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HANDBOOK

OF THE

9.45-INCH TRENCH MORTAR MATÉRIEL

WITH

INSTRUCTIONS FOR ITS CARE AND USE

(Twenty-one Plates)

Compiled and Edited by the
Ordnance Department, U. S. A.

ARMY WAR COLLEGE
DECEMBER, 1917

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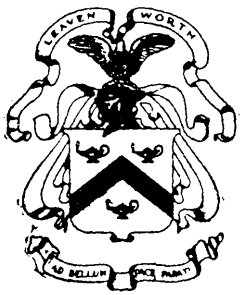
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WAR DEPARTMENT,

WASHINGTON, *December 4, 1917.*

The following manual, entitled "Handbook of the 9.45-Inch Trench Mortar Matériel with Instructions for its Care and Use," is published for the information and guidance of all concerned.

(710, A. G. O.)

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The Adjutant General.

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
WASHINGTON, *June 19, 1917.*

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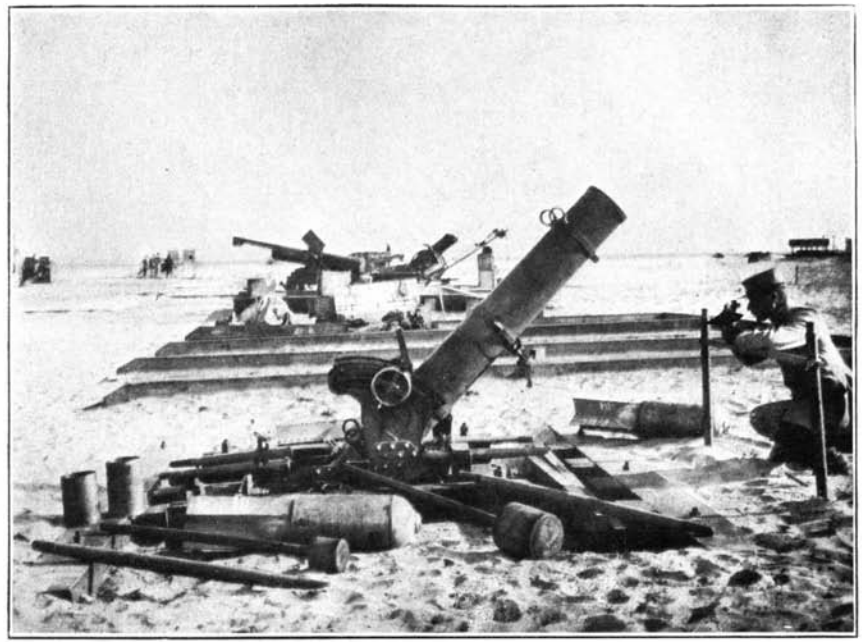
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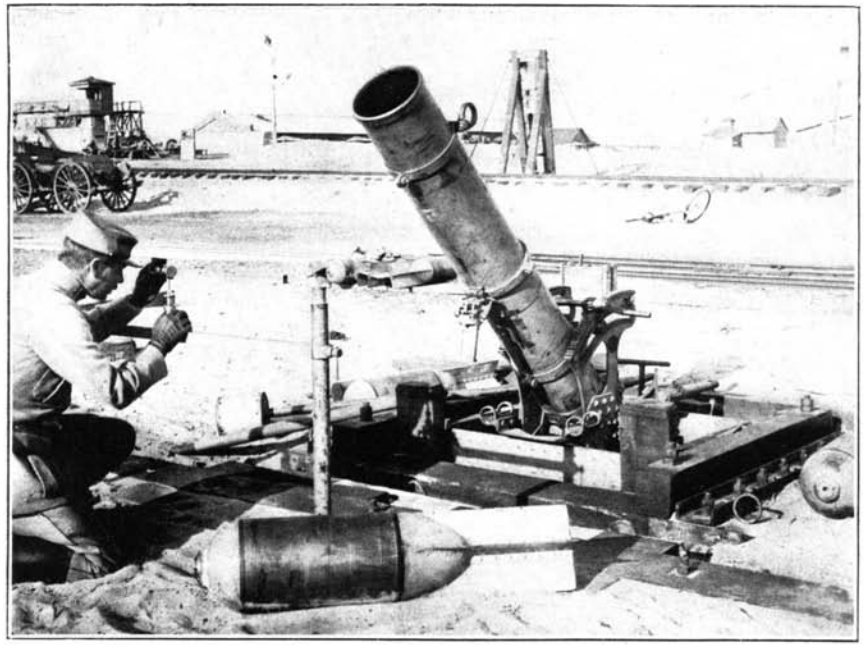
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List of Equipment Furnished to One Trench-Mortar Battery Equipped With 9.45-inch Trench-Mortar Matériel.

No.	Equipment.
6	9.45-inch trench mortars.
6	carriages on carriage carts.
6	bases on carts.
12	park wagons for carrying wooden platform, the tools and tool cases.
1	park wagon carrying spare-parts case and spare parts.
1	park wagon carrying the forge and its accessories.
1	forage wagon.
3	vans.



No. 1.—Side view of assembled mortar with shells, cartridge cases, sponges, and carrying shafts.



No. 2.—Front view of assembled mortar, showing general construction of the wooden platform

HANDBOOK

OF THE

9.45-INCH TRENCH MORTAR.

GENERAL DESCRIPTION.

The 9.45-inch trench mortar is the heaviest of its type as yet adopted for the United States Service. It throws a projectile weighing when charged about 180 pounds and containing about 90 pounds of explosive to a range which may be made to vary between 660 and 2,500 yards. It will hence readily appear from the large caliber of the piece, the great weight of its projectile, and its comparatively extended range that the use for which it is primarily adapted is in the bombardment of strongly protected targets—dwellings, covered shelters, command posts, entrances to galleries, etc.—or in the destruction of sectors of trenches, salients, and the like. Under certain circumstances the length of its range enables it to attain even the more advanced casements of the enemy batteries. Moreover, its enormous demoralizing action on the personnel forms no inconsiderable part of the general effectiveness of this weapon (plates 14, 15, 16).

The mortar when mounted is composed of four major parts:

1. The barrel, or mortar proper, a hollow steel forging, smooth bored, 68.9 inches long, with an inside diameter of 9.45 inches, which is joined to the breech by screw threads.

2. The carriage, consisting essentially of the *racer*, the *trunnion seats* supporting the trunnions of the breech, and the *cheeks* and *racks* which carry the elevating mechanism of the piece. All of these parts of the carriage are of steel and are riveted together to form a solid whole.

3. The base, a complex arrangement of superimposed steel plates and of angles, riveted together and forming a suitable

platform to support the weight of the carriage and barrel, as well as to provide a surface, especially designed for traversing the piece. The hub or axis feature of the traversing system is a pintle riveted to the bottom plate and projecting through the upper plate to receive the racer which may be pivoted around it.

4. A demountable wooden platform upon which the above parts are invariably mounted. This is sunk into the ground and is composed roughly of two floors of timbers, the whole being held solidly together by an appropriate arrangement of tie rods, jack screws, and wedges.

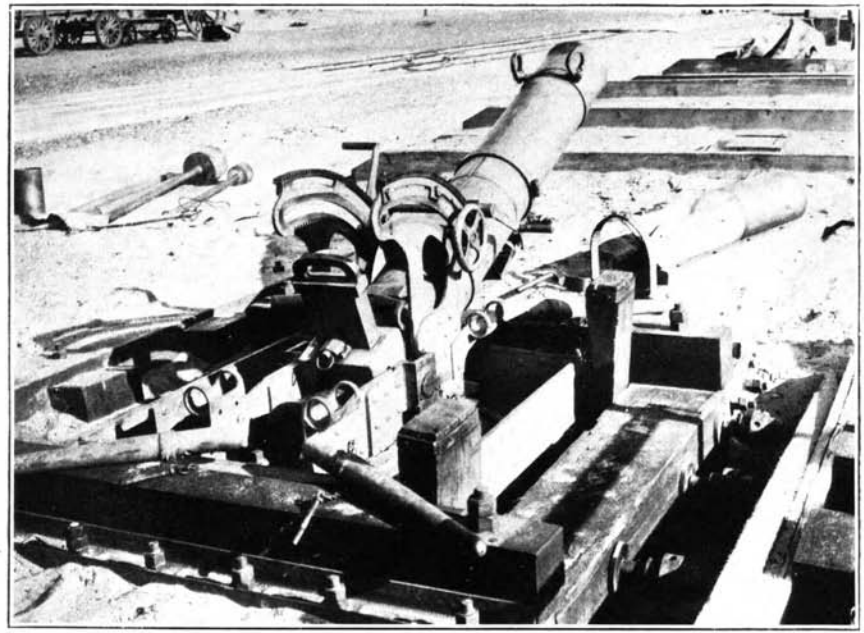
The mortar is elevated by means of two handles and a crank shaft which is keyed to two pinions meshing with the racks. A collar formed of three semicircular clamping bands bolted together encircles the barrel and is attached to the crank shaft. A clamping handwheel working on a shaft which is supported by the curved slots of the cheeks may be tightened against a washer to hold the barrel at the desired angle of elevation.

The mortar is traversed by the rotation of the racer. When the piece has been traversed to the desired direction it is held in position by clamping the racer to the base.

Three one-horse carts are employed to transport, respectively, the barrel and breech, the carriage, and the base. The timbers of the wooden platform, together with the accessory equipment of one mortar, are carried on two ordinary transport wagons. Each of the one-horse carts may in turn be converted into a shell carrier by the installation of a shell-carrying attachment.

WEIGHTS, DIMENSIONS, ETC.

Weight:	
Barrel ---------- (about) pounds --	700
Carriage ---------- do ----	450
Base ---------- do ----	760
Wooden platform ---------- do ----	5,730 (cir.).
Total weight of mounted piece ---------- do ----	7,720 (cir.).
Weight of projectile filled and fused ---- do ----	180
Caliber ----------	9.45 inches.
Length of barrel ----------	68.9 inches.
Angles of elevation ----------	45° to 75°
Horizontal field of fire ----------	36°
Number of shots per minute ----------	1/6
Maximum pressure (high charge) -	3,700 pounds per square inch.
Muzzle velocity (high charge) ----------	475 feet per second.
Maximum range (high charge) ----------	about 2,400 yards.
Minimum range (low charge) ----------	about 660 yards.



No. 3.—Rear view of assembled mortar with breech slide open, showing insertion of cartridge case and details of wooden platform.

DETAILED DESCRIPTION OF THE VARIOUS PARTS OF THE MATÉRIEL.

DESCRIPTION OF THE BARREL.

The barrel (4A) is a hollow forging of gun steel 68.9 inches in length, with an external diameter at the breech of 10.9 inches. The bore is threaded at the breech end for a distance of 1½ inches for screwing onto the breech. This end is also shaped octagonally, to allow for the application of a wrench. At about 27 inches from the breech end the barrel is thickened by 0.08 of an inch for a distance of 4.75 inches and is appropriately grooved to serve as the seat for the gunner's quadrant. A similar thickness, about 2 inches in length, appears at the muzzle end. It is traversed by a sight cut.

A 2-inch groove situated about a foot from the breech end is designed to receive the clamping bands (8H and 8K) of the elevating mechanism.

A register cut (4a) on the breech end serves for a correct alignment of the barrel and breech.

Four sectional register cuts at intervals of 90° on the muzzle end of the barrel are intended to receive the cross hairs used together with the sight plug (see under accessories) in aligning the sight (9M) with the axis of the bore. The barrel and breech are locked together by means of a set screw (4N).

DESCRIPTION OF BREECH MECHANISM.

Nomenclature (plate 1).

Symbol.	Quantity.	Name of part.	Location.
4B	1	Breech	Breech end of barrel.
4D	1	Locking-pin housing	Fastened to top of breech.
4K	1	Locking-pin housing cover.	Fastened to end of locking-pin housing (4D).
4F	1	Locking pin	Inside locking housing (4D).
4G	1	Locking-pin nut	On end of locking pin (4 F).
4E	1	Locking-pin spring	Inside locking-pin housing (4D).
4H	1	Locking-pin ring	Attached to locking-pin nut (4G).
4C	1	Breech slide	Inserted into vertical recess of breech (4B).
4L	2	Breech-slide stops	Screwed to sides of breech slide (4C).
4M	4	Fillister head screws	Fasten housing (4D) to breech.
4N	1	Headless set screw	For locking barrel to breech.
4Q	4	Countersunk head screws	Fasten breech-slide stops (4L) to breech slide (4C).
4P	2	....do	Fasten locking-pin housing cover (4K) to locking-pin housing (4D).

The breech is provided with two trunnions (4d), which are supported in the trunnion seats (5T and 5U) of the carriage. Its front end is threaded to screw into the barrel. Immediately to the rear of the threads the breech is octagonal in shape for a distance of 1 inch to allow for the application of a wrench. One face of the octagon is marked with a register cut (4b), corresponding to the similar cut (4a) on the barrel. Between the octagon and the vertical recess of the breech there is a small hole (4c), $\frac{3}{4}$ inch in diameter and $\frac{1}{8}$ of an inch deep, which serves to receive the lifting band key (4AE). (Cf. description of breech-lifting attachments.)

The vertical recess, 6.75 inches long and 2.34 inches wide, extending through the breech between the trunnions is designed to receive the breech slide (4C). The breech is chambered out to receive the cartridge case.

The locking-pin housing (4D) is secured to the top of the breech by means of four fillister head screws (4M). This housing contains the locking pin (4F) and the locking-pin spring (4E). A hole extending lengthwise through the housing is counterbored to provide a shoulder for the locking-pin collar. The locking-pin housing cover (4K) is secured to the locking-pin housing (4D) by means of the two screws (4P). The purpose of the cover is to hold the locking pin and its spring in position within the housing.

A nut (4G) is screwed and riveted to the outer end of the locking pin. It serves merely as a seat for the locking-pin ring (4H) which is used as a handle for manipulating the locking pin.

The locking pin (4F) is designed to hold the slide up during the operation of loading or down during that of firing. The locking-pin spring (4E) is designed to hold the locking pin in position in the locking-pin recess of the breech slide.

The breech slide (4C) is inserted through the vertical recess of the breech and is designed to close the breech chamber.

A hole is drilled and tapped in the breech slide to receive the firing mechanism. It is provided with a handle (4f) at its upper end for raising it during the operation of loading. Its lower end is curved to facilitate the insertion of the cartridge. Slightly below the handle on each side is a dovetail groove to receive the dovetail tongue of the breech-slide stops (4L). These stops are designed to prevent the slide from sinking too far within the vertical recess. Between them on the rear face

of the slide and slightly to the left of the center is a recess for the locking pin, which prevents any upward movement of the slide.

A recess directly corresponding to the locking-pin recess already mentioned is drilled in the lower part of the breech slide to receive the locking pin when the breech slide is raised.

DESCRIPTION OF FIRING MECHANISM.

Nomenclature (plate 2).

Symbol.	Quantity.	Name of part.	Location.
4U	1	Housing	Screws into breech slide (4C).
4Y	1	Anvil	Inside of the housing (4U).
4W	1	Plunger	Inside of housing above the anvil.
4AA	1	Striker	Inserted in lower end of housing.
4V	1	Plunger spring	Around lanyard cord (4R).
4Z	1	Striker spring	Around striker (4AA).
4S	1	Plug	Screws into upper end of housing.
4AB	1	Vent bushing	Screws into lower end of housing.
4R	1	Lanyard cord	Extends through the plug and plunger.
4T	1	Lanyard eye	On the outer end of lanyard cord.
4X	1	Lanyard washer	Tied to inner end of lanyard cord.

The firing-pin housing (4U) is threaded for a distance of 1 inch around the outside of the smaller end in such a manner that it can be screwed into the breech slide after the insertion of the projectile. This end is also tapped to receive the vent bushing (4AB), which is tightened to the housing by means of the mounting key. The outer end of the housing is tapped to receive the plug (4S). Above the striker is situated the main chamber of the housing, which contains the anvil (4Y), plunger (4W), plunger spring (4AC) and plug (4S), the lanyard cord (4R), and the lanyard washer (4X). The outer end of this chamber is closed by the plug (4S), which projects a distance of 1¾ inches into the chamber. This projection is in the form of a tube, which serves as a core for the plunger spring (4AC). It is traversed by the lanyard cord (4R). Two small holes are drilled through the plug (4S) to allow the application of a mounting key. Around the inner end of this chamber are drilled 10 vent holes leading through the flutes (4e). The plunger (4W) is a steel cylinder traversed through the center by a channel whose diameter is slightly enlarged at one end to form a shoulder for the bearing surface of the lanyard washer (4X). The lanyard washer is wrapped with twine and then spliced to the

end of the lanyard cord (4R) after the latter has been inserted through the plunger hole. The lanyard washer (4X), which is of steel, serves as a durable shoulder to prevent the detachment of the lanyard cord from the plunger hole during the operation of firing.

The lanyard cord (4R) is of sash cord about 6 inches in length. Its outer end is spliced to the lanyard eye (4T), which is of spring steel, and is split at its outer end to allow the passage of the lanyard hook (4AD) at the moment of firing.

The anvil (4Y) is tapped at the outer end to allow for screwing to the plunger (4W) after the insertion of the lanyard washer (4X) in the plunger. It is situated immediately above the striker (4AA) and forms, when assembled, the lower part of the plunger. It serves the twofold purpose of communicating the pressure of the plunger spring to the striker and of holding the lanyard washer in position.

The striker (4AA) is a steel cylinder slightly pointed at one end. A collar situated at about ¼ inch from its outer end serves as a compressing surface for the striker spring (4Z). The striker communicates the blow of the anvil (4Y) to the percussion cap of the cartridge.

The vent bushing (4AB) is threaded to screw into the inner end of the firing pin housing (4U) and forms a shoulder which serves as the lower compressing surface for the striker spring. A hole drilled through its center, having a diameter equal to that of the striker (4AA), permits the functioning of the latter. Two small holes in the inner face of the vent bushing allow for the application of a mounting key.

ACTION OF THE FIRING MECHANISM.

1. The lanyard (4V) is drawn to the rear. This compresses the plunger spring (4AC) and carries the plunger (4W) to the rear of the chamber.

2. Upon the release of the hook (4AD) from the lanyard eye (4T) the plunger spring is also released and carried forward, the plunger and anvil against the striker (4AA).

3. The striker is driven against the percussion cap of the cartridge, at the same time compressing the striker spring (4Z).

4. The striker spring returns the striker to its former position.

DESCRIPTION OF THE CARRIAGE.

The carriage consists of—

(*a*) The racer.
(*b*) The trunnion seats.
(*c*) The cheeks.
(*d*) The racks.

(*a*) THE RACER.

Nomenclature (plates 3 and 4).

Symbol.	Quantity.	Name.	Location.
6A	1	Lower horizontal plate	Base of racer.
5A	1	Upper horizontal plate	Do.
5B	2	Angles	Riveted to plate (5A).
5D	2	Inner plates	Riveted to angles (5B).
5E	2	Outer plates	Riveted to plates (5D).
5K	2	Filler plates	Riveted to plates (5E).
5AB	1	Rear guide shoe	Riveted to plate (5A).
6D	1	Racer clamp shoe	Fastened to stud (6F).
6E	1	Clamping nut	Do.
6F	1	Stud	Through hole in plate (5A).
6G	1	Pin	Through stud (6F).
6H	1	Washer	Over stud (6F).
6C	1	Chock plate	Riveted to plate (5A).
6D	1	Racer clamp shoe	Do.
5R	1	Cover plate (right)	Fastened to plate (5A).
5S	1	Cover plate (left)	Do.
5L	4	Shoulder pins	Riveted to plate (5A).
5M	4	Keys	Through shoulder pins (5L).
5Q	8	Chain rings	Through pins (5L) and bolts (5N).
5P	4	Twisted coil chains	Fastened to chain rings (5Q).
5N	4	Eyebolts	Fastened to plates (5E).
5AQ	1	Vernier bracket	Riveted to racer wall.
5AR	1	Vernier scale	Fastened to bracket (5AQ).
6K	1	Front socket (right)	Riveted to racer wall.
6L	1	Front socket (left)	Do.
6M	1	Rear socket (right)	Do.
6N	1	Rear socket (left)	Do.
6R	1	Tie-plate	Fastened to front sockets.
6P	2	Reinforcing angles	Fastened to rear sockets.
6Q	4	Screws	Fasten angles (6P) to sockets (6M and 6N).

The racer consists of a series of steel plates and angles riveted together to form a solid whole. It may be regarded as the foundation of the carriage and it serves the double purpose of adequately supporting the superstructure of the trunnion seats, cheeks, and racks and of appropriately transmitting the shock of recoil to the base.

The short lower horizontal plate (6A) 16½ inches long, 8¾ inches wide, and ½ inch thick, and the long upper horizontal

plate (5A) 34 inches long, 16½ inches wide, and ⅜ inch thick are riveted together. These two plates are in turn riveted to the horizontal flanges of the angles (5B). The two vertical walls of the racer are composed of inner (5D) and outer (5E) plates of an unequal length riveted to each other and to the vertical flanges of the angles (5B). The space left between the longer outer plates and the vertical flanges of the angles are filled by the filler plates (5K) which serve as a reinforcement to the walls. A little to the front of the center both vertical walls are cut away to form a recess for the boxes of the trunnion seats (5T and 5U). The dimensions of this recess are 4⅝ inches deep by 4¼ inches wide.

The rear guide shoe (5AB) is bolted underneath to the rear end of the long horizontal plate (5A). It hooks under the outer edge of the rail of the base ring (6AC) and thus facilitates the turning of the carriage when traversing the piece. It is cut away on one side through the center to provide a space for the racer clamp shoe (6D). A hole is drilled in the rear end of the long horizontal plate immediately above the recess in the rear guide shoe to receive the racer clamp stud (6F).

The racer clamp consists of a shoe (6D) and clamping nut (6E) and washer (6H) connected by a stud (6F) threaded on both ends. This shoe fits into the recess of the rear guide shoe (5AB) and is screwed beneath the long horizontal plate (5A) to the stud (6F) which passes through the hole in the plate indicated above. The nut (6E) with its washer (6H) is screwed to the upper end. A split pin (6G) passing through the stud above the nut holds the latter in place. A lug on the upper end of the nut provides for the application of a wrench. The lip of the clamp shoe is brought to bear against the under side of the rail of the base ring (6AC) and holds the carriage rigid after the piece has been traversed.

The chock plate (6C) is riveted underneath the long horizontal plate (5A) at about 3½ inches from the rear end. A lug (6a) projects from its upper surface into a hole drilled for that purpose in the long horizontal plate. It is designed to relieve a portion of the strain on the rivets caused by the recoil and to facilitate the transmission of the shock to the base. The lower surface of the chock plate is provided with a shoulder so designed as to bear against the inner edge of the base ring (6AC). Its entire purpose is to transmit the shock of the recoil to the base.

The front guide shoe (6B) is riveted underneath the front end of the long horizontal plate (5A). It hooks under the inner edge of the rail of the base ring (6AC) and, together with the rear guide shoe (5AB), facilitates the rotation of the carriage during the operation of traversing.

The cover plates (5R and 5S) $\frac{5}{8}$ inch thick are semicircular in shape with a radius of 15$\frac{5}{8}$ inches. They are fastened to the outer edge of the long horizontal plate (5A) by means of four shoulder pins (5L) and keys (5M). They project over and protect the portions of the base ring (6AC) left uncovered by the long horizontal plate (5A) of the racer. The inside edge of these plates is cut away to allow for the rivet heads on the long horizontal plate.

The two front shoulder pins (5L) used for attaching the cover plates (5R and 5S) pass through the long horizontal plate (5A) and the front guide shoe (6B), and their ends are riveted over underneath. Their upper projection is slotted to receive the key (5M) which locks the cover plate in position. The keys are attached to the outer vertical plates by means of chains (5P) and eyebolts (5N). The arrangement of the two rear shoulder pins differs from the above only in the fact that their ends are riveted over underneath the chock plate (6C).

Two holes (5a) are drilled near the rear of the right-hand vertical plate to receive the rivets attaching the vernier bracket (5AQ) to the racer.

The vernier scale (5AR) is a zinc strip fastened by screws to the surface of the vernier bracket designed especially to receive it. It is so graduated as to render possible the measurement of the angles used in traversing the piece. The limit of accuracy of the scale is within three minutes.

Both of the horizontal plates are traversed by a hole for the pintle (6AB), which has a diameter of 3.145 inches.

Four sockets are riveted to the side vertical plates (5D and 5E), two at the front end and two at the rear end of the carriage. The two front sockets (6K and 6L) are connected and reinforced by a tie plate (6R), which is cut away in the center to make space for the barrel at low angles of elevation. The sockets are designed to take the racer-carrying handles, which are 2$\frac{1}{2}$ inches in diameter. Two small filler plates (6S) between the sockets and the tie plates serve as an additional reinforcement of the latter. The two rear sockets (6M and 6N) are riveted

to the vertical plates (5E) and are reinforced by small angles (6P) fastened by screws (6Q) to their inner face. A half-inch hole is drilled in each of the four sockets to receive the locking pin of the racer-carrying handle.

(*b*) TRUNNION SEATS.

Nomenclature (plate 5).

Symbol.	Quantity.	Name.	Location.
5T	1	Trunnion seat (right)	Riveted to right racer wall.
5U	1	Trunnion seat (left)	Riveted to left racer wall.
5Y	1	Trunnion lock (right)	Fastened to trunnion seat (5T).
5W	1	Trunnion lock (left)	Fastened to trunnion seat (5U).
5X	2	Trunnion lock handles	Fastened to trunnion locks.
5Y	4	Screws	Fasten handles to locks.
5AA	4	Stop screws	Fastened to trunnion seats.
5Z	2	Stops	Do.

Two steel trunnion seats (5T and 5U) are designed to support the trunnions (4d) of the breech (4B). They are riveted to the outside of the vertical walls of the racer, and thus form an additional partition as well as a slight extension of these walls. Their front half rises to a distance of 3 inches above the walls of the racer, to serve as a support for the cheeks. Immediately behind this extension is situated a bearing box (5c) (the trunnion seat proper), about 4 inches wide and 2 inches in depth. A hole is drilled through the cover of the outer side 2½ inches in diameter to serve as a recess for the trunnion locks (5V and 5W). This hole is counterbored to a depth of 0.20 inch, to form a shoulder against which the trunnion lock operates.

The lock itself consists of two parts:

(*a*) *The handle* (5X), 6½ inches long, which operates the lock from the outside.

(*b*) *A short shaft* (5V and 5W) attached by screws (5Y) to the handle and carrying at the other end a semicircular ring whose inner radius is slightly greater than the radius of the trunnion (4d).

The short shaft traverses the hole and the ring bears against the shoulder mentioned above. The trunnion is lowered into the semicircular ring and is locked by bringing the ring over the trunnion by means of the handle.

Two stop screws (5AA) are screwed into the outside of the box to act as stops for the handle and to maintain it either in the locked or unlocked position.

Two stops (5Z) on each trunnion seat are attached by screws to the outside of the box. Their purpose is to maintain the carriage in position during possible transportation by a carriage cart of the model used in the French army.

(*c*) THE CHEEKS.

Nomenclature (*plate 4*).

Symbol.	Quantity.	Name.	Location.
5AC	1	Racer cheek (right).....	Riveted to trunnion seat (5T).
5AD	1	Racer cheek (left).....	Riveted to trunnion seat (5V).

The cheeks (5AC and 5AD) are irregularly shaped plates riveted to the inside face of the extensions of the trunnion seats (5T and 5U) indicated above and extending 22⅜ inches above them. Their purpose is to support the elevating mechanism and the clamping device which maintains the barrel at the desired angle of elevation.

They are cut away through the center to minimize weight. A slot (6b) traversing nearly the entire length of their upper part serves as a recess to receive the shaft (8C) of the clamping mechanism. Their extreme upper edge is cut away, leaving three lugs (6C), to which the racks (6AD) are bolted. A slot (6d) is located immediately behind the rear lug, to receive the cross-sight post shaft (9A). The slot of the right cheek is counterbored to form a bearing surface for the collar of this shaft. The slot of the left cheek is similarly counterbored to act as a bearing surface for its shoulder.

(*d*) THE RACKS.

Nomenclature (*plate 3*).

Symbol.	Quantity.	Name.	Location.
6AD	2	Racks.....	Fastened to cheeks (5AC and 5AD).
6AE	6	Bolts.....	Fasten racks to cheeks.

The racks (6AD) are curved strips with a tee-shaped cross section. The web of the tee is cut away leaving lugs which correspond, and are riveted to the lugs of the cheeks (5AC and 5AD). Teeth are cut in their upper and wider edge to mesh with the teeth of the pinions (8A) of the elevating mechanism.

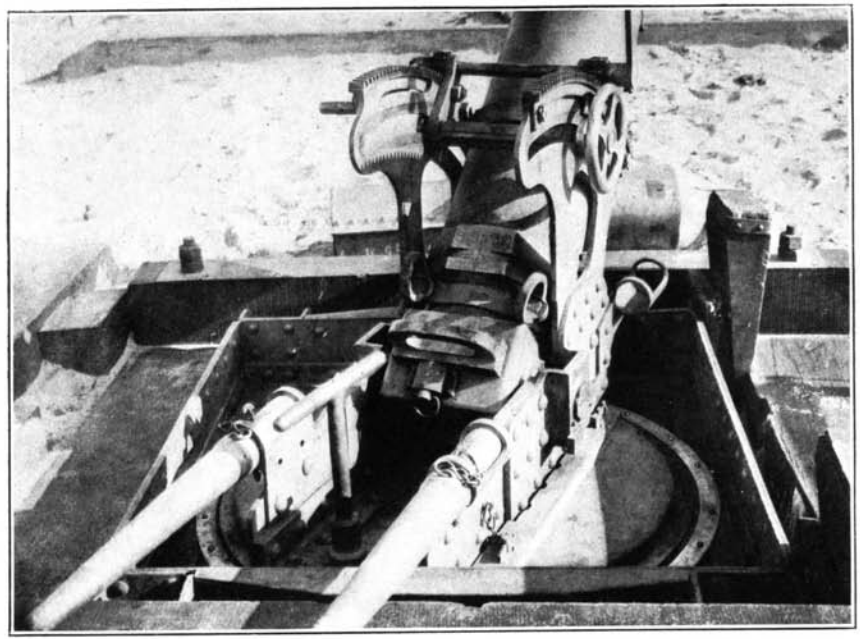
DESCRIPTION OF THE BASE.

Nomenclature (plates 3 and 4).

Symbol.	Quantity.	Name.	Location.
6U	1	Base plate	Main part of base.
5AE	1	Angle	Riveted to plate (6U).
5AF	2	Plates	Riveted to angle (5AE).
5AG	2	....do	Riveted to plates (5AF).
5AH	2	Angles	Do.
6AB	1	Pintle	Riveted to plate (6U).
5C	1	Pintle cover	Fits over pintle (6AB).
6AA	1	Disk	Riveted to plate (6U).
6AC	1	Base ring	Riveted to disk (6AA).
5AM	1	Azimuth circle	Fastened to angle (5AE) and packing plates (5AN).
5AN	4	Packing plates	Fastened to plate (6U).
6V	2	Angles	Riveted to plate (6U).
6W	4	....do	Do.
6X	2	Spades	Riveted to plates (5AG) and angles (6V).
6Y	2	Plates	Riveted to plate (6U).
6Z	4	....do	Do.
5AK	10	Locking lugs	Riveted to plates (5AF).
5AL	4	Sockets	Do.

The base is a complex arrangement of plates and angles riveted together. Roughly it forms a steel box designed to act as a support and a runner for the carriage and to transmit the shock of recoil to the wooden platform.

The square base plate (6U), 39½ inches long, 39½ inches wide, and ¼ inch thick, is to be regarded as the foundation of the rest of the base. It is surrounded on all four sides by an angle (5AE), which is riveted to its upper face, and whose vertical flange rises 2½ inches above the plate. This flange is surmounted by two plates (5AF). Each plate is bent at right angles and is riveted to two sides of the flange, thus forming with the flange a vertical wall 6½ inches in height around the square base plate. An added reinforcement of the side walls is obtained by two angles (5AH), 27¾ inches long, which are riv-



No. 4.—Rear view of assembled mortar with breech slide closed, showing base, azimuth circle, and details of wooden platform.

eted to the upper edges of these walls. Two additional plates (5AG) are riveted to the front and rear walls. The upper edge of these is flush with the upper edge of the walls; their lower edge projects 3 inches below the square base plate and serves as a riveting surface for the front and rear spades (6X).

The pintle (6AB) is a hollow steel cylinder, 2½ inches long, which is machined down to three diameters to provide for the riveting collar and the successive projections of the pintle through the square base plate (6U), the steel disk (6AA) of the base, and the two horizontal plates (5A and 6A) of the racer. Its collar is riveted to the under face of the square base plate. The pintle serves as the axis of the carriage for traversing the piece.

The pintle is covered and protected by a steel *pintle cover* (5C).

On the upper surface of the square base plate and concentric with it is riveted a steel disk (6AA), ½ inch thick. Its diameter is 33¾ inches.

Its outer edge is cut down to form a circular bearing surface $\frac{3}{16}$ inch deep and 5⅜ inches wide. It is designed to support the base ring (6AC). The base ring is riveted to this surface and is surmounted by a T head rail which is of one piece with it. The rail has a width of 1¼ inches. It serves as a runner for the carriage and as a channel for the front (6B) and rear (5AB) guide shoes of the racer. The head of the rail is cut away at two opposite parts of its circumference to allow for disengaging the guide shoes (5AB and 6B) when dismounting the carriage.

The azimuth circle (5AM) is made of zinc and is composed of four segments which, when screwed to the horizontal flange of the angle (5AE) and to the packing plates (5AN) (see below) form a ring 1⅜ inches wide and ⅛ inch thick, with an outside diameter of 37½ inches. This circle is graduated in degrees, each degree and half degree being represented by a cut and every 10 degrees designated by a numeral. The azimuth circle serves as a scale used in conjunction with the vernier scale (5AR) when traversing the piece.

Four small packing plates (5AN), whose thickness, $\frac{5}{16}$ inch, corresponds with the thickness of the horizontal flange of the angle (5AE), are fastened by screws to the square base plate

(6U). Both ends are cut to fit the angle (5AE) and their intervening curve corresponds to the curve of the azimuth circle (5AM). They serve to support those segments of the azimuth circle which are left unsupported by the horizontal flange of the angle.

To the lower face of the square base plate (6U) are riveted six angles (6V and 6W), whose horizontal flanges project between or over the sides of the timbers of the wooden platform, and thus serve as spades in establishing the connection between the latter and the superstructure of the mortar. The vertical flanges of the four inner angles (6W) are 5 inches long; those of the two outer angles (6V) 3 inches long. Each pair of horizontal flanges of the inner angles face each other.

Two spades (6X) are inserted and riveted between the front and rear angles (6V) and the additional plates (5AG) mentioned above as riveted to the vertical walls of the base. They project $2\frac{5}{8}$ inches below the vertical flanges of the angles and serve as a reinforcement and extension of the outer spades. Each is traversed by two holes for the locking pins (13C), which secure it to the carrying attachment of the cart.

Six reinforcing plates, two (6Y) between the two outer angles and two (6Z) between the two center angles on either side of the pintle shoulder, are riveted to the under face of the base plate (6U). The dimensions of the two outer plates are, length $38\frac{3}{4}$ inches, width 5 inches, thickness $\frac{5}{16}$ inch; those of the central plates, length $16\frac{1}{8}$ inches, width $2\frac{3}{8}$ inches, thickness $\frac{5}{16}$ inch.

Five locking lugs (5AK), $2\frac{3}{8}$ inches long, $1\frac{5}{16}$ inches wide, and $\frac{1}{2}$ inch thick, are riveted to each vertical side wall of the base. They are designed to fit into the locking plates (7BN) of the wooden platform and serve to fix the base in position.

Four sockets (5AL) are riveted flush with the upper edge of the side walls of the base, two at the front and two at the rear end. They are designed to take the base-carrying handles, which are $2\frac{1}{2}$ inches in diameter.

DESCRIPTION OF THE WOODEN PLATFORM.

Nomenclature (plate 5).

Symbol.	Quantity.	Name.	Location.
7A	5	Lower floor timbers	Between long beams (7D).
7B	2	Lower channels	Do.
7C	10	Assembling bolt pins	In flanges of channels (7B).
7D	2	Long beams	Outside of framework.
7E	2	Struts	Connect beams (7D).
7F	2	Upper channels	Across ends of beams (7D).
7G	4	Bolts	Fasten channels (7F) to beams (7D).
7H	10	...do	Fasten channels (7F) to channels (7B).
7K	8	Tie rods	Fasten ends of beams (7D) together.
7L	4	Eyebolts	Fastened to beams (7D).
7M	5	Upper floor timbers	Rest on timbers (7A).
7N	10	Reinforcing bands	Around ends of timbers (7M).
7P	10	Spacers	Fastened to timbers (7M).
7Q	5	Tie plates	Do.
7R	10	Locking screws	Fastened to tie plates (7Q and 7S).
7S	5	Tie plates	Fastened to timbers (7M).
7T	10	Shoulder screws	Fastened to tie plates (7Q and 7S).
7U	5	Locking plates	Fastened to tie plates (7Q).
7V	5	.....do	Fastened to tie plates (7S).
7W	2	Cross beams	Fastened to beams (7D).
7Y	4	Front beams	At front of excavation.
7Z	4	Rear beams	At rear of excavation.
7AA	6	Bolts	Through front (7Y) and rear (7Z) beams.
7AB	4	Vertical blocks	Between beams (7D) and (7Y).
7AE	3	.....do	Between beams (7D) and (7Z).
7AC	4	Wedges	Between beams (7D) and (7M).
7AD	4	Reinforcing bands	On large ends of wedges (7AC).
7BN	10	Locking plates	Fastened to timbers (7AO).
7BP	10	Handles	Fastened to plates (7BN).

The wooden platform is composed of a rigid framework formed by a suitable arrangement of timbers which are held together by a system of tie-rods, channel irons, and bolts. The whole is sunk into an excavation prepared for it in the ground and is clamped rigidly by means of jackscrews and wedges. It is designed to serve as a level and firm-bearing surface for the mortar, adapted to sustain both the superimposed weight of the piece and to adequately take up the shock of recoil during firing.

The platform itself is composed of the following major parts:

(*a*) The lower floor.

(*b*) The framework.

(*c*) The upper floor.

(*d*) The eight front and rear bracing beams.

(*a*) *The lower floor* is composed of five oak timbers (7A), 86½ inches long, 8⅝ inches wide, and 4¾ inches thick, laid horizontally side by side across the excavation. Plates (7BN) with handles (7BP) are bolted to both ends of each timber to facilitate carrying them. The ends of the timbers rest on two lower channels (7B), 43¼ inches long and 6 inches wide, the flanges of which face downward. These flanges are pierced by holes at suitable distances to receive the assembling bolt pins (7C).

(*b*) *The framework* consists of four beams: Two long beams (7D) parallel with the timbers of the lower floor, 86½ inches long, 11¾ inches wide, 11 inches thick; they rest on a slightly higher level of the excavation than the lower floor timbers and project 9½ inches above the latter; two struts (7E), 49⅝ inches long, 5⅞ inches wide, and 9½ inches deep, which are supported by the ends of the lower-floor timbers and fit between the two long beams in recesses especially prepared in the latter to receive them.

An upper channel iron (7F), 6 inches wide and 65½ inches long, crosses the ends of the long beams of the framework and rests on each strut. It is attached to the long beams by bolts (7G). The bolts (7H) pass through this channel, the strut, the lower-floor timbers and the lower channel iron where they are prevented by the assembling bolt pins (7C) from turning while the nuts are being tightened. The bolt heads are slotted to receive these pins. This arrangement provides for the perfect solidity of the lower floor with the framework.

Two pairs of tie-rods (7K) at each side, 68⅝ inches long, one above the other, connect the ends of the long beams of the framework and contribute to its solidity. Ay eyebolt (7L) is attached to each end of the long beams of the framework to facilitate carrying them.

(*c*) *The upper floor* is composed of five square oak timbers (7M) 59 inches long, 7¼ inches wide, and 7¼ inches thick, which are laid parallel across the top of the lower-floor timbers. They rest between the two long beams of the framework. The ends of each timber are provided with a steel reinforcing band (7N). Between each pair of timbers and between the last timber and the rear long beam of the framework, steel spacers (7P) are located which are attached by screws to the timbers and serve to provide proper intervals to receive the spades of the base.

About 10 inches from both ends of each timber there is a *tie plate* (7Q and 7S) which serves as a seat for the locking lugs (5AK) of the base. Attached to each tie-plate by a shoulder screw (7T) there is a locking plate (7V or 7U) designed to lock the lugs of the base in position. The locking plate is held in place by a locking screw (7R).

Two cross beams (7W), 54⅛ inches long, 5½ inches wide, and 9 inches deep, rest on the ends of the upper floor timbers and are secured by bolts (7X) to the long beams of the framework. They are designed merely to hold down the timbers of the upper floor.

(*d*) *The eight bracing beams*, four in front (7Y) and four in rear (7Z), are oak timbers 9¾ inches wide and 5½ inches deep. The front timbers (7Y) have a length of 137 inches, those of the rear 156 inches. Each set of four is fastened together by bolts (7AA), making a solid block. These blocks fit into the appropriate portions of the excavation to the front and rear of the platform.

The platform is clamped solidly together by means of the following arrangement:

(*a*) *Four vertical blocks* (7AB), 22 inches long, are installed so as to bear against the inner face of the four front-bracing beams and in turn to furnish a bearing surface for four jack-screws. The latter bear against the side of the front long beam of the framework. Three vertical blocks (7AE) of like dimensions fit between the rear long beam of the framework and the four rear bracing beams. Their purpose is to transmit a more even pressure to these last when the jack screws are tightened.

(*b*) *A pair of oak wedges* (7AC) 13¾ inches long is inserted at each side between the long front beam (7D) of the framework and the front vertical plate of the base. The larger end of each wedge is provided with a reinforcing band (7AD) of steel.

THE EXCAVATION.

The depth of the excavation is about 20 inches and its shape conforms closely to that of the platform. Its bottom must be horizontal and the rear wall must be carefully dressed and absolutely vertical, because it is against this surface that the horizontal recoil of the mortar presses at the moment of fire.

DESCRIPTION OF THE ELEVATING MECHANISM.

Nomenclature (plate 6).

Symbol.	Quantity.	Name.	Location.
8A	2	Pinions	Keyed to shaft (8B).
8B	1	Elevating shaft	Through ends of upper clamping band (8H).
8E	1	Crank (right)	On end of shaft (8B).
8Q	1	Crank (left)	Do.
8N	1	Crown nut	Do.
8P	1	Split pin	Through end of shaft (8B).
8C	1	Clamping shaft	Through ends of upper clamping band (8H).
8D	1	Key	In left end of shaft (8B).
8F	1	....do	In right end of shaft (8B).
8G	1	Handwheel	On right end of shaft (8C).
8H	1	Upper clamping band	Around barrel (4A).
8K	2	Lower clamping bands	Do.
8L	2	Countersunk head screws	Through upper band (8H).
8Y	4	....do	Do.
8V	4	Nuts	On ends of screws (8Y).
8M	1	Separator	Between ends of band (8H).

The elevating mechanism is composed of the following major parts:

(*a*) Two pinions (8A) operating on the racks (6AD).

(*b*) Two shafts—one upper or elevating shaft (8B) and one lower or clamping shaft (8C).

(*c*) Two cranks (8E and 8Q) for manipulating the elevating shaft (8B).

(*d*) One handwheel (8G) for clamping against washer.

(*e*) Three clamping bands, one upper (8H) and two lower (8K), which connect the barrel (4A) with the elevating mechanism.

(*a*) *The pinions.*—The cut-steel pinions (8A), 2½ inches in diameter, are drilled through the center to receive the crank shaft (8B). These pinions mesh with the racks (6AD). They are keyed to the elevating shaft (8B).

(*b*) *The crank shaft.*—The elevating or upper shaft (8B) is of rolled steel, 18⅝ inches long and 1 inch in diameter, which holds and serves to rotate the pinions (8A) by means of two cranks (8E and 8Q). The right end of this shaft has a diameter of 1⅛ inches for a distance of ½ inch, which forms a collar designed to hold the right crank (8E) in position. The other end is machined to ⅝ inch for a distance of 1⅜ inches and threaded to receive the crown nut (8N). The same end is drilled through the threaded part to receive the split pin (8P), which holds the nut in position. Both ends are channeled to

correspond with the feather-key ways of the pinions (8A) and cranks (8E and 8Q).

The clamping or lower shaft (8C) of rolled steel is 15 inches long and 1¼ inches in diameter. It is designed to maintain the barrel at the desired angle of elevation. Its right end has a diameter of 2⅜ inches for a distance of ½ inch, which forms a collar, bearing against the cheek (5AC) and thus maintaining the shaft in position. At a distance of ½ inch from the collar there is a feather-key way parallel with the shaft for a distance of 1 inch to receive a feather key (8D) designed to prevent the rotation of the shaft. The other end is threaded for a distance of 1¾ inches to receive the clamping handwheel. The clamping shaft traverses and is operated in the long curved slot (6a) indicated above in the description of the racer cheeks (5AC) of the carriage.

(*c*) *The cranks* (8E and 8Q) are merely forged-steel handles used to rotate the elevating shaft. They are drilled at one end to a depth of ⅛ inch to receive it. The interior of this drilled surface is also channeled to correspond with the feather-key way of the shaft and pinions. The cranks are held in position by means of the feather keys (8D and 8F). The right crank differs slightly from the left by reason of the fact that it is counterbored to a distance of ½ inch to provide a shoulder, which bears against the collar of the shaft and prevents its detachment at that end.

(*d*) *The clamping handwheel* (8G) of cast iron, with a diameter of 6¾ inches, screws onto the right end of the clamping shaft. Its outer circumference is ¾ inch thick; its four spokes have a thickness of ⅜ inch. It is bored through the center and tapped to receive the end of the clamping shaft (8C). A steel washer (8R) is located between the wheel and the right racer cheek (5AC) of the carriage. The handwheel is designed when tightened to maintain the clamping shaft (8A) in any desired position; it must be loosened before operating the cranks (8E) of the elevating mechanism.

(*e*) *The clamping bands.*—There are one upper (8H) and two lower (8K) clamping bands of forged steel. When finally bolted together they form a single band encircling the barrel and fitting into the groove especially designed to receive it. (See above under the description of the barrel.) The under ends of the two lower clamping bands (8K) are bent at right angles to allow them to be bolted together. With the exception of this projection they form a semicircular arch with an inside

diameter of 10½ inches, fitting snugly to the curve of the barrel. Their two upper ends fit into the channels designed for them in the two parallel sides of the upper clamping band (8H). Their ends are fastened to the upper clamping band by means of nuts (8V) and screws (8L).

Between the parallel sides of the upper clamping band (8H) the curve of the band completes the circle around the barrel. In addition to providing a suitable means for securing the upper ends of the lower clamping bands, the parallel sides are designed to receive both the elevating (8B) and clamping (8C) shafts and thus serve as a connection between the barrel and the elevating mechanism. For this purpose the upper arms of these sides are drilled and slotted to receive the elevating shaft and the feather keys which hold the shaft in position; the lower arms are drilled to receive the clamping shaft. Of these last the left arm is slotted for the appropriate feather key.

A steel separator (8M) 11⅝ inches long, 1⅝ inches wide, and ⅝ inch thick is fastened to the lower arms of the sides of the upper clamping band and serves to keep them parallel during the operation of clamping.

DESCRIPTION OF THE SIGHT.

Nomenclature (plate 7).

Symbol.	Quantity.	Name.	Location.
9M	1	Sight	Fastened to stud (9R).
9R	1	Sight-post stud	Inserted in bracket (9V).
9AN	1	Nut	Screwed to stud (9R).
9V	1	Bracket	Fastened to post (9X).
9N	1	Split pin	Through hole in bracket (9V).
9Q	1	Chain	Fastened to split pin (9N).
9S	1	Pin	Driven into stud (9R).
9W	1	Bracket band	Pinned to bracket (9V).
9AF	1	Cam pin	Fastened to upper clamp (9AA).
9AK	1	Lock-nut rod	Inserted in upper clamp (9AA).
9AP	1	Washer	Over end of cam pin (9AF).
9AG	1	Cam lever	Riveted to cam pin (9AF).
9AA	1	Sight-bracket clamp	Fastened to top of sight-post bracket (9V).
9V	1	Sight-post bracket	Against post (9X).
9Z	1	Sight-bracket clamp	Fastened to sight-post bracket (9V).
9T	2	Straps	Fastened to bracket (9V).
9AE	2	Strap locks	Fastened to straps (9T).
9A	1	Cross sight-post shaft	Between racer cheeks (5AC and 5AD).
9E	1	Holder	Slips over shaft (9A).
9L	1	Socket	Around post (9F).
9F	1	Sight post	Fits into holder (9E).
9K	1	Clamp lever	Screwed onto post (9F).

The major parts of the sighting device are as follows:

(*a*) The sight.
(*b*) The bracket.
(*c*) The cam and cam-locking mechanism.
(*d*) The sight post.
(*e*) The cross sight-post shaft.

(*a*) *The sight* (9M).—The front and rear sights are formed by bending upward at both ends a plate of flange steel 9⅞ inches long, 1⅝ inches wide at the center, and tapering from the center to a minimum width of ¾ inch. The front and rear sights are pointed and V-slotted, respectively. Through the center of the sight plate a ¾-inch flat-sided hole is punched to receive, by means of a forced fit, the upper threaded end of the sight-post stud (9R). A nut (9AN) further insures the security of the attachment.

(*b*) *The bracket* (9V) is a hollow steel cylinder 9 inches long. Its upper end has an inside diameter of 1 inch for a distance of 2½ inches to serve as a recess for the sight-post stud (9R). The diameter of the remainder of the bracket is ⅞ inch. The bracket is connected with the sight (9M) by means of the sight-post stud (9R). The latter is a solid-steel cylinder 3⅛ inches long, with a diameter of 1 inch machined down on the upper end to a diameter of ½ inch and then threaded to a like distance. A bearing shoulder for the sight plate is formed by a second reduction of the 1 inch diameter to ¾ inch for a distance of ⅛ inch below the threads. A hole 1¼ inches beneath the collar is drilled through the stud to receive the split pin (9N), which serves to hold the stud within the bracket. In order to prevent its possible loss, the split pin (9N) is attached by means of a chain (9Q) to the sight plate. To prevent the rotation of the stud, and hence of the sight plate, as well as to avoid the contact of the latter with the bracket, the stud (9R) is provided with a pin (9S), which is driven into the stud about ¼ inch below the sight plate and rests in a slot designed to receive it on the upper edge of the bracket. The bracket band (9W) is pinned to the bracket 1½ inches below the top of the bracket. Its outer side is provided with an arm appropriately slotted to receive the cam pin (9AF).

(*c*) *The cam and cam-locking mechanism.*—The cam (9AF) is merely a device designed to correct the alignment of the sights. The mechanism consists of—

(1) *The cam pin* (9AF) which traverses the upper clamp and the lock-nut rod (9AK) and is riveted over a washer (9AP) inside the clamp. The cam pin fits within the slot of the bracket band (9W) and serves to turn the bracket by means of the cam lever (9AG).

(2) *The cam lever* (9AG) which passes through and is riveted to the cam.

The cam-locking mechanism consists of a lock-nut rod (9AK) passing through half the length of the clamp (9AA) and traversed by the cam pin (9AF). It may be tightened against the latter or loosened as desired by means of the lock nut (9AH).

The bracket (9V) is attached to the sight post (9X) by means of two clamps, an upper clamp (9AA) carrying the cam (9AF) and its locking device and a lower clamp (9Z). Each clamp consists of two parts—the clamp proper fitting around the sight post and the strap (9T) which encircles the bracket (9V). In addition to the fact that the upper clamp is arranged to carry the cam and its locking device, it differs also from the lower clamp in that it merely fits over the end of the sight post by means of a circular recess ½ inch deep bored in the clamp to receive it, whereas the sight post passes completely through the lower clamp. Each clamp is secured permanently to the sight post by means of a pin (9AD). The strap, semicircular in shape, is hooked and riveted at one end to hinge around a pin (9AB) which passes through and secures it to the clamp. A suitable recess in the clamp provides for the passage of the pin through the looped end of the strap (9T) and also for sufficient play for this end when the strap is opened. The strap is slotted at the other end to receive the strap lock (9AE) which attaches it to the clamp when finally closed around the sight post (9X). The strap lock (9AE) is secured to the clamp by means of the strap-lock bearing (9AC).

(*d*) *The sight post* (9X) is a steel tube 48¼ inches long with an outside diameter of 1.307 inches closed at the lower end by a bronze plug (9Y) which is soldered to it. It is connected by a cross socket (9L), socket post (9F), and holder (9E), to the cross sight-post shaft (9A) which supports it. Six holes arranged at equal distances along the lower half of the sight post provide for raising or lowering it as desired. The post is secured at the desired elevation by means of a holding pin (9AL). The sight post (9X) passes through the cross socket (9L) which in turn fits loosely over the socket post (9F). After the socket

post (9F) has been inserted in the holder (9E), the latter is passed over the cross sight-post shaft (9A) which traverses likewise the inner end of the socket post. A pin (9G) driven into the socket post and resting in the slot prepared for it in the holder insures the alignment of the latter with the socket post. The socket is slotted to form a rest for the holding pin. The rear end of the socket post is threaded to receive the clamp lever (9K) which is designed to tighten the whole arrangement to the cross sight shaft (9A). A split pin (9H) passing through this end prevents the detachment of the lever (9K) from the socket post (9F).

(*c*) *The cross sight-post shaft* (9A) is a steel rod about 14 inches long with a diameter of 1¼ inches. It extends between the cheeks (5AC and 5AD) and rests in the slots prepared for them in the latter. (See above paragraph under description of cheeks.) The left end of the shaft is machined down to ¾ inch for a distance of 1⅞ inches and is then threaded to receive the wing nut (9C). The shoulder formed by this process bears against the shoulder of the slot (6b) in the left cheek. The extreme right end of the shaft has a diameter of 1⅝ inches for a distance of ¼ inch forming a head which bears against the shoulder of the slot in the right-racer cheek.

The cross sight-post shaft (9A) is tightened to the racer cheeks by means of a wing nut (9C) on the threaded end of the shaft. The wing nut is further secured to the shaft by means of a split pin (9D). The shaft is prevented from rotating by means of a ¼-inch dowel pin (9G) driven into the shaft at the collar. This pin fits into the small recess prepared for it at the bottom of the slot in the right cheek.

To secure the correct alignment of the sights with the axis of the bore of the barrel, the sight plug (see under accessories) and the cross hairs, held in the register cuts in the muzzle, are used. The intersection of the cross hairs is brought over the center of a suitable trial target. If the center of the same target appears immediately above the front sight the sights are correctly aligned.

GUNNER'S QUADRANT.

The gunner's quadrant is designed for measuring the angles of elevation. It consists of a frame, a sliding spirit level with its spring, and two stop screws. The *frame* is a 3-cornered bronze plate, 0.406 of an inch thick with two straight sides 5⅛

inches long, which are perpendicular to each other. Its third side is curved inward and represents the fourth of a circle with a radius of 3.906 inches. The curved edge of this side is slotted to receive the sliding level and spring. It is graduated from 0° to 90°, each degree being represented by a cut and every 10 degrees designated by a numeral. The frame is cut away through the center to minimize weight. The *spirit level* is of bronze. One side is curved to fit the curved side of the frame and is secured to the latter by means of a T-shaped projection designed to fit into the slot in the frames referred to above. The upper face of the level is graduated with a vernier scale by means of which the angles of elevation may be determined within a limit of accuracy of 5 minutes. The *spring* which is attached to the edge of this projection and bears against the bottom of the slot maintains the level at any desired point on the curved section of the frame. The *stop screws* at each end of the curved side of the frame hold the level within the slot.

THE CARTS AND CARRYING ATTACHMENTS.

As was indicated in the general description of the mortar (p. 9) the barrel, carriage, and base are transported on three one-horse carts, which are provided with carrying attachments adapted to these three parts of the matériel. Each cart may also be used for the transportation of shells by the installation of a suitable shell-carrying attachment.

DESCRIPTION OF THE CARTS.

Nomenclature (plate 8).

Symbol.	Quantity.	Name.	Location.
10A	2	Long outside timbers	On sides of carts.
10B	4	Packing blocks	Bolted to timbers (10A).
10C	2	Lower guides	Do.
10D	4	Shaft sleeves	Do.
10E	2	Shaft stops	Do.
10F	2	Hand-shaft brackets	Bolted to right timbers (10A).
10G	2	Rear cross timbers	Bolted to timbers (10A).
10H	2	Reinforcing bands	Fastened to timbers (10A).
10K	2	Long inside timbers	Bolted to timbers (10G, 10L, and 10M).
10L	1	Front cross timber	Bolted to timbers (10A and 10K).
10M	2	Intermediate cross timbers	Bolted to timbers (10K).
10N	1	Axle	Fastened to timbers (10A and 10K).
10P	2	Handles	Bolted to timbers (10L).
10Q	2	Hooks	Do.
10R	1	Locking pin	Through timber (10L).
10S	1	Cart pole	Through cart-pole guide (10T).
10T	1	Cart-pole front guide	Bolted to timber (10L).
10U	2	Braces	Bolted to axle (10N), and riveted to T (10V).
10V	1	T	Bolted to cross timber (10G) riveted to braces (10U).
10X	4	Packing plates	Bolted to timber (10G).
10Y	2	Angles	Do.
10Z	4	Axle straps	Bolted to timber (10A and 10K).
10AA	1	Eyepiece	Riveted to braces (10U) and T (10V).
10AB	1	Singletree	Hooked to eyepiece (10AA).
10AC	28	Hickory spokes	In wheels.
10AD	14	Felloe segments	Make up felloes of wheels.
10AE	2	Bronze hub boxes	Fit over axle (10N).
10AF	2	Bronze flanges	Fastened to hub boxes (10AE).
10AG	14	Bolts	Bolt flanges to boxes (10AF).
10AH	2	Tires	Fitted over felloes.
10AK	14	Clips	Between felloe segments (10AD).
10AL	2	Linch pins	Through axle.
12S	2	Steel bars	Fastened to timbers (10A).
12T	2	Ash poles	Fastened to bars (12A).
12U	2	Upper braces	Do.
12V	2	Lower braces	Do.
12W	2	Shaft hooks	Fastened to poles (12B).
12X	2	Steel guides	Fit over bands (10H).
10AM	2	Locking pins	Through timbers (10A).
10AN	1	Prop body	Fits into socket (10AP).
10AP	1	Socket	Fastened to prop fixture (10AR).
10AQ	1	Ferrule	Fits over lower end of bar (10AN).
10AR	1	Prop fixture	Bolted to timber (10L).
10AS	1	Hand shaft	Through hand-shaft shackle (10S).
10AU	1	Hand-shaft shackle	Over end of cart pole (10S).
10AV	2	Upper guides	Riveted to angles.

The cart is composed essentially of—

(*a*) The body.

(*b*) The wheels.

(*c*) The shafts and singletree.

(*a*) THE BODY.

The oaken body of the cart consists of (1) four long timbers, (2) five cross timbers, (3) one axle (10N), (4) the rod and two braces (10U), all of which are suitably bolted or riveted together to form a rigid frame.

The two long outside timbers (10A) are 52 inches long and 2⅜ inches square. Two packing blocks (10B) are bolted underneath the rear half of each of these timbers to serve as a support for the lower guides (10C) of the ammunition racks. Two steel shaft sleeves (10D) are bolted around the front end of the timbers and a shaft stop (10E) is bolted to the top of the same end to hold the shafts (12A) of the cart. Two hand-shaft brackets (10F) are bolted to the right timber immediately in front of the cross timbers (10G). The brackets are designed to carry the hand shaft when not in use. A reinforcing band (10H) of sheet iron protects the front end of the timbers. It is grooved for the insertion of the shafts (12A).

The two long inside timbers (10K) are 48½ inches long and 2 inches square. They are provided with the proper number of bolt holes to receive the bolts which secure the cross timbers (10A, 10G, and 10M) and axle (10N) to it.

The front cross timber (10L) is 50½ inches long and 2⅜ inches square. It is bolted to each of the long timbers (10A and 10K) and projects 8⅜ inches on each side. To each of these projecting ends there is attached a steel handle (10P) to facilitate maneuvering the cart by hand. The hooks (10Q) are bolted to the cross timber between the outside and inside long timbers on each side. A hole is bored through this section of the timber to receive a pin (10R), which secures the cart pole (10S) when not in use. A steel cart-pole guide (10T), 6 inches long, is bolted to the center of the cross timber to receive and support the cart pole. Secured by the same bolts to underside of this timber, beneath the cart-pole guide, is located the prop fixture (10AR), a steel plate with a ring of one piece with it, which serves as an attachment for the upper end of the prop (10AN). A channel is cut immediately below the cart-pole guide (10T) to receive the ends of the braces (10U) and the T rod (10V).

The two rear cross timbers (10G), 38¾ inches long and 2 inches square, are bolted to each of the long timbers (10A and 10K). A steel socket (10BN) is bolted underneath the left end of each timber to receive the cart pole (10S) when this is not

in use. Secured to the upper sides of the timbers by the same bolts which secure them to the timbers there are steel plates (10X) 2 inches square and ½ inch thick surmounted by angles (10Y) which are parallel to the long timbers. The vertical flanges of these angles serve as one of the supports for the ammunition racks (pl. 14).

The two intermediate cross timbers (10M), 23¼ inches long and 1⅜ inches square, are bolted to the long beams (10A and 10K) and serve merely as additional braces.

The axle (10N), a bar of forged steel, 56 inches long and 1½ inches square is secured to the long timbers by steel straps (10Z). Both ends are turned down for a distance of 10⅝ inches and are tapered to receive the hub boxes (10AE) of the wheels. A rectangular slot is cut in each of these ends to take the linchpin (10AL), which secures the wheel to the axle. A vertical bolt hole for attaching the flange of the T rod (10V) is drilled at the center of the axle. Horizontal bolt holes for the bolts of the braces (10U) are drilled about 14 inches from each end.

The T rod (10V) of steel 20⅝ inches long, $\frac{3}{16}$ inch thick, with a flange 1¼ inches wide and a web 1¼ inches deep, is bolted to the front face of the axle (10N), passes through the central channel of the front cross timber (10L), and is riveted to the ends of the braces (10U) and the eyepiece (10AA).

The braces (10U) are steel bars 32¾ inches long, ⅞ inch wide, and ½ inch thick. Their rear ends are bent to allow for bolting to the axle, as indicated above. They pass through the central channel of the front crossbeam and are riveted on each side of the web of the T rod (10V).

A connection is established between the ends of the braces (10U) and the T rod (10V) and the singletree (10AB) of the pole by means of the eyepiece (10AA), which fits between the ends of the braces and the web of the T rod and is riveted in place.

(*b*) THE WHEELS.

The wheels are the same as those used on the 2.95-inch mountain gun carriage. They are 36 inches in diameter. Each wheel has 14 hickory spokes (10AC) and an ash felloe built up of seven segments (10AD), a bronze hub box (10AE) which is connected through the spokes to a bronze flange (10AF) on the outside by seven bolts (10AG), and a steel tire (10AH). The tire is 1⅞ inches wide and ⅜ inch thick. The felloe segments are

joined by sheet-metal clips (10AK) bolted through the felloe to the tire. The hub box has a taper fit on the axle (10N).[1]

(c) THE SHAFTS AND SINGLETREES.

Each of the two shafts is composed of (1) an ash-wood pole (12T), (2) a steel bar (12S), (3) two braces (12U and 12V), (4) a steel guide (12X).

The poles are 77 inches long, tapering toward the front end to a diameter of 2⅜ inches. From the rear end for a distance of 24 inches they are rectangular in shape. At about the center of each pole a shaft hook (12W) is bolted for a harness attachment. Their rear ends are bolted to the steel bars.

The steel bar (12S) is a strip, 56 inches long, 1¼ inches wide, and $\frac{9}{16}$ inch thick, designed as a convenient means of attaching the pole (12T) to the cart. Its front end is bolted to the pole as indicated above. Its middle part (about one-third of its entire length) curves downwards from the pole and passes horizontally through the shaft guide (12X) which is bolted to it. A hole for the locking pin (10AM) which secures the shaft to the outside long timber (10A) is drilled 4⅜ inches from the rear end of the bar.

Two steel braces (12U and 12V) are designed to reinforce the bar.

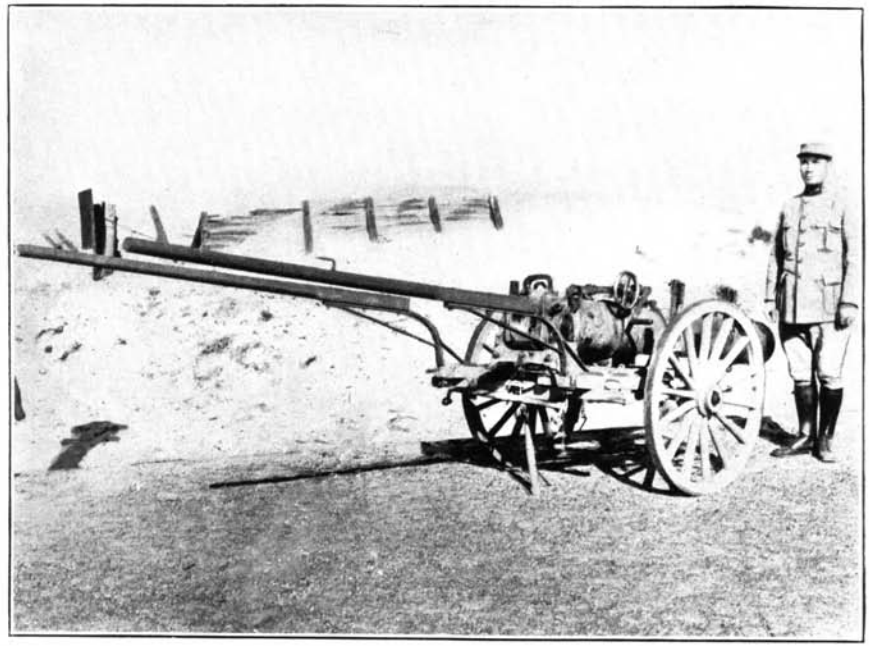
The lower brace (12V) is 37 inches long, 1¼ inches wide, and $\frac{5}{16}$ inch thick. Its front end is bent to allow for bolting and its rear end for riveting to the bar. *The upper brace* (12U) is 17½ inches long and is riveted at both ends to the bar.

The steel guide (12X) is bolted to the end of the curved portion of the bar as described above, and serves as an additional support for the latter. It fits over the reinforcing band (10H) on the end of the long outside timber.

Each shaft is attached to the long outside timber by a *locking pin* (10AM) which is inserted through a hole prepared for it in both.

The cart is held level after unhitching the horse by means of the prop, which consists of an ash prop body (10AN), 12¾ inches long and 1½ inches in diameter, tapering at the upper end, and riveted into a socket (10AP) attached by means of an eye in the prop fixture (10AR). The lower end is reinforced by a ferrule (10AQ), which is riveted to it. The total length of the prop is 17⅝ inches.

[1] The above description of the wheel is taken from Ordnance Pamphlet No. 1761; Handbook of the 2.95-Inch Mountain Gun Matériel (p. 42).



No. 5.—View of cart carrying barrel and breech.

In addition to the shafts, a 27¾-inch steel singletree (10AB) completes the hitching equipment.

When it is necessary to maneuver the cart by hand, an attachment consisting of a cart pole (10S), hand shaft (10AS), and hand-shaft shackle is used. The cart pole (10S) is a cold-drawn steel tube 47 inches long and 1⅝ inches in diameter. It is made 1¼ inches square at one end for a distance of 2 inches. A hole ½ inch in diameter is drilled through this end for the locking pin (10AT). The other end is 1¼ inches in diameter for a distance of 1½ inches. A steel hand-shaft shackle (10AU) is provided with a hole to receive the cart pole, to which it is welded. It is pierced by a second hole at right angles to the former to receive the hand shaft. The hand shaft is made of ash, 29½ inches long and 1¼ inches in diameter. It is pierced by a hole, $\frac{5}{16}$ of an inch in diameter, at a distance of 4½ inches from one end for the pin (10AT), which locks it when not in use.

DESCRIPTION OF THE CARRYING ATTACHMENTS.

As already suggested (p. 32), there are four different carrying attachments—one for the barrel and breech, one for the carriage, one for the base, and one for the shells.

BREECH AND BARREL CARRYING ATTACHMENTS.

Nomenclature (plate 9).

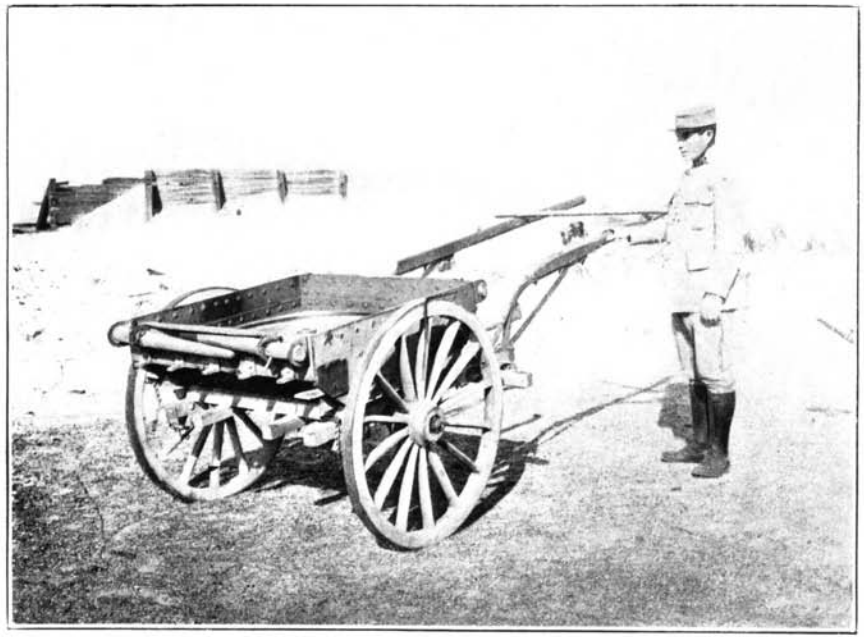
Symbol.	Quantity.	Name.	Location.
11A	4	Angles	Fastened to plates (11B).
11B	2	Plates (end)	Riveted to angles (11A).
11C	2	Plates (side)	Fastened to side of chock (11D).
11D	1	Rear chock	Secured above cross timbers (10G).
11E	2	Angles	Bolted to timbers (10G)
11F	2	Plates	Fastened to sides of front chock (11H).
11G	2	....do	Fastened to timbers (10G).
11H	1	Front chock	Across front end of cart.
11P	7	Rivets	Rivet angles (11A), plates (11B), and chock (11D) together.
11V	1	Slotted half collar	Hinged between the two left-end angles (11A).
11W	1	Eyebolt half collar	Do.
11Y	1	Eyebolt	Hinged to upper end of collar (11W).
11AA	2	Collar liners	Riveted to half collars (11V and 11W).
11AC	1	Wing nut	Screwed onto eyebolt (11Y).
11AG	4	Hinge pieces	Fastened to plates (11F) and chock (11H).
11AK	2	Slotted half collars	Hinged to front hinge pieces (11AG).
11AH	2	Eyebolt half collars	Hinged to rear hinge pieces (11AG).
11AR	4	Collar liners	Riveted to half collars (11AH and 11AK).
11AV	2	Rear-chock locking pins	Secure attachment to cart.
11AW	2	Front-chock locking pins	Do.

The carrying attachment for the barrel and breech consists essentially of two oak chocks secured firmly to the cart by means of an appropriate arrangement of plates and angles, and of a system of half collars, which may be bolted and tightened above the respective parts, thus securing them to the cart. The front chock is situated immediately above the front cross timber, the rear chock above the rear cross timber. Their upper surface is cut away to conform to the shape of the barrel and breech.

The rear chock (11D) which supports the barrel is of oak, $12\frac{3}{16}$ inches long, 6 inches wide, and $4\frac{7}{8}$ inches deep. It is secured to the cart by means of two side plates (11C), two end plates (11B), and four vertical angles (11A), $10\frac{1}{2}$ inches high. All are of steel and are riveted together. The plates are $\frac{1}{8}$ of an inch thick and correspond exactly to the lines of the chock except that they project $1\frac{3}{8}$ inches below it. The angles project beneath to a level with the bottom of the long timbers (10K) of the cart, and together with the side plates (11C) extend above the chock for a distance of $1\frac{3}{8}$ inches. The plates are secured to the chock by seven rivets (11P); four of these pass through the plates, angles, and chock; three merely traverse the plates and chock. The lower projections of the angles are slotted to receive two locking pins (11AV), which pass through them and under the rear cross timber (10G), thus fastening the carrying attachment to the cart.

Two half collars (11V and 11W) are hinged to the upper projections of the angles (11A) and during transportation are brought together and tightened above the barrel by means of a wing nut (11AC) and eyebolt (11Y). The barrel surface is protected from contact with the collars by means of leather liners (11AA), which are riveted to the latter.

The front chock (11H), which supports the breech, is reinforced and secured to the cart by means of two side plates (11F) and two horizontal angles (11E). The form of the plate corresponds with the lines of the chock. The horizontal flanges of the angles are bolted to plates (11G) on the upper surface of the inside long timbers (10K). Two steel plates (11G) $10\frac{1}{16}$ inches long, designed to protect the timbers (10K), extend between the carrying attachment and the timbers. Two locking pins (11AW) passing through the angles (11E), plates (11F), and chock (11H) fasten the plates and chock to the cart.



No. 6.—View of cart carrying carriage.

The breech is secured to the cart by means of half collars (11AH and 11AK), which are designed to encircle each trunnion in the following manner: Two hinge pieces (11AG) 5 inches long project above each end of the chock (11H). They are attached to the plates by means of four tie bolts (11N), which pass through the plates and chock, and in a similar fashion the hinge pieces (11AG) serving for the half collars of the trunnion on the opposite side of the breech. Two half collars are hinged to them and during transportation are bolted and tightened above the trunnion by means of an eyebolt (11AM) and wing nut (11AN). As in the case of the rear attachment, the trunnions are protected from contact with the collars by means of leather liners (11AR).

CARRIAGE-CARRYING ATTACHMENT.

Nomenclature (plate 10).

Symbol.	Quantity.	Name.	Location.
12A	1	Plate	Bolted to rear cross timbers (10G).
12B	2	Reinforcing angles	Riveted to plate (12A).
12C	2	Angles	Do.
12F	1	Shoulder-stud	Fastened to plate (12A).
12L	1	Crown nut	Fastens stud (12F) to plate (12A).
12H	1	Fastening key	Fits into slot in stud (12L).
12G	1	Shoulder stud pin	Fastens key (12H) to stud (12L).
12R	1	Leather thong	Fastened to handle of pin (12G).

The carrying attachment for the mortar carriage consists of—

(*a*) One steel plate (12A).

(*b*) Four angles—two (12B) designed to reinforce this plate and two (12C) to serve as a seat for the horizontal plates of the carriage.

(*c*) One shoulder stud (12F) together with one pin (12G) and fastening key (12H).

The whole is fastened together and to the cart by a suitable arrangement of bolts and rivets.

The plate (12A), 19¾ inches long, 16½ inches wide, and ¼ inch thick is bolted to the rear cross timbers (10G) and the long inside timbers (10K) thus forming a base for the attachment. A 1¼-inch hole is drilled through its center to receive the shoulder stud (12F).

Two reinforcing angles (12B) 15⅜ inches long, $\frac{3}{16}$ inch thick, with flanges 1½ inches wide, are riveted to the underside of the plate, at a distance of 5½ inches from each side, in such a position that they will fit between the rear cross timbers (10G).

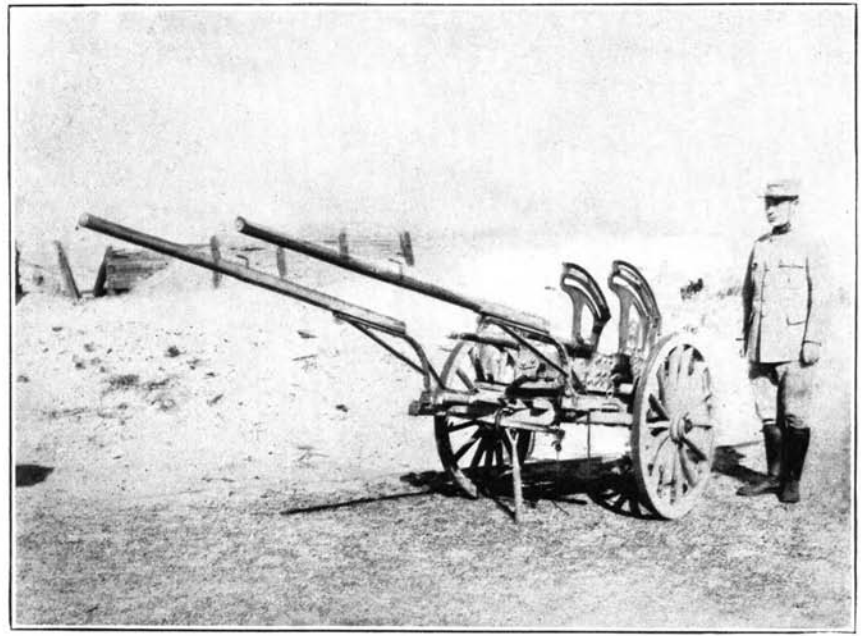
The vertical flanges of *two angles* (12C) 8¾ inches long, ¼ inch thick, with flanges 1½ inches wide are also riveted to the under face of the square plate (12A) at each side in such a manner that the vertical flanges project above the plate for a distance of 1¼ inches. As indicated above, these flanges form a seat for the horizontal plates of the carriage.

The threaded end of the *shoulder stud* (12F) projects down through the central hole in the square plate which is designed to receive it. It is secured firmly to the underside of the plate by a nut (12L). The projection of the shoulder stud above the plate is $3\frac{1}{16}$ inches high. A collar on the stud immediately above the central hole is designed to fit into the pintle hole of the two horizontal plates of the carriage. The upper end of the stud above the collar is slotted to receive the *fastening key* (12H) which is secured to the stud by the *stud pin* (12G). A hole through one end of this pin is designed to receive a leather thong (12R) which locks the fastening key (12H) in place; a hole is provided at the other end for a split pin (12N) which holds the stud pin in position. The steel fastening key (12H) is 5¼ inches long, 1½ inches wide, and ½ inch thick. A slot near one end $2\frac{49}{64}$ inches long and $\frac{41}{64}$ inch wide is designed to receive the stud pin (12G). By means of this slot the key may be placed in either a horizontal or vertical position, when in the former the key locks the carriage to the cart; its vertical position, on the other hand, permits the removal of the carriage. A smaller slot immediately above the former is provided for one end of the leather thong (12R) which maintains the fastening key (12H) in the horizontal position.

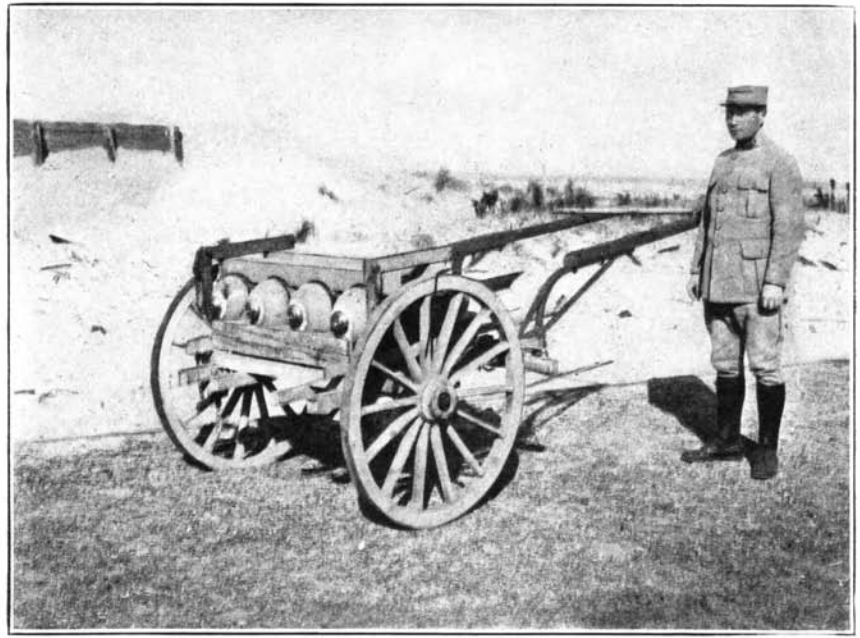
THE BASE-CARRYING ATTACHMENT.

Nomenclature (plate 11).

Symbol.	Quantity.	Name.	Location.
13A	3	Base supports	Bolted to timbers (10K).
13B	1	Base support	Do.
13C	4	Locking pins	Through holes in supports (13A and 13B).
13D	4	Chains	Fasten locking pins (13C) to cart.



No. 7.—View of cart carrying base.



No. 8.—View of cart carrying shells.

The base-carrying attachment is a simple device which consists of four supports (13A and 13B) bolted to the cart and four locking pins (13C) which are attached to the cart by small chains (13D).

The supports (13A and 13B) are steel plates ½ inch thick, $7\frac{1}{16}$ inches lang, and 2 inches wide, with two prongs of one piece, with them, which extend vertically 2¼ inches above the support and $1\frac{5}{16}$ inches below it. The supports are bolted to the ends of the two rear cross timbers (10G), with the exception of the rear right-hand support (13B), which is secured by means of a wood screw (13F) in order to allow room for the hand shaft (10AS). The prongs are traversed by channels for the locking pins (13C) which secure the base to the cart. The spades (6X) of the base are inserted between the prongs of the supports and are held in place by the locking pins (13C), which are introduced through the holes in the prongs and the plates provided for that purpose.

THE SHELL-CARRYING ATTACHMENT.

Nomenclature (plate 12).

Symbol.	Quantity.	Name.	Location.
14B	4	Racks	Fit into guides (10C).
14A	2	Angles	Fastened to chocks (14F).
14M	8	Locking pins	Fasten racks (14B) to carts and to angles (14A).
14F	2	Upper chocks	Hold shells in place.
14K	4	Upper-chock collar bolts	Fasten chocks (14F) to angles (14A).
14G	1	Lower front chock	Fastened to angles (10Y).
14H	1	Lower rear chock	Do.
14L	4	Lower-chock collar bolts	Fasten lower chocks (14G and 14H) to angles (10Y).
14S	4	Projectile supports	Fastened to chock (14G).
14T	4	Carriage bolts	Fasten supports (14S) to chock (14H).
14U	4	Lag screws	Do.

The shell-carrying attachment, designed for the transportation of four shells, consists essentially of—

(*a*) Four forged steel racks (14B).

(*b*) Two angles (14A).

(*c*) Two lower chocks (14G and 14H), one for the front and one for the rear.

(*d*) Two upper chocks (14F), one for the front and one for the rear.

(*e*) Four steel projectile supports (14S).

The forged steel racks (14B) are 24¾ inches long, 2 inches wide, and ⅝ inch thick. Near their center they are bent out to allow for the curve of the shell. At their upper ends they are thickened to 1⅝ inch for a distance of 2¾ inches. This portion of the racks is slotted to a depth of 2 inches to form forks designed to receive the vertical flanges of the angles (14A). The lower ends of the racks pass through the channels provided for them in the upper and lower guides and are fastened beneath to the carts by means of locking pins (14M). An 1⅛-inch stop pin (14D) is riveted to the inner face of each rack 9¾ inches above the lower end. It projects ¼ inch from the rack and fits into a slot provided for that purpose in the angles, thus limiting the distance to which the rack may be lowered into the guides (10AV).

The angles (14A) are 19¾ inches long and ¼ inch thick, with flanges 2 inches wide. The horizontal flanges are cut away at each end for a distance of 2⅛ inches, which permits the insertion of the vertical flanges in the forked ends of the racks. The vertical flanges of the angles are secured to the racks by locking pins (14M). Two holes are drilled in the horizontal flanges at a distance of 5⅛ inches from the ends of the angles for the bolts (14K) which fasten the upper chocks (14F) to the under faces of these flanges.

The lower front chock (14G) is an oak timber 34⅛ inches long, 4¾ inches wide, and 4¾ inches thick. Its upper face is cut away suitably to receive the curved surface of the front end of the shells (plate 15). It is secured at each end to the horizontal flanges of the angles by collar bolts (14L).

The lower rear chock (14H) has the same dimensions as the preceding, with the exception that it has a thickness of 3½ inches. Its upper face is likewise cut away to receive the rear ends of the shells. It is also bolted at each end to the horizontal flanges of the angles (10Y).

The projectile supports (14S) are steel strips 7 inches long, 2 inches wide, and ⅝ inch thick. They are bent to fit against the underside of the rear end of the shells and against the rear face of the rear chock (14H). They are secured to the latter by means of bolts (14T) and wood screws (14U).

AMMUNITION.

Separate loading ammunition is used in the 9.45-inch trench mortar. Each projectile is issued filled but unfused. The components of one round are the cartridge case with primer, powder charge, projectile, adapter, booster, and fuse.

CARTRIDGE CASE.

The cartridge case is of solid drawn brass 9.776 inches long and 6.67 inches in diameter. The head or base of the case has a projecting flange or rim to facilitate the removal of the case from the breech. The center of the base is bored out to form a seat, into which the primer is forced. The primer seat is mandreled to near the finished dimensions with a tapered steel plug to toughen the metal of the case around the primer seat and then reamed to finished size. This toughening is necessary to prevent expansion of the seat under gas pressure, with a consequent looseness of the primer in subsequent firings. The primer is inserted in the case by means of a primer-inserting press to avoid injury to the primer seat or cause the explosion of the primer.

The base of the case is marked with the name of the mortar and the lot number of the case.

CARE OF THE CARTRIDGE CASE.

As soon after firing as practicable the fired primers should be removed from the cartridge case by means of the decapping tool furnished with the reloading outfit. The case should be thoroughly washed in a strong solution of lye or soft soap to remove all powder residue. It should then be thoroughly dried.

If the cartridge cases are carefully cleaned and washed immediately after firing, not only will less labor be required but the life of the case will be greatly prolonged.

A good solution for washing cartridge cases may be prepared by using ingredients in the following proportions:

1 gallon of water.
2½ ounces of soft soap.
5½ ounces of soda.

The mixture should be boiled and stirred until the ingredients are entirely dissolved.

In washing cartridge cases this solution should be used hot and in sufficient quantity to completely immerse the cases.

Primers that misfire should be turned in with the cases to the ordnance establishment prescribed.

THE PRIMER.

The "110-grain percussion primer" consists of a brass case resembling in shape a small-arms cartridge case. The head or rear end of the primer case is countersunk, forming a cup-shaped recess, in which is seated the cap or percussion primer proper. The latter consists of the cup, the anvil, and the percussion composition assembled. The percussion composition is known as the "H 42" mixture and contains the following ingredients: Flowers of sulphur, 21.97 per cent; sulphide of antimony, 30.83 per cent; and chlorate of potash, 47.20 per cent.

The percussion-cap recess is connected with the interior of the primer case by a small axial vent. The body of the case contains 95 grains of black powder, constituting the rear priming or igniting charge for the propelling charge. This black powder is inserted under a pressure of 2,400 pounds per square inch and is pressed into the primer body around a central wire, which is then withdrawn, leaving a longitudinal hole the full length of the primer. Eight radial holes are drilled through the primer and compressed powder, affording 16 vents for the free exit of the black-powder flames. After filling the body the front end is closed by two cardboard wads, waterproofed with shellac. The radial perforations in the body are covered by a tin-foil wrapper, shellacked on, to retain loose black powder in the case as well as to exclude all moisture.

In action, the blow of the striker explodes the percussion cap, which ignites the black powder; the flames of the latter shoot out through the vents in the priming case and ignite the propelling charge.

PROJECTILE.

Merely one type of projectile is employed for the 9.45-inch trench mortar—a steel shell which may consist of one, two, or three pieces welded together. Its weight is 87 pounds, unloaded; when loaded, 180 pounds.

Nomenclature (plate 13).

Symbol.	Quantity.	Name.	Location.
15A	1	Body	Main part of shell.
15B	2	Plates	Welded to body (15A).
15C	4	Angles	Riveted to plate (15B).
15D	1	Adapter	Screwed into nose of body (15A).
15E	1	Booster casing	Screwed into adapter (15D).
15F	1	Fuse socket	Fits into fuse-socket holder (15G).
15G	1	Fuse-socket holder	Fits into booster casing (15E).
15H	1	Washer (felt)	Fits around booster casing (15E).
15K	1	.....do	Fits around fuse socket (15F).
15L	1	Washer (lead)	Fits around adapter (15D).
15N	1	Link	Soldered to washer (15S).
15P	1	Cover	Pinned to washer (15R).
15Q	1	Ring	Fastened to link (15N).
15R	1	Adapter-plug felt washer	Between cover (15P) and washer (15S).
15S	1	Adapter-plug copper washer.	Against felt washer (15R).

The shell consists of the following major parts:

(*a*) One body.

(*b*) Four vanes formed by the intersection of two plates.

(*c*) Four angles.

(*d*) One adapter.

(*e*) One adapter plug.

(*a*) *The body* (15A) is composed of one, two, or three steel parts welded together to form a solid whole. It is 28¼ inches long, including the vanes, and has a diameter of 9.433 inches. Its wall is 0.315 inch thick. A hole 3.2687 inches in diameter is cut through the nose of the shell and is then threaded to receive the adapter.

(*b*) The four *vanes* are formed by the intersection at right angles of two plates (15B) 17.915 inches long, 9.173 inches wide, and 0.203 inch thick, each of which is slotted to a distance of approximately half its length for the purpose. The intersection of the plates is reinforced and made rigid by the use of angles (15C) to which they are riveted. The plates are cut away suitably at one end to allow for the curved rear end of the body to which they are welded.

(*c*) *The angles* (15C) are 11.22 inches long and ⅛ inch thick with flanges 1¼ inches wide. They are fitted into the right angles formed by the intersection of the plates and are riveted to them as already indicated.

(*d*) *The adapter* (15D) is a steel bushing 3¾ inches in diameter and 1.18 inches thick. It is especially designed to receive the fuse, and when removed from the shell provides a larger filling hole. It is machined at its inner end to a diameter of 3¾ inches to a distance of 0.775 inch. This end is also threaded for a distance of 0.65 inch to screw into the nose of the shell. The outer end of the adapter is notched on two sides to facilitate the application of a wrench. The central channel of the adapter has a diameter of 0.807 inch and is cut with metric threads to receive the fuse. Its inner end is enlarged to a diameter of 1⅜ inches and is tapped with a left-hand thread for a depth of 0.39 inch to receive the booster casing (15E). Its outer end is counterbored to a diameter of 1.84 inches for a depth of 0.16 inch to allow for the head of the fuse. Until the insertion of the fuse, the core of the adapter is protected by the adapter plug.

A lead washer (15L) placed over the threaded end of the adapter fits between its shoulder and the nose of the shell. *A felt washer* (15H) is placed against the inner face of the adapter between it and the bursting charge in the shell. *The booster casing* (15E), a cylindrical steel pocket 3¾ inches long and 1.16 inches in diameter, is threaded at its open end to screw into the adapter.

The device employed to receive the fuse consists of a *fuse socket holder* (15G) and a *fuse socket* (15F). The former is a hollow steel cylinder closed at the upper end. It has a diameter of $\frac{9}{16}$ inch and a length of 0.948 inch. Its upper end is flanged to fit over the edges of the booster casing (15E) into which it is inserted. Its lower end is traversed by a hole 0.575 inch in diameter, which provides a seat for the upper end of the *fuse socket* (15F). The fuse socket is a brass or gilding metal cup 1.171 inches long and 0.56 inch in diameter. Its upper end is flanged to fit into its seat in the socket holder, where it is secured by means of a pure tin solder. A felt washer (15K) designed to hold the booster charge in place surrounds the fuse socket.

(*e*) *The adapter plug* is inserted in the adapter and is designed to protect the seat of the fuse. It consists of a link (15N), a cover (15P), a ring (15Q), a felt washer (15R), and a copper washer (15S). The washers and cover are held together by means of the link which is inserted through the holes in the cover and is soldered to the lower face of the copper washer. The plug is forced into the adapter under 100 pounds pressure. The ring (15Q) attached to the link (15N) provides a convenient means of removing the plug.

FUSE.

The fuse to be used with the 9.45 shell is similar to the French BT fuse model 1916, as regards its external shape. It is to be of the impact type, but is still in the experimental stage. Details of the fuse will be published in a later bulletin.

INSTALLING AND ASSEMBLING THE MATÉRIEL.

ASSEMBLING THE WOODEN PLATFORM.

(*a*) **Preparation of the ground.**—The platform of the 9.45-inch mortar is set into an excavation, the design of which appears on Plate 7.

The base of the excavation must be horizontal and the rear wall carefully dressed and absolutely vertical, because it is against this surface that the horizontal recoil of the mortar presses at the moment of fire.

The depth of the excavation is 22 inches; its volume is 7.9 cubic yards.

(*b*) **Installation of the front and rear bracing beams** (Plate 5).—Put the lower front (7Y) and rear (7Z) beams with their three assembling bolts (7AA) into the front and rear parts of the excavation; the two intermediate beams are then placed on each side and the upper beams brought into position. Then set up the vertical blocks (7AE) in the rear, as is shown in the design.

Spread sand on the bottom of the excavation to a depth of about 4 inches; if sand is lacking, use tightly packed mold.

(*c*) **Installation of the lower floor** (Plate 5).—Place the two channel irons (7B) at their prescribed distance on the bottom of the excavation, each one being provided with its five vertical bolts (7H) held in place by the pins (7C); sink the irons into the layer of sand with their plane surface up. The surface formed by sand and the upper surface of the channel irons must be even and perfectly horizontal.

Put the five timbers (7A) of the lower floor into position, commencing with the front timber.

Spread a layer of sand 2 inches deep in front of the front timber and behind the rear timber as a support during the mounting of the long beams (7D) of the framework.

(*d*) **Assembly and installation of the framework** (Plate 5).—The framework is assembled near the platform; if there is not sufficient space available, it is assembled over the excavation itself, its lower surface being supported at the ground level.

Place the two long beams (7D) at their prescribed distance; each one is provided with its two channel end bolts (7G) and its two cross-beam assembling bolts (7X), every bolt being held in place by a nut; place the eight tie-rods (7K) in position and fasten each one with a nut (7 AW).

Pass a bar through each of the eyebolts (7L) and let the framework sink into position, the nuts (7AW) of the tie-rods (7K) being placed toward the front in such a manner that they may be tightened during firing; tighten the nuts of the tie-rods slightly, so as to bring the long beams (7D) into contact with the outermost timbers of the lower floor (7A).

Remove the nuts (7AM) and (7AL) from the bolts (7G) and (7H); put the struts (7E) in place, set the channel irons (7F) and the faceplates (7AS) in position; then tighten the nuts and the lock nuts of the assembling bolts (7G and 7H) firmly, so as to bring the long beams (7D) of the platform into their proper place.

Tighten the nuts (7AW) of the eight tie rods (7K), screwing them only little by little and each nut after the other, so that the different parts may be perfectly in position. Put the check nuts (7AX) in place and clamp them tightly.

Clamp the nuts (7AL and 7AQ) and the lock nuts (7AM and 7AR) of the bolts (7G and 7H).

(*e*) **Installation of the jack screws.**—Set up the four vertical blocks (7AB) and the four jackscrews (7BS) in the manner shown on plate 7 with the two outside jackscrews at the upper part of the bearing surface (7a) and the two inside jackscrews at its lower part. Screw them slowly one after the other until the whole framework is firmly clamped together.

(*f*) **Installation of the upper floor and cross beams.**—Beginning at the rear, place the upper timbers (7M) in the interior of the framework.

The cross beams (7W) are not put into position until after the mortar is entirely mounted.

MOUNTING THE BASE.

(*a*) **To unload the base cart.**—Unhitch the cart and take out the shafts.

Remove the locking pins (13C) which secure the spades (6X) to the framework of the cart; incline the cart to the rear and let the platform slip to the ground.

To load the base cart.—Put the platform on the ground with the spades (6X) parallel to the side of the cart; bring up the cart, raise the shafts, and place the platform on the cart, at the same time fitting the spades into the framework of the cart; insert the two front locking pins (13C) raise the cart and put in the two other locking pins (13C).

(*b*) **To place the base in position.**—Open the locking plates (7U) of the upper timbers (7M); introduce the carrying shafts into the sockets (5AL) and raise the base, using as many men at each shaft as is necessary; put the base on the upper floor and at the same time fit the spades into the intervals between the timbers.

Close the locking plates and tighten them by hand without forcing the locking screws.

MOUNTING THE CARRIAGE.

(*a*) **To unload the carriage cart.**—Unhitch the cart, take out the shafts, introduce the carrying shafts into the sockets of the carriage, bring the fastening key (12H) to the vertical position, raise the carriage and pass it out over one of the wheels, using four men at the carrying shafts.

To load the carriage cart.—Raise the carriage by means of the four carrying shafts place it on the cart with the cheeks (5AD) to the front, the racer over the stud (12F), insert the fastening key (12H) and fasten the thong (12R).

(*b*) **To place the carriage in position.**—Loosen the clamping nut (6E) of the traversing mechanism; place the carriage on the base, at the same time fitting the pintle (6AB) into its seat, with the cheeks (5AC and 5AD) to the rear.

Turn the carriage so as to bring its register cut (5b) opposite the zero mark on the azimuth circle.

As soon as the guide shoes (5AB and 6B) of the carriage are caught under the rail of the base ring (6AC), turn the racer one-eighth around in a clockwise direction in order to bring it to the position for mounting the mortar.

Open the trunnion locks (5V and 5W) and tighten the clamping nut (6E) of the traversing mechanism.

MOUNTING THE MORTAR.

(*a*) **To unload the mortar cart.**—Unhitch the cart, take out the shafts, and introduce the iron pole.

Unscrew the locking handwheel (8G) and take out the clamping shaft (8C); remove the breech slide (4C).

Open the bands (11AH and 11AK) for the trunnions and the bands (11V and 11W) for the barrel by unscrewing the wing nuts; introduce a carrying shaft into the rings of the carrying band of the muzzle and another into the rings of the carrying band of the breech.

Raise the mortar, using two men at the muzzle-carrying shaft and four men at the breech-carrying shaft, while a fifth holds the cart pole steady in order to keep the cart horizontal; rest the breech on the framework of the cart so as to allow two of the men at the breech-carrying shaft to get over the pole; pass the mortar out over one of the wheels of the cart and put it on the ground; take away the cart.

To load the mortar cart.—Proceed in a manner inverse to the above.

(*b*) **Mounting the mortar.**—Raise the mortar, using four men at the breech-carrying shaft, two men at the muzzle-carrying shaft, and two men at a third shaft passed under the mortar at the point of the clamping bands (8H and 8K).

Bring the mortar to the front of the platform immediately above the carriage; rest the breech-carrying shaft on the cheeks of the carriage; raise the mortar gently, making it pivot around this shaft; the trunnions (4d) will fit into their seats (5T and 5U) by themselves.

Engage the pinions (8A) of the elevating mechanism on the racks and see to it that the teeth of the racks (6AD) in front of the pinions are equal in number on both sides.

Take out the breech-carrying shaft; place the clamping shaft (8C) in position by passing it into the left racer cheek (5AD); put on the washer (8R) and screw down the handwheel (8G); close the trunnion locks (5V and 5W); remove the muzzle-carrying shaft.

Turn the carriage half around so as to bring the cheeks (5AC and 5AD) to the front; then lower the mortar down until the clamping shaft comes to the front end of the slots (6b) of the cheeks. The mortar is then in the position for loading.

Insert the breech slide (4C) and let it descend into the position of "closed" by pulling the locking pin (4F) to the rear.

The mortar being held in position, adjust the two upper cross-beams (7W) and bolt them to the long beams (7D).

Tighten the upper-floor timbers against the rear of the wedges (7AC) against each of the right and left ends of the front timber.

DISMOUNTING THE MATÉRIEL.

For the platform and the different parts of the mortar, use inversely the same method as in mounting.

DISMOUNTING THE FIRING MECHANISM.

Unscrew the vent bushing (4AB) and the plug (4S) with the mounting key.

To replace the lanyard (4R), unscrew the anvil (4Y) from the plunger (4W).

CARE OF THE MATÉRIEL.

Battery commanders, with the aid of the personnel at their disposition, may make slight repairs or replace worn parts from the spare parts contained in the carts, but should take precautions that this work does not include work with the file, forging, riveting, or the adjustment of the aiming instruments or of their supports.

Any accident which can not be remedied by the means indicated should be brought to the attention of the repairing crew of the general depot.

Daily care.

After each period of fire, clean the mortar and the breech, wash them plentifully with water, dry carefully with rags attached to the head of the cleaning rod, and then grease them slightly with the sponges.

Take out the breech slide (4C), clean it, and grease it slightly.

Remove with care all earth or foreign substances from the base right (6AC) of the platform and grease it.

Dismount the firing mechanism and clean it. Never put thick grease into the interior; simply pass in an oily rag or put several drops of oil on the outside of the plunger (4W); tallow the part of the lanyard (4R) which rubs against the plug (4S).

Finally put back the sponge into the mortar, replace the muzzle, breech, and platform covers.

INSPECTION OF THE MATÉRIEL.

As frequently as circumstances permit, usually once a week, or after a period of intensive fire, the battery commander should make a detailed inspection of the mortars, the wooden platform, the tools, and the carts.

For these inspections the matériel should be thoroughly cleaned and the mortar and its platform taken down.

In each battery only a single piece is taken down at a time.

Inspect the bore of the mortar, the breech slide (4C), and the firing mechanism, and make sure that the locking handwheel (8G) of the elevating mechanism and the clamping nut (6E) of the traversing system may be properly tightened; ascertain that the base plate (5A) of the racer is not bent, that the base ring (6AC) is in good condition, and that the spades (6X and 6W) are not bent.

Inspect carefully the various parts of the wooden platform and repair them if necessary; take up the play by tightening the nuts and the jackscrews.

Any deterioration which might possibly cause accidents while firing must be reported without delay to the general depot.[1]

Advantage is taken of these inspections to replace imperfect parts and to carefully grease the following:

Racks (5AC and 5AD) and pinions (8A) of the elevating mechanism.

The threads of the locking handwheel (8G).

The joints of the carrying bands of the mortar.

The breech trunnions (4d).

The boxes of the trunnion seats (5T and 5U) and the trunnion locks (5V and 5W).

The pintle (6AB) and the racer clamp.

The base ring (6AC) of the base.

The threads of the clamping nut (6E) of the racer clamp.

The screws of the jackscrews (7BS) of the wooden platform.

ACCIDENTS DURING FIRE AND PRECAUTIONS TO BE TAKEN.

Misfires.

After the firing mechanism has failed three times to function, verify the position of the breech slide (4C); the misfires may

[1] Particularly deformations of the barrel which might be due to enemy projectiles.

be due to the fact that the breech slide has not been brought into the position of "closed;" make sure that the striker (4AA) is not broken and that its point is not worn.

If the breech appears to have been properly closed and the striker (4AA) seems to be in good condition, open the breech gently, extract the case, lay it aside, and replace it by a new one.

Replace the striker if it is broken or worn or if other misfires take place; if the trouble recurs when a new striker is used, change the striker spring (4Z) or even the entire firing mechanism.

DEFECTIVE FUNCTIONING OF THE LOCKING PIN.

If the locking pin (4F) closes badly or opens with difficulty, take it out and examine it; if necessary, replace the pin or its spring (4E).

DIFFICULTY IN INTRODUCING THE PROJECTILE.

It is absolutely forbidden to use force in introducing a projectile into the mortar. A shell which can only be introduced with difficulty must be withdrawn by means of the breech wrench; it is then cleaned, the ridges are removed by means of a file, and the vanes are straightened, if necessary.

DEFECTIVE FUNCTIONING OF THE PLATFORM.

When during fire the platform jumps or undergoes abnormal displacement, put it back in position; verify carefully that the jackscrews and the nuts are tight, and clamp them thoroughly.

ABNORMAL SHOTS.

A shot is regarded as abnormal in the matter of range when it falls at a distance from the mortar which is less than two-thirds of its average range.

Abnormal shots are generally due to the following causes:

(*a*) **The charge has hung fire.** Hangfires are due to a too slow combustion of the powder, which develops an insufficient pressure in the powder chamber; the projectile may then fall near the mortar, sometimes even on the parapet of the trench. This accident may be caused either by the use of a damp charge or because the projectile has not been pushed deeply enough into the mortar upon loading.

(*b*) **The vanes are warped,** a defect which gives the projectile a bad position on its trajectory.

(*c*) **The platform is badly put together or installed on ground which is not homogenous or has little consistency.** In this case, the slant of the platform causes, upon firing, abnormal reactions, which may cause the projectile to "tumble" on its trajectory.

(*d*) **A wind which blows in squalls** may cause abnormal shots, particularly when firing at large angles.

Wind from the side has also a considerable influence on the aim.

PREMATURE BURSTS.

These may be due to the following causes:

(*a*) **Premature functioning of the fuse.**—A fuse may function prematurely on account of a sudden diminution in the speed of the projectile within the barrel.

A projectile which has been caked with earth, whose body is seamed, or the vanes of which have deteriorated, may, after starting, be wedged inside the bore by foreign bodies or by a deformation of the tube; this wedging produces a sudden stoppage, which may bring about the functioning of the fuse.

(*b*) **The bomb strikes against the front wall of the trench,** either in the case of a hangfire or a grazing shot; this latter accident may arise particularly if the clamping handwheel (8G) of the elevating mechanism has been insufficiently tightened and the mortar accordingly sinks from the desired angle.

(*c*) **Rarely, the spontaneous detonation of the explosive.**—The defective transportation of the shells makes the explosive sensitive to the shock sustained upon firing.[1]

MISFIRES AT THE POINT OF FALL.

Misfires of this type are due generally to the fact that the projectile does not fall upon its nose, either because it has slanted in its trajectory or because the fire has been executed on a terrain full of craters or upon a descending slope.

Abnormal shots are generally followed by misfires at the point of fall.

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[1] In the filling shops the explosive is shaken down into the shell, the latter being held vertically with the vanes down. When the projectiles are transported in any other position the jarring may produce empty places near the walls and cause the tar with which they are coated on the inside to scale; premature bursts are then to be feared on firing, due to the rubbing of the explosive against the roughness of the exposed walls.

PRECAUTIONS TO BE TAKEN IN ORDER TO AVOID ACCIDENTS.

RAILROAD TRANSPORTATION OF THE AMMUNITION.

The shells should be in their packing cases.

The cases should be so arranged in the cars that the vanes of the shells are beneath. It is absolutely essential to comply with this direction.

Avoid transporting cases of shells and cases of fuses or charges in the same car. If it is necessary, however, to do this, pack the cases of fuses or charges solidly on top of those containing the shells, separating them by means of sacking or straw.

The shell bearers should be directed never to set the shells on the ground on their vanes, a procedure which might bend them or cause their deterioration.

THE PRESERVATION OF THE AMMUNITION.

(*a*) **Shells.**—As soon as they are brought to the mortars, the shells should be piled up in the shelters, and the mortar chief should ascertain personally that the projectiles are in good condition, that the cylindrical bodies are without seams, and that the vanes are not bent.

(*b*) **Charges and fuses.**—The boxes which contain the cases and the boxes which contain the fuses should be sheltered from rain and dampness; do not open them until the moment of fire, close them as soon as the fire is ended; open only one case at a time.

INSTALLING THE MORTAR.

The construction of the platform should be carefully superintended.

During the course of firing the mortar chief should inspect the position of the platform after each shot, have the wedges driven in, and the jack screws or the bolts tightened, if necessary.

As soon as the mortar is put in position the mortar chief should see to it that the mortar does not graze at 45° and that the fire is unhindered in any direction by a tree or by some other obstacle.

DURING FIRE.

Each projectile should be inspected to make sure that its surface is free from foreign bodies and that its vanes are not bent; care should be taken that the case is in good condition and shows no traces of dampness.

Under no circumstances should the felt washer at the tail of the fuse be removed or attempt be made to screw or unscrew the booster (there is danger of a serious accident).

The depth gauge should be used to ascertain whether or not the projectile is properly seated in the mortar for firing.

In rainy weather, to keep water out of the mortar, take the following precautions:

During the aiming operations put a sheet-iron muzzle cover on the mortar.

Keep the sponge from the rain by covering it with a pack cover or by placing it under a shelter.

Wipe the projectile carefully with very dry rags before introducing it into the mortar.

Accessories list and spare parts list No. 1, 9.45-inch trench mortar, Mark I.

Name of part.	Accessories.[1]	Spare parts No. 1.[2]
Spare parts box with two 1½-inch Yale locks, No. 840	1	.....
Bar, 50 inches long, for lifting the timbers[3]	1	.....
Breast collars, canvas	6	.....
Brush, cleaning	1	.....
Brush, grease	1	.....
Bucket, canvas	1	.....
Can, grease, containing 3 pounds of No. 4½ lubricant	1	.....
Candles	12	.....
Chisel, flat	1	.....
Cleaning rod (scraper), two parts	1	.....
Cleaning rod (screw point), for cleaning threads	1	.....
Emery cloth, No. 0, sheets	6	.....
File, half round, with handle	1	.....
File, rat-tail, with handle	1	.....
File, saw (three-cornered), with handle	1	.....
Firing mechanism, complete	1	.....
Flash light, electric	1	.....
Gauge, loading	1	.....
Handle for electric flash light	1	.....
Handle, sponging, in two parts	1	.....
Handles, removable, for locking plate on upper sleeper	20	.....
Hammer, riveting	1	.....
Jack-screw lever	1	.....
Key for locking screw (ear head)	1	.....
Key for mounting firing mechanism	1	.....
Key for removing bomb	1	.....

[1] This list includes number of items carried with each mortar.
[2] Spare parts of gun carried in accessories box.
[3] Not packed in box.

Accessories list and spare parts list No. 1, 9.45-inch trench mortar, Mark I—Continued.

Name of part.	Accessories.[1]	Spare parts No. 1.[2]
Lantern	1	
Lanyard cord with spring eye attached		1
Lanyards with steel hooks attached, long		1
Level, carpenter's	1	
Loading tray, complete[3]	1	
Mallet, wooden	1	
Muzzle cover, metal	1	
Muzzle cover with tightening strap, canvas	1	
Oil, engine, No. 1, in can with spout, quart	1	
Paulin, canvas[3]	1	
Pencil, carpenter's	1	
Pliers, combination	1	
Plug for firing mechanism		
Plumb bob, with 5-foot line attached	1	
Plunger for firing mechanism		1
Quadrant, range, with wood (37K) and leather (37S) cases	1	
Rings for carrying projectiles[3]	6	
Rope[3]	1	
Sack, canvas (combining items 31 to 36 inclusive)	1	
Screw driver	1	
Screws for breech lock housing cover		2
Shafts, carrying, for lifting the barrel, 75 inches long[3]	4	
Shafts, carrying, for lifting base and racer, 36 inches long[3]	8	
Shafts, carrying, for projectile carrying rings, 54 inches long[3]	12	
Sight plug	1	
Sledge hammer with handle	1	
Sling, rope, for barrel	1	
Slings for breast collars	12	
Spring for breech lock		1
Spring for firing-mechanism plunger		1
Spring for firing-mechanism striker		2
Trimming (wool) large head, for sponging handle	3	
Trimming (wool) small head, for sponging handle	3	
Twine, heavy, 1 pound $\frac{3}{32}$ inch diameter, ball	1	
Waste (colored), cotton, pounds	6	
Wrench, 12 inches, adjustable "S"	1	
Wrench, double socket, for 1-inch and $1\frac{1}{8}$-inch hex. nuts	1	
Wrench, single head socket, for racer clamp	1	

[1] This list includes number of items carried with each mortar.
[2] Spare parts of gun carried in accessories box.
[3] Not packed in box.

THE LOADING TRAY.

The shell is carried from the cart to the muzzle of the mortar on a loading tray. The tray consists of a steel plate, four angles, a supporting strap, two oak guides, a brass strip, two pairs of handles.

The steel plate which forms the base of the tray is 41 inches long, 11 inches wide, and $\frac{3}{8}$ inch thick. It is reinforced by the four angles riveted around the edges of its under face. The supporting strap is a steel band bent in the shape of a U, and its ends are riveted to the flanges of the angles at one end of

the tray. The strap hooks over the muzzle of the mortar and is prevented from slipping too far down by a small steel stop, which is riveted to its upper part. This arrangement is designed to facilitate the insertion of the shell into the mortar. The two oak guides are bolted along the sides of the upper face of the base plate and form a suitable rest for the shell. The brass strip is riveted to the center of the base plate and prevents the body of the shell from coming in contact with the upper face of the plate. A pair of handles riveted to each end of the plate provide a suitable means for transportation by four men.

THE SIGHT PLUG.

The sight plug is a hollow cylinder 2.795 inches long, with a diameter at its large end of 1¾ inches. It is designed to screw into the breech slide and serves as an eyepiece to be used in connection with the cross hairs of the muzzle in securing a correct alignment of the sight with the axis of the bore. The outer circumference of the large end is knurled for a distance of ½ inch. The smaller end is machined down to a diameter of 1.417 inches and threaded to screw into the hole in the breech slide (4C) designed to receive the firing mechanism. A ½-inch hole extends through the center of the plug to within 1/16 inch from its larger end, where it is continued by a 1/8-inch hole or peep sight. (For the manner of using this to secure the correct alignment of the sight, see above under the description of the sight, p. 28.)

Spare parts of accessories for 9.45-inch trench mortar, Mark I.

Name of part.	Spare parts list.[1]		
	No. 2.	No. 4.	No. 5.
Alidade		½	½
Attachment for carrying bomb	0	2	1
Bag, canvas, for firing mechanism parts, etc.	4		
Bag, inner, for barrel sponge	1	1	1
Bag, inner, for breech sponge	1	1	1
Bag, outer, for barrel sponge	1	1	1
Bag, outer, for breech sponge	1	1	1
Bar for carrying bomb[2]	0	8	4
Bar for carrying barrel	0	8	4
Battery for electric flashlight[2]		12	24
Bottom for inner bag	3	3	3
Box (empty)[2]		1	0

[1] Each list contains the items for 6 mortars. No. 2 list in box, attached to battery train; No. 4 list in box, attached to ordnance park repair depot; No. 5 list in box, attached to interior arsenals.
[2] Not carried in boxes.

Spare parts of accessories for 9.45-inch trench mortar, Mark I—Continued.

Name of part.	Spare parts list.[1]		
	No. 2.	No. 4.	No. 5.
Breast collar, with slings, complete	12	3	3
Brush [2]		12	24
Brush for grease [2]		12	24
Bucket, canvas [2]		1	2
Bulb, for electric flash light [2]		12	24
Can with 3 pounds No. 4½ lubricant [2]		24	48
Candles (gross) [2]		14	28
Chain, twisted coil, No. 10, 7 inches long	6	8	4
Chain, 0.187 inch, about 12 inches long	12	12	12
Chisel, 8-inch, flat cold [2]		1	2
Compass, drawing, lengthening bar, pen and pencil points		½	½
Compass for drawing board		½	½
Compass, surveyor's		½	½
Coupling sleeve	2	1	1
Drawing board, small		½	½
Ears	12	12	12
Emery cloth No. 0 (sheets) [2]		144	288
Ends, round, for sponge head	3	1	2
Eraser, ink		12	24
Eraser, pencil		12	24
Field glasses		1	1
File, half round, second cut, and handle 10 inches [2]		1	2
File, metal saw, and handle, No. 00, 6 inches [2]		1	2
File, rat-tail, and handle, No. 00, 12 inches [2]		1	2
Flashlight, electric		1	2
Handle for barrel sponge	1	1	1
Handle for breech sponge	1	1	1
Handles, carrying	8	2	2
Handles, complete, for electric flashlight [2]		1	2
Handles for carrying racer and base [2]	0	8	4
Hammer for riveting [2]		1	2
Handles for sledge [2]		1	2
Handles, removable carrying, for locking plates	12	3	3
Hand shafts	3	1	2
Head for breech sponge	3	1	2
Ink, black drawing, bottle		12	24
Ink, blue drawing, bottle		12	24
Ink, red drawing, bottle		12	24
Key for locking screw [2]	0	2	1
Key for removing bomb	0	1	1
Key, mounting	1	1	1
Lantern for candles [2]		21	42
Level, carpenter's, 6 inches	1	1	1
Lever (for jack screw) [2]	0	1	1
Lifting band for breech	4	1	1
Lifting band for muzzle	4	1	3
Lining of sheep skin sewn to inner bag	3	3	3
Do	3	3	3
Links, 0.24 chain	24	24	24
Loading gauge	0	1	1
Loading tray, complete [2]	1	1	1
Mallet [2]		1	2
Muzzle cover complete [2]		1	2
Muzzle shield [2]		1	2
Nut, 0.625 shoulder screw crown	0	6	3
Oil, No. 1 engine, in can with spout (quart) [2]		24	48

[1] Each list contains the items for 6 mortars. No. 2 list in box, attached to battery train; No. 4 list in box, attached to ordnance park repair depot; No. 5 list in box, attached to interior arsenals.

[2] Not carried in boxes.

Spare parts of accessories for 9.45-inch trench mortar, Mark I—Continued.

Name of part.	Spare parts list.[1]		
	No. 2.	No. 4.	No. 5.
Paulin, 19 by 12 feet [2]	.....	1	2
Paper, drawing, sheets	.....	72	144
Paper, tracing, sheets	.....	144	288
Pencils, box assorted colored	.....	12	24
Pencils, box 6H drawing	.....	12	24
Pencils, carpenters' [2]	.....	24	48
Pen for ruling	.....	½	
Pick rod	2	1	1½
Pin for locking carrying bar shaft	6	8	4
Pliers, combination [2]	.....	1	2
Plate for handles	8	2	2
Plate for scraping	2	1	1
Plumb bob with 5-foot line [2]	.....	1	2
Protractor (10 inches) celluloid	.....	½	
Protractor T square, nickel-plated steel	.....	½	
Range quadrant and wood and leather cases, complete [2]	.....	1	2
Rings for carrying projectile	0	4	2½
Rings for chain	6	8	4½
Rings for lifting band	3	6	3
Rings, steel	6	6	6
Rivet, C' sunk head, 0.25 by 1.875 inches	1	1	1
Rivets, button head, 0.25 by 0.625 inch	16	4	4
Rivets, C' sunk head, 0.375 by 1.375 inches	24	24	24
Rivets, round head, 0.185 by 0.75 inch	4	2	2
Rods for cleaning threads [2]	.....	1	2
Rods for scraper	2	1	1
Rope, maneuvering, 33 feet long [2]	.....	1	2½
Scale, boxwood, engineer's	.....	½	
Screw driver, 9-inch, machinist's [2]	.....	1	2
Screw, headless wood, No. 18 by 1.5 inches	1	1	1
Screws, C' sunk head, wood, No. 12 by 1.75 inches	3	1	2
Do	48	16	32
Do	3	1	2
Screws, ring shoulder	0	6	3
Sledge hammer [2]	.....	1	2
Sling for barrel	0	1	2
Split pins, 0.156 by 1¼ inches, for muzzle lifting band	18	6	3
Split pins, 0.156 by 1.5	0	6	3
Staples, 2 inches	6	8	4
Staves for sponge head	24	8	16
Straight edge, steel, nickel-plated	.....	½	½
Strap for handle	8	2	2
Tape, steel, engineer's, 25 feet long	.....	½	½
Thongs, leather, 16.25 inches long	4	4	4
Thumb tacks, dozen	.....	12	24
Timber, 50 inches long [2]	.....	1	2
Triangle, 8 by 8 inches, steel, nickel plates 45°	.....	½	½
Tripod for drawing board	.....	½	½
Tube splice	1	1	1
Twine, heavy, 1 pound, 3/32 inch diameter, balls [2]	.....	24	48
Waste, cotton, colored [2] ..... pounds	.....	144	288
Wrench, 12-inch, adjustable "S" [2]	.....	1	2
Wrench, double-headed (for 1-inch and 1.125-inch hexagon nuts)	0	1	2
Wrench, single head socket, for racer clamp	0	1	2

[1] Each list contains the items for 6 mortars. No. 2 list in box, attached to battery train; No. 4 list in box, attached to ordnance park repair depot; No. 5 list in box, attached to interior arsenals.

[2] Not carried in boxes.

Fire-control matériel for 9.45-inch trench mortar, Mark I.

Name of part.	List No. 3.[1]	Name of part.	List No. 3.[1]
Alidade	1	Paper, tracing, sheets	12
Board, small drawing	1	Pencils, box of 6 assorted colored	1
Candles, gross	2	Pencils, box of 6H drawing	1
Compass, drawing, with lengthening bar, pen, and pencil points	1	Pen for ruling	1
Compass for drawing board	1	Protractor, celluloid	1
Compass, surveyor's	1	Protractor T square, nickel-plated steel	1
Eraser, ink	1	Scale, boxwood, engineer's	1
Eraser, pencil	1	Straightedge, nickel-plated steel	1
Field glasses	2	Tape, steel, engineer's, 25 feet long	1
Ink, black, drawing, bottle	1	Thumb tacks, dozen	1
Ink, blue, drawing, bottle	1	Triangle, 8 by 8 inches, nickel-plated, 45°	1
Ink, red, drawing, bottle	1	Tripod for drawing board	1
Lanterns, dark	20		
Paper, drawing, sheets	6		

[1] No. 3 list in box, attached to battery train. List contains items for battery of 6 mortars.

Spare parts of accessories for 9.45-inch trench mortar, Mark I.

Symbol.	Name of part.	Spare parts list.[1]		
		No. 2.	No. 4.	No. 5.
4Y	Anvil	1	1	1
7X	Bolt, cross beam assembly	4	4	4
7L	Bolt, eye, for long beam	2	2	2
7AN	Bolt plate, channel end, for long beam	4	4	4
7H	Bolt, assembly, for upper and lower channel	6	3	3
7G	Bolts, end, for upper channel	4	2	3
7AA	Bolts, assembling, front and rear	4	4	4
7B	Channel, lower	1	1	1
7F	Channel, upper	1	1	1
6E	Clamping nut	1	1	1
10BU	Coil chains, twisted	6	3	3
4T	Eye for lanyard	8	2	2
Pl. 4a	Firing mechanism complete	3	2	2
5X	Handle for trunnion lock	2	2	2
4AD	Hook, steel, for lanyard	8	2	2
7BS	Jack screws, complete	2	2	2
4V	Lanyard, braided sash cord, 0.25 inch by 50 feet long	8	2	2
4R	Lanyard cord, $\frac{3}{16}$ inch, 11 inches long	8	2	2
5V 5W	Lock for trunnion	0	2	1
10AM	Locking pin for shaft	6	3	3
7V	Locking plate, left hand	6	$1\frac{1}{2}$	$1\frac{1}{2}$
7U	Locking plate, right hand	6	$1\frac{1}{2}$	$1\frac{1}{2}$
4G	Nut for locking pin	8	2	2
8Z	Nuts, crown	6	3	3
7AK	Nuts for locking screw	12	3	3
7BA	Nuts, 0.625	2	2	2

[1] Each list contains the items for six mortars. No. 2 list in box, attached to battery train; No. 4 list in box attached to ordnance park repair depot; No. 5 list in boxes attached to interior arsenals.

Spare parts of accessories for 9.45-inch trench mortar, Mark I—Continued.

Symbol.	Name of part.	Spare parts list.[1]		
		No. 2.	No. 4.	No. 5.
7BF	Nuts, 1-inch	4	4	4
7AW	Nuts, 1-inch	4	2	3
7BL	Nuts, 1.125 inches	4	4	4
7BM	Nuts, 1.125 inches, check	4	4	4
7C	Pin, assembling bolt, for lower channel	60	15	15
4F	Pin for locking breech slide	2	2	2
6G	Pin for clamping nut	6	2	4
8A	Pinions	0	2	2
7BC	Plates, assembling bolt, with slot	4	2	2
7BD	Plates, assembling bolt, without slot	4	2	2
7AS	Plates, bolt, for upper channel	6	3	3
7BG	Plates, cross beam assembly bolt with slot	4	4	4
7BH	Plates, cross beam assembly bolt, without slot	4	4	4
7AY	Plates, eyebolt, for long beam	2	2	2
4S	Plug for firing mechanism	2	2	2
4W	Plunger	1	1	1
6AD	Racks	0	2	2
	Rings for chain (10BU)	6	3	3
4Q	Screws, C′ sunk head, 0.312 by 1.25 inches	0	2	1
5Y	Screws, 0.375 by 0.75 inch, C′ sunk head	4	4	4
6AE	Screws, C′ sunk head, 0.625 by 2 inches	6	3	3
4P	Screws, C′ sunk head, for locking-pin housing	2		
7BK	Screws, flat head wood, No. 16 by 1.75 inches	8	8	8
7AP 7AV 7AZ	Screws, flat head wood, No. 16 by 1.75 inches	200	50	50
7BE	Screws, flat head wood, No. 16 by 1.75 inches	96	96	96
7R	Screws, locking, for tie plate	12	3	3
7T	Screws, shoulder, for locking plate	12	3	3
6D	Shoe for racer clamp	1	1	1
4C	Slide for breech	0	1	1
8AA	Split pins	168	84	84
8P	Split pins, 0.156 by 1.5 inches	3	1	2
4E	Spring for locking pin	8	2	2
4AC	Spring, plunger, for firing mechanism	8	2	2
4Z	Spring, striker, for firing mechanism	2	2	2
	Staples, 2 inches	6	3	3
4L	Stops for breech slide	0	2	1
4AA	Striker for firing mechanism	8	2	2
6F	Stud	1	1	1
4AF	Thimble, 0.25 inch, for lanyard rope	8	2	2
7S	Tie plates for upper floor timber, left hand	6	1½	1½
7Q	Tie plates for upper floor timber, right hand	6	1½	1½
7K	Tie rods for long beam	4	2	2
7AT	Tie-rod plates, for long beam, with slot	1	1	1
7AU	Tie-rod plates, for long beam, without slot	1	1	1
6H	Washer	1	1	1
8R	Washer, steel	3	3	3

[1] Each list contains the items for six mortars. No. 2 list in box, attached to battery train; No. 4 list in box attached to ordnance park repair depot; No. 5 list in boxes attached to interior arsenals.

Nomenclature of 9.45-inch trench mortar matériel.

BARREL, BREECH, AND FIRING MECHANISM.

X

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
4A	1	Barrel	Gun steel	Screwed onto breech (4B).
4B	1	Breech	do	Screwed into barrel (4A). Fits into trunnion seats.
4C	1	Breech slide	Forged steel	Fits into recess in breech (4B). Holds cartridge in place.
4D	1	Locking-pin housing	do	Fastened to breech (4B). Contains locking pin (4F).
4E	1	Locking-pin spring	Spring-steel wire	Fits over pin (4F). Forces pin into hole in slide (4C).
4F	1	Locking pin	Forged steel	Fastened to housing (4D). Holds breech slide (4C) open or closed.
4G	1	Locking-pin nut	Steel	Screwed and riveted to end of pin (4F).
4H	1	Locking-pin ring	Cold-rolled steel	Fastened to nut (4G). Provides handle to pull out pin (4F).
4K	1	Locking-pin housing cover	Steel	Fastened to locking-pin housing (4D), and holds pin (4F) and spring (4E) in place.
4L	2	Breech-slide stops	Tool steel	Fastened to breech slide (4C). Stop slide in proper position.
4M	4	Fillister-head screws	Steel	Fasten locking-pin housing (4D) to breech (4B).
4N	1	Headless set screw	do	Locks barrel (4A) and breech (4B) together.
4P	2	Countersunk-head screws	do	Fasten locking-pin housing cover (4K) to locking-pin housing (4D).
4Q	4	do	do	Fasten breech-slide stops (4L) to breech slide (4C).
4R	1	Lanyard cord	Braided sash cord	Through plug (4S) and plunger (4W). Means of pulling back plunger.
4S	1	Plug	Forged steel	Screws into end of housing (4U). Cover for firing mechanism.
4T	1	Lanyard eye	Spring-steel wire	Attached to end of lanyard cord (4R).
4U	1	Housing	Forged steel	Screws into ho e in breech slide (4C). Contains firing mechanism.
4V	1	Lanyard	Braided sash cord	Attached to lanyard hook (4AD). Operates firing mechanism.
4W	1	Plunger	Forged steel	Fits inside housing (4U). Delivers blow to anvil (4Y).
4X	1	Lanyard washer	Steel	Fits over end of lanyard cord (4R), preventing it from pulling through the plunger (4W).
4Y	1	Anvil	Tool steel	Fits inside housing (4U). Drives striker (4AA).
4Z	1	Striker spring	Spring-steel wire	Fits inside housing (4U). Returns striker (4AA) to position.
4AA	1	Striker	Tool steel	Fits inside housing (4U). Strikes percussion cap of cartridge.
4AB	1	Vent bushing	Forged steel	Screws into end of housing (4U).
4AC	1	Plunger spring	Spring-steel wire	Fits inside plunger (4W) and over plug (4S). Drives plunger.
4AD	1	Lanyard hook	Steel	Catches in lanyard eye (4T) attaching lanyard (4V).
4AE	1	Lifting band key	do	Locks lifting band in place.
4AF	1	Rope thimble	do	Fits into lanyard hook (4AD). Protects lanyard (4V).
4AG	1	Sight plug	do	Fits into breech slide (4C) when aligning sight.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
5A	1	Upper horizontal plate	Forged steel	Main part of horizontal base of racer.
5B	2	Angles	Steel	Riveted to horizontal and vertical plates holding them together.
5C	1	Pintle cover	Flange steel	Protects pintle (6AB).
5D	2	Inner plates	Steel	Riveted to angles (5B) and plate (5E). Carries trunnion seat (5T) and (5U).
5E	2	Outer plates	do	Riveted to angles (5B) and plate (50). Carries trunnion seat (5U) and (5U).
5F	2	Plow bolts	do	Fasten rear guide show (5AB) to under side of plate (5A).
5G	2	Crown nuts	do	Hold plow bolts (5F) in place.
5H	2	Split pins	do	Prevent crown nuts (5G) from coming off.
5K	2	Filler plates	do	Fill space between angles (5B) and plates (5E).
5L	4	Shoulder pins	do	Riveted to chock plate (6C) and front guide shoe (6B). Part of cover-plate fastening devices.
5M	4	Keys	do	Fit into slots in shoulder pins (5L). Lock cover-plate fasteners to racer.
5N	4	Eyebolts	Forged steel	Riveted to plate (5E). Fasten one end of chains (5P) to racer.
5P	4	Twisted coil chains	Steel	Connect eyebolts (5N) and rings (5Q). Prevent shoulder pins (5L) from being lost.
5Q	8	Chain rings	do	Fasten ends of shoulder pins (5L) to chains (5P).
5R	1	Cover plate—right	Flange steel	Fastened to racer. Protects rail of base ring (6AC).
5S	1	Cover plate—left		
5T	1	Trunnion seat—right	Forged steel	Riveted to racer. Carries trunnion (4d).
5U	1	Trunnion seat—left		
5V	1	Trunnion lock—right	do	Fastened in holes in trunnion seats (5T and 5U). Lock the barrel (1A) to the carriage.
5W	1	Trunnion lock—left		
5X	2	Handles	Steel	Fastened to trunnion locks (5V and 5W).
5Y	4	Countersunk-head screws	do	Fasten handles (5X) to trunnion locks (5V and 5W).
5Z	2	Stops	Forged steel	Fastened to trunnion seats (5T and 5U) to aid in holding the carriage to the cart in transportation.
5AA	4	Trunnion lock-stop screws	Steel	Screw into trunnion seats (5T and 5U). Hold trunnion locks (5V and 5W) in open or locked position.
5AB	1	Rear guide show	Forged steel	Riveted to under side of plate (5A). Aids in guiding carriage.
5AC	1	Cheek—right	do	Riveted to trunnion seat (5T and 5U). Carries rack (6AD).
5AD	1	Cheek—left		

5AE	1	Angle	Steel	Riveted around four edges on the upper face of plate (6U).
5AF	2	Plates	....do	Riveted to outer face of vertical flange of angle (5AE).
5AG	2	....do	....do	Riveted to outer face of plates (5AF).
5AH	2	Angles	....do	Do.
5AK	10	Locking lugs	Forged steel	Riveted to outer face of plates (5AF). Means by which base is fastened to wooden platform.
5AL	4	Sockets	Steel	Riveted to outer face of plates (5AF). Provide a convenient means of lifting base.
5AM	4	Segments of azimuth circle	Zinc	Fastened to the angle (5AE) or packing plates (5AN) for use in fire control.
5AN	4	Packing plates	Steel	Fastened to plate (6U) by screws. Aid in supporting azimuth circle (5AM).
5AP	26	Round-head screws	Brass	Fasten segments (5AM) to angle (5AE) and packing plates (5AN).
5AQ	1	Vernier bracket	Cast steel	Riveted to vertical wall of racer. Holds vernier scale (5AR).
5AR	1	Vernier scale	Zinc	Fastened to bracket (5AQ). Used in laying mortar.
6A	1	Lower horizontal plate	Steel	Riveted to underside of plate (5A). Bears against metal base.
6B	1	Front guide shoe	Forged steel	Belted to under side of plate (5A). Aids in guiding carriage.
6C	1	Chock plate	....do	Riveted to under side of plate (5A). Transmits shock to metal base.
6D	1	Racer clamp shoe	....do	Fits into recess in rear guide shoe (5AB) and on stud (6F).
6E	1	Clamping nut	....do	Screws onto stud (6F). Provides means for locking carriage to base.
6F	1	Stud	....do	Riveted to racer clamp shoe (6D). Racer clamp parts are assembled to it.
6G	1	Pin	....do	Through stud (6F). Prevents clamping nut (6E) from being unscrewed too far.
6H	1	Washer	....do	Fits over stud (6F).
6K	1	Front socket—right	....do	Riveted to racer. Provide means for lifting racer.
6L	1	Front socket—left		
6M	1	Rear socket—right		
6N	1	Rear socket—left		
6P	2	Reinforcing angles	Steel	Fastened to sockets (6M and 6N) by screws. Reinforce socket.
6Q	4	Hexagonal-head cap screws	....do	Fastens reinforcing angles (6P) to sockets (6M and 6N).
6R	1	Tie-plate	Flange steel	Fastened to front sockets (6K and 6L) bracing them.
6S	2	Filler plates	Steel	Held between front sockets (6K and 6L) and tie-plate (6R) by screws.
6T	4	Hexagonal-head cap screws	....do	Fasten tie-plate (6R) to sockets (6K and 6L).
6U	1	Base plate	....do	Square plate to which most other plates and angles are riveted.
6V	2	Angles	....do	Riveted to the lower face of plate (6U).
6W	4	....do	....do	Do.
6X	2	Spades	....do	Riveted to plates (5AG) and angles (6V).
6Y	2	Plates	....do	Riveted to the lower face of plate (6U).
6Z	4	....do	....do	Do.
6AA	1	Disk	....do	Riveted to upper face of plate (6U).

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CARRIAGE AND BASE—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
6AB	1	Pintle	Steel	Riveted to under face of plate (6U). Axis for carriage.
6AC	1	Base ring	do	Riveted to upper face of disk (6AA). Provides a runner for carriage.
6AD	2	Racks	Forged steel	Fastened to cheeks (5AC) and (5AD) by screws. Engage with teeth of pinions (8A).
6AE	6	Countersunk-head screws	Steel	Fasten racks (6AD) to cheeks (5AC and 5AD).

WOODEN PLATFORM.

7A	5	Lower-floor timbers	Oak	Bolted to lower channels (7B). Carry upper-floor timber (7M).
7B	2	Lower channels	Steel	Fastened to struts (7E) by bolts running through upper-floor timbers (7M) and upper channel.
7C	10	Assembling-bolt pins for lower channels.	Forged steel	Through holes in lower channels (7B) and slots in bolts (7H) preventing these from turning.
7D	2	Long beams	Oak	Fastened to ends of upper channels (7F).
7E	2	Struts	do	Fastened to lower channels (7B) between long beams (7D).
7F	2	Upper channels	Steel	Bolted to upper-floor timbers (7M) and long beams (7D).
7G	4	Upper-channel end bolts	Forged steel	Fasten upper channels (7F) to long beams (7D).
7H	10	Upper and lower channel assembling bolts.	do	Fasten upper (7F) and lower (7B) channels, struts (7E) and upper-floor timbers (7M) together.
7K	8	Tie-rods for long beams	do	Fasten long beams (7D) and struts (7E) together, holding platform rigid.
7L	4	Eyebolts for long beams	do	Fastened to long beam (7D). Provide means for lifting beam.
7M	5	Upper-floor timbers	Oak	Rest on lower-floor timbers (7A). Carry metal base.
7N	10	Reinforcing bands	Forged steel	Driven onto ends of upper-floor timbers (7M).
7P	10	Spacers	Steel	Fastened to rear faces of upper-floor timbers (7M) holding the timbers the desired distance apart.
7Q	5	Tie-plates for upper-floor timber.	do	Fastened to right end of upper-floor timbers (7M).
7R	10	Locking screws for tie-plates	Forged steel	Fasten to tie-plates (7Q and 7S). Fasten locking plates in place.
7S	5	Tie plates for upper floor timbers.	Steel	Fastened to left end of upper floor timbers (7M).

7T	10	Shoulder screws for locking plates.	.....do.....	Fasten locking plates (7U and 7V) to tie plates.
7U	5	Locking plates—right hand..	Forged steel.....	Fastened to tie plates (7Q). Lock base to platform.
7V	5	Locking plates—left hand'.....	.....do.....	Fastened to tie plates (7S). Lock base to platform.
7W	2	Cross beams.....	Oak.....	Between long beams (7D). Hold upper floor timbers (7M) in place.
7X	4	Cross-beam assembling bolts.	Forged steel.....	Fasten long beams (7D) and cross beams (7W) together.
7Y	4	Front beams.....	Oak.....	Form front wall for platform.
7Z	4	Rear beams.....	.....do.....	Form rear wall for platform.
7AA	6	Front and rear assembling bolts.	Steel.....	Hold front beams (7Y) together and rear beams (7Z) together.
7AB	4	Vertical blocks.....	Oak.....	Between beams (7Y) and long beams (7D).
7AC	4	Wedges.....	.....do.....	Between long beams (7D) and upper floor timbers (7M) holding latter rigid.
7AD	4	Bands for wedges.....	Forged steel.....	Reinforced heads of wedges (7AC).
7AE	3	Vertical blocks.....	Oak.....	Between beams (7Z) and long beams (7D).
7AF	20	Tie-plate bolts.....	Steel.....	Fasten tie plates (7T) to upper floor timbers (7M).
7AG	20	Crown nuts.....	.....do.....	Fasten tie plates bolts (7AF) in place.
7AH	20	Split pins.....	.....do.....	Hold crown nuts (7AG) in place.
7AK	10	Nuts for locking screw.....	.....do.....	Fastened to end of locking screws (7R), holding it to tie plates (7Q and 7S).
7AL	10	Nuts.....	.....do.....	Hold upper and lower channel assembling bolts (7H) in place.
7AM	10	Check nuts.....	.....do.....	Lock nuts (7AL) in place.
7AN	4	Channel and bolt plates for long beams.	.....do.....	Fastened to underside of long beams (7D) to protect them.
7AP	8	Wood screws.....	.....do.....	Fasten plates (7AN) to long beams (7D).
7AQ	4	Nuts.....	.....do.....	Hold upper channel end bolts (7G) in place.
7AR	4	Check nuts.....	.....do.....	Lock nuts (7AQ) in place.
7AS	14	Channel bolt plates.....	.....do.....	Bears against channels (7B and 7F) preventing bolt heads and nuts from slipping through.
7AT	2	Tie-rod plates for long beams (with slots).	.....do.....	Fasten to rear long beam (7D).
7AU	2	Tie-rod plates for long beams (without slots).	.....do.....	Fastened to front long beam (7D).
7AV	16	Wood screws.....	.....do.....	Fasten tie-rod plates to long beams (7D).
7AW	8	Nuts.....	.....do.....	Hold tie rods (7K) in place.
7AX	8	Check nuts.....	.....do.....	Hold nuts (7AW) in place.
7AY	4	Eyebolt plates for long beams	.....do.....	Fastened to underside of long beam (7D).
7AZ	8	Wood screws.....	.....do.....	Fastens eyebolt plate (7AY) to long beam (7D).
7BA	4	Nuts.....	.....do.....	Hold eyebolt (7L) in place.
7BB	30	Wood screws.....	.....do.....	Fasten spacers (7P) to upper floor timbers (7M).

WOODEN PLATFORM—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
7BC	6	Assembling-bolt plates for front and rear beams (with slot).	Steel	Fastened to lower front (7Y) and rear (7Z) beams.
7BD	6	Assembling-bolt plates for front and rear beams (without slot).	do	Fastened to upper front (7Y) and rear (7Z) beams.
7BE	24	Wood screws	do	Fasten bolt plates (7BC and 7BD) to beams (7Y and 7Z).
7BF	6	Nuts	do	Fasten bolts (7AA) in place.
7BG	4	Cross-beam assembling-bolt plates (with slot).	do	Fastened to underside of long beams (7D).
7BH	4	Cross-beam assembling-bolt plates (without slot).	do	Fastened to upper face of cross beams (7W).
7BK	16	Flat-head wood screws	do	Fasten plates (7BG and 7BH) to beams (7D and 7W).
7BL	4	Nuts	do	Hold assembling bolts (7X) in place.
7BM	4	Check nuts	do	Lock nuts (7BL) in place.
7BN	10	Locking plates	do	Fastened to timbers (7A). Carry handle (7BP).
7BP	10	Handles	Forged steel	Fastened to locking plates (7BN). Part of lifting device for timbers (7A).
7BQ	20	Handle straps	do	Fasten handles (7BP) to plates (7BN).
7BR	50	Round-head wood screws	Steel	Fasten plates (7BN) to beams (7A).
7BS	4	Jack screws	do	Hold wooden platform rigid.

ELEVATING MECHANISM.

8A	2	Pinions	Forged steel	Keyed to elevating shaft (8B). Elevates or depresses the barrel.
8B	1	Elevating shaft	Cold-rolled steel	Through upper clamping band (8H).
8C	1	Clamping shaft	do	Goes through upper clamping band (8H). Carries handwheel (8G).
8D	1	Feather key	Steel	Keys pinion and crank (left) (8Q) to elevating shaft (8B).
8E	1	Crank—right	Forged steel	Keyed to elevating shaft (8B). Operates elevating shaft (8B).
8F	1	Feather key	Steel	Keys pinion and crank (right) (8E) to elevating shaft (8B).

8G	1	Handwheel	Cast iron	Screwed onto clamping shaft (8C). Locks elevating mechanism.
8H	1	Upper clamping band	Forged steel	Around barrel. Attach elevating mechanism to barrel.
8K	2	Lower clamping bands	do	Do.
8L	2	Countersunk-head screws	Steel	Fasten upper (8H) and lower clamping (8K) bands.
8M	1	Separator	Forged steel	Between ends of upper clamping band (8H) reinforcing it.
8N	1	Crown nut	Steel	Holds elevating shaft (8B) in place.
8P	1	Split pin	do	Holds crown nut (7N) in place.
8Q	1	Crank—left	Forged steel	Keyed to elevating shaft (8B). Operates elevating shaft.
8R	1	Washer	Steel	Fits over end of elevating shaft (8B).
8S	1	Feather key	do	Keys clamping shaft (8C) to left side of clamp (8H).
8T	1	Washer	do	Fits over end of elevating shaft (8B).
8U	1	Bolt	do	Fasten lower clamping bands (8K) together.
8V	4	Crown nuts	do	Hold screws (8Y) and bolt (8U) in place.
8W	4	Split pins	do	Hold crown nuts (8V) in place.
8X	2	Hexagonal-head cap screws	do	Fasten separator (8M) to upper clamping bands (8H).
8Y	4	Countersink-head screws	do	Fasten upper (8H) and lower clamping bands (8K).
8Z	6	Crown nuts	do	Hold screws (6AE) in place.
8AA	6	Split pins	do	Hold crown nuts (8Z) in place.
8BB	1	Crown nut	do	Holds bolt (8U) in place.
8AC	1	Split pin	do	Holds nut (8AB) in place.

SIGHT.

9A	1	Cross sight-post shaft	Steel	Slips into slots in cheeks (5AC and 5AD). Supports sight.
9B	1	Pin	do	Driven into shaft (9A). Prevent shaft from turning.
9C	1	Wing nut	Forged steel	Clamps cross sight-post shaft (9A) in place.
9D	1	Split pin	Steel	Holds wing nut (9C) in place.
9E	1	Holder (sight post)	Cast iron	Slips over shaft (9A) and holds post (9F).
9F	1	Sight post	Steel	Fits into holder (9E) and over shaft (9A). Carries socket (9L).
9G	1	Pin	do	Driven into post (9F) and prevents it from turning.
9H	1	Split pin	do	Goes through end of post (9F). Prevents clamp lever (9K) from coming off.
9K	1	Clamp lever (sight post)	Forged steel	Screws onto post (9F). Clamps socket (9L), post (9F), and holder (9E) so that they are rigid.
9L	1	Socket	Cast iron	Around post (9F). Supports sight post (9X).
9M	1	Sight	Flange steel	Fits over sight-post stud (9R). For use in fire control.
9N	1	Split pin	do	Through sight-post bracket (9V). Prevents sight (9M) from being lost.

SIGHT—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
9P	1	Ring	Flange steel	Through hole in sight (9M). Attaches sight to chain (9Q).
9Q	1	Chain 5 feet long	Brass	Fastens ring (9P) to split pin (9N).
9R	1	Sight-post stud	Steel	Slips into slot in sight-post bracket (9V). Carries sight (9M).
9S	1	Pin	do	Driven into stud (9R). Catches in slot in sight-post bracket (9V).
9T	2	Sight-post straps	Copper	Hold sight post (9X) and sight-post bracket (9V) together.
9U	6	Round-head rivets	Iron	Rivet sight-post straps (9T) around pins (9AB).
9V	1	Sight-post bracket	Steel	Link between sight post (9X) and sight-post stud (9R).
9W	1	Bracket	do	Fits over sight-post bracket (9V). Part of device to align sight with center of post.
9X	1	Sight post	Steel tubing	Through socket (9L) and straps (9T).
9Y	1	Plug	Bronze	Soldered into lower end of sight post (9X).
9Z	1	Sight-bracket clamp (bottom)	do	Around post (9X) and against bracket (9V).
9AA	1	Sight-bracket clamp (top)	do	Do
9AB	2	Pins	Steel	Fasten one end of straps (9T) to sight-bracket clamps (9Z and 9AA).
9AC	2	Strap-lock bearings	do	Driven into clamps (9Z and 9AA). Provide catch for straps (9T).
9AD	2	Rivets	do	Fasten sight-bracket clamps (9Z and 9AA) to sight post (9X).
9AE	2	Strap locks	Bronze	Riveted onto strap-lock bearings (9AC). Fasten end of straps (9T) around sight-bracket clamps (9AA and 9Z).
9AF	1	Cam pin	Steel	Fits into hole in (top) sight-bracket clamp (9AA) and into bracke (9W).
9AG	1	Cam-pin lever	Bronze	Over cam pin (9AF). With the cam tightens the sight (9M).
9AH	1	Bracket-lock nut	do	Fits into hole in sight-bracket clamp (9AA). Holds lock-nut rod (9AK).
9AK	1	Lock-nut rod	do	Fits into hole in sight-bracket clamp (9AA). Locks cam pin (9AF).
9AL	1	Holding pin	Steel	Through holes in sight post (9X) and catches in slot in socket (9L).
9AM	1	Spring	do	Fastened to holding pin (9AL), keeping it in place.
9AN	1	Nut	do	Screws onto end of stud (9R) fastening sight (9M) in place.
9AP	1	Washer	do	Fits over ends of cam pin (9AF).

10A	2	Long outside timbers	Oak	Sides of body of cart.
10B	4	Packing blocks	do	Bolted to under face of timbers (10A). Support lower guides (10C).
10C	4	Lower guides	Forged steel	Bolted to timbers (10A) and packing blocks (10B). Support racks (14B).
10D	4	Shaft sleeves	do	Bolted to timbers (10A). Hold shafts (12A) in place.
10E	2	Shaft stops	do	Fastened to timbers (10A). Hold shafts (12A) in proper place.
10F	2	Band-shaft brackets	do	Bolted to right timber (10A). Support hand shaft (10AS).
10G	2	Rear cross timbers	Oak	Bolted to timbers (10A and 10K). Part of body.
10H	2	Reinforcing bands	Sheet steel	Fastened to timbers (10A) protecting ends.
10K	2	Long inside timbers	Oak	Bolted to timbers (10G, 10L, and 10M). Part of body.
10L	1	Front cross timber	do	Bolted to timbers (10A and 10K). Part of body.
10M	2	Intermediate cross timbers	do	Bolted to timbers (10K). Strengthen the body.
10N	1	Axle	Forged steel	Fastened to timbers (10A and 10K).
10P	2	Handles	do	Bolted to timber (10L). An aid in moving cart.
10Q	2	Hooks	do	Riveted to timber (10L). For breast bands.
10R	1	Locking pin	Steel	Locks cart pole (10S) in pulling or carrying positions.
10S	1	Cart pole	Cold-drawn steel tubing.	Fastened to cart for pulling it by hand.
10T	1	Cart-pole front guide	Steel	Bolted to timber (10L). Supports cart pole (10S).
10U	2	Braces	do	Bolted to axle (10N) and riveted to T (10V). Strengthens body.
10V	1	T	do	Bolted to timber (10G) and riveted to braces (10U). Strengthens body.
10X	4	Packing plates	do	Bolted to timbers (10G). Supports angles (10Y).
10Y	2	Angles	do	Bolted to timbers (10G). Support carrying attachment.
10Z	4	Axle straps	Forged steel	Fastened to timbers (10A and 10K). Fasten axle (10N) to cart.
AA	1	Singletree eyepiece	do	Riveted to ends of braces (10U). Fastens singletree (10AB) to cart.
10AB	1	Singletree	Steel	Hooked to eyepiece (10AA). Provides means for pulling cart.
10AC	28	Spokes	White oak or hickory	Fit in hub boxes (10AE) and felloes (10AD).
10AD	14	Felloe sections	do	Make up felloes of wheels.
10AE	2	Hub boxes	Bronze	Fit over axle (10N).
10AF	2	Hub flanges	do	Bolted to boxes (10AE).
10AG	14	Bolts	Steel	Fasten flanges (10AF) to boxes (10AE).
10AH	2	Tires	Tire steel	Fitted over felloes (10AD).
10AK	10	Clips	Flange steel	Aid in fastening felloe sections (10AD) together.
10AL	2	Linch pins	Forged steel	Through hole in axle (10N). Hold wheels on axle.
10AM	2	Locking pins	Steel	Lock bars (12A) to timbers (10A).
10AN	1	Prop body	Ash	Fits into socket (10AP). Holds shafts off ground.
10AP	1	Socket	Malleable iron	Hooks into prop fixture (10AR). Carries prop body (10AN).

CART—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
10AQ	1	Ferrule	Steel	Protects end of prop body (10AN).
10AR	1	Prop fixture	Forged steel	Bolted to timber (10L). Supports prop.
10AS	1	Hand shaft	Ash	Passes through hand-shaft shackle (10AU).
10AU	1	Hand-shaft shackle	Steel	Fastened to end of cart pole (10S).
10AV	4	Upper guides	Forged steel	Riveted to angles (10Y). Support racks.
10AW	2	Drag washers	Steel	Fit over end of axle (10N) after shells have been put on.
10AX	4	Countersunk-head carriage bolts.	.....do	Fasten angles (10Y), timbers (10A and 10G), and packing blocks (10B) together.
10AY	6	Crown nuts	.....do	Hold bolts (10AX and 10BA) in place.
10AZ	6	Split pins	.....do	Hold nuts (10AY) in place.
10BA	2	Countersunk-head carriage bolts.	.....do	Fasten timbers (10A and 10L) together.
10BB	2	Countersunk-head rivets	.....do	Rivet braces (10U), T (10V), and eyepiece (10AA) together.
10BC	8	.....do	.....do	Rivet upper guides (10AV) to angles (10Y).
10BD	2	Carriage bolts	.....do	Fasten timbers (10K and 10G) together.
10BE	2	.....do	.....do	Do.
10BF	2	.....do	.....do	Fasten timbers (10G and 10L) together.
10BG	16	.....do	.....do	Fasten lower guides (10C) to timbers (10A) and packing blocks (10B).
10BH	1	Round-head bolt	.....do	Fasten T (10V) to axle (10N).
10BK	2	Bolts	.....do	Fasten braces (10U) to axle (10N).
10BL	2	Countersunk-head wood screws.	.....do	Fasten reinforcing bands (10H) to timbers (10A).
10BM	12	Carriage bolts	.....do	Fasten axle straps (10Z) to timbers (10A and 10K).
10BN	2	Cart-pole brackets	Forged steel	Bolted to left timber (10A). Supports cart pole (10S) in carrying position.
10BP	1	Cart-pole rear guide	.....do	Bolted to T (10V). Holds cart pole (10S) in place.
10BU	2	Twisted coil chains	Steel	Fasten locking pins (10AM) to timber (10L), preventing its loss.
10BW	4	Carriage bolts	.....do	Fasten handles (10P) to timber (10L).
10BX	2	.....do	.....do	Fasten guide (10T) and fixture (10AR) to timber (10L).
10BY	2	Hexagonal nuts	.....do	Fasten bolts (10BX) in place.
10BZ	1	Hand-shaft bracket locking pin.	.....do	Locks hand shaft (10AS) in carrying position.
10CA	1	Twisted coil chain	.....do	Prevents pin (10BZ) from being lost by fastening it to timber (10G).
10CB	1	Keeper pin	Wrought iron	Fastened to chain (10CC).
10CC	1	Twisted coil chain	Steel	Fastened to timber (10L). Holds up prop (10AN).

CARRYING ATTACHMENT FOR BARREL AND BREECH.

11A	4	Angles	Steel	Riveted to plates (11B). Connects plates (11B) and plates (11C).
11B	2	Plates (end)	do	Riveted to angles (11A). Cover end of chock (11D).
11C	2	Plates (side)	do	Riveted to angles (11A). Cover sides of chock (11D).
11D	1	Rear chock	Oak	Between plates (11B and 11C) to receive barrel (4A).
11E	2	Angles	Steel	Bolted to timbers (10K).
11F	2	Plates	do	Fastened to sides of front chock (11H) for protection.
11G	2	do	do	Lie between long timbers (10K) of cart and angles (11E).
11H	1	Front chock	Oak	Fastened between plates (11F) to receive the breech (4B).
11K	2	Chain eyebolts	Forged steel	Fastened to front chock (11H) and rear cross timber (10G) to secure chains (11S).
11L	4	Bolts	Steel	Secure angles (11E) and plates (11G) to long timbers (10K).
11M	12	Crown nuts	do	Secure tie bolts (11N) and plates (11F) in place.
11N	4	Tie bolts	do	Secure hinge pieces (11AC) and plates (11F) to chock (11H).
11P	7	Round hand rivets	do	Rivet angles (11A), plates (11B), and chock (11D) together.
11Q	16	Countersunk-head rivets	do	Rivet angles (11A) and plates (11B) together.
11R	6	Chain rings	do	Connects chains (11S) to chain eyebolts (11K) and locking pins (11AV and 11AW).
11S	4	Twisted coil chains	do	Attached to chain eyebolts (11K) and locking pins (11AV and 11AW).
11T	12	Split pins	do	Secure nuts (11M) in position.
11U	16	Countersunk oval head rivets	do	Secure plates (11C) to angles (11A).
11V	1	Slotted half collar	Forged steel	Hinged between two right end angles (11A). To receive eyebolt (11Y).
11W	1	Eyebolt half collar	do	Hinged between two left-end angles (11A). To hold eyebolt (11Y).
11X	2	Half-collar hinge pins	Steel	Traverse end angles and half collars. To secure half collars.
11Y	1	Eyebolt	Forged steel	Hinged to upper end of eyebolt half collar (11V). Connects both half collars.
11Z	1	Eyebolt collar	Steel	Pinned to end of eyebolt (11Y). Prevents wing nut (11AC) from becoming detached.
11AA	2	Collar liners	Leather	Riveted to inner surfaces of half collars (11V and 11W). Protects barrel.
11AB	1	Eyebolt hinge pin	Steel	Traverses upper end of half collar (11V). Secures eyebolt (11Y) in position.
11AC	1	Wing nut	Forged steel	Screwed to end of eyebolt (11Y). Tightens half collars (11V and 11W).
11AD	1	Wing-nut washer	Steel	Between wing nut (11AC) and slotted half collar (11W).
11AE	16	Rivets	Copper	Rivet liners (11AA) to half collars (11V and 11W).
11AF	1	Eyebolt-collar pin	Steel	Pins eyebolt collar (11Z) to eyebolt (11Y).
11AG	4	Hinge pieces	Forged steel	Fastened to plates (11F) and chock (11H). Receive half collars (11AH and 11AK).

CARRYING ATTACHMENT FOR BARREL AND BREECH—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
11AH	2	Eyebolt half collars	Forged steel	Hinged to rear hinge pieces (11AG).
11AK	2	Slotted half collars	do	Hinged to front hinge pieces (11AG).
11AL	4	Half-collar hinge pins	Steel	Fastens upper end of hinge pieces (11AG) to half collars (11AH and 11AK).
11AM	2	Eyebolts	Forged steel	Hinged to eyebolt half collars (11AH). Secures half collars together.
11AN	2	Wing nuts	do	Screwed to end of eyebolts (11AM). Tightens half collars around trunnions (4d).
11AP	2	Wing-nut washers	Steel	Between wing nuts (11AN) and slotted half collars (11AK).
11AQ	2	Eyebolt collars	do	Pinned to end of eyebolts (11AM). Prevent wing nuts (11AN) from becoming detached.
11AR	4	Collar liners	Leather	Riveted to inner surfaces of half collars (11AH and 11AK). Protect trunnions.
11AS	2	Eyebolt hinge pins	Steel	Hinge eyebolt (11AM) to eyebolt half collars (11AH).
11AT	2	Eyebolt collar pins	do	Pin eyebolt collars (11AQ) to eyebolts (11AM).
11AU	16	Rivets	Copper	Rivet liners (11AR) to half collars (11AH and 11AK).
11AV	2	Rear-chock locking pins	Steel	Secures barrel-carrying attachment to cart.
11AW	2	Front-chock locking pins	do	Secures breech-carrying attachment to cart.

CARRYING ATTACHMENT FOR THE CARRIAGE.

12A	1	Plate	Steel	Bolted to rear timbers (10K). Makes seat for base of carriage.
12B	2	Reinforcing angles	do	Riveted to underside of plate (12A), reinforcing it.
12C	2	Angles	do	Riveted to underside of plate (12A) to aid seating of carriage.
12D	2	Countersunk-head bolts	do	Fasten plate (12A) to rear cross timbers (10G).
12E	2	do	do	Do.
12F	1	Shoulder stud	do	Bolted to plate (12A). Fits through pintle hole in carriage.
12G	1	Shoulder-stud pin	do	Through stud (12F) holding fastening key (12H) in place.
12H	1	Fastening key	do	Fastened to stud (12F). Secures carriage to cart.
12K	1	Washer	do	Over end of pin (12G).
12L	1	Crown nut	do	Fastens stud (12F) to place (12A).
12M	1	Split pin	do	Holds nut (12L) in place.

12N	1	.....do.....	.....do.....	Holds pin (12G) in place.
12P	4	Nuts.....	.....do.....	Hold bolts (12D and 12E) in place.
12Q	4	Washers.....	.....do.....	Between nuts (12D) and place (12A).
12R	1	Leather thong.....	Leather.....	Through handle of pin (12G).
12S	2	Bars.....	Steel.....	Fastened to poles (12S). Make up rear end of shafts.
12T	2	Poles.....	Ash.....	Fastened to bars (12T). Make up main part of shafts.
12U	2	Upper braces.....	Steel.....	Fastened to bars (12T). Brace shafts.
12V	2	Lower braces.....	.....do.....	Do.
12W	2	Shaft hooks.....	.....do.....	Fastened to poles (12B). For harness attachment.
12X	2	Shaft guides.....	.....do.....	Fit over bands (10H) helping to support shafts.

CARRYING ATTACHMENT FOR BASE.

13A	3	Base support.....	Steel.....	Bolted to cross timbers (10G). Carry spades (6X) of base.
13B	1	.....do.....	.....do.....	Do.
13C	4	Locking pins.....	Forged steel.....	Fasten base to cart.
13D	4	Chains.....	Steel.....	Fastened to locking pins (13C).
13E	4	Chain washers.....	.....do.....	Fastened to bolts. Chains (13D) are fastened to them.
13F	1	Countersunk wood screw.....	.....do.....	Fasten support (13B) to timber (10G).
13G	3	Countersunk-head bolts.....	.....do.....	Fastens supports (13A) to timbers (10G).
13H	4	Bolts.....	.....do.....	Fastens supports (13A and 13B) to timbers (10G).
13K	7	Hexagonal nuts.....	.....do.....	Holds bolts (13G and 13H) in place.
13L	3	Washers.....	.....do.....	Fit over ends of bolts (13G).

CARRYING ATTACHMENT FOR BOMB.

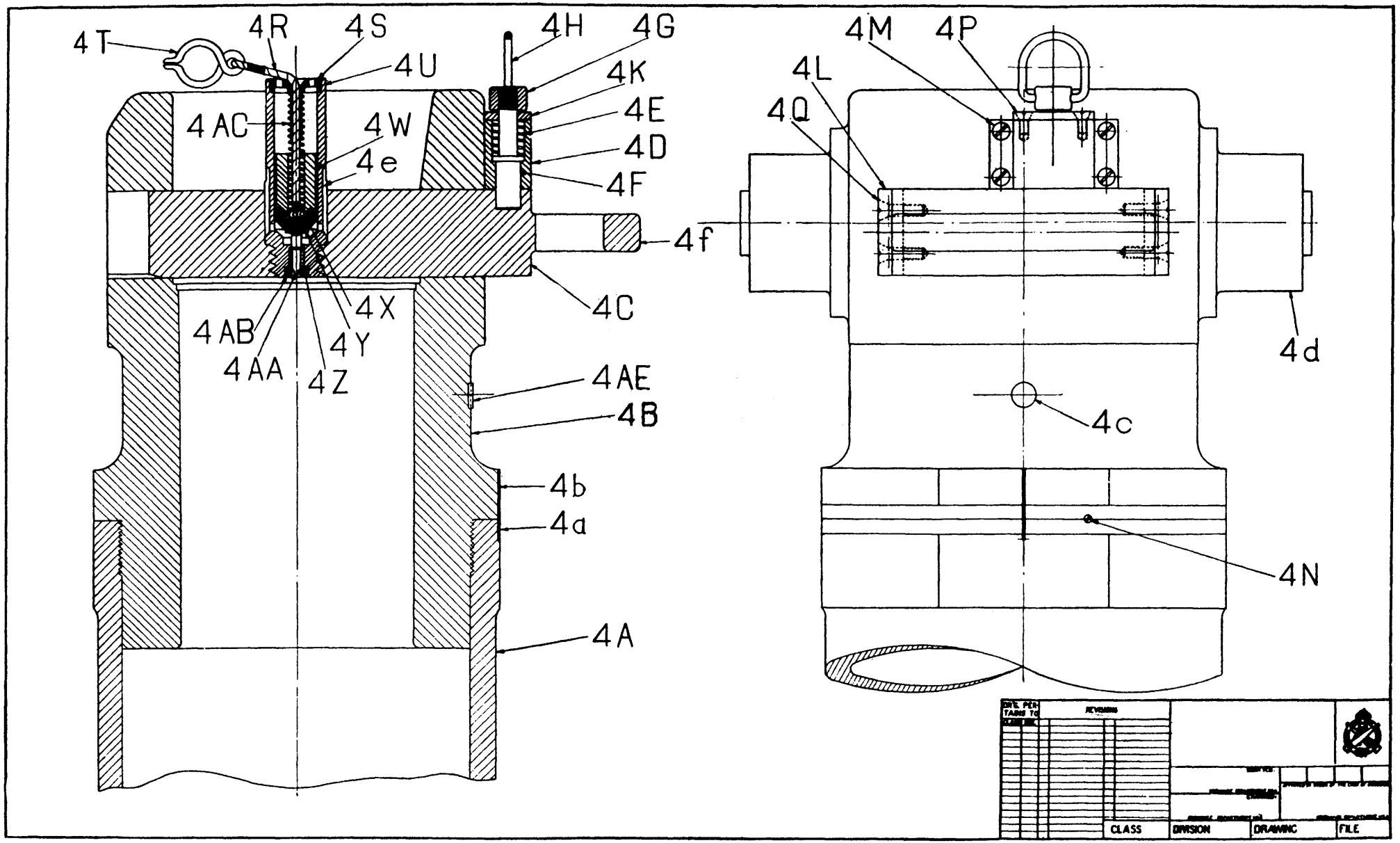
14A	2	Angles.....	Steel.....	Fastened to upper chocks (14F) and support them.
14B	4	Racks.....	Forged steel.....	Fastened to guides (10C). Support upper framework.
14C	4	Eyebolts.....	.....do.....	Fastened to racks (14B). Fastening for chains (14P).
14D	4	Stop pins.....	Steel.....	Fastened to racks (14B), holding them in proper position.
14E	4	Upper-chock locking pins.....	.....do.....	Pass through racks (14B) and angles (14A), locking upper framework to racks.
14F	2	Upper chocks.....	Oak.....	Between angles (14A). Hold shells in place.
14G	1	Lower front chock.....	.....do.....	Fastened to (10AS). Support shells.
14H	1	Lower rear chock.....	.....do.....	Fastened to angles (10AS). Support shells.
14K	4	Upper-chock collar bolts.....	Steel.....	Fasten upper chocks (14F) to angles (14A).
14L	4	Lower-chock collar bolts.....	.....do.....	Fasten lower chocks (14G) and (14H) to angles (10Y).

CARRYING ATTACHMENT FOR BOMB—Continued.

Symbol.	Quantity.	Nomenclature.	Material.	Location and purpose.
14M	4	Rack locking pins	Steel	Lock racks (14B) to carts.
14N	4	Chain rings	Wrought iron	Fastening under cart for chains (14P).
14P	8	Twisted coil chain	Steel	Prevent locking pins (14E and 14M) from being lost.
14Q	4	Split pins	do	Hold nuts (14R) in place.
14R	4	Crown nuts	do	Hold bolts (14K) in place.
14S	4	Projectile supports	do	Fastened to lower rear chock (14H).
14T	4	Carriage bolts	do	Fasten supports (14S) to chock (14H).
14U	4	Lag screws	do	Do.
14V	4	Nuts	do	Hold bolts (14T) in place.

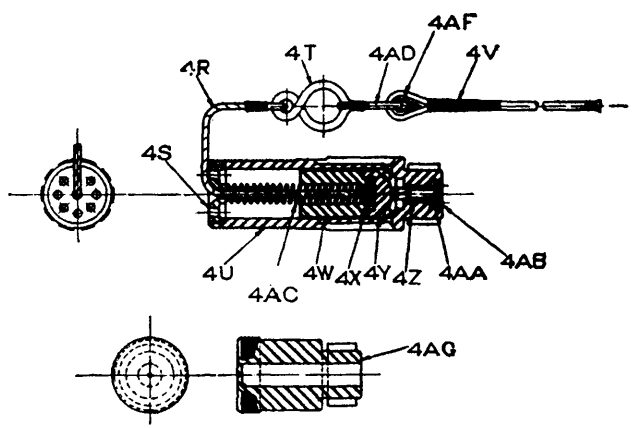
SHELL.

15A	1	Body	Steel	Main part of shell.
15B	2	Plates	do	Welded to body (15A). Steady shell in its flight.
15C	4	Angles	do	Riveted to plates (15B) holding them rigidly at right angles.
15D	1	Adapter	do	Screwed into nose of body (15A). Carries booster casing (15E).
15E	1	Booster casing	do	Screwed into adapter (15D). Carries booster charge.
15F	1	Fuse socket	Brass or gilding metal	Fitted into fuse socket holder (15G). Part of fuse container.
15G	1	Fuse-socket holder	Steel	Fitted into booster casing (15E). Carries fuse socket (15F).
15H	1	Washer	Felt	Fits around booster casing (15E). Holds bursting charge in place.
15K	1	do	do	Fits around fuse socket (15F). Holds booster charge in place.
15L	1	do	Lead	Fits between adapter (15D) and body (15A).
15M	28	Rivets	Steel	Fastens angles (15C) to plates (15B).
15N	1	Link	do	Fastens cover (15P), ring (15Q), and washers (15R and 15S) together.
15P	1	Cover	Tin plate	Fastened to one side of felt washer (15R).
15Q	1	Ring	Steel	Fastened to end of link (15N). Provides means of withdrawing plug from adapter (15D).
15R	1	Adapter plug washer	Felt	Forms main part of plug.
15S	1	do	Copper	Fits against felt washer (15R) and is soldered to link (15N).

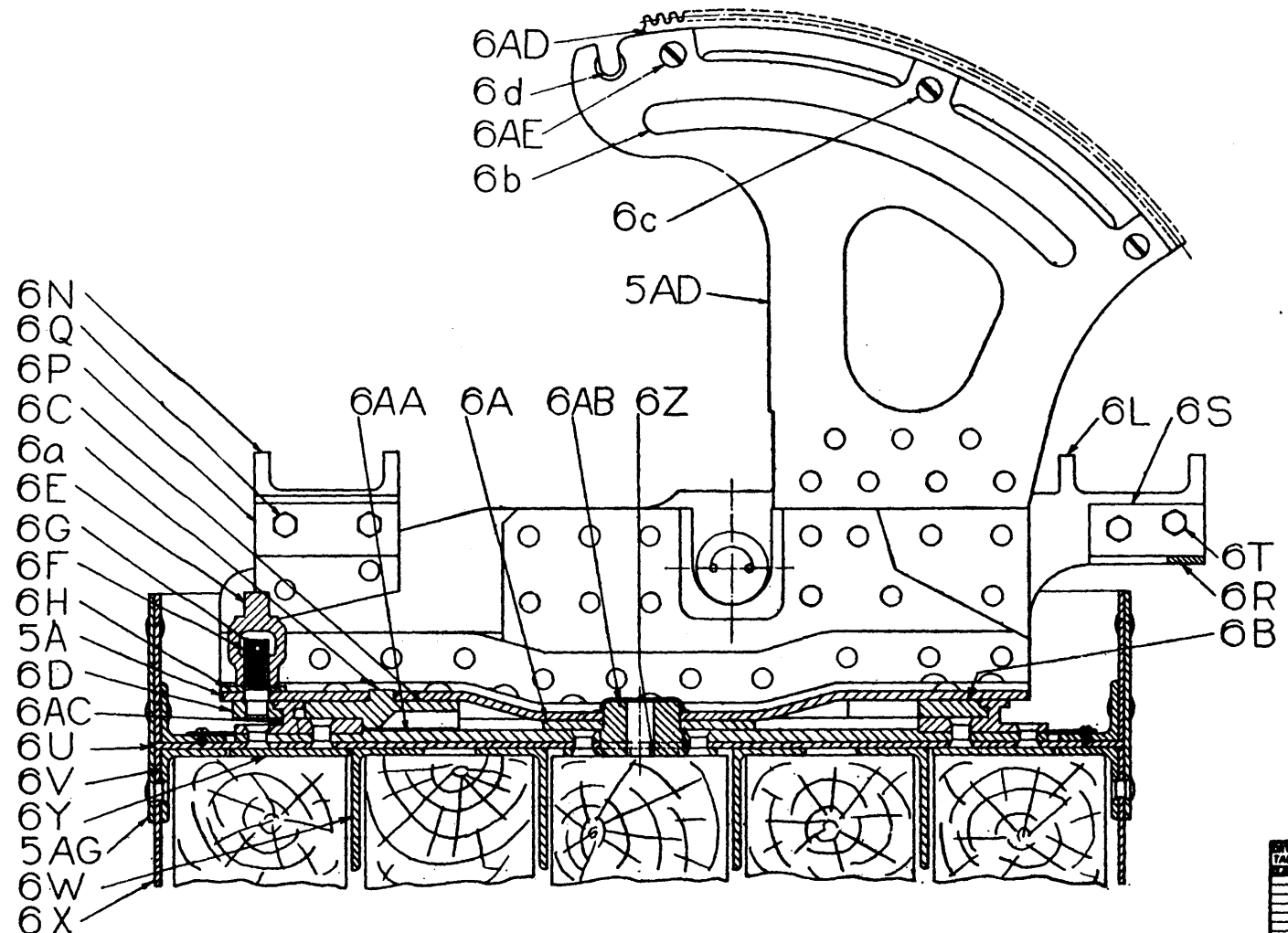


Sectional views of the breech and the firing mechanism.

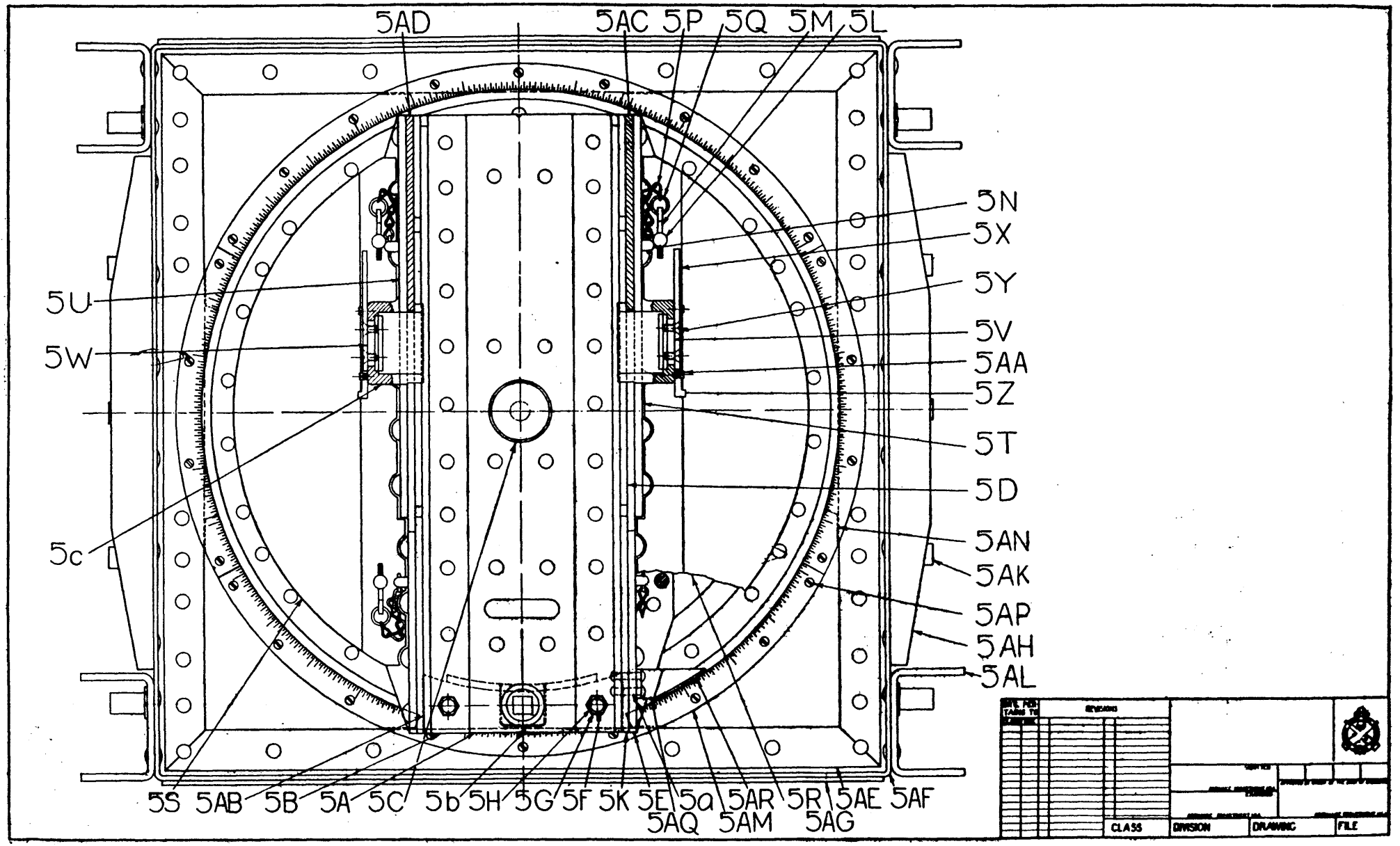
PLATE 2.



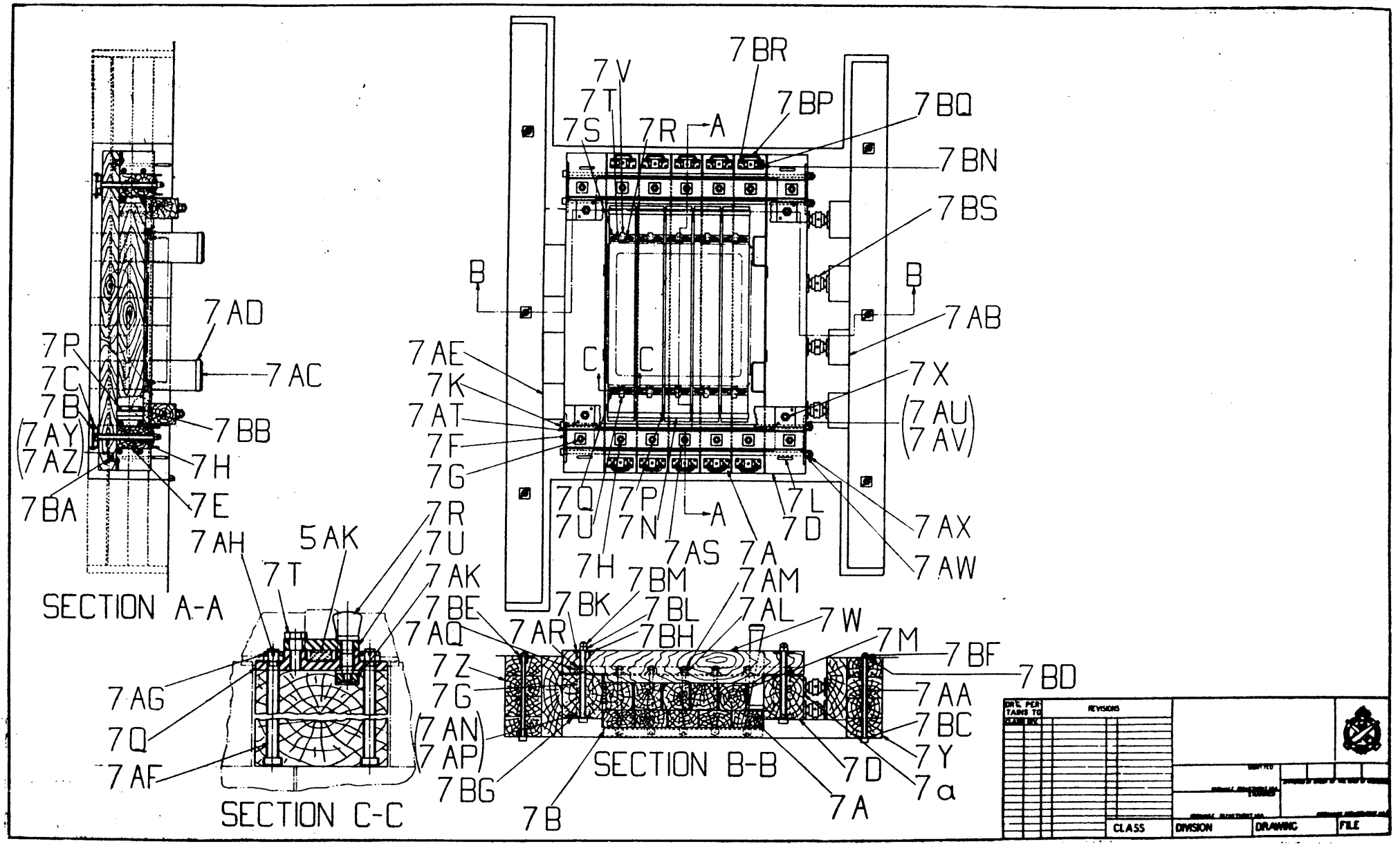
Sectional views of the firing mechanism and the sight plug.



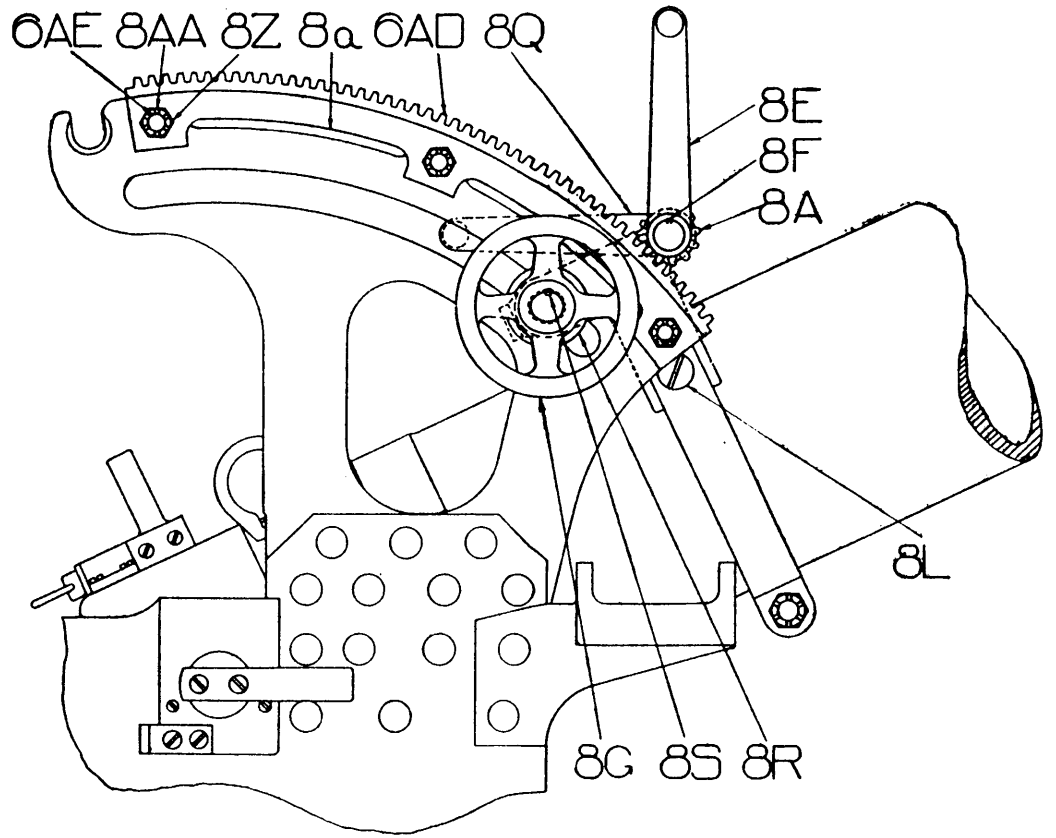
Sectional side view of the assembled carriage and base.

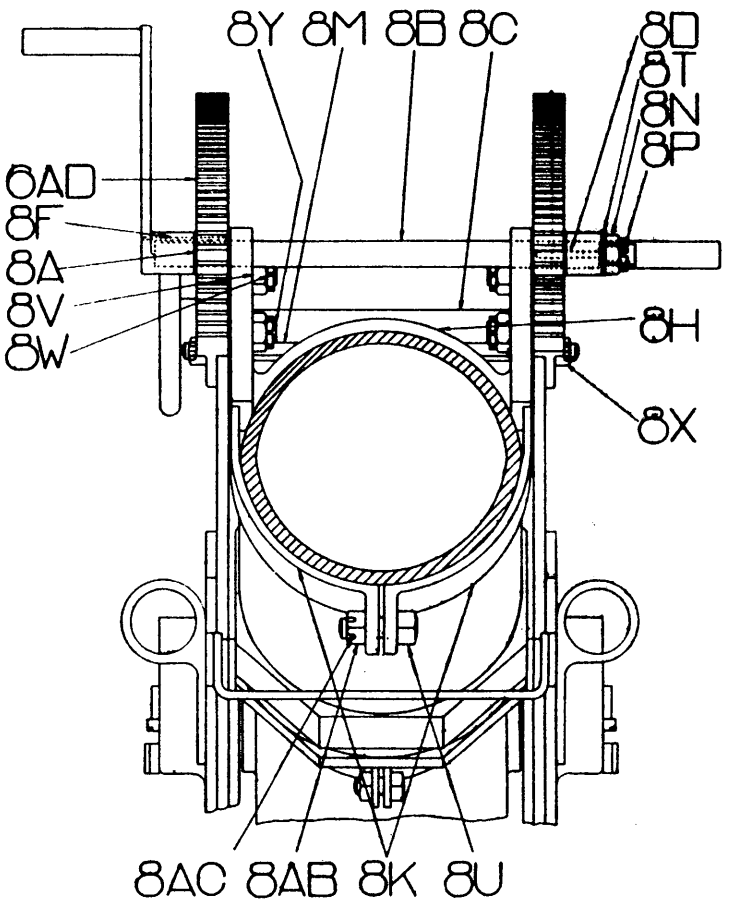


Plan view of assembled carriage and base.



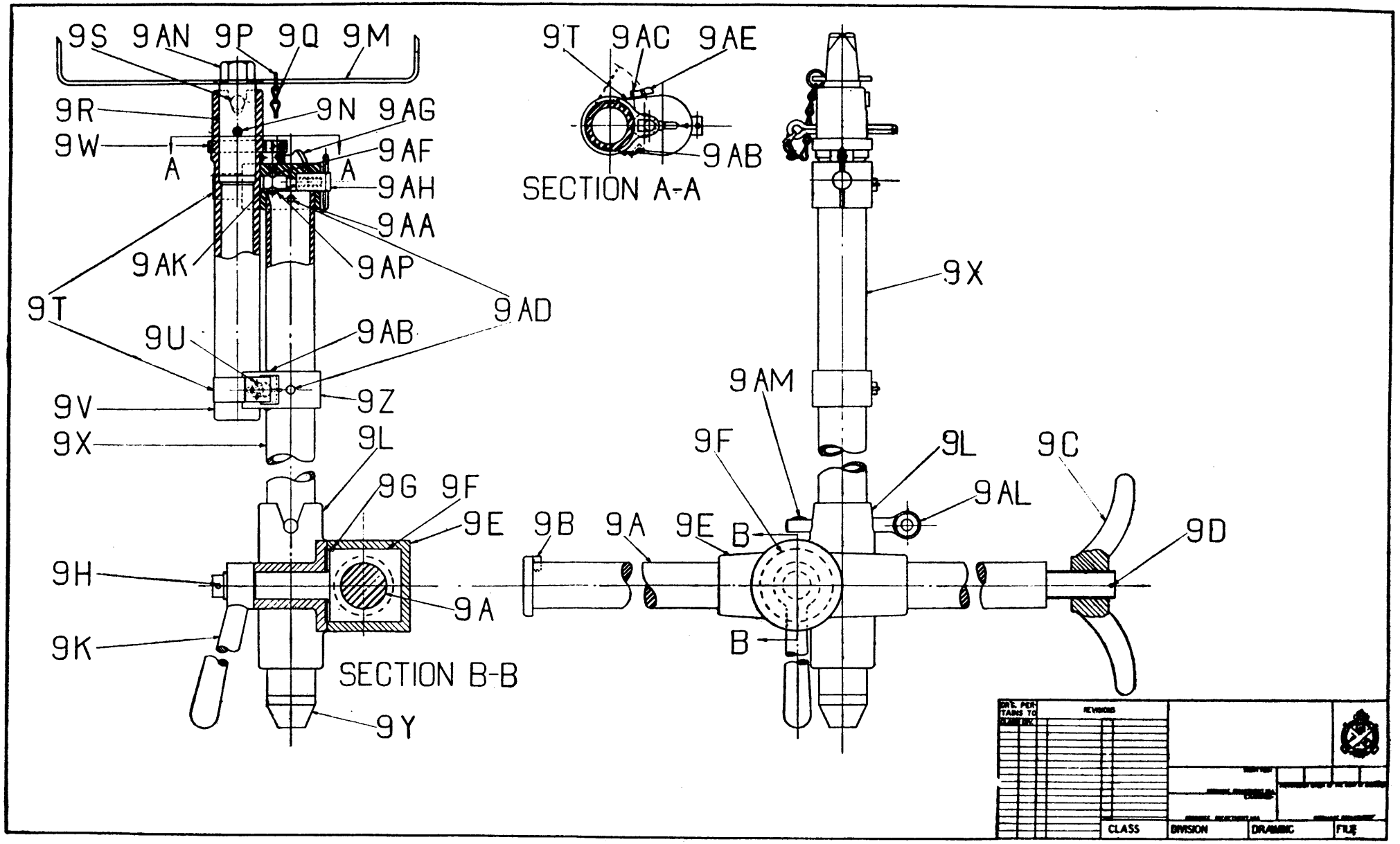
Four views of the wooden platform.



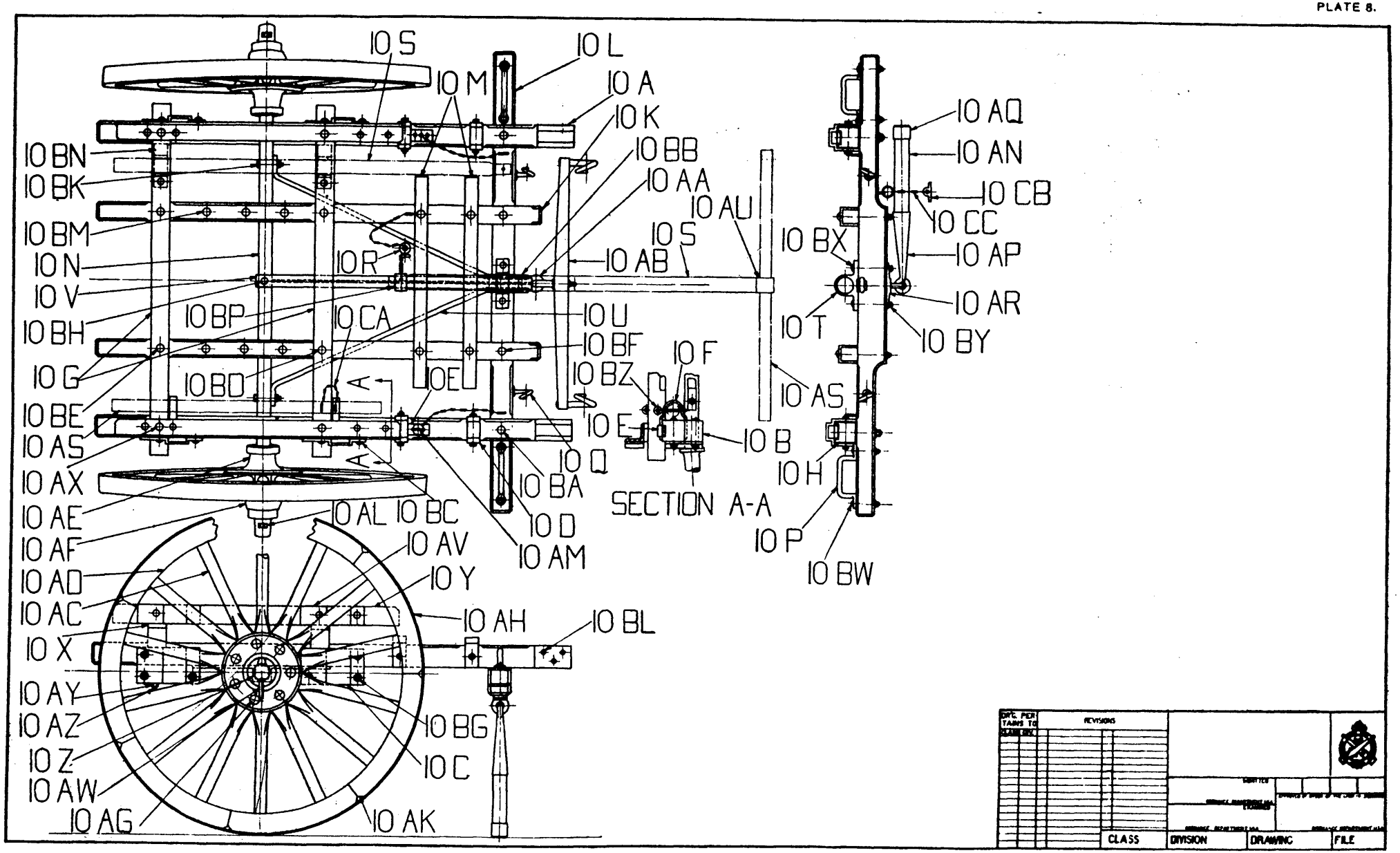


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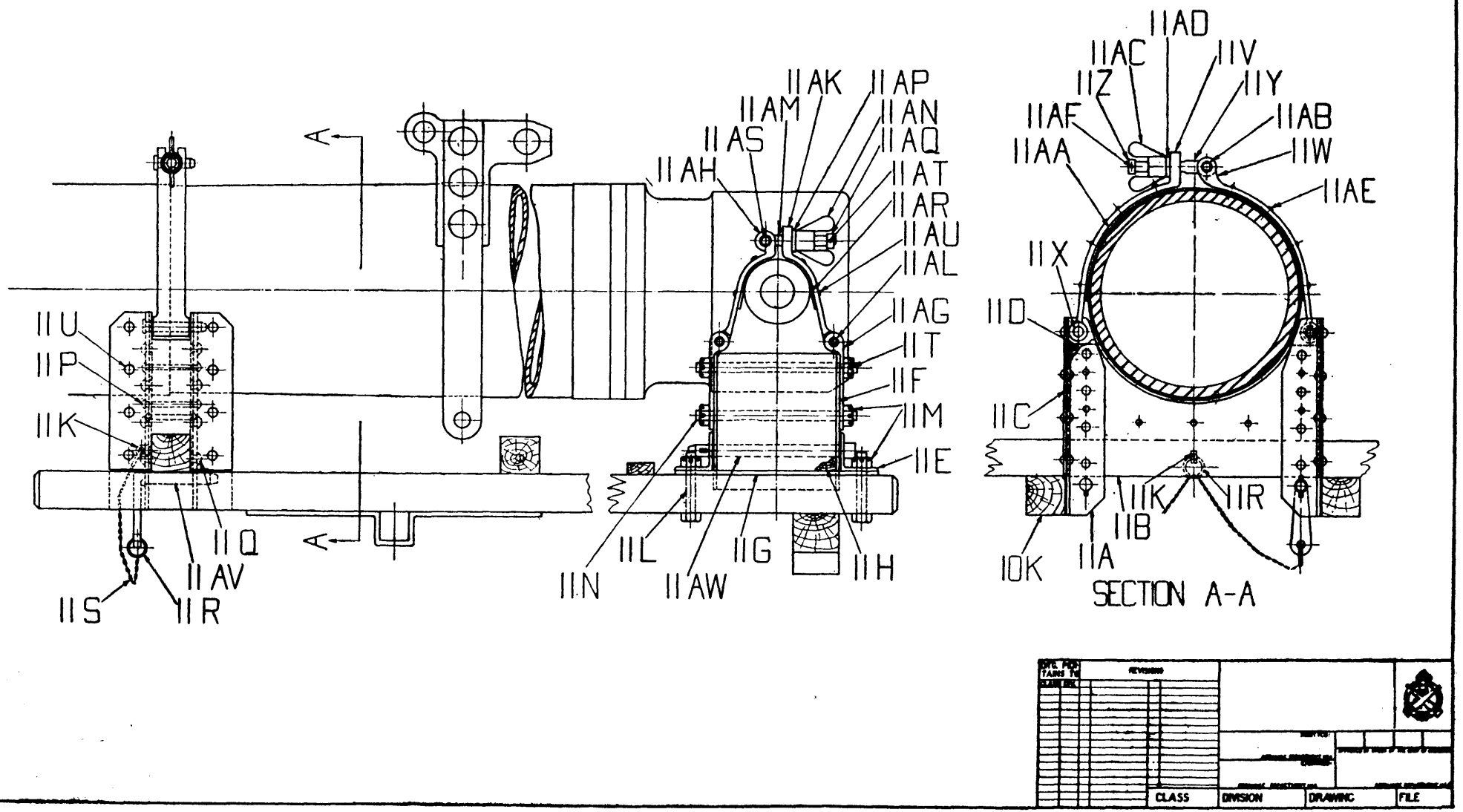
Two views of the assembled elevating mechanism.



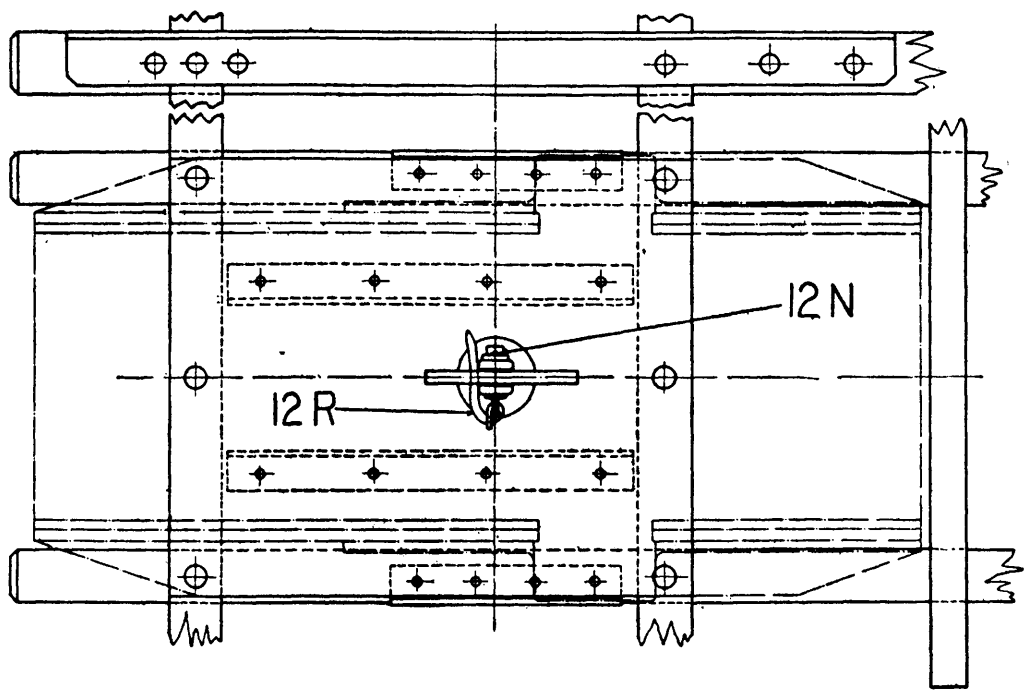
Two views of the assembled sight.

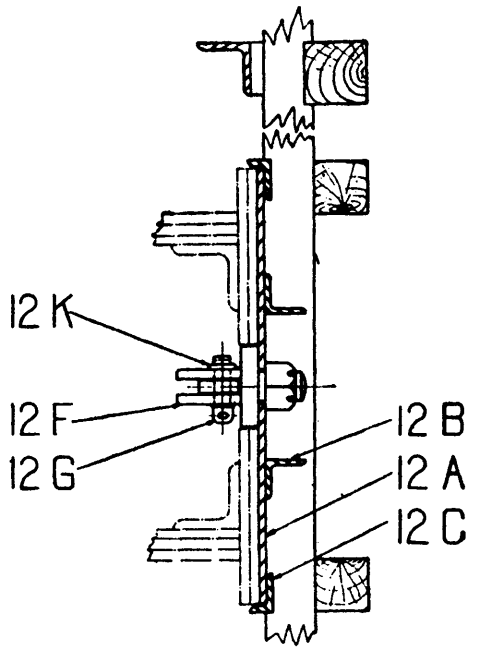


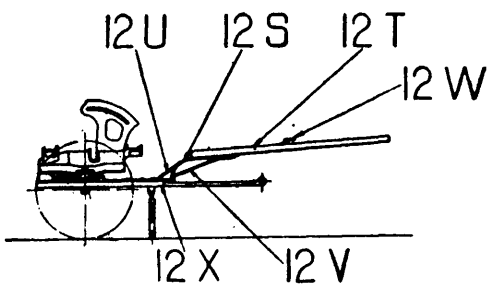
Three views of the assembled cart.

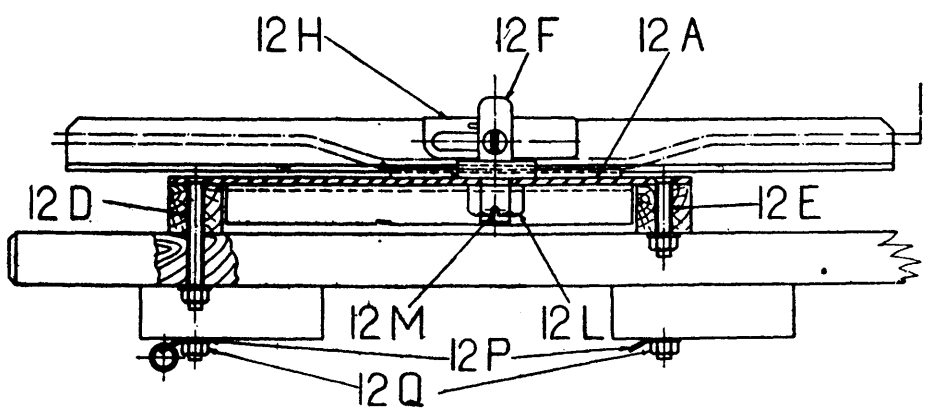


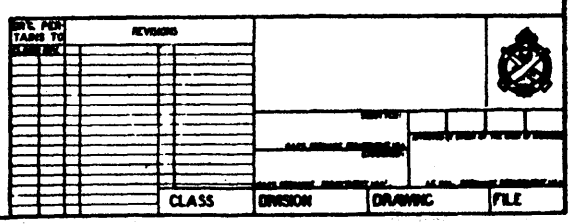
Two views of the carrying attachment for the barrel and breech.



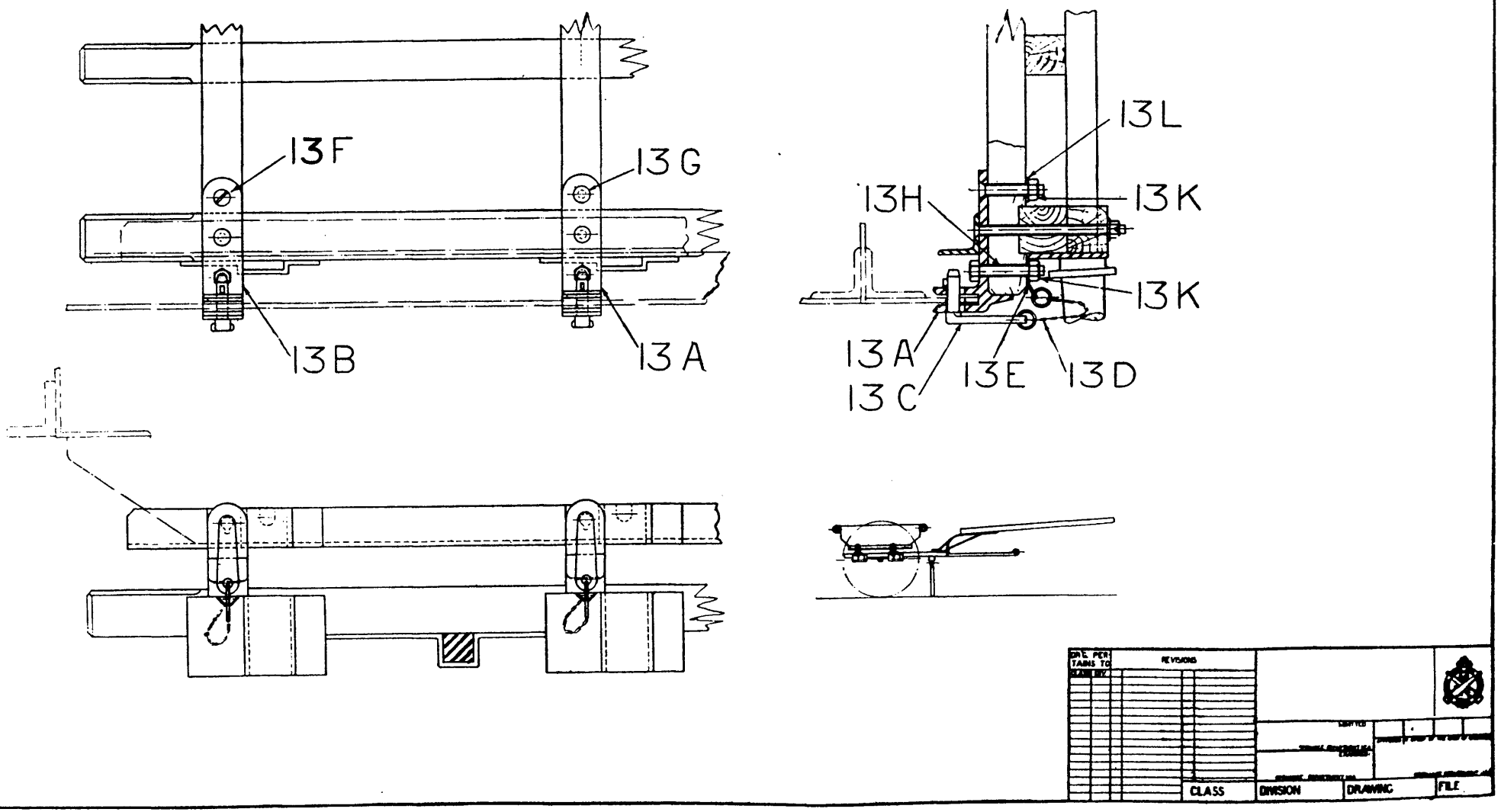




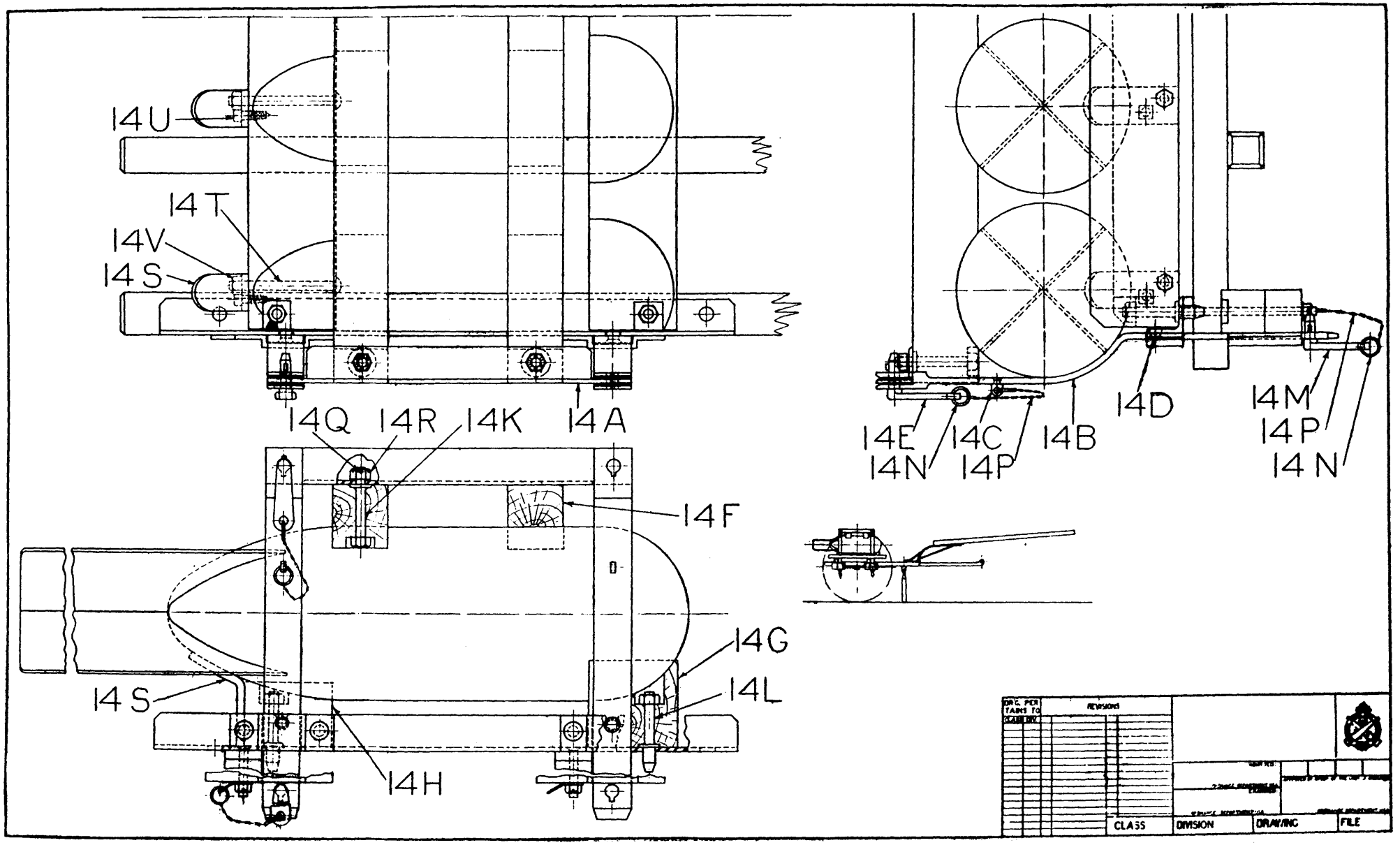




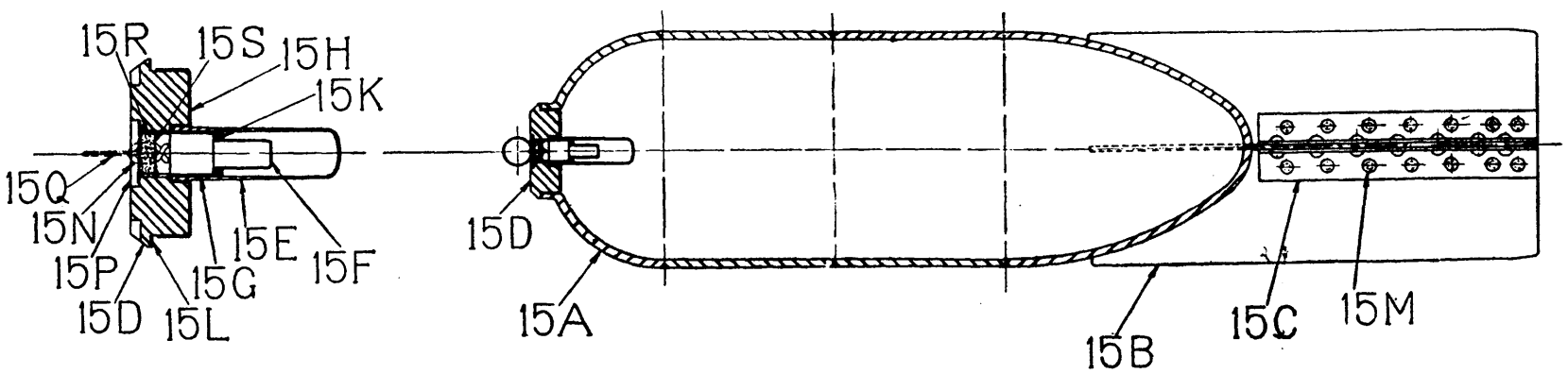
Three views of the carrying attachment for the carriage.



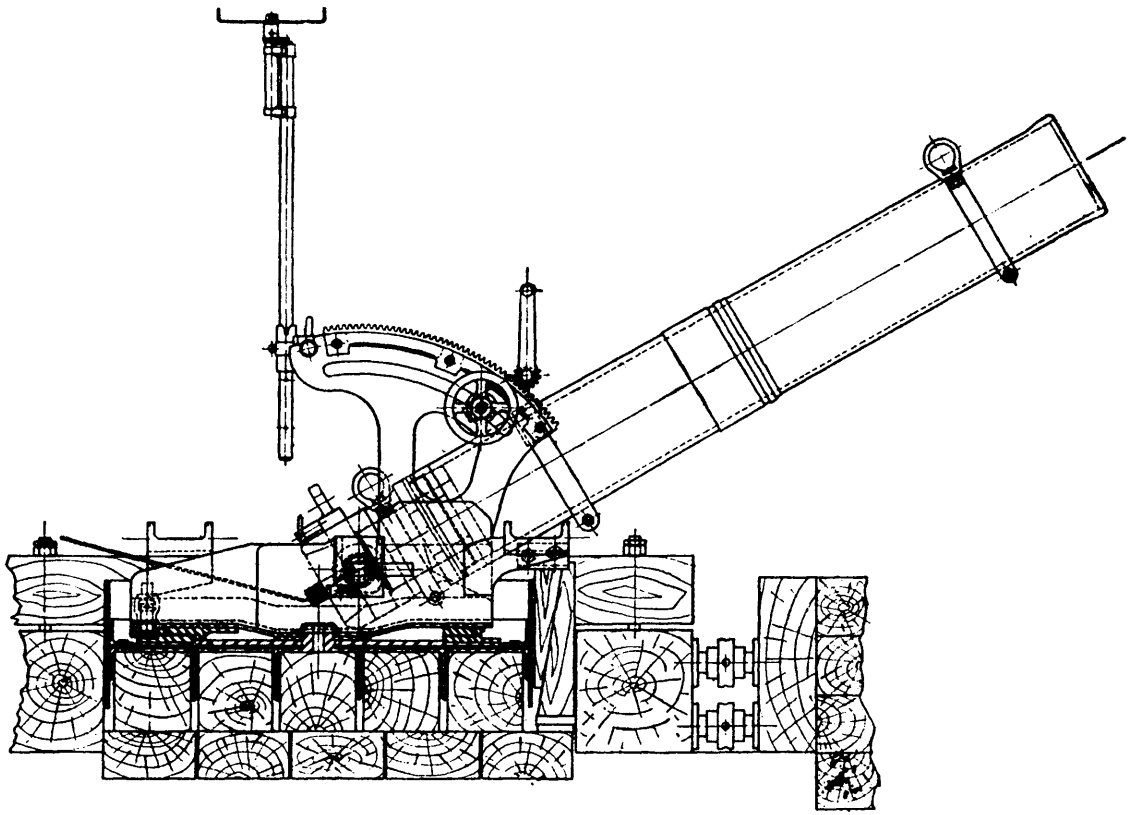
Three views of the carrying attachment for the base.



Three views of the carrying attachment for the shell.



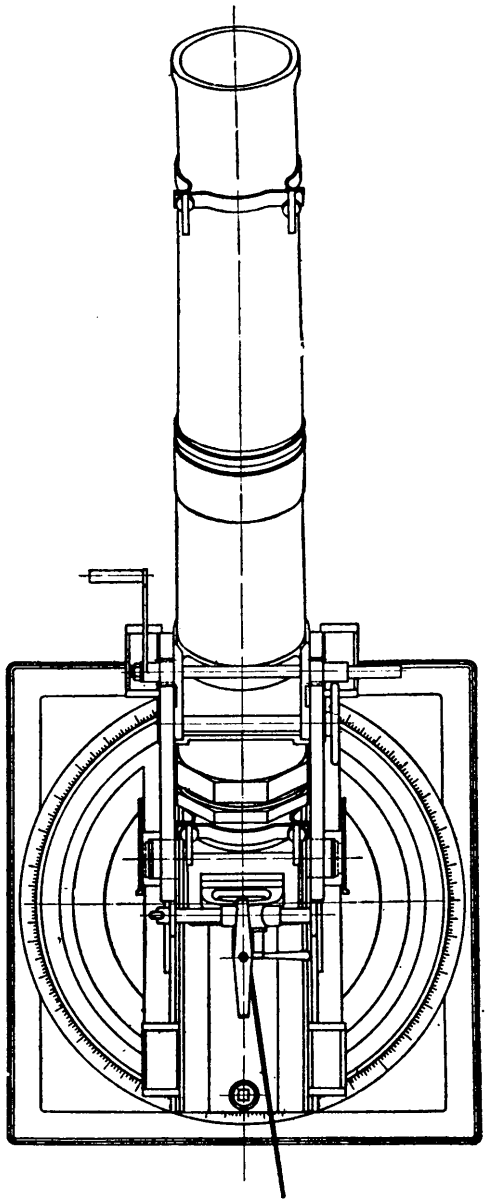
Sectional view of the assembled shell.



REVISIONS

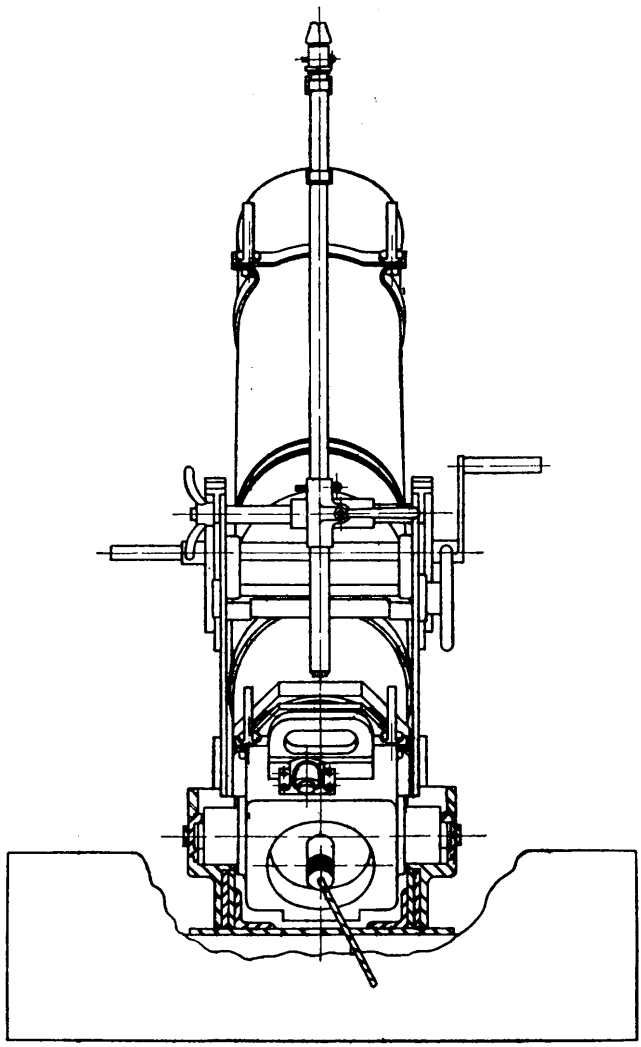
CLASS | DIVISION | DRAWING | FILE

Front elevation of assembled mortar.



Plan view of assembled mortar.

PLATE 16.



Side elevation of assembled mortar.