock	2	High-grade steel plate.
	5	Safety clip lock	2	Spring steel.
	6	Safety clip spring	2	Do.
	7	Locking screw	2	Machine steel.
		Gun axle spring, complete, including	1	
508	1	Gun axle spring	1	Spring steel.
509	1	Spring plate bolt	4	Machine steel.
	2	Centering bolt	1	Do.
	3	Spring plate and centering bolt nut	5	Do.
	4	Centering bolt washer	1	Do.
510	1	Top spring plate	1	Fiber.
	2	Bottom spring plate	1	Cast steel.
		Bolt sleeve	2	Steel, case hardened.
	3	Wheels, complete, including	2	
516	1	Wheel	2	Cast steel.
	2	Tire (1,160 x 120 mm.)	4	Rubber.
517	1	Hub cap	2	Bronze.
	2	Hub cap gasket	2	Leather.
	3	Hub liner	2	Phosphor bronze.
518	1	Lock nut	2	Machine steel.
	3	Lock collar	2	Steel, case hardened.
	4	Journal washer	2	Machine steel.
	5	Do	2	Fiber.
		Wheel brakes, complete, including	2	
521	1	Brake drum	2	Cast steel.
522	1	Brake drum bolt	14	Machine steel.
	2	Brake drum bolt nut	14	Do.
	3	Shear collar	14	Do.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Gun axle, complete, including—Continued.		
		Wheel brakes, complete, including—Continued.		
523	1	Brake bracket (1 right-hand, 1 left-hand)	2	Cast steel.
524	1	Brake bracket shackle	4	Machine steel.
	2	Brake bracket shackle nut	8	Do.
	4	Brake bracket bushing	4	Steel, case hardened.
525	1	Brake shaft	2	Machine steel.
	2	Key 34 x 14 x 6 mm	2	Do.
	3	Brake rocker adjusting collar	2	Do.
	4	Brake rocker	2	Do.
	5	Brake shaft nut	2	Do.
	6	Washer	2	Do.
526	1	Link	2	Do.
	2	Link spindle	2	Steel, case hardened.
	3	Spindle locking stud	2	Machine steel.
	4	Spindle locking stud nut	2	Do.
	6	Connecting pin	2	Mild steel.
	7	Connecting pin nut	2	Machine steel.
527	1	Upper brake band end	2	Cast steel.
	2	Lower brake band end	2	Do.
	3	Brake band	2	Laminated spring steel.
	4	Brake band lining	2	Asbestos compound.
528	1	Band adjusting bolt	2	Machine steel.
	2	Band adjusting bolt nut	4	Do.
	3	Collar	2	Steel, case hardened.
	4	Adjusting bolt spindle	2	Mild steel.
	5	Spindle nut	4	Machine steel.
529	7	Washer	4	Do.
		Brake rocker spring, right-hand	1	Spring steel.
		Brake rocker spring, left-hand	1	Do.
		Limber, complete, including	1	
		Chassis, complete, including	1	
601	1	Side rail, right-hand	1	Mild steel plate.
	2	Side rail, left-hand	1	Do.
	3	Rear transom	1	Do.
	4	Forward transom bolt	8	Machine steel.
	5	Forward transom bolt nut	8	Do.
	6	Lock washer (Grower) 24 mm	8	Spring steel.
	7	Rear transom bolt	8	Machine steel.
	8	Rear transom bolt, countersunk head	4	Do.
	9	Rear transom bolt nut	12	Do.
	10	Lock washer (Grower), 16 mm	12	Spring steel.
602	.....	Forward transom	1	Cast steel.
603	.....	Forward spring hanger (1 right-hand, 1 left-hand).	2	Do.
604	1	Rear spring hanger (1 right-hand, 1 left-hand)	2	Do.
		Limber spring, complete, including	2	
605	1	Limber spring	2	Spring steel.
606	1	Limber spring clip	4	Machine steel.
	2	Limber spring clip nut	8	Do.
	4	Limber spring centering bolt	2	Do.
	5	Limber spring centering bolt nut	2	Do.
	6	Washer	2	Do.
607	1	Lower spring plate	2	Fiber.
	2	Upper plate	2	Machine steel.
	3	Limber spring eye bushing	6	Mild steel.
608	1	Limber spring shackle	2	Machine steel.
	2	Limber spring eye pin	6	Mild steel.
		Axle with steering knuckle, complete, including	1	
610	1	Limber axle	1	2 per cent nickel steel.
611	1	Steering knuckle, left-hand	1	Do.
	2	Steering knuckle, right-hand	1	Do.
612	1	Steering knuckle spindle	2	Mild steel.
	2	Steering knuckle spindle lock nut	2	Machine steel.
	4	"Rotherham-Coventry" oil cup, series N	2	Mild steel.
613	1	Upper steering knuckle bushing	2	Phosphor bronze.
	2	Lower steering knuckle bushing	2	Do.
614	1	Female steering knuckle washer	2	Mild steel.
	2	Male steering knuckle washer	2	Do.
		Wheels, including	2	
516	1	Wheel	2	Cast steel.
	2	Tire (1,160 x 120 mm.)	4	Rubber.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Limber, complete, including—Continued.		
		Wheels, including—Continued.		
517	1	Hub cap	2	Bronze.
	2	Hub cap gasket	2	Leather.
	3	Hub liner	2	Phosphor bronze.
518	1	Lock nut		Machine steel.
	3	Lock collar		Steel, case hardened.
616	1	Journal washer, fiber		Fiber.
		Steering gear, complete, including	1	
617	1	Pivot pin	1	Mild steel.
	2	Universal joint pin	6	Do.
	3	Bushing for male universal joint piece and for steering tie-rod.	6	Phosphor bronze.
	4	Inner universal joint bushing	2	Do.
	5	Pivot and universal joint pin nut	8	Machine steel.
	6	Washer	2	Do.
618	1	Steering arm, right-hand	1	2 per cent nickel steel.
	2	Steering arm, left-hand	1	Do.
	3	Steering arm nut	2	Machine steel.
	4	Steering arm nut washer	2	Do.
619	1	Outer universal joint male piece	2	Do.
	2	Inner universal joint male piece	2	Do.
620	1	Female universal joint piece	4	Mild steel.
	2	Steering tie-rod	2	Mild steel tube.
		Draft gear, complete, including	1	
621	1	Drawbar tie	1	Machine steel.
622	1	Pintle bolt	1	Do.
	2	Pintle bolt nut	1	Do.
623		Drawbar	1	Do.
624	1	Drawbar pin	1	Do.
	2	Drawbar pin nut	1	Do.
625	1	Drawbar key	2	Do.
	2	Chain eyebolt	1	Do.
	3	Eyebolt nut	1	Do.
	4	Locking screw	2	Do.
	5	Drawbar key chain	2	Galvanized chain.
	6	Chain ring	3	3 mm. steel wire.
		Trail clamping mechanism, complete, including	1	
626	1	Trail clamping transom	2	Cast steel.
627	1	Trail clamping bolt	2	Machine steel.
	2	Trail clamping bolt nut	2	Do.
	3	Trail clamping bolt nut handle	2	Do.
	4	Retaining knob	4	Do.
628	1	Trail clamping bolt pin	2	Do.
	2	Tightening washer	2	Do.
		Brake controlling machanism, complete, including	1	
629	1	Brake lever yoke bearing	1	Cast steel.
630		Brake lever shaft bearing	1	Do.
631	1	Brake lever bearing bushing	4	Phosphor bronze.
	2	Bearing stud	4	Machine steel.
	3	Brake quadrant	1	Cast steel.
	4	Brake quadrant bolt	2	Machine steel.
	5	Brake quadrant bolt nut	2	Do.
	6	Bearing stud nut	4	Do.
632	1	Brake lever shaft	1	Mild steel tubing.
	2	Cable rocker bushing	2	Bronze.
633		Brake lever	1	Steel.
634	1	Brake lever handle	1	Brass.
	2	Brake lever latch handle	1	Do.
	3	Latch handle spring	1	Spring steel.
	4	Brake lever latch	1	Machine steel.
	5	Latch connection	1	Do.
	6	Latch handle pin	2	Do.
	7	Castle nut	2	Do.
	9	Latch bolt	2	Do.
	11	Brake lever clamping bolt	1	Do.
	12	Cable rocker clamping bolt	2	Do.
635		Cable rocker, right-hand	1	Cast steel.
		Cable rocker, left-hand	1	Do.
636	1	Longitudinal cable	2	8 mm. wire rope.
	2	Transverse cable	1	Do.
	3	Thimble	6	Mild steel.
	4	Cable clamp	4	Do.
	5	Cable clamp bolt	4	Do.
	6	Cable clamp bolt nut	4	Do.
	7	Lock washer (Grower) 6 mm.	4	Do.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Limber, complete, including—Continued.		
		Brake controlling mechanism, complete, including—Continued.		
636	8	Cable connecting pin	2	Machine steel.
	9	Washer	2	Do.
637	1	Ball connection	2	Do.
	2	Threaded connection	2	Do.
	3	Connection body	2	Do.
	4	Connection housing	2	Bronze.
	5	Stop plug	2	Machine steel.
	6	Spring	2	Spring steel.
	7	Pin, 4 mm	2	Steel.
638	1	Rear cable guide	2	Bronze.
	2	Rear cable guide cap	2	Do.
	3	Front cable guide	2	Machine steel.
	4	Front cable guide screw	8	Do.
	5	Rear cable guide stud	8	Do.
	6	Cable guide stud nut	16	Do.
640	1	Seat support	1	Mild steel.
	2	Seat support bolt	4	Machine steel.
	3	Seat support bolt nut	4	Do.
	4	Lock washer (Grower) for 10 mm. bolts	4	Spring steel.
		Limber seat, complete, including	1	
641	.....	Limber seat frame	1	
642	.....	Limber seat	1	
643	.....	Limber seat back	1	
		Sight, complete, including	1	
701	1	Sight housing	1	Bronze.
702	1	Column foot socket plate	1	Do.
	2	Worm cover plate	1	Do.
	3	C. S. head screw, 4 mm	6	Mild steel.
703	1	Hindley worm	1	Machine steel.
	2	Worm adjusting nut	1	Bronze.
	3	Thrust bearing	1	Do.
	4	Micrometer	1	German silver.
	5	Micrometer washer	1	Machine steel.
	6	6 mm. screw	1	Mild steel.
	7	Locking screw, 4 mm	2	Do.
	8	Adjusting washer	8	Do.
	9	Thrust bearing screw	4	Do.
704	1	Sight column foot socket	1	Bronze.
	2	Nut	1	Machine steel.
	3	Sight latch plunger	1	Do.
	4	Plunger spring	1	Spring steel.
	5	Latch housing plug	1	Bronze.
	6	Driving lug plunger	2	Machine steel.
	7	Driving lug plunger spring	2	Spring steel.
	8	Plunger recess plug	2	Bronze.
	9	Foot socket arm	1	Machine steel.
	10	Arm screw	4	Mild steel.
	11	Arm finger	1	Machine steel.
	12	Pivot screw	1	Mild steel.
	13	Arm finger spring	1	Spring steel.
	14	Locking screw	1	Mild steel.
705	1	Sight column foot	1	Bronze.
	2	Sight column foot plug	1	Machine steel.
	3	Level body (Model 1901)	1	Bronze.
	4	Level plug	2	Do.
	5	Level plug locking screw	2	Machine steel.
	6	Vial cover	1	Bronze.
	7	Vial cover spring	1	Spring steel.
	8	Vial cover spring screw	1	Brass.
	9	Vial	1	Glass.
	10	Vial cover hinge pin	1	Brass.
	11	Level body	1	Bronze.
	12	Vial	1	Glass.
	13	Level screw	3	Mild steel.
	14	Level plug	1	Bronze.
706	1	Drum	1	Do.
	2	Drum spindle	1	Machine steel.
	3	Drum washer	1	Do.
	4	Drum nut	1	Mild steel.
	5	Drum spindle nut	1	Machine steel.
	6	Rocking screw	1	Do.
	7	Rocking nut	1	Bronze.
	8	Rocking screw nut	1	Machine steel.
	9	Rocking screw nut washer	1	Do.
	10	Locking screw (2 mm.) for drum spindle nut	1	Mild steel.
	11	Graduated drum ring	1	German silver.
	12	Locking screw (2 mm.) for drum	3	Mild steel.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Limber, complete, including—Continued.		
		Sight, complete, including—Continued.		
707	1	Sight column	1	Gun steel.
	2	Collimator finger	1	Machine steel.
	3	Collimator bed of 75 mm. sight	1	Bronze.
	3′	Collimator, complete (sight of 75 mm. gun with bed modified according to piece No. 3).	1	Do.
708	1	Trunnion locking plunger	2	Machine steel.
	2	Plunger springs	2	Spring steel.
	3	Plunger bushing	2	Bronze.
718	1	Degree index	1	German silver.
	2	Minute index	1	Do.
	3	Index screws	2	Do.
		Goniometer, complete, including	1	
707	4	Limb	1	Bronze.
	5	Limb locking screw	2	Mild steel.
	6	Index collar	1	Bronze.
	7	Index collar pin	1	Mild steel.
	8	Index spring	1	Spring steel.
	9	Collimator bracket	1	Brass.
	10	Collimator bracket friction spring	1	Spring steel.
	11	Worm bearing bushing	1	Brass.
	12	Worm bearing bushing screw	2	Mild steel.
	13	Worm	1	Bronze.
	14	Worm friction spring	1	Spring steel.
	15	Spring washer	1	Machine steel.
	16	Micrometer drum	1	German silver.
	17	Locking screw	1	Mild steel.
	18	Micrometer drum pin	1	German silver.
	19	Wing nut screw	1	Mild steel.
	20	Wing nut	1	Do.
	21	Pressure block	1	High-class steel.
	22	Screw plug	1	Mild steel.
	23	Collimator finger spring	1	Spring steel.
	24	Finger spring screw	2	Mild steel.
	25	Collimator spindle	1	Gun steel.
	26	Collimator spindle pin	1	Mild steel.
		Sight support, complete, including	1	
711	1	Fixed support	1	Machine steel.
	2	Fixed support nut	1	Do.
	3	Fixed support screw, 16 mm	3	Do.
	4	Locking screw	1	Mild steel.
	5	Centering pin	1	Do.
	6	Taper dowel pin	2	Do.
712	1	Movable support	1	Cast steel.
713	1	Trunnion cap	2	Mild steel.
	2	Pressure pin	2	Do.
	3	Pressure pin head	2	Do.
	4	Trunnion cap screw	4	Do.
714	1	Rocking screw bracket	1	Bronze.
	2	Rocking screw bracket screw	3	Machine steel.
715	1	Adjusting shim set screw	1	Mild steel.
	2	Locking screw	1	Copper.
	3	Adjusting shim	1	Machine steel.
		Slotted screen, complete, including	1	
741	1	Front plate	1	Steel, bronzed.
	2	Side plate	1	Do.
	3	Stop	2	Machine steel.
	5	Screw	1	German silver.
		Accessories, including:		
		Traveling bar, complete, including	1	
812	1	Side rail	2	10 mm. steel plate.
813	.....	End transom (1 right-hand, 1 left-hand)	2	Bronze.
814	1	Locking transom	2	Cast steel.
	2	Central transom	2	80x40x10 mm. channel.
815	1	Clamping screw housing	1	Cast steel.
	2	Set screw	1	Machine steel.
816	1	Clamping screw	1	Do.
	2	Clamping lever	1	Mild steel.
	3	Clamping ever riveting collar	2	Do.
	4	Belleville washer	2	Spring steel.
	5	Clamping nut	1	Machine steel.
817	1	Operating pinion	2	Do.
	2	Operating pinion nut	2	Do.
	3	Nut locking screw	2	Mild steel.
		Locking device for recoil piston rod nut, complete, including:		
42	1	Latch housing	1	Bronze.
43	1	Latch	1	Machine steel.

Nomenclature of parts of gun and carriage—Continued.

A. Drawing No.	B. Part No.	C. Name of part.	D. No. Req.	E. Matériel.
		Accessories, including—Continued.		
		Locking device for recoil piston rod nut, complete, including—Continued.		
43	2	Latch spring	1	Spring steel.
	3	Latch stop	1	Mild steel.
	6	Housing plug	1	Do.
	7	Housing screw	4	Do.
		Pawl lever, complete, including	1	
821	1	Pawl lever	1	Machine steel.
	2	Grip	2	Hardwood.
	3	Riveting collar	6	Mild steel.
	5	Cheek	1	Machine steel.
	6	.....do	1	Do.
	7	Guard locating screw	2	Mild steel.
	8	Cheek screw	7	Do.
	9	Ratchet	1	Machine steel.
	10	Pawl	1	High-grade steel.
	11	Pawl bushing	1	Machine steel.
	12	Pawl spindle	1	Mild steel.
	13	Push button	1	High-grade steel.
	14	Push-button spring	1	Spring steel.
	15	Guard	1	Mild steel.
	16	Guard screw	2	Do.
		Lifting bar, complete, including	1	
831	1	Lifting bar body, 180x82x6.9 mm. I-beam	1	Do.
	2	Lower top plate	1	Steel plate.
	3	Upper top plate	1	Do.
	4	Upper bottom plate	1	Do.
	5	Lower bottom plate	1	Do.
	6	Upper end plate	2	Do.
	7	Lower end plate	2	Do.
832	1	Lifting bar center	1	Cast steel.
833	1	Chain eye-bolt	1	Machine steel.
	2	Pin chain	1	Galvanized chain.
	3	Chain ring	2	Mild steel.
	4	Pin	1	Do.
	5	Lock washer (Grower), 12 mm	1	Spring steel.
		Loading tray, complete, including	1	
851	1	Tray	1	Mild steel.
	2	Centering cone	1	Bronze.
	3	Right-hand guide	1	Do.
	4	Left-hand guide	1	Do.
	5	Position lug	1	Do.
	6	Protecting plate	2	Do.
	7	Handle	2	Mild steel.
	8	Grip	4	Wood.
	9	Base stop	1	Mild steel.
	17	Riveting collar	8	Brass or copper.
		Mirror laying device, complete, including	1	
866	1	Stake head	2	High-grade steel.
	2	Stake	2	Mild steel.
	3	Stake point	2	Machine steel.
	5	Rule	1	Mild steel.
	6	Rule eye	1	Cast steel.
	7	Rule head	1	Machine steel.
867	1	Rule bracket, right hand	1	Cast steel.
	2	Rule bracket, left hand	1	Do.
	3	Rule bracket washer	1	Mild steel.
	4	Rule bracket pin	1	Do.
	5	Pressure plug	4	Bronze or brass.
	6	Clamping screw	4	Machine steel.
	7	Pressure plug pin	4	Mild steel.
	8	Clamping screw handle	4	Do.
	9	Clamping screw handle knob	8	Do.
868	1	Frame	1	Bronze.
	2	Glass	1	Glass.
	3	Shims	.....	Paper.
	4	Back plate	1	Bronze.
	5	Dowel pin	2	Mild steel.
	6	Frame screw	4	Do.
	7	Shank	1	Do.
	8	Mirror foot	1	Cast steel.
	10	Level of model 1903 Goniometer	1	
	11	Level screw	1	
		Caterpillar band, complete, including	4	
881	1	Caterpillar band segment, type A	48	Do.
882	.....	Caterpillar band segment, type B	4	Do.
883	.....	Caterpillar band shoe	48	Do.
887	1	Caterpillar band segment pin	48	Machine steel.

COMPOSITION IN ARTILLERY MATÉRIEL OF A BATTALION OF 155-MM. FILLOUX GUNS.

The following table states the composition, in French matériel, in accordance with French tables of organization, of the 155-mm. Filloux battalion.

1. ARTICLES FOR THE SERVICE OF THE PIECE.

(*a*) TOOLS, EQUIPMENT, AND ACCESSORIES FOR THE SERVICE OF THE PIECE.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
		155-mm. Filloux gun with limber and drawbar for motor traction.	4	.....	.....	8	
881	.....	Caterpillar band segment, mark A	192	.....	.....	384	Forming four complete caterpillar bands per piece.
883	.....	Caterpillar band shoe	192	.....	.....	384	
887	.....	Caterpillar band segment pin	192	.....	.....	384	
	.....	Arrangement for carrying caterpillar bands.	4	.....	.....	8	
		Sledge	5	.....	.....	10	
441	.....	Large spade	8	.....	.....	16	
831–833	.....	Lifting bar	4	.....	.....	8	
	.....	8-ton jack	8	.....	.....	16	
812–817	.....	Traveling bar	4	.....	.....	8	On the piece.
44	298	Wooden maneuvering lever with iron ring.	8	.....	.....	16	
44	303	Handspike	8	.....	.....	16	
995	.....	Muzzle cover	4	.....	.....	8	Do.
996	.....	Breech cover	4	.....	.....	8	Do.
997	.....	Covers for recoil and counter-recoil cylinder piston rod ends.	4	.....	.....	8	Do.
998	.....	Sight support cover	4	.....	.....	8	Do.
45	21	Cleaning sponge	4	.....	.....	8	
	.....	Sponge cover	8	.....	.....	16	
45	27	Greasing sponge	4	.....	.....	8	
45	88	Short rammer	4	.....	.....	8	
45	89a	Unloading rammer, with extension.	4	.....	.....	8	
851	.....	Loading tray	4	.....	.....	8	
866	1–4	Mirror stake	8	.....	.....	16	
866	5–8	Mirror rule	4	.....	.....	8	
867	1–9	Rule brackets, right hand and left hand, complete.	4	.....	.....	8	
44	0	Fuse-setter, Model 1917, with accessories and chest, for 24/31 fuse.	2	.....	.....	4	
44	7	Wooden tubs	4	.....	.....	8	
52	66	Watering buckets	4	.....	.....	8	
44	457	Canvas fire bucket	10	.....	.....	20	
		Cooling pump for the piece	1½	.....	.....	3	
56	43	Block	24	.....	.....	48	
56	107	Half block	24	.....	.....	48	
58	36	Timber 4″ x 8″ x 11′	32	.....	.....	64	
58	48	Timber 4″ x 8″ x 5′ 6″	16	.....	.....	32	
58	24	Timber 9″ x9″ x 11′	4	.....	.....	8	
56	10	Wheel wedge	16	.....	.....	32	
		Wedge handle	16	.....	.....	32	
56	190	Iron shod square stake 1 yard long.	.....	.....	.....	32	
58	69	Square wooden stake, 3½″	16	.....	.....	48	
53	141	Wooden mall	24	.....	.....	16	
52	60	Sledge hammer (about 5 lbs.)	8	.....	.....	16	
53	139	Single crow bar	12	.....	.....	24	
56	240	Roller, 12″ diameter, 6′ 7″ long.	8	.....	.....	16	
52	76	Square shovel	8	.....	.....	16	
52	78	Round shovel	12	.....	.....	24	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

1. ARTICLES FOR THE SERVICE OF THE PIECE—Continued.

(*a*) TOOLS, EQUIPMENT, AND ACCESSORIES FOR THE SERVICE OF THE PIECE—continued.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
53	81	Pick	12	.....	.....	24	
		1¾″ (40 mm.) rope, 650′ long	2	.....	.....	4	2 on reel trailer.
		Reel trailer for 650′ rope	1	.....	.....	2	
		Double block, 10-ton capacity	4	.....	.....	8	
		1½″ (33 mm.) rope, 165′ long, with eyes.	4	.....	.....	8	
52	.....	Snatch block, 1¾″ (40 mm.) 6-ton capacity.	16	.....	.....	32	
		S-hooks	[1] 12	.....	.....	24	
56	.....	Rope, 1¾″ (40 mm.) with eye at each end, 65′ long.	4	.....	.....	8	
56	.....	Same, 35′ long	4	.....	.....	8	
56	234	80′ rope 1½″ diameter	8	.....	.....	16	
56	235	50′ rope 1″ diameter	8	.....	.....	16	
	247	Lashing rope, 33′	32	.....	.....	64	
53	248	Lashing rope, 16′ 6″	32	.....	.....	64	
		Wheel mat	48	.....	.....	96	
	9	Wheel barrow	4	.....	.....	8	

(*b*) ARTICLES CONTAINED IN THE SIGHT CHEST.

		Sight chest	4	.....	.....	8	
52	17	Padlock	4	.....	.....	8	
52	24	Padlock key	4	.....	.....	8	
701–708	.....	Sight	4	.....	.....	8	
740	.....	Case for sight	4	.....	.....	8	
46	161	Quadrant, Model 1888	4	.....	.....	8	
38	86	Quadrant case, Model 1888	4	.....	.....	8	
		Lantern for night laying	8	.....	.....	16	
868	1–11	Mirror support with mirror	4	.....	.....	8	
868	2	Mirror	4	.....	.....	8	
46	36	Plumb bob with line	4	.....	.....	8	

(*c*) ARTICLES CONTAINED IN THE SECTION ARMAMENT CHEST.

		Armament chest	4	.....	.....	8	
52	17	Padlock	8	.....	.....	16	
52	24	Padlock key	8	.....	.....	16	
821	.....	Pawl lever	8	.....	.....	16	
851	.....	Loading tray	4	.....	.....	8	
852	.....	Charge carrier	8	.....	.....	16	
44	453	Gunner's pouch	8	.....	.....	16	
44	17	Gunner's blouses	8	.....	.....	16	
44	212	Gunner's gloves	16	.....	.....	32	
52	88d	Cotton batting sack (¼ lb.)	4	.....	.....	8	
		Chalk pouch	4	.....	.....	8	
700	.....	Primer holder, assembled, complete.	4	.....	.....	8	
950	.....	Double wrench for brake piston rod nuts, with bar.	4	.....	.....	8	
957	2	Counterpoise spring adjusting pin.	4	.....	.....	8	
159	34	Lanyard extension rope 40 feet long	4	.....	.....	8	
		Set of range tables	4	.....	.....	8	
		Data book (*chief of section*)	8	.....	.....	16	

[1] Eight of 10-ton capacity and four of 2½-ton capacity.

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

I. ARTICLES FOR THE SERVICE OF THE PIECE—Continued.

(*d*) ARTICLES CONTAINED IN THE SECTION TOOL AND SPARE PART CHEST.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
		Tool and spare part chest	4			8	
52	17	Padlock	8			16	
52	24	Padlock key	8			16	
		1-gallon can	12			24	For oil and kerosene.
159	152	Wheel grease, special (galls.)	5			10	
	152	Recoil mechanism oil, special (galls.).	5			10	In their cans.
	153	Kerosene (galls.)	5			10	
38	22	Grease box, Model 1887	4			8	
159	132	Heavy grease (lbs.)	25			50	
159	138	Tallow (piece of 1 lb.)	4			8	
51	32	Greasing brush, small	8			16	
51	207	Large greasing brush	8			16	
51	44	Oil can, Model 1897	4			8	Filled.
159	22	Waste (lbs.)	20			40	
159	87	Sponge (weight ½ lb.)	4			8	
801		Oil cup	3			6	
612	4	Rotherham-Coventry oil cup	1			2	
23	24	Set of 15 split pins	4			8	
44	116	Brass scraper	4			8	
51	57	Drift	4			8	
185	468	Carpenter's mallet	4			8	
51	103	Medium size adjustable end wrench.	4			8	
51	102	Large adjustable end wrench	4			8	
51	199	Copper hammer	8			16	
51	171	Scraper, steel	4			8	
51	211	6″ flat-nose pliers	4			8	
51	218	Brass drift	4			8	
51	239	10″ screw driver	4			8	
140	28	Steel wire, approx. 0.04″ diam., coil of ½ lb.	4			8	
185	454	Triangular file	4			8	
158	49	File handle	4			8	
958		Breech thread file	4			8	
185	510	Small hammer, Model 1897	4			8	
192	88	1-meter brass folding rule	4			8	
65	1–2	Lanyard, with handle	4			8	
802		Metal wash basin	4			8	
984	1	Double-ended wrench for hub cap and lock nuts.	4			8	
51	2–4	Spindle nut key, assembled with spring and rivet.	4			8	
85	1, 2, 4	Complete obturator spindle	4			8	
7008	1	do	4			8	
86	1–4	Complete plastic obturator	4			8	
955		Rack drift	4			8	
53	167	Burlap bag	12			24	
44	457	Canvas fire bucket	8			16	
56	234	Lashing rope, 35′ long	8			16	

(*e*) ARTICLES CONTAINED IN THE CATERPILLAR BAND CHEST.

		Caterpillar band chest	4			8	
185	515	Locksmith's hammer	8			16	
51	57	Drift	4			8	
51		Cotter-pin pliers	4			8	
185	628	Side cutting pliers	4			8	
887	1	Segment pin, with split pin	16			32	
822		Small crowbar	8			16	
143	5	Iron wire, about 0.04″ diam. (lbs.)	16			32	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

II. ARTICLES FOR THE SERVICE OF THE BATTERY.

(*a*) SPARE EQUIPMENT AND ACCESSORIES.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
812-817	.....	Traveling bar	1	.....	.....	2	
56	235	Rope, 1″ diam., 50′ long	4	.....	.....	8	
	247	Lashing ropes 1″ diam., 33′ long.	16	.....	.....	32	
	248	Lashing ropes 16′ 6″ long	8	.....	.....	16	
44	298	Maneuvering lever, wooden, with iron ring.	8	.....	.....	16	
	303	Handspike, iron	4	.....	.....	8	
56	10	Wheel wedge	8	.....	.....	16	
45	.....	Wedge handle	8	.....	.....	16	
45	21	Cleaning sponges	1	.....	.....	2	
		Sponge cover	2	.....	.....	4	
	27	Greasing sponges	1	.....	.....	2	
	88	Short rammer	1	.....	.....	2	
	89a	Unloading rammer, with extension.	1	.....	.....	2	
866	1–4	Mirror stake	2	.....	.....	4	
53	5–8	Mirror rule	1	.....	.....	2	
882	14	Wooden mall	4	.....	.....	8	
		Caterpillar band segment, mark B	4	.....	.....	8	
881	.....	Caterpillar band segment, mark A	12	.....	.....	24	
883	.....	Caterpillar band shoe	12	.....	.....	24	
516	1–2	Wheel, with rubber tires, brake drum, and hub cap.	1	.....	.....	2	
517	1–3	.....do	1	.....	.....	2	
521	.....	.....do	1	.....	.....	2	
522	1–3	.....do	1	.....	.....	2	
605	2	Complete limber spring	1	.....	.....	2	
606	1, 2, 4	.....do	1	.....	.....	2	
607	3	Bolt sleeves for limber spring	2	.....	.....	4	
		Tarpaulin	2	.....	.....	4	

(*b*) ARTICLES CONTAINED IN THE SIGHT SPARE PART CHEST.

		Sight spare part chest	1	.....	.....	2	
52	17	Padlock	1	.....	.....	2	
52	24	Padlock key	1	.....	.....	2	
701–708	.....	Sight	1	.....	.....	2	
740	.....	Sight case	1	.....	.....	2	
868	1, 4–11	Mirror support	1	.....	.....	2	
868	2	Mirror	4	.....	.....	8	
		Range tables, set of	4	.....	.....	8	
		Data book for chief of section	8	.....	.....	16	

(*c*) ARTICLES CONTAINED IN THE BATTERY MECHANICS' TOOL CHEST.

		Battery mechanics' tool chest	2	.....	.....	4	
52	17	Padlock	2	.....	.....	4	
52	24	Padlock key	2	.....	.....	4	
954	.....	Screw driver for rack lock bushing	2	.....	.....	4	
955	1	Rack drift	2	.....	.....	4	
821	.....	Pawl lever	2	.....	.....	4	
956	.....	Spanner wrench for disassembling the obturator spindle.	2	.....	.....	4	
955	2	Rack spindle drift	2	.....	.....	4	
957	1	Counterpoise spacing clip	4	.....	.....	8	
957	2	Counterpoise spring adjusting pin.	2	.....	.....	4	
984	2	Double-ended wrench, 77 mm., 54 mm.	4	.....	.....	8	
984	3	Double-ended wrench, 40 mm., 26 mm.	4	.....	.....	8	
980	1	Double-ended wrench, 20 mm., 17 mm.	4	.....	.....	8	
		10-inch screw driver	4	.....	.....	8	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

II. ARTICLES FOR THE SERVICE OF THE BATTERY—Continued.

(*d*) ARTICLES CONTAINED IN THE RECOIL MECHANISM CHEST.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
		Recoil mechanism chest	2			4	
52	17	Padlock	4			8	
52	24	Padlock key	4			8	
906		Portable pump	2			4	
928		Funnel, with strainer	2			4	
24	196	Oil extractor (75 mm. gun, Model 1897).	2			4	
34	45	Screw filler (75 mm. gun, Model 1897).	2			4	
1020	1	Graduated rule	2			4	
1056	1	Special screw-driver blade	2			4	
1055		21 and 35 mm. wrench	2			4	

(*e*) ARTICLES CONTAINED IN THE CHEST OF SPARE ASSEMBLIES.

		Spare assembly chest	1			2	
52	17	Padlock	1			2	
52	24	Padlock key	1			2	
51–88		Complete breechblock	1			2	
31–36		Counterpoise	1			2	
86	1–4	Complete obturator	2			4	
51	1	Complete obturator spindle nut	2			4	
700		Complete primer holder	4			8	
505		Shackle adjusting device, assembled.	2			4	
507		Gun axle spring eye pin, assembled.	2			4	

(*f*) ARTICLES CONTAINED IN THE SEPARATE SPARE PART CHEST.

		Separate spare part chest	1			2	
52	17	Padlock	2			4	
52	24	Padlock key	2			4	
7002	2	Firing pin bushing	12			24	
	3	Firing pin	12			24	
	5	Firing pin spring	12			24	
64	1	Hammer support	2			4	
	2	Hammer rack	1			2	
	3	Rack washer	1			2	
	4	Rack lock bushing	1			2	
	5	Rack spindle	1			2	
	6	Rack spring	2			4	
	7	Hammer	1			2	
	8	Hammer catch	2			4	
	10	Hammer catch spring	2			4	
	11	Lanyard eyebolt	1			2	
	12	Eyebolt washer	1			2	
	13	Eyebolt pin	2			4	
65	1	Lanyard, with handle	6			12	
77	1	Hinge pin collar	1			2	
	2	Lock collar	1			2	
	3	Pin (spherical head)	2			4	
79	1	Rack lock	1			2	
	2	Rack lock spring	1			2	
85	2	Spindle plug washer	4			8	
7008	1	Spindle plug	4			8	
509	1	Spring plate bolt	4			8	
510	1	Top spring plate	1			2	
517	1	Hub cap	1			2	
	2	Hub cap gasket	1			2	
528	2	Adjusting bolt nut	4			8	
601	4–5	Forward transom bolts and nuts	2			4	
	8–9	Rear transom bolts (C. S. heads) and nuts.	1			2	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

II. ARTICLES FOR THE SERVICE OF THE BATTERY—Continued.

(*f*) ARTICLES CONTAINED IN THE SEPARATE SPARE PART CHEST—continued.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
608	2	Spring eye pin	2			4	
7007	3	Operating finger spring	1			2	
633, 634	1–13	Brake lever, with handle and latch.	1			2	
636	1	Longitudinal cable	2			4	
	2	Transverse cable	1			2	
	3	Thimble	6			12	
636	4–7	Rope clamp, complete	4			8	
636	8	Cable connecting pin	2			4	
	9	Washer	2			4	
637	1–7	Cable connection, complete	2			4	
638	1–2	Rear cable guide, complete	2			4	
	5–7	....do	2			4	
	3–4	Front cable guide, with screws	2			4	
310	5	....do	2			4	
311	6	Common nut for 16 mm. bolt	2			4	
312	6	....do	2			4	
317	4	Common nut for 10 mm. bolt	4			8	
318	3	....do	4			8	
522	2	Castle nut for 16 mm. bolt	6			12	
526	7	....do	6			12	
528	4	....do	6			12	
503	5	Castle nut for 24 mm. bolt	20			40	
509	3	....do	20			40	
524	2	....do	20			40	
525	5	....do	20			40	
606	3	....do	20			40	
608	3	....do	20			40	
617	5	....do	20			40	
522	4	3 mm. split pin	6			12	
526	8	....do	6			12	
528	6	....do	6			12	
503	6	3.5 mm. split pin	30			60	
509	5	....do	30			60	
524	3	....do	30			60	
525	7	....do	30			60	
606	5	....do	30			60	
608	4	....do	30			60	
617	7	....do	30			60	
408	6	5 mm. split pin	5			10	
612	3	6 mm. split pin	5			10	
618	5	....do	5			10	
622	3	....do	5			10	
624	3	....do	5			10	
628	4	....do	5			10	
518	2	8-mm. split pin	5			10	
317	7	10-mm. lock washer (Grower)	4			8	
318	5						
320	4	14-mm. lock washer (Grower)	2			4	
317	6	16-mm. lock washer (Grower)	6			12	
601	10						
601	6	24-mm. lock washer (Grower)	4			8	

III. TOOLS AND ACCESSORIES.

I. ARTIFICER'S TOOL CHEST.

39	0	Unpainted chest	1			3	
	207	Flat brush for greasing shell bands.	8	1		16	
	247	Small nippers	1			3	
52	17	Padlock	1	1		3	
	24	Padlock key	1	1		3	
	80	Key for powder and munition chests.	4	4		12	
150	13	Wire nails (pounds)	5	2		12	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

III. TOOLS AND ACCESSORIES—Continued.

I. ARTIFICER'S TOOL CHEST—continued.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
159	22b	Waste (pounds)	5	5	.....	15	
	35	Silk choke lashing (pounds)	2	7	.....	6	
	104	Cord, 0.04 to 0.08 inch diameter (pounds).	½	2	.....	1½	
	139	Cold chisel	1	1	.....	3	
	147	Pair of small shears	1	1	.....	3	
	229	Common knife	1	1	.....	3	
185	438	Screw-driver bit (for brace)	4	4	.....	12	
	510	Hand hammer	1	1	.....	3	
	628	Side-cutting pliers	2	1	.....	5	
	896	Extra heavy brace	2	2	.....	6	
38	26	Grease box of armament chest	2	.....	.....	4	
185	0	Wire brush for cleaning projectiles.	4	.....	.....	8	
53	56a	Wrench for 24/31 detonating fuses.	2	.....	.....	4	
	50	Wrench for 30/55 time and percussion fuses.	2	.....	.....	4	

II. TOOLS AND STORES FOR WOOD AND IRON WORKERS.

(*a*) *Tools.*

18	48	Chest	2	2	.....	6	
33	51	Special oiler	1	.....	.....	2	
44	118	Brass scraper	1	.....	.....	2	
51	27	Greasing brush	1	.....	.....	2	
	43	Oil can	1	1	.....	3	
	57	Drift	5	1	.....	11	1 $\frac{1}{16}$ in. diam.; 2 $\frac{1}{4}$ in. diam.; 2 $\frac{1}{2}$ in. diam.
		Adjustable end wrench:					
	102	Large	1	.....	.....	2	
	103	Medium	1	1	.....	3	
	104	Small	1	1	.....	3	
	199	Copper hammer	1	.....	.....	2	
	207	Flat greasing brush	2	.....	.....	4	
	218	Bronze drift	1	.....	.....	2	
		Screw drivers:					
	238	¼-inch blade width	1	1	.....	3	
		⅛-inch blade width	1	.....	.....	2	
52	17	Padlock	2	2	.....	6	
	24	Padlock key	2	2	.....	6	
52	33	Bench vise	1	.....	.....	2	
158	22	Carpenter's chalk	1	1	.....	3	
	49	File handle	10	4	.....	24	
	83	Oilstone	1	1	.....	3	
		Chisels:					
185	31	Firmer, ½ and ¾ inch	2	2	.....	6	
	32	Locksmith's	2	2	.....	6	
	104	Small cold chisel	2	2	.....	6	
	118	Flatter	.....	.....	1	1	
	120	Swage	.....	.....	1	1	
	130	Tinner's shears	1	1	.....	3	
	144	Chisel, firmer, ½-inch	2	2	.....	6	
	191	Dividers	1	1	.....	3	
		Squares:					
	289	Wooden, carpenter's	1	1	.....	3	
	299	Common iron	1	1	.....	3	
	322	Hand vise	1	1	.....	3	
	336	Plane iron, with clamp	1	1	.....	3	
	339	Soldering iron	1	1	.....	3	
		Die stock:					
	348	Medium	1	1	.....	3	
	349	Small	1	1	.....	3	
	355	Drills (for breast drill), assorted	10	10	.....	30	
	434	Hack-saw blade	3	3	.....	9	
	438	Screwdriver bit for brace	4	1	.....	9	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

III. STOOLS AND ACCESSORIES—Continued.

II. TOOLS AND STORES FOR WOOD AND IRON WORKERS—continued.

(*a*) *Tools*—Continued.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
		Files:					
	452	Assorted bastard	6	3	.....	15	
	454	Second cut and smooth	2	2	.....	6	
	454	Triangular (for saw blades)	3	3	.....	9	
		Rough—					
	455	Flat	2	1	.....	5	
	455	Half-round	1	1	.....	3	
		File cleaner	1	1	.....	3	
		Hammers:					
	506	Sledge	.....	.....	1	1	
	510	Hand sledge	.....	.....	1	1	
	511	Carpenter's	1	1	.....	3	
	515	Locksmith's	1	1	.....	3	
		Bits for brace:					
	549	Countersink	1	1	.....	3	
	553	Common	3	6	.....	12	
	557	Grindstone, complete	.....	.....	1	1	
	573	Hack-saw frame	1	1	.....	3	
	578	Swab rod	.....	.....	1	1	
	582	Fire shovel	.....	.....	1	1	
	628	Side-cutting pliers	2	1	.....	5	
	647	Spokeshave	1	1	.....	3	
		Punches:					
	659	Center	2	2	.....	6	
	663	Blacksmith's, with handle	1	1	.....	3	
	664	Blacksmith's, hand	1	1	.....	3	
	686	Carpenter's plane without bit	1	1	.....	3	
	699	Wood rasp, half round, 1½ inches	1	1	.....	3	
	708	Fire rake	.....	.....	1	1	
		Saws:					
	741	Hand	1	1	.....	3	
	742	Buck coping, narrow blade	1	1	.....	3	
	744	Keyhole saw	1	1	.....	3	
	747	Small handsaw	1	1	.....	3	
	752	Ripsaw	1	1	.....	3	
	824	Blacksmith's tongs, assorted	.....	.....	2	2	
	844	Poker	.....	.....	1	1	
	855	Hot shear, blacksmith's	.....	.....	1	1	
	855	Cold shear, blacksmith's	.....	.....	1	1	
	867	Nippers, medium	1	1	.....	3	
	894	Breast drill	1	1	.....	3	
	896	Extra heavy brace	1	1	.....	3	
		Gimlets:					
	899	Large	1	1	.....	3	
	900	Medium	2	1	.....	5	
192	88	Folding meter rule, metal	1	1	.....	3	
193	57	Tin funnel	2	1	.....	5	For oil or kerosene.
199	293	Anvil, with block	.....	.....	1	1	
	352	Portable forge, with blower	.....	.....	1	1	

(*b*) *Stores for wood and iron workers.*

199	211	Pins, assorted	25	25	.....	75	
	212	Set of 14 split pins	2	.....	.....	4	
	220	Steel washers, assorted	20	20	.....	60	
38	32	Box for grease	2	.....	.....	4	
139	12	Forge coal (lbs.)	.....	.....	200	200	
140	5	Bar steel, assorted (lbs.)	10	10	.....	30	
141	14	Solder (lbs.)	1	1	.....	3	
143	2	Round, square, flat iron, assorted (lbs.)	100	100	.....	300	
	6	Wrought-iron wire, 0.08–0.12 in. diam. (lbs.)	10	10	.....	30	
	12	Sheet iron, 0.08 to 0.12 in. thick (sheets)	1	.....	.....	2	
148	1	Sheet of zinc	1	.....	.....	2	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

III TOOLS AND ACCESSORIES—Continued.

II. TOOLS AND STORES FOR WOOD AND IRON WORKERS—continued.

(*b*) *Stores for wood and iron workers*—Continued.

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
149	2	Carriage bolts assorted	200	100	.....	500	
		Common wood screws (metric system):					
	79	No. 26–40	12	12	.....	36	
	80	C. S. head No. 25 assorted	48	48	.....	144	
	81	Fillister head No. 24–60	12	12	.....	36	
		C. S. head—					
	82	No. 23 assorted	24	24	.....	72	
	84	No. 21–25	24	24	.....	72	
	86	No. 19–20	12	12	.....	36	
	87	No. 18–25	12	12	.....	36	
150	13	Nails, assorted (lbs.)	15	15	.....	45	
158	142	Thongs, rawhide	50	.....	.....	100	
159	22	Waste (1 box) (lbs.)	50	50	.....	150	In bags.
	87	Sponges (lbs.)	2	2	.....	6	
	104	Cord, assorted (lbs.)	1	1	.....	3	
	132	Heavy grease (lbs.)	20	20	.....	60	
	152	Special oil for recoil mechanism (gal.)	2	.....	.....	4	
	153	Kerosene (gal.)	2	2	.....	6	
	179	Resin (lbs.)	½	½	.....	1	
	387	Salammoniac (lbs.)	1	1	.....	3	
		2-gallon can	2	1	.....	5	

III. SADDLER'S TOOLS AND STORES.

(*a*) *Tools.*

		Saddler's tool chest	1	1	1	4	
51	238	Screwdriver	1	1	1	4	
	9	Saddler's needle	25	25	50	125	
51	11	Awls, flat and round	4	4	4	16	
	146	Pair of large shears	1	1	1	4	
	229	Knife, shoeing	1	1	1	4	
	260	Thimble	1	1	1	4	
	516	Saddler's hammer	1	1	1	4	
	637	Stitching horse	1	1	1	4	
	828	Cutting nippers	1	1	1	4	
192	88	Folding meter rule, metal	1	1	1	4	
	279	Punch, with 5 spare tubes	1	1	1	4	
185	104	Cold chisel	1	1	1	4	
		Awl blades, spare, assorted	10	10	25	55	
		Eyelet set	1	1	1	4	
		Riveting set	1	1	1	4	
		Round knife	.....	.....	1	1	
185	195	Compass	.....	.....	1	1	

(*b*) *Stores.*

150	13	Saddler's nails (lbs.)	1	1	1	4	
156	49	Waterproof cloth (sq. yds.)	3	3	3	12	
159	108	Hemp thread No. 6 (lbs.)	½	½	1	2½	
		Pitch, prepared (lbs.)	1	1	1	4	
		Chrome leather (0.16–0.20″ thickness (lbs.).	10	10	10	40	
		Tubular rivets, assorted	200	200	100	700	
		Eyelets for tarpaulins	10	10	50	80	
		Buckles, 1-inch	10	10	50	80	
		Snap fasteners, assorted	12	12	25	61	
		Tumbuttons for curtains, male and female.	10	10	30	60	
		Sacking needle	.....	.....	6	6	
		Leather belting 1¼ to 2-inch width (lbs.).	.....	.....	10	10	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

III. TOOLS AND ACCESSORIES—Continued.

III. SADDLER'S TOOLS AND STORES—continued.

(*b*) *Stores*—Continued.

Series or drawing No.	Detail No.	Name of part.	Required for— One battery.	Required for— One ammunition train.	Required for— One battalion headquarters.	Total required.	Remarks.
		Black oilcloth (sq. yds.)	.....	.....	2	2	
		Galvanized rings, ¾ to 1 inch diam.	.....	.....	25	25	
		Brown canvas (sq. yds.)	.....	.....	5	5	
153	1	Belt fasteners ¾ to 1 inch	.....	.....	12	12	
	1	I-belt fastener	.....	.....	12	12	

IV. TOOLS FOR THE CONSTRUCTION OF EMPLACEMENTS, SHELTERS, ETC.

52	49	Axe	8	2	.....	18	
	76	Square shovel	10	4	.....	24	
	78	Round shovel	30	10	.....	70	
	79	Rock pick	10	4	.....	24	
	81	Pick	30	10	.....	70	
	100	Sickle	10	5	.....	25	
53	98	Tamper	5	1	.....	11	
	141	Iron-bound mall	10	4	.....	24	
	143	Iron sledge	6	2	.....	14	
	167	Burlap bag, copper treated	200	.....	.....	400	
56	135	Double crowbar	6	.....	.....	12	
143	6	Galvanized iron wire, about 0.12 inch diam. (lbs.)	50	20	.....	120	
150	13	Shingle nails (lbs.)	50	.....	.....	100	
158	54	Round shovel handle	20	.....	.....	40	
	55	Pick handle	20	.....	.....	40	
	48	Axe handle	4	.....	.....	8	
185	144	Carpenter's chisel	4	.....	.....	8	
	304	Adz	4	.....	.....	8	
	404	Hand axe	4	.....	.....	8	
	468	Carpenter's mallet	4	.....	.....	8	
	510	Hand hammer	4	.....	.....	8	
	553	Bits, for brace, assorted	8	.....	.....	16	
	628	Side cutting pliers	6	.....	.....	12	
		Saws:					
	747	Hand	3	1	.....	7	With covers.
	750	Crosscut	3	1	.....	7	Do.
	750	Buck coping	1	.....	.....	2	Do.
52	92	Buck ripsaw	4	2	.....	10	Do.
185	195	Brace	3	.....	.....	6	
192	84	Common meter rule	6	.....	.....	12	
194	78	10-meter steel tape	1	.....	.....	2	
	106	Mason's level	1	.....	.....	2	
	136	Straight edge, 10-foot	2	.....	.....	4	

V. ILLUMINATING MATÉRIEL.

39	416	Boxes for lanterns and candles	.....	.....	.....	.....	
53	126a	Folding lantern	20	16	4	60	
201	123	Large kerosene lantern	10	2	2	24	
158	60	Lantern wick	6	3	3	18	
159	9	Candles (lbs.)	80	60	10	230	
138	1	Box of matches	10	8	2	30	
201	126a	Acetylene lamp	8	4	2	22	
159	373	Small barrel of calcium carbide, 75 pounds' capacity.	1	1	1	4	
		Electric pocket lamp	20	.....	4	44	
158	6a	Spare burner for acetylene lamp	20	10	5	55	
		Spare battery for pocket lamp	40	.....	10	90	
		Spare bulb for pocket lamp	10	.....	4	24	
158	37	Mica sheets for folding lantern	36	27	9	108	
	89	Holder for mica sheets	4	3	1	12	

Composition in artillery matériel of a battalion of 155-mm. Filloux guns—Continued.

IV. MATÉRIEL FOR LIAISON AND FIRE CONTROL.

(*a*) *Instruments for reconnaissance and fire control.*

Series or drawing No.	Detail No.	Name of part.	Required for—			Total required.	Remarks.
			One battery.	One ammunition train.	One battalion headquarters.		
39	334	Instrument chest	1		1	3	
		Plane table, 28x43 inches	1		1	3	
		Topographic plane table, with tripod.	1		1	3	
		Declinator	1			2	
		Large declinator			1	1	
		Alidade slope ruler	1		1	3	Graduated in decigrades clockwise.
		Celluloid protractor	1		1	3	
		Zinc protractor	1		1	3	
		Graduated zinc square	1		1	3	
		Metal rule, 1 meter long, graduated	1		1	3	
		Peigné compass	1		1	3	
		Ordinary compass	1			2	
		Clinometer ruler			1	1	
		Stadia rod (2 meters)			1	1	
		20-meter steel wire	1		2	4	
		Sitogoniometer	1		1	3	
		Sitogoniometer case	1		1	3	
		Observation circle (in mills) complete with field glass, support, and tripod.	2			4	
		Parallax protractor	1			2	
		Barometer			1	1	
		Thermometer	2			4	
		Chronograph			1	1	
		Jobin theodolite, with tripod			1	1	
		Morin theodolite, with tripod	1			2	
		Observation telescope, with tripod and case.	1		1	3	Do.
		Scissors telescope, with tripod and case.	1			2	
		Position data book	5			10	
		Firing data book	10			20	
		Firing bulletin	100			200	
		Logarithmic tables (in grades)			1	1	

(*b*) *Small tools for telephonic truck.*

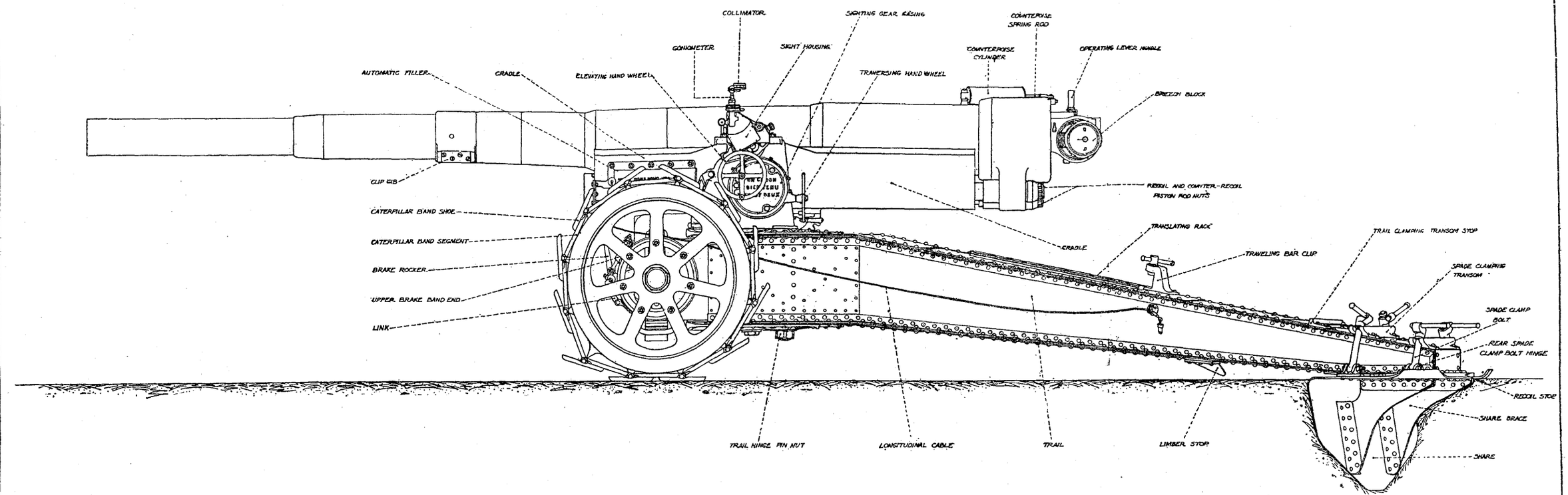
52	78	Round shovel	2		2	6	
	81	Pick	1		1	3	
		Nails (lbs.)	10		10	30	
185	144	Carpenter's chisel	1		1	3	
	405	Hatchet	1		1	3	
	511	Hammer	1		1	3	
	747	Wood saw	1		1	3	
	867	Medium size nippers	1		1	3	

UNITED STATES MATÉRIEL ENTERING INTO THE COMPOSITION OF A BATTALION OF 155-MM. FILLOUX GUNS.

Name of article.	Required for—			Total required.
	One battery.	One ammunition train.	One battalion headquarters.	
Borax, pounds	5	5		15
Brush, sash, No. 3–0	3		1	7
Brush, varnish, No. 4–0	2	1	1	6
Brush, varnish, No. 6–0	2	1	1	6
Brush, camel's-hair, No. 1	2	1	1	6
Chamois skins	3	2	1	9
Crocus cloth, quires	3	2	1	9
Emery cloth, No. 00, quires	3	2	1	9
Emery cloth, No. 0, quires	3	2	1	9
Emery cloth, No. ½, quires	3	2	1	9
Lens paper, reams	1		1	3
Lye, powdered, pounds	15	10	10	50
Oil, light slushing, 2 gallon cans	2			4
Oil, sperm, gallon cans	1			2
Oil, clock, 1-ounce bottles	1		1	3
Oil, lubricating or engine No. 1, 5-gallon cans	2			4
Turpentine, gallon cans	2	2	1	7
Paint, Japan drier, quart cans	2	2	1	7
Paint, black, gallon cans	2	2	1	7
Paint, blue-gray, gallon cans	2	2	1	7
Paint, dark buff, gallon cans	2	2	1	7
Paint, light olive-green, gallon cans	2	2	1	7
Sandpaper, No. 00, quires	3	2	1	9
Sandpaper, No. 2½, quires	3	2	1	9
Soap, H. & H., ¾-pound cakes	4	2	2	12
Soap, castile, 1-pound cakes	4	2	2	12
Stores chest	1	1	1	4
Vaseline, 5½-ounce cans	1		1	3
Webbing, O. D., ⅝ inch wide, yards	12	6	3	33
Webbing, O. D., 1 inch wide, yards	18	9	4	49

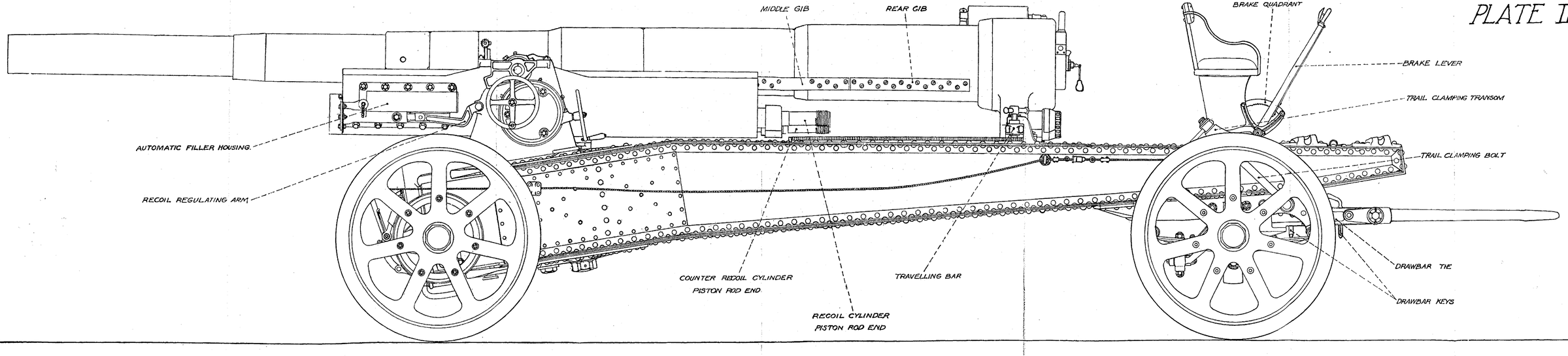
O

PLATE I.



REVISIONS	155 m/m. FILLOUX GUN SIDE ELEVATION FIRING POSITION	Jan. 6, 1918
	SUBMITTED: J. H. Sheppard, First Lieut. Ordnance U.S.R.	APPROVED BY CHIEF OF ORDNANCE OFFICER, A.E.F.
	EXAMINED:	K. H. Adamson, Capt. Ordnance Dept. U.S.A.

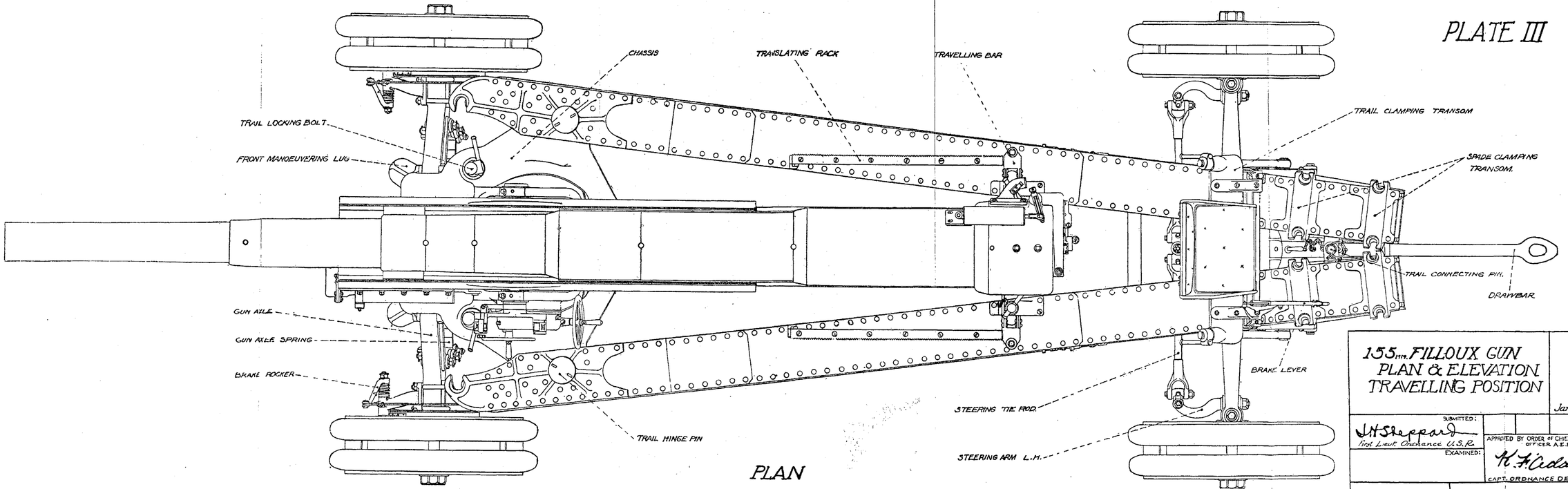
PLATE II



ELEVATION

63234 "-18

PLATE III



PLAN

155 m/m. FILLOUX GUN
PLAN & ELEVATION
TRAVELLING POSITION

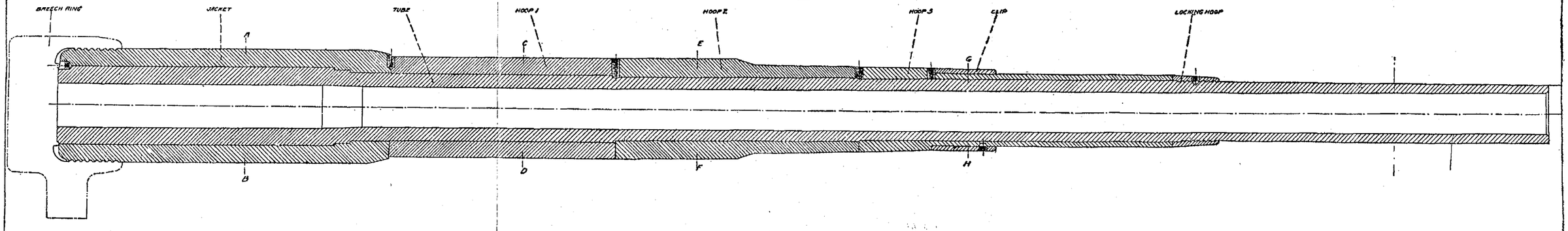
Jan. 6, 1918.

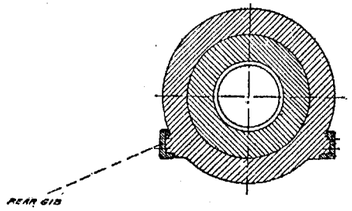
SUBMITTED:
J. H. Sheppard
First Lieut. Ordnance U.S.R.

EXAMINED:

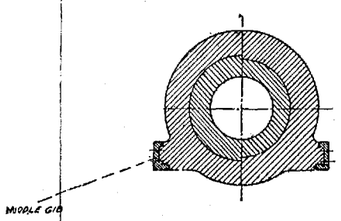
APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER A.E.F.
H. F. Adamson
CAPT. ORDNANCE DEPT. U.S.R.

PLATE IV

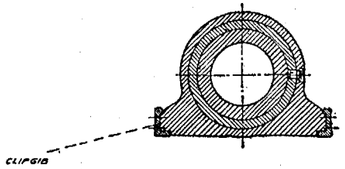




SECTION "AB"



SECTIONS "CD" AND EF

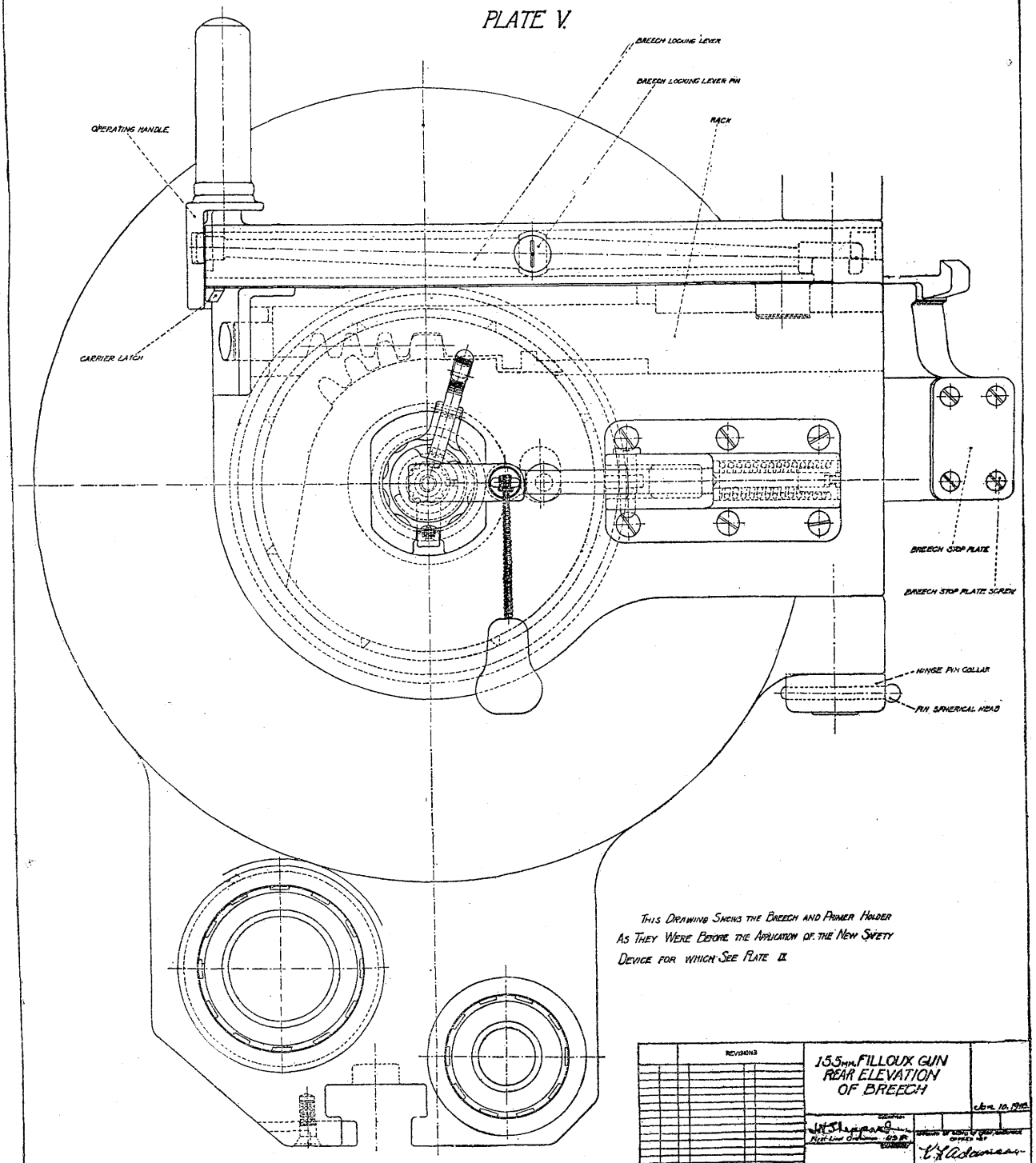


SECTION "GH"

REVISIONS.	155 m/m. FILLOUX GUN GUN LONGITUDINAL & TRANSVERSE SECTIONS.	Jan. 10, 1918
	SUBMITTED: J.N. Sheppard, First Lieut. Ordnance U.S.A.	APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, AEF: H.A. Adamson, CAPT. OF ORDNANCE DEPT. U.S.A.

63234°—18

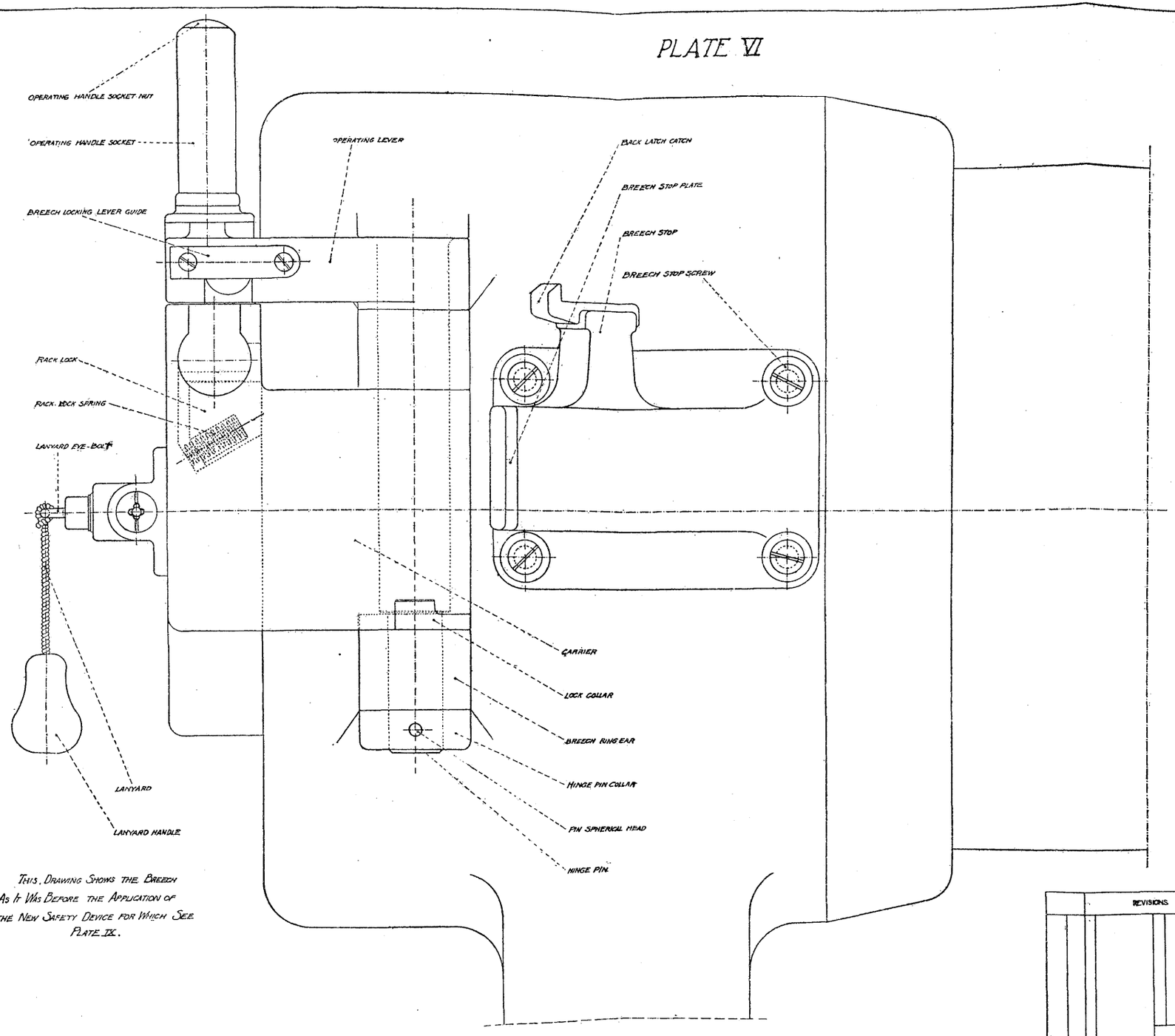
PLATE V.



THIS DRAWING SHOWS THE BREECH AND PRIMER HOLDER AS THEY WERE BEFORE THE APPLICATION OF THE NEW SAFETY DEVICE FOR WHICH SEE PLATE IX

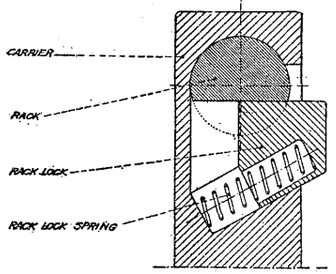
REVISIONS	155MM. FILLOUX GUN REAR ELEVATION OF BREECH	Jan. 10, 1918
	Approved: W. Sheppard, Brig. Gen., Chief of Ordnance, U.S.A.	Approved: C. C. Williams, Major General, Chief of Ordnance Office, U.S.A.
		Approved: C. C. Adamson, Asst. Chief Ordnance Dept. U.S.A.

PLATE VI

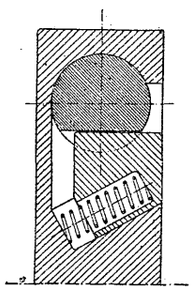


OPERATION OF THE RACK LOCK

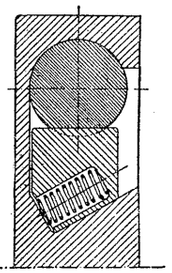
BREECH OPEN



BREECH CLOSED



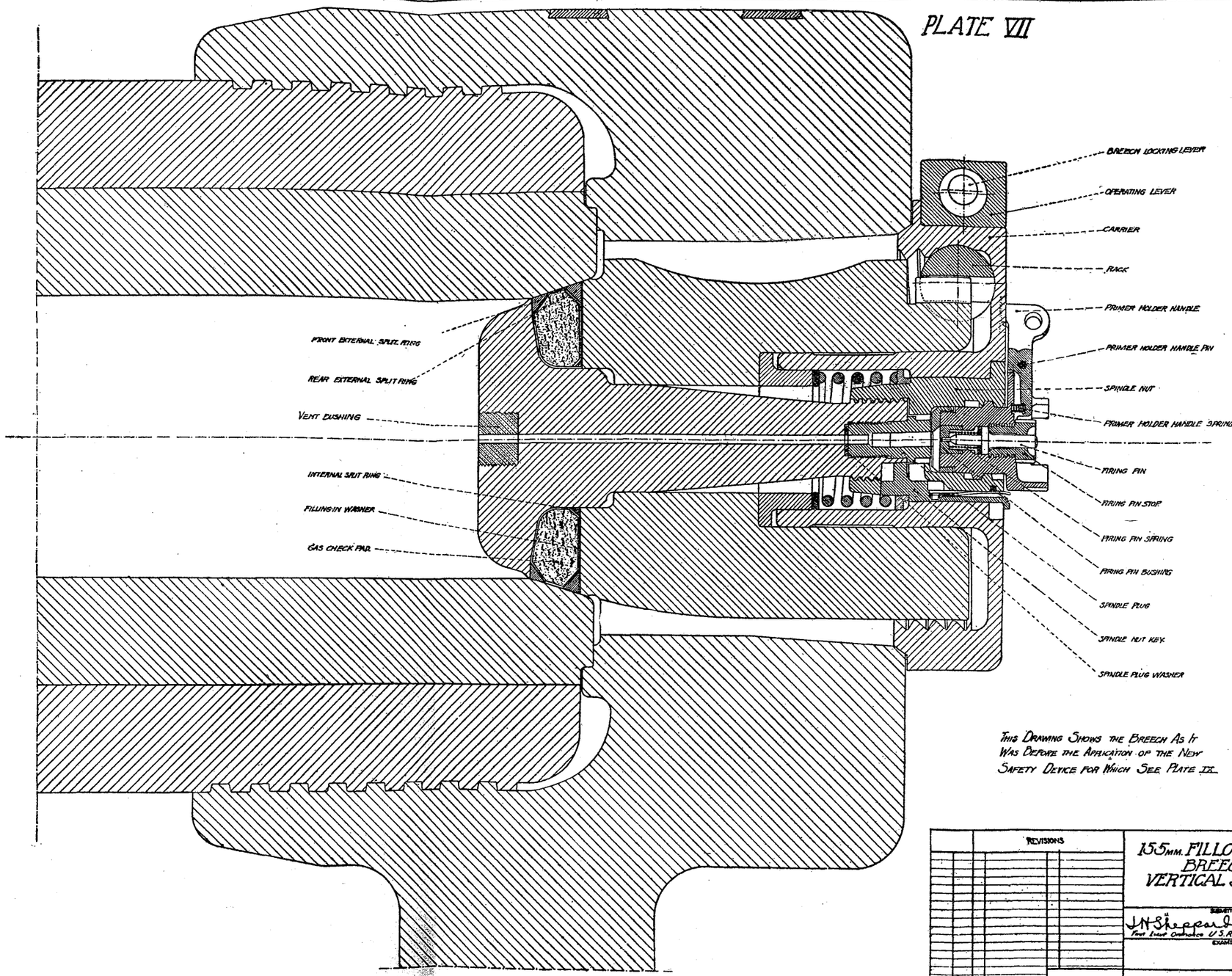
ASSEMBLING POSITION.



THIS DRAWING SHOWS THE BREECH AS IT WAS BEFORE THE APPLICATION OF THE NEW SAFETY DEVICE FOR WHICH SEE PLATE IX.

REVISIONS	155 MM. FILLOUX GUN BREECH RIGHT SIDE ELEVATION
	JULY 11, 1918
SUBMITTED: J.H. Sheppard, First Lieut Ordnance U.S.R.	APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
EXAMINED:	K. L. Sibley, CAPT. ORDNANCE DEPT. U.S.A.

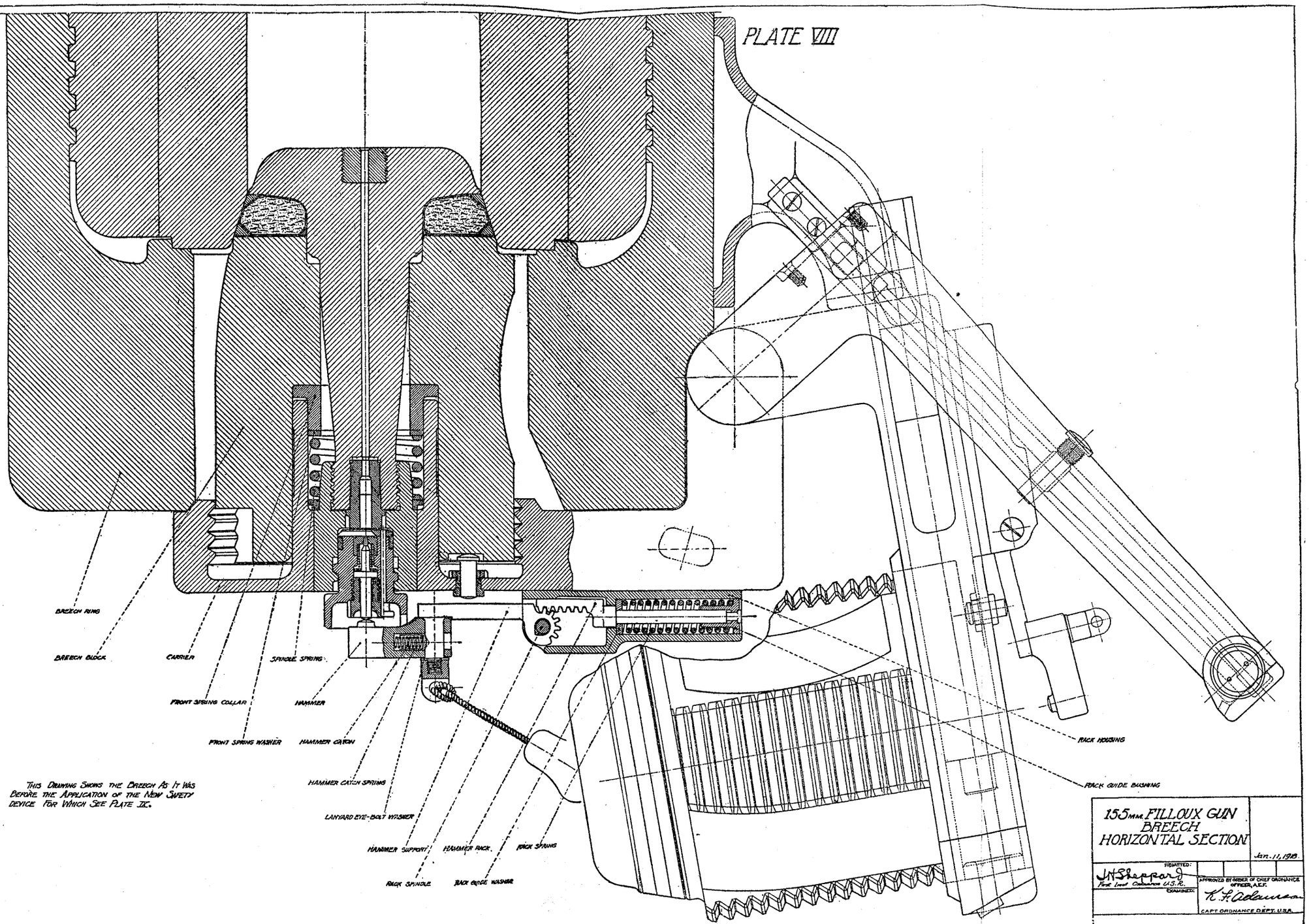
PLATE VII



This Drawing Shows the Breech As it Was Before the Application of the New Safety Device for Which See Plate IX.

REVISIONS	155 MM. FILLOUX GUN. BREECH VERTICAL SECTION.	Jan. 11, 1918
	SUBMITTED. J.N. Sheppard, First Lieut Ordnance U.S.R. EXAMINED	APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F. R.L. Adamson, CAPT. ORDNANCE DEPT. U.S.A.

PLATE VIII



THIS DRAWING SHOWS THE BREECH AS IT WAS BEFORE THE APPLICATION OF THE NEW SAFETY DEVICE FOR WHICH SEE PLATE II.

155 MM. FILLOUX GUN
BREECH
HORIZONTAL SECTION

Jan. 11, 1918

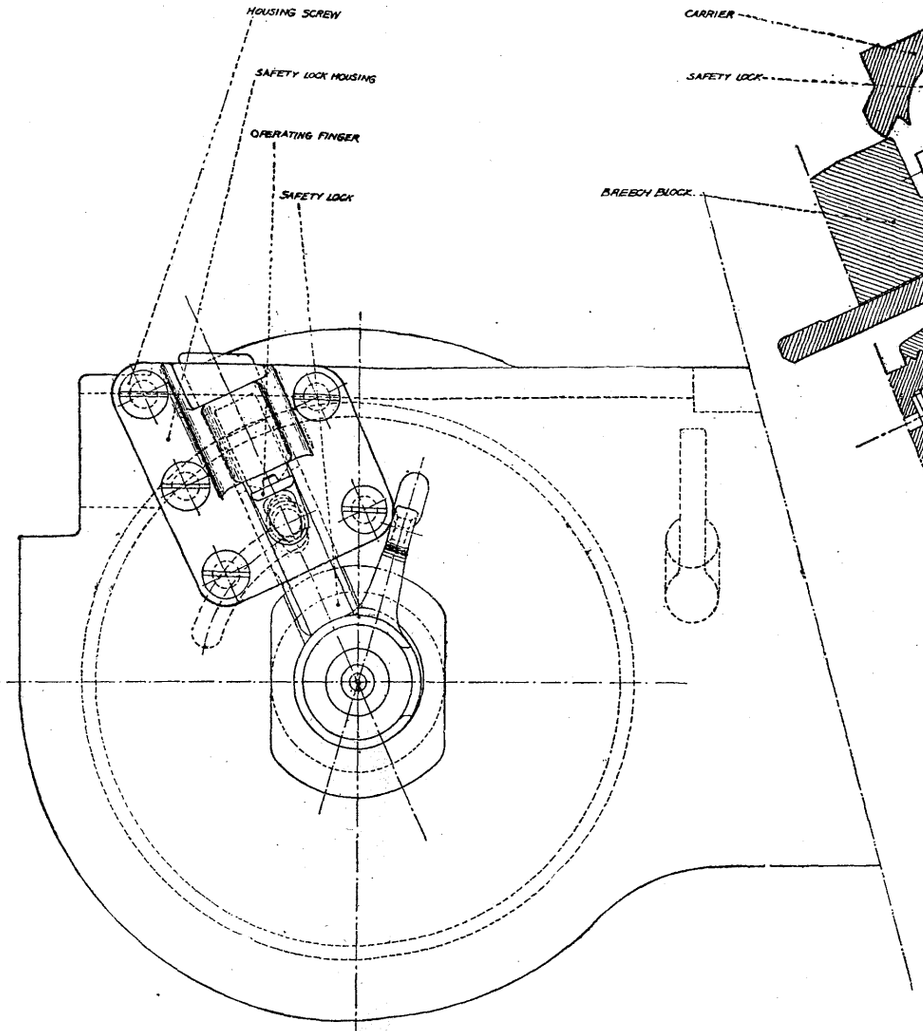
SUBMITTED:
J. H. Sheppard
First Lieut. Ordnance U.S.R.

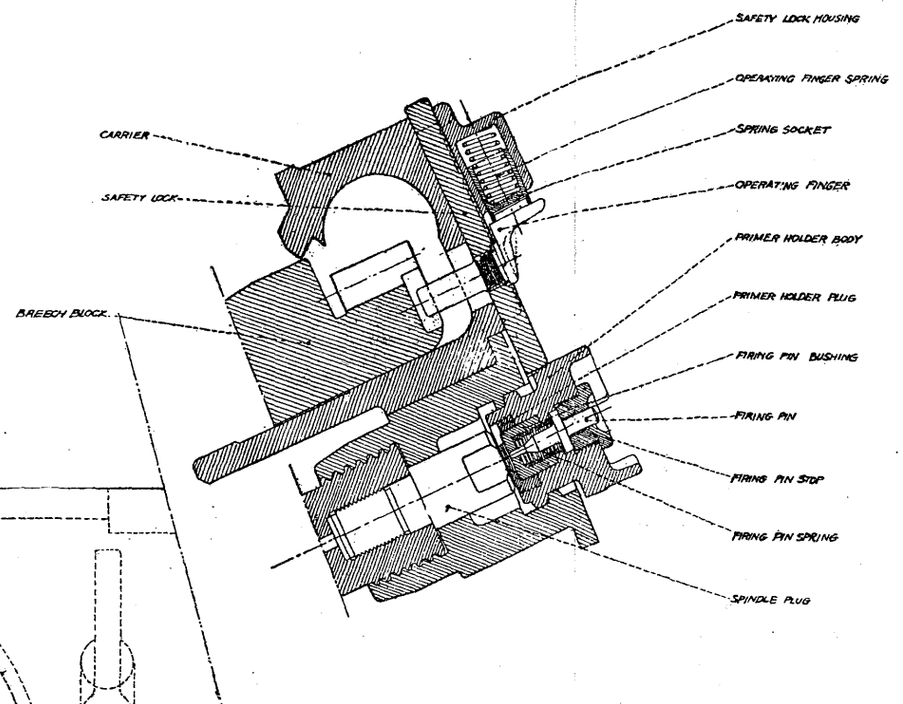
EXAMINED:

APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
K. P. Adamson
CAPT. ORDNANCE DEPT. U.S.A.

63234°—18

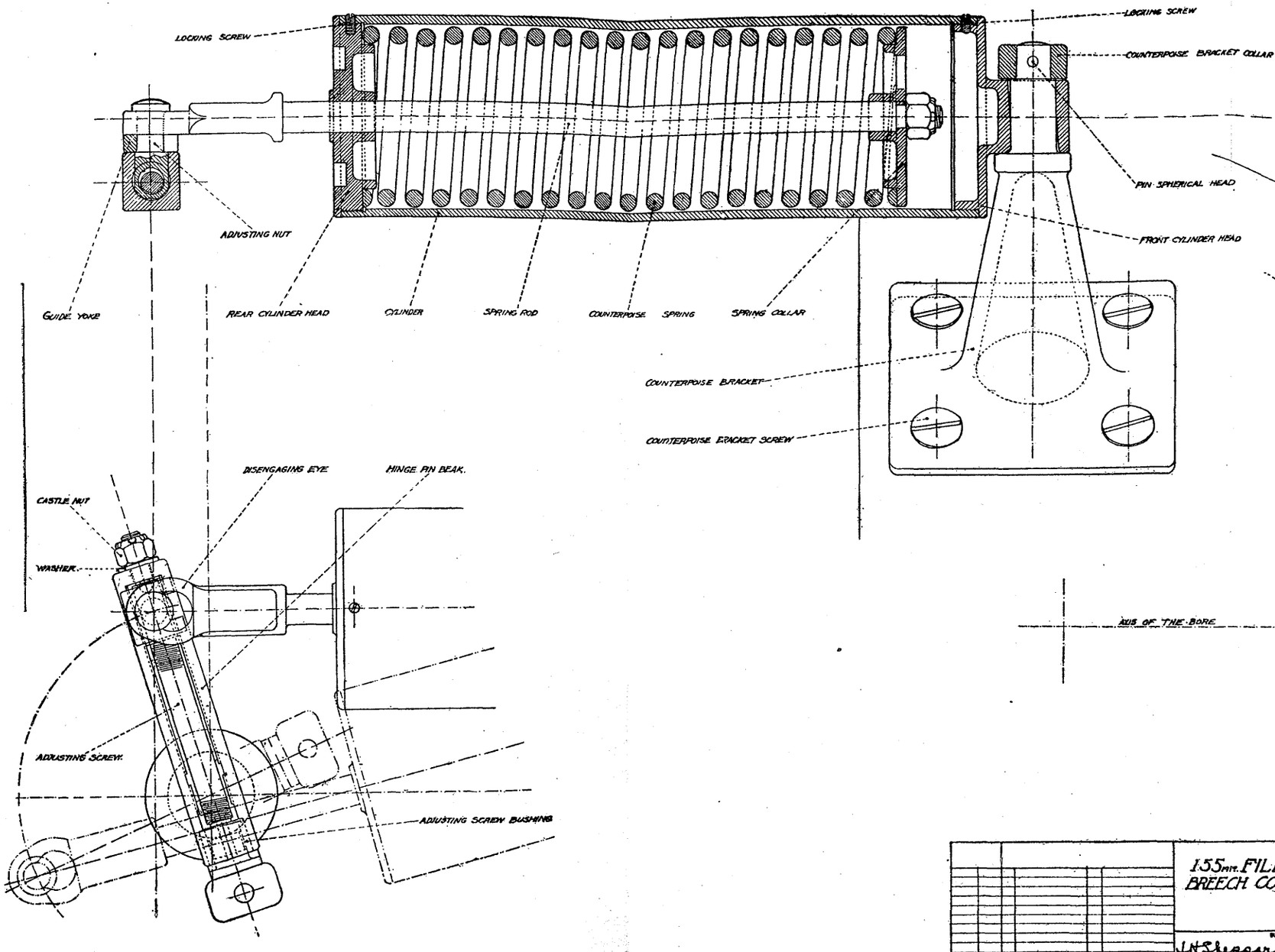
PLATE IX.





REVISIONS	155mm FILLOUX GUN. BREECH SAFETY DEVICE	Jan. 10. 1919
	SUBMITTED: W. W. Sheppard, First Lieut. Ordnance U.S.R. EXAMINED:	APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F. K. F. Adamson, CAPT. ORDNANCE DEPT. U.S.A.

PLATE X



155 m/m. FILLOUX GUN
BREECH COUNTERPOISE

June 10, 1918

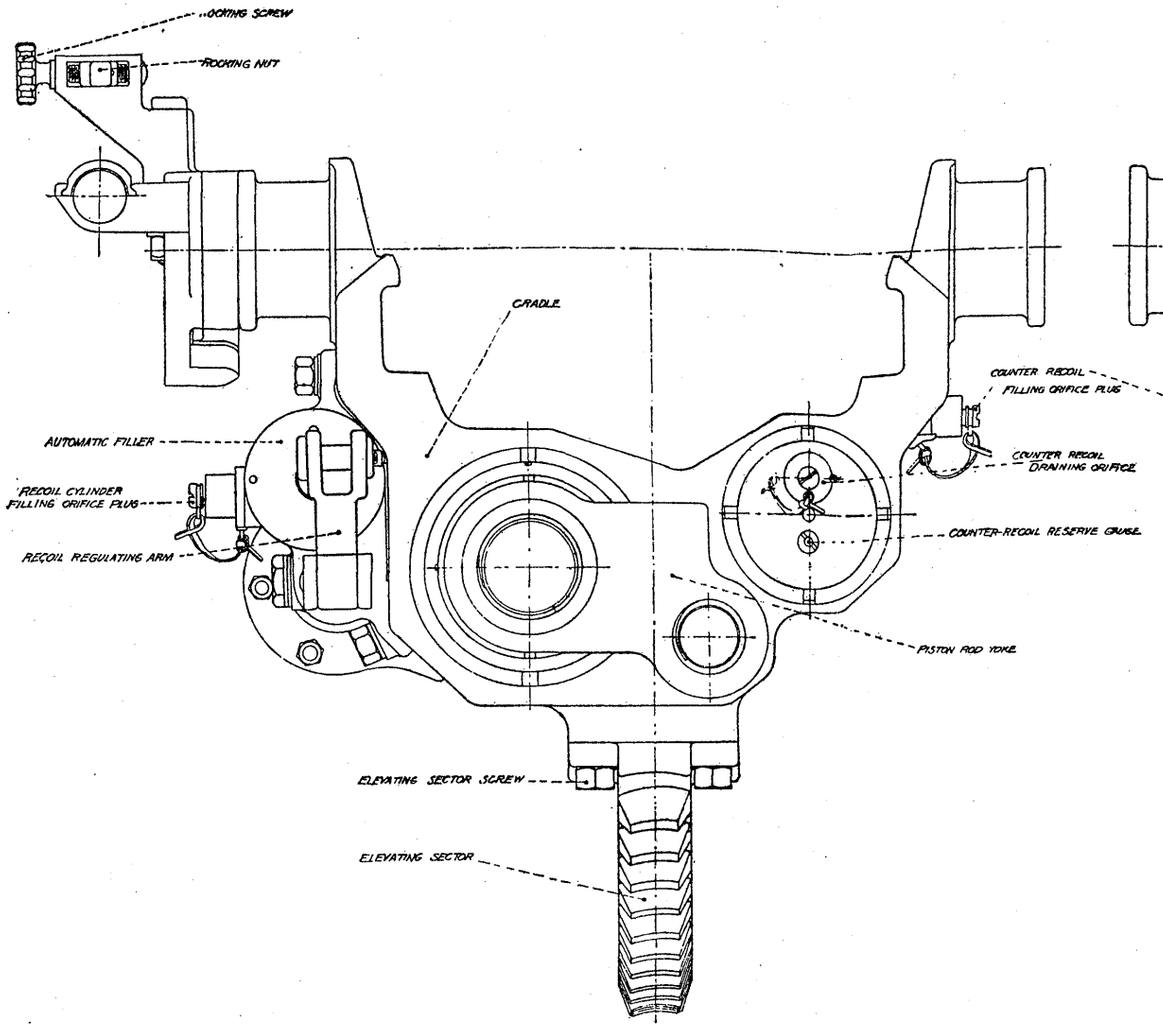
SUBMITTED:
J. H. Sheppard
First Lieut. Ordnance U.S.R.

EXAMINED:

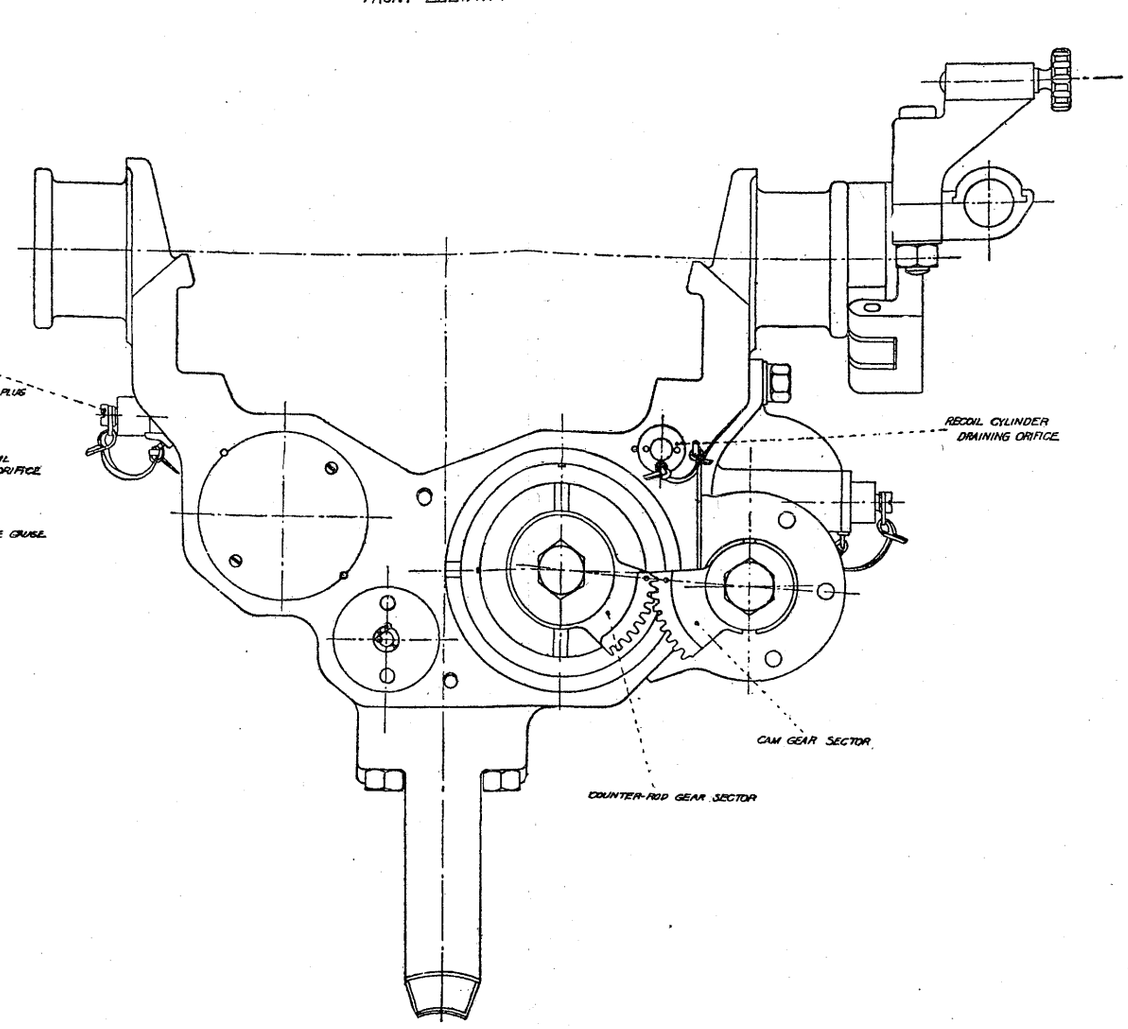
APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
K. F. Adamson
CAPT. ORDNANCE DEPT. U.S.A.

PLATE XI

REAR ELEVATION



FRONT ELEVATION



REVISIONS			

155MM FILLOUX GUN CRADLE

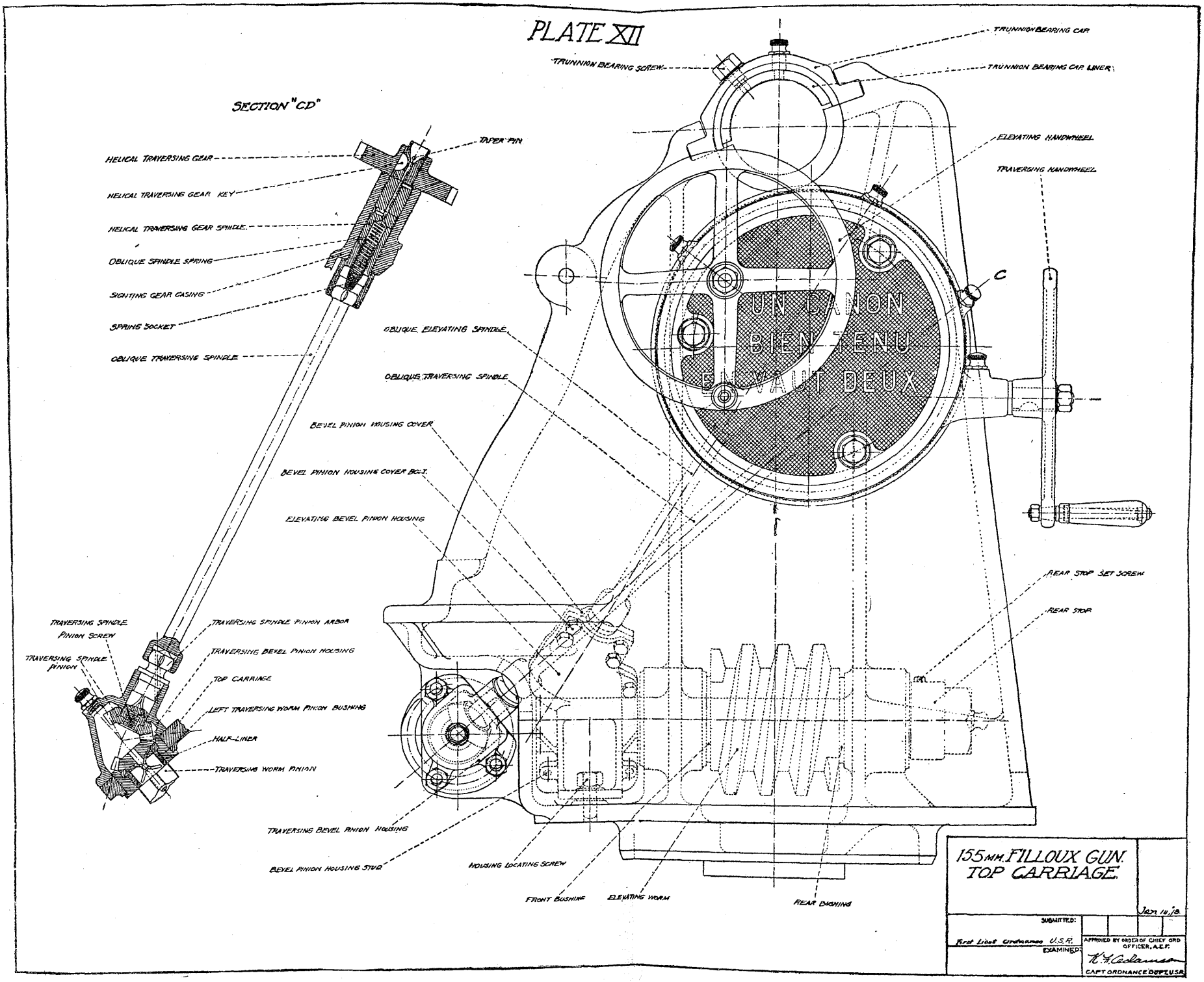
Jan 11, 1918

SUBMITTED:
J.H. Sheppard
First Lieut Ordnance U.S.R.
EXAMINED:

APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
H.H. Adamson
CAPT. ORDNANCE DEPT U.S.R.

63234°—18

PLATE XII

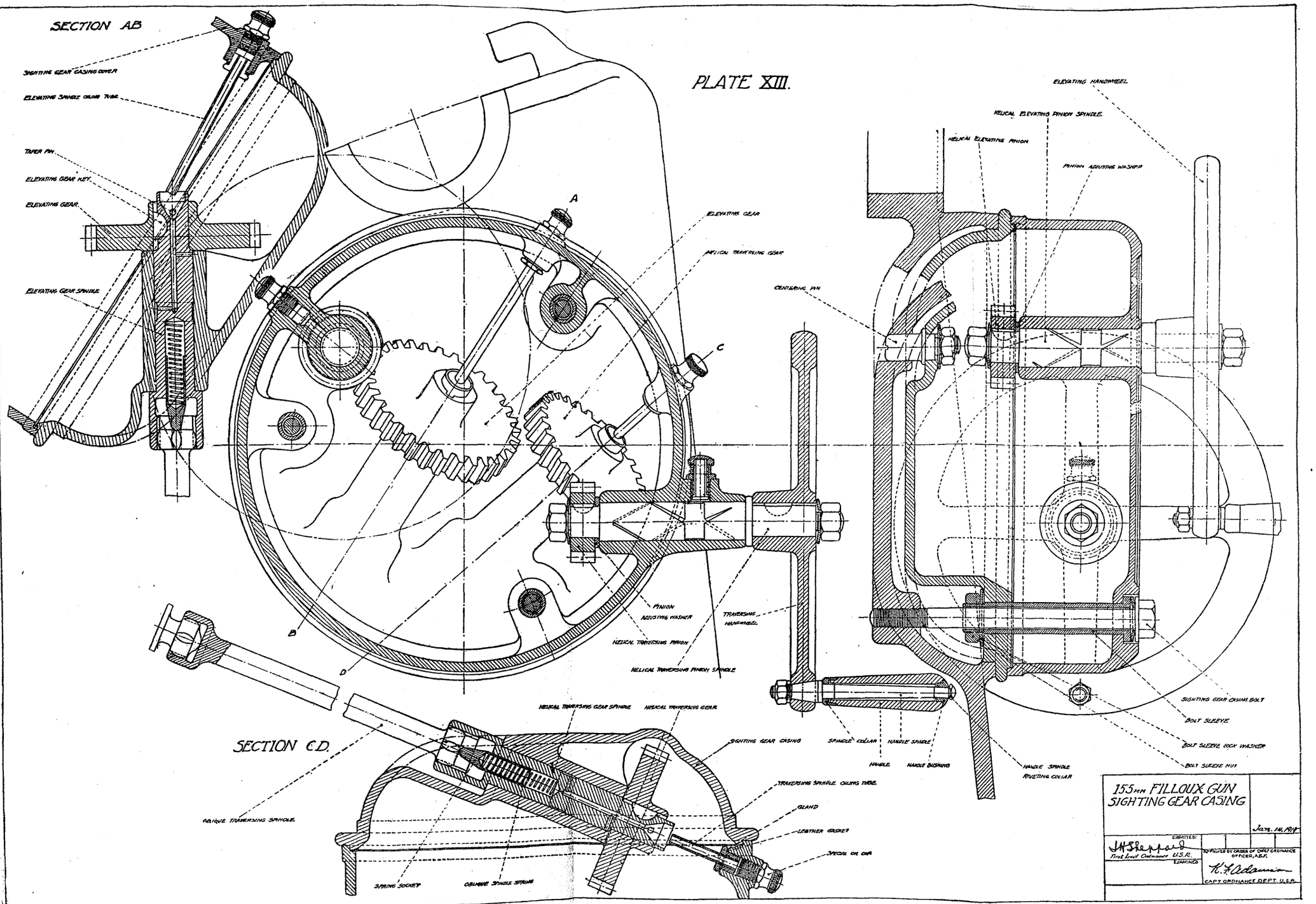


155 MM. FILLOUX GUN.
TOP CARRIAGE.

Jan 10, 18.

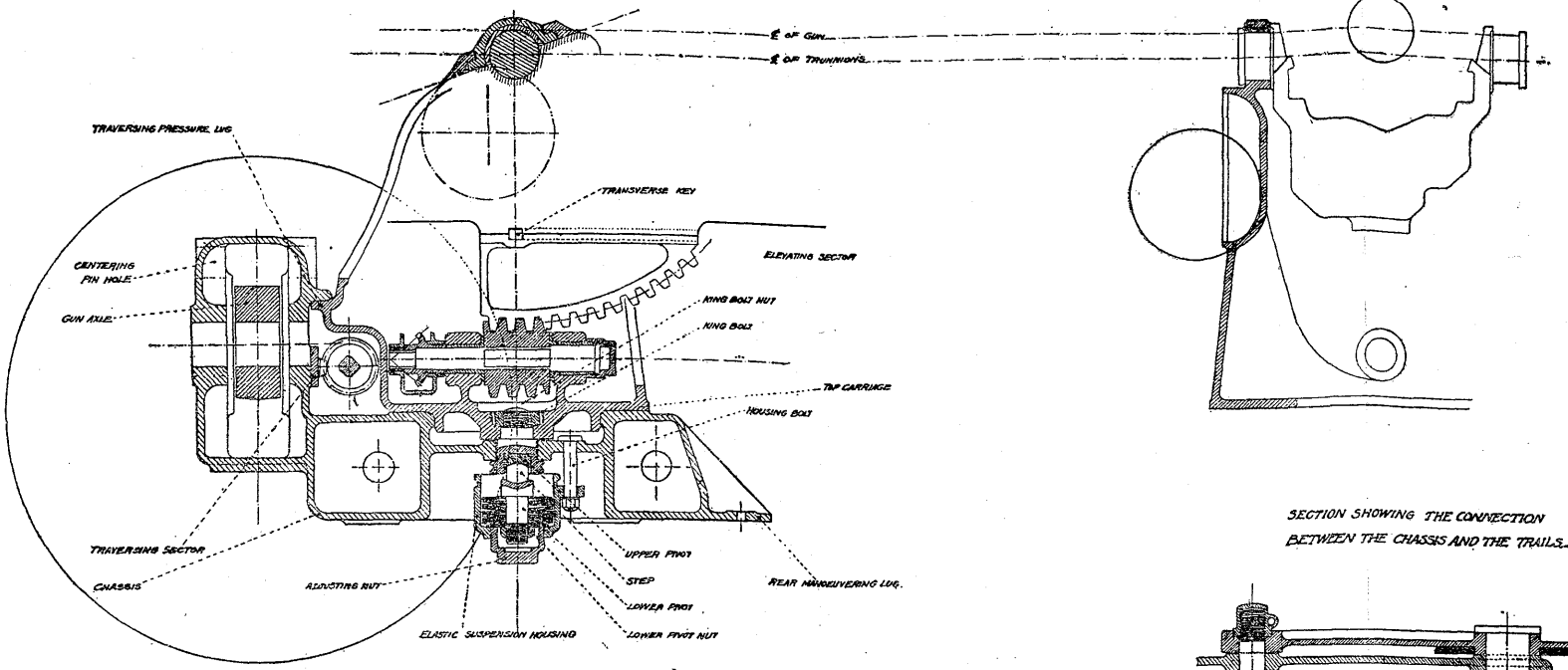
SUBMITTED:
First Lieut Ordnance U.S.R.
EXAMINED:

APPROVED BY ORDER OF CHIEF ORD OFFICER, A.E.F.
H. H. Adams
CAPT ORDNANCE DEPT U.S.A.

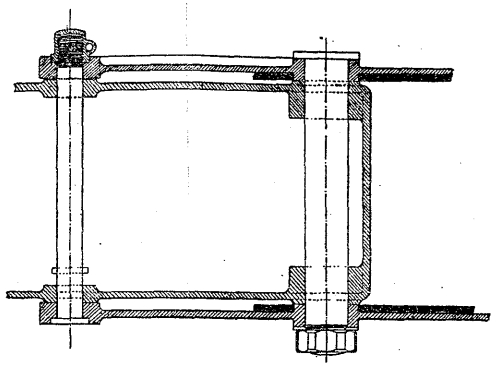

SECTION AB
PLATE XIII.
Sighting Gear Casing Cover
Elevating Spindle Casing Tube
Taper Pin
Elevating Gear Key
Elevating Gear
Elevating Gear Spindle
A
B
C
D
Elevating Gear
Helical Traversing Gear
Centering Pin
Pinion Adjusting Washer
Helical Traversing Pinion
Traversing Handwheel
Helical Traversing Pinion Spindle
Elevating Handwheel
Helical Elevating Pinion Spindle
Helical Elevating Pinion
Pinion Adjusting Washers
Sighting Gear Casing Bolt
Bolt Sleeve
Bolt Sleeve Lock Washer
Bolt Sleeve Nut
Handle Spindle Riveting Collar
Spindle Collar
Handle Spindle
Handle
Handle Bushing
SECTION C.D.
Helical Traversing Gear Spindle
Helical Traversing Gear
Sighting Gear Casing
Traversing Spindle Casing Tube
Gland
Leather Gasket
Special Oil Cup
Oblique Traversing Spindle
Spring Socket
Oblique Spindle Spring
155mm FILLOUX GUN
SIGHTING GEAR CASING
Jan. 14, 1918
SUBMITTED:
J. H. Shepard
First Lieut Ordnance U.S.R.
APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
H. F. Adamson
CAPT ORDNANCE DEPT. U.S.A.

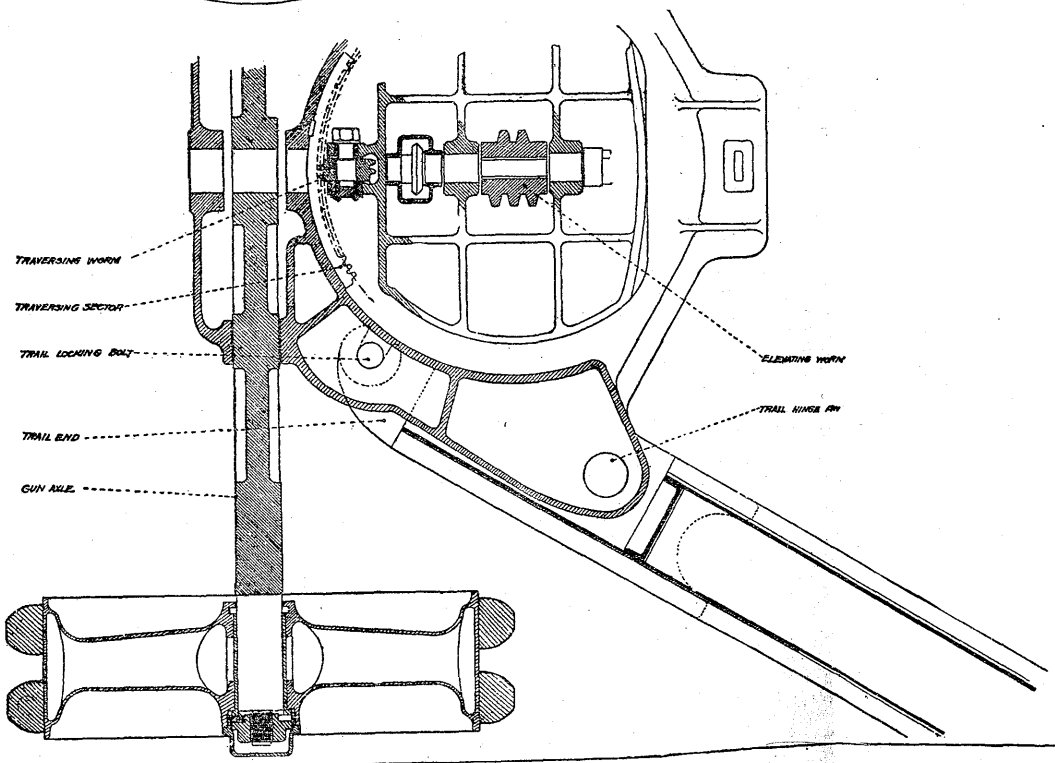
63234°—18

PLATE XIV



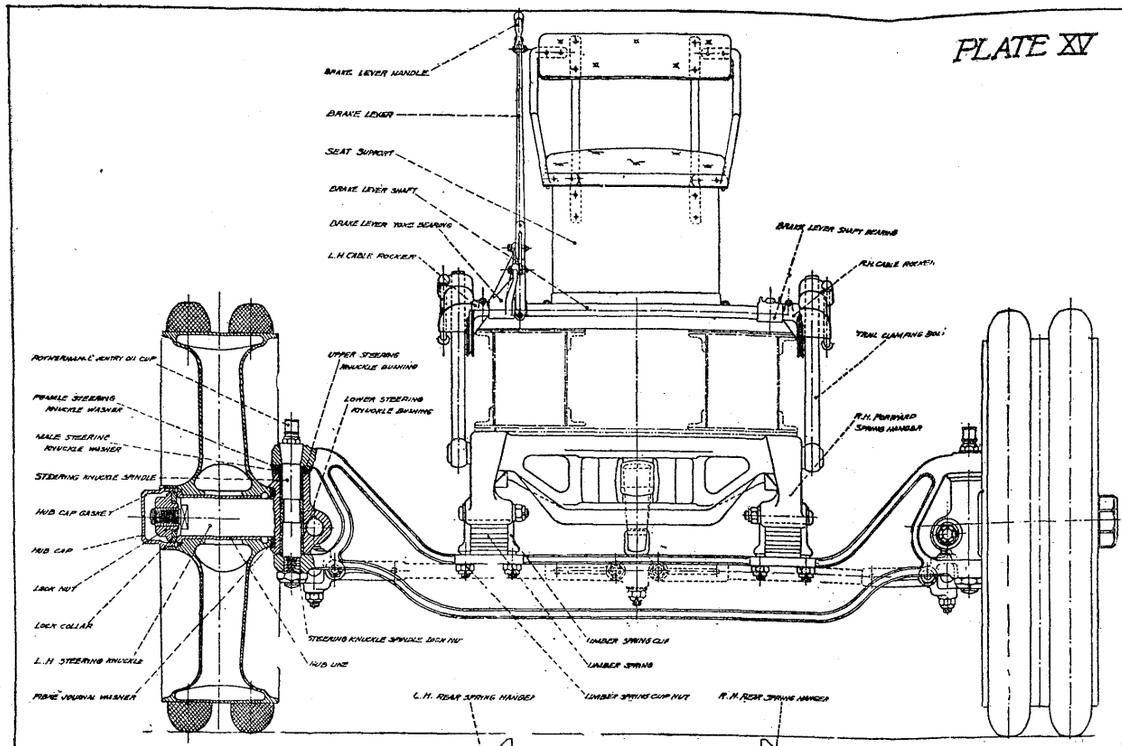
SECTION SHOWING THE CONNECTION BETWEEN THE CHASSIS AND THE TRAILS.

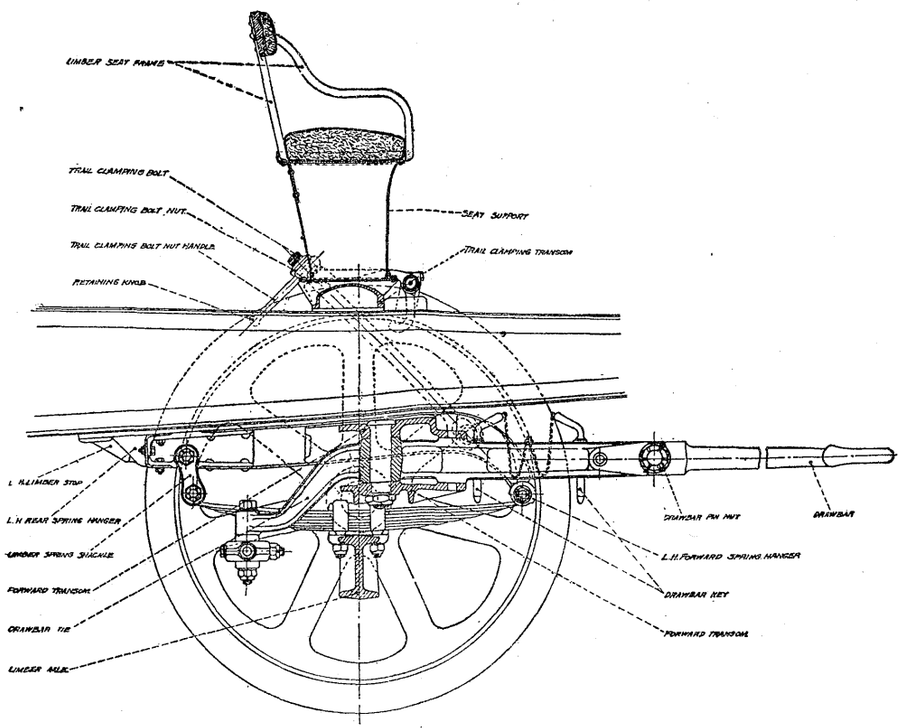


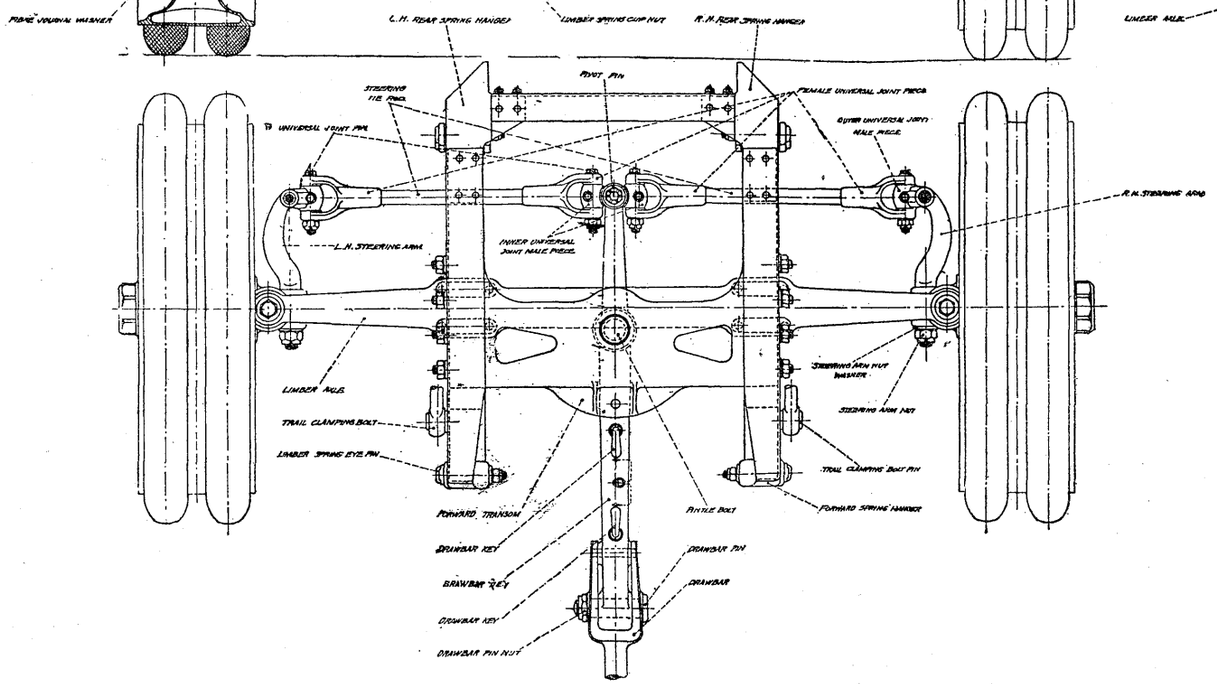


	155MM. FILLOUX GUN CHASSIS & TOP CARRIAGE	Jan. 13, 1918
SIGNED: J.H. Sheppard, First Lieut Ordnance U.S.A.	APPROVED BY CHIEF OF ORDNANCE OFFICER A.S.F.	
	K.L. Adamson, CAPT. ORDNANCE DEPT. U.S.A.	

PLATE XV







REVISIONS	

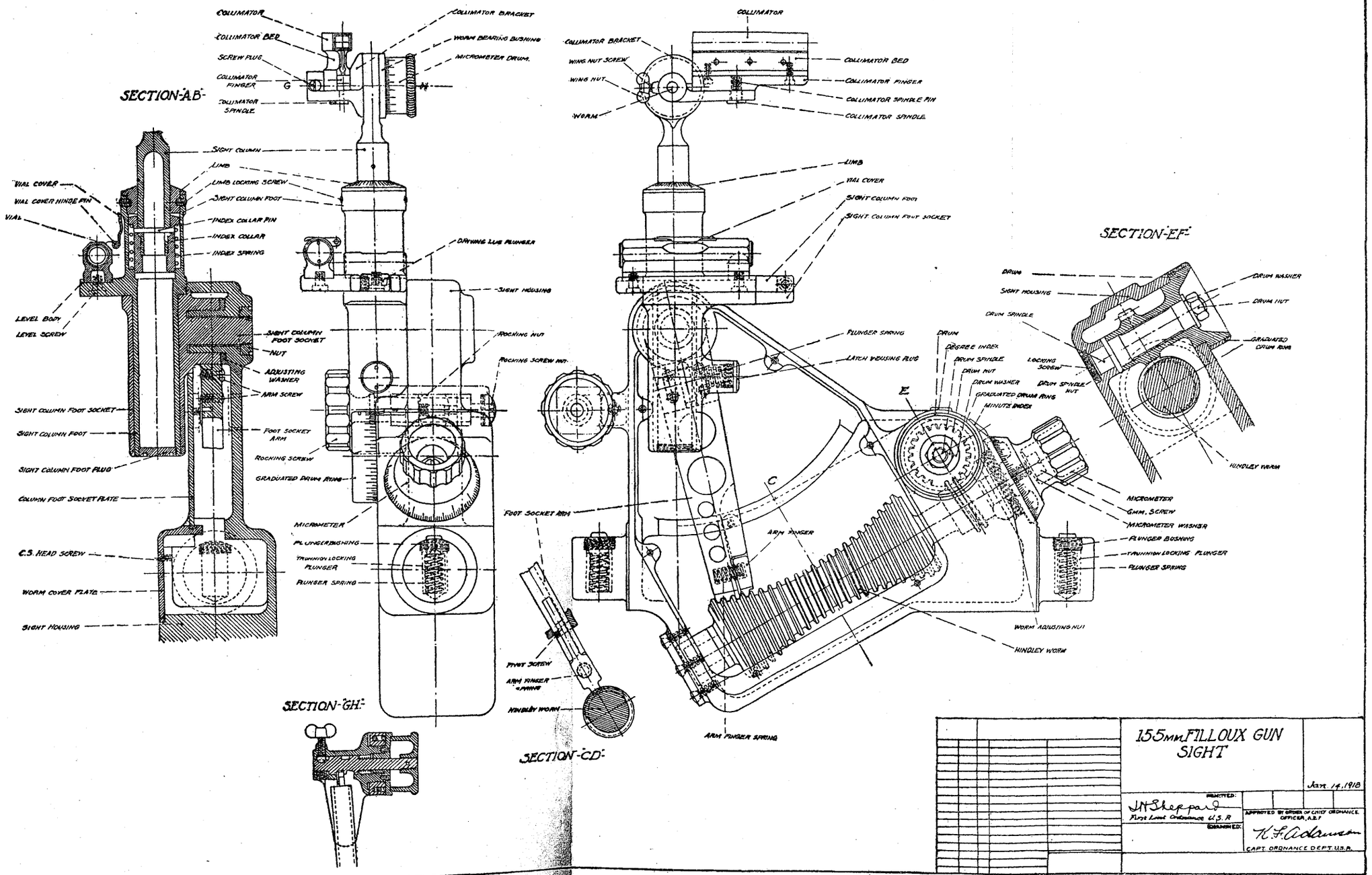
155MM. FILLOUX GUN
LIMBER

Jan. 18, 1918

SUBMITTED:
J. H. Shippard
First Lieut. Ordnance U.S.A.
REMARKED:

APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
H. A. Adamson
CAPT. ORDNANCE DEPT. U.S.A.

PLATE XVI



155mm FILLOUX GUN SIGHT	Jan 14, 1918
PRINTED: J.H. Sheppard, First Lieut Ordnance U.S.R.	APPROVED BY ORDER OF CHIEF ORDNANCE OFFICER, A.E.F.
DRAWN BY:	T.F. Adamson, CAPT. ORDNANCE DEPT. U.S.A.

COMBINED ARMS RESEARCH LIBRARY
FORT LEAVENWORTH, KS
3 1695 00428 4857