PROVISIONAL INSTRUCTIONS
FOR THE
4.2" CHEMICAL MOTAR

Prepared by direction of the
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The 4.2 Chemical Mortar

DESCRIPTION OF MORTAR

1. The 4.2" Chemical Mortar is a rifled muzzle loading weapon designed for high-angle fire, capable of a maximum range of 2400 yards and a minimum range of 600 yards.

2. The mortar consists essentially of a barrel, bipod and baseplate. A sight is furnished for laying elevation and direction. The range may be varied by changing the elevation or by varying the propellant charge, or by a combination of the two. The mortar may be fired at a sustained rate of fire of five rounds per minute, and if emplaced in hard ground may be fired for a rapid burst of 20 rounds per minute.

3. The barrel is a steel tube finished to careful inside dimensions and closed in at one end called the breech or base end. It is fitted near the muzzle with barrel clamps. The clamps are so designed that the barrel is free to rotate but cannot move longitudinally with reference to the clamp. On the underside of the front clamp is a threaded lug through which the traversing screw travels. The breech is closed and fitted with a base cap which carries a striker pin protruding into the barrel. The base cap is screwed over the breech or base end of the barrel. The base cap washer is placed in the base cap to insure a gas-tight joint between the base cap and barrel. The base cap has two pins projecting radially which fit in slots in the baseplate cup and prevent rotation of the barrel. The barrel is rifled with 24 grooves and lands. The depth of the groove is 0.03 inch, the width of land is 0.0625 inch. The pitch is zero to one turn in 20 calibers. The recoil of the mortar is transmitted to the ground through the baseplate, against which the base cap rests. The barrel is supported near the muzzle by a bipod fitted with elevating and traversing screws. A muzzle cover of canvas or leather is placed over the muzzle end of the barrel to protect the interior surface from moisture.

4. The bipod consists essentially of the following:-

a. Legs. The legs consisting of two steel tubes fitted with feet and cross-stay lugs, are attached by means of male and female fork ends to the trunion standard. They are held rigidly apart by the cross stay which is hinged at its middle point but which locks in position as the hinge passes the dead center. The cross-stay end is tapped to take one end of the cross-stay tongue so that any wear which may occur in the cross-stay bolts can be taken up at this point.

b. Trunion Standard. The trunion standard forms the bipod head and also houses the elevating mechanism.

c. Elevating Mechanism. The trunion standard is fitted with a bevel gear, threaded to receive the elevating screw, and a bevel pinion which turns on a stud. These gears are operated by an elevating gear handle. A clockwise movement of the handle elevates the screw.

A bevel gear cover, fastened to the trunion standard by three cap screws, protects the elevating mechanism. The upper end of the elevating screw is fitted with a yoke which holds the traversing mechanism.

d. Traversing Mechanism. Holes in each arm of the yoke form bearings in which the traversing screw shaft revolves. The shaft supports and drives the hollow traversing screw by means of a dog clutch. The screw passes through and engages with threads in the lug of the barrel clamp. The screw is rotated by the traversing screw shaft handle. The traversing screw shaft, together with the clutch and traversing screw handle, forms a bolt for locking the barrel and bipod together. This bolt is held in position by the traversing screw shaft locking pin, which in turn is held in its socket by a spring. The traversing mechanism limits are 40 mils right and 40 mils left.

5. The baseplate is made of alloy steel in the form of a truncated pyramid 25 inches square at the base. A cast-steel cup is bolted to the baseplate. The cup is slotted to receive the pins on the base cap and steel latches are closed over the pins to keep the barrel from rebounding from the base plate when the mortar is in action.

6. The MI sight consists essentially of three parts, viz., body, traversing head and sighting tube. It serves the purpose of determining the elevation of the barrel, aiming the mortar on initial set up, and correcting the mortar position between rounds during action. The body is so designed that it is readily attached to a bracket carried on the front barrel clamp. On the body is mounted the traversing head with sighting tube. The traversing head is designed so that it can be rotated both horizontally and vertically. The degree of movement is indicated by scales graduated to mils. Two level bubbles indicate the position of the barrel with reference to the horizontal or ground line. The sighting tube, mounted on the traversing head, carries the open sights and also the vertical cross wire and slit. The sighting tube is held by two fulcrum screws which allow the sighting tube to swing in a vertical plane without disturbing the traversing head setting. This sight does not correct for "cant" or "drift".

7. The goniometer sight has been issued in the past to certain organizations and is now obsolescent. This sight is a compact right angle telescope containing cross lines and a mil scale. It is mounted on a base which fits the upper edge of the muzzle of the mortar when in the firing position. A cross bubble is provided to set the sight in the vertical plane of the axis of the bore. In operation, the sight is placed on the upper edge of the muzzle, the bubble centered, and the desired deflection laid off by traversing the mortar. This operation places the sight off center, and it is necessary to again center the bubble and traverse the mortar. This sight corrects for "cant" but not for "drift".

8. The weights of the component parts are as follows:

Barrel	95 lbs.
Baseplates	100 "
Bipod	35 "
Total	230 "

9. The mortar packing box is a strongly braced wooden box fitted with a hinged lid secured with metal hasps and a padlock. The inside of the box is provided with partitions and cross members for holding the various mortar components, accessories, and spare parts. The packing box has four rope handles to facilitate handling. It is approximately 55 inches long by 18 inches wide by 13-1/2 inches high, has a displacement of 7.7 cubic feet and a combined box and packing weight of 263 pounds.

II

DESCRIPTION AND FUNCTIONING OF SHELL AND FUZE

10. a. The shell, filled and completely assembled ready to fire weighs 25 lb. 8 oz. Of this weight about 7 lb. 3 oz. is the filling, 1 lb. 8 oz. is the assembled fuze, burster tube, and bursting charge.

b. The overall dimensions of the assembled shell ready to fire are: major diameter 4.191 in., length 20.40 in., of which the fuze comprises 2.00 in.

c. Two complete rounds of shell are packed into a box which weighs 10 lb. and whose approximate dimensions are 26 in. x 10 in. x 6 in. The total weight of the box containing two complete rounds is 61 lb. approximately.

11. a. The shell body is made from a steel forging, machined inside and out. A sheet-steel vane is welded inside the body to aid in stabilizing the shell by forcing the liquid fillings to rotate with the shell. On the base of the shell, integral with the forging, is a threaded stud to which the cartridge container is secured. The cartridge container is made of steel tubing. It has an external thread and two nuts for holding the propellant in the proper location. Radial holes are drilled through the walls to carry the ignition flash to the propellant. An internal thread is provided for attaching the cartridge container to the shell.

b. The nose of the shell is made from drawn steel and welded to the body of the shell. The nose has an adapter which is threaded to take the fuze and a finished cylindrical projection into which the central outside burster tube is pressed, after the shell is filled, thus forming a gas-tight seal. The rotation unit consists of two discs, one of brass called the rotating disc, and one of steel called the pressure plate. The brass member is held to the base of the shell and is approximately equal to the diameter of the shell. The pressure plate is smaller in diameter and fits into the brass disc. The pressure of the propellant gases expands the brass disc forcing it into the rifling grooves.

12. a. The fuze is a bore-safe point-detonating fuze which weighs

1 lb. 8 oz; of this weight 57 grams comprises the tetryl burster charge. The fuze has three safety features:

(1) The setback pellet.
(2) The detonator container which cannot arm until the fuze is fired from the mortar.

(3) The two brass spacers held under the head of the firing pin which prevents the firing pin from being forced down until the spacers are removed by centrifugal force after the fuze is fired from the mortar. To prepare the fuze for firing, it is only necessary to remove the safety pin by pulling same from the fuze just before the shell is dropped down the mortar barrel.

b. The fuze is assembled to the shell and, after removing the safety pin, the shell is ready to fire. When the propellant is ignited, the pressure of the gases creates a setback force which causes the setback pellet to move down against the setback spring, thus releasing the combination detonator carrier and safety fork. At the same time the setback force acts on the retaining ring causing it to cut the shear wire releasing the two brass spacers supporting the firing pin head and firing pin. Although the two brass spacers are released, they remain in position until setback ceases, after which centrifugal force causes them to fly free of the fuze. Centrifugal force also causes the detonator carrier to move in the direction of its projection from the fuze body. The detonator carrier, however, cannot move over into armed position until the shell is clear of the gun, because the free end of the carrier is held back by the inner surface of the barrel. Once the fuze is clear of the muzzle centrifugal force carries the detonator carrier out to the full armed position where the detonator is in line with the firing pin and explosive train. In this position, centrifugal force also actuates the lock pin causing it to move partly out of the detonator carrier into a hole provided in the body, thus locking the carrier in the armed position. After the spacers leave the fuze, the firing pin is supported by the shear wire which prevents air pressure forcing the firing pin against the detonator while the shell is in flight. On impact with the ground or other obstacle, the firing pin is driven down, shearing the wire and setting off the detonator, which detonates the tetryl and so bursts the shell.

13. One unit of the propellant consists of a standard No. 12-gage shotgun cartridge loaded with five grains of black powder and 150 grains of ballistite. The black powder is placed next to the primer and acts as an aid in igniting the ballistite. The second unit is made up of thin perforated discs of non-hydroscopic powder. In the center of each disc is a hole which allows the disc to slip over the cartridge container. To assemble the propellant, the disc powder, which is packed in bundles of 150 grains each, is slipped over the cartridge container and the compression nuts adjusted to hold the discs in proper location with reference to the radial holes in the cartridge container. The 12-gage cartridge is then inserted in the cartridge container and pushed forward until the flange of the cartridge is seated against the container. A full charge consists of eight bundles of discs of 150 grains each, making a total of 1200 grains. The charge may be increased or diminished by adding or removing the number of bundles of powder discs.

III

OPERATING INSTRUCTIONS

14. An excavation should be made and the baseplate fitted so that it faces normal to the line of fire and is bisected by it. The baseplate should make an angle with the horizontal equal to the complement of the angle of elevation. In order to add stability in soft ground, four sand bags filled and flattened to three (3) inches thickness should be placed under baseplate. When ground is very wet or soft three (3) 2-inch boards should be placed under sand bags. These boards are carried on ammunition carts. The excavation should be deep enough so that when barrel and bipod are in firing position, the bipod feet will be firmly on the ground with the following precautions observed:

a. Barrel normal to baseplate.
b. Plane of bipod normal to barrel.
c. Not more than six (6) inches of elevating screw visible above the bevel gear.

The lower end of the barrel is placed in the depression of the baseplate cup and the steel latches clamped over the radial pins of the base cap. With the barrel held in a position approximating the desired setting of the mortar, the bipod is placed in position and locked to the barrel. The feet of the bipod should be planted firmly in the ground, with the legs as nearly as possible at right angles to the barrel. A line from the center of the baseplate in the direction of fire should pass midway between the feet of the bipod. Sand bags are placed upon each foot of the bipod to overcome any tendency of the mortar to lift up the feet of the bipod during action. Sand bags are also placed on the baseplate around the base of the barrel to aid in stabilizing the mortar, one bag wedged between barrel and ground.

15. After the mortar is emplaced, minor adjustments for lateral direction are secured by means of the traversing screw. The barrel is then given the elevation corresponding to the desired range by operating the elevating screw. The sight, being set for the desired range indicates when the barrel has the proper elevation. On the initial setting of the mortar, the sight is set for the desired elevation. The mortar is then adjusted until both bubbles are centered. The mortar is now ready for laying on the target. When lining the sight on the target or aiming stake, the traversing head should read zero. This will simplify subsequent adjustments as all readings will be direct from the scale. If during action the mortar shifts from its original setting, it can be restored by recentering both bubbles and relining sight on target or aiming stake. This must be done between rounds, as sight cannot be safely operated during action.

16. Deviation of the shell from the line of fire is caused by wind and drift. These factors must be corrected by proper changes in the deflection applied to the sight. Drift is due to rotation of the projectile and causes the shell to deviate to the right of the line of fire. Corrections for wind and drift are shown in the following tables.

Table I

Corrections for Drift

Range Yds.	Drift to Right Mils
400	5
800	10
1200	15
1600	20
2000	25
2400	30

Table II

Correction for 3:00 o'clock or 9:00 o'clock winds

(Flank Winds)

Deflection in Mils

Range Yds.	Velocity of Wind 5 MPH	10 MPH	15 MPH	20 MPH
400	0 Mils	5 Mils	5 Mils	10 Mils
800	0 "	5 "	10 "	15 "
1200	5 "	10 "	15 "	20 "
1600	5 "	10 "	20 "	25 "
2000	5 "	15 "	25 "	30 "
2400	10 "	20 "	30 "	40 "

For a wind from Left give Deflection Left.

For a wind from Right give Deflection Right.

Interpolate for midranges and winds.

TABLE III

Corrections in yards for 12:00 o'clock or 6:00 o'clock winds.

(Head or Tail Winds)

Range Yds.	Velocity of Wind			
	5 MPH	10 MPH	15 MPH	20 MPH
400	5 Yds.	10 Yds.	20 Yds.	20 Yds.
800	10 "	20 "	30 "	50 "
1200	20 "	40 "	60 "	80 "
1600	30 "	60 "	90 "	120 "
2000	40 "	80 "	120 "	160 "
2400	50 "	100 "	150 "	200 "

For tail wind (6:00 o'clock) subtract from the Range.

For a head wind (12:00 o'clock) add to the Range.

Interpolate for midranges and winds.

TABLE IV

Corrections for 10:00 to 11:00 o'clock winds or 1:00 to 2:00 o'clock winds

Range	Velocity of Wind							
	5 MPH		10 MPH		15 MPH		20 MPH	
Yds.	Def. Mils	Rn. Yds.	Def. Mils	Rn. Yds.	Def. Mils	Rn. Yds.	Def. Mils	Rn. Yds.
400	0	+ 5	0	+ 5	0	+10	5	+ 15
800	0	+ 5	0	+10	5	+ 20	5	+ 30
1200	0	+15	5	+30	10	+ 40	10	+ 50
1600	5	+20	5	+40	10	+ 60	15	+ 80
2000	5	+25	10	+50	15	+ 80	15	+100
2400	5	+30	10	+60	15	+100	20	+130

For a wind from Left give deflection Left.

For a wind from Right give deflection Right.

Interpolate for midranges and winds.

TABLE V

Corrections for 7:00 o'clock to 8:00 o'clock winds or 4:00 to 5:00 o'clock winds.

Range Yds.	Velocity of Wind							
	5 MPH		10 MPH		15 MPH		20 MPH	
	Def. Mils	Rn. Yds.	Def. Mils	Rn. Yds.	Def. Mils	Rn. Yds.	Def. Mils	Rn Yds.
400	0	-5	0	-5	0	-10	5	-15
800	0	-5	0	-10	5	-20	5	-30
1200	0	-15	5	-30	10	-40	10	-50
1600	5	-20	5	-40	10	-60	15	-80
2000	5	-25	10	-50	15	-80	15	-100
2400	5	-30	10	-60	15	-100	20	-130

For a wind from Left give deflection Left.

For a wind from Right give deflection Right.

Interpolate for midranges and winds.

EXAMPLES SHOWING USE OF WIND AND DRIFT TABLES.

Example No. 1. The magnetic azimuth and range to a target has been determined from the map (method described in Par. 7d TR 415-35) to be magnetic azimuth 4020 mils and the range 1800 yds. What is the correction for drift?

Answer. From Table I, it is found that the drift is 22½ mils to the right at 1800 yds. Therefore 4020-23 = 3997 mils magnetic azimuth.

Example No. 2. The magnetic azimuth has been determined to be 15 mils and the range 2000 yds. What is the new magnetic azimuth for drift allowance?

Answer. Table I gives drift as 25 mils right. 15 mils - 25 = 10, 6400 mils - 10 = 6390 mils magnetic azimuth.

Example No. 3. The magnetic azimuth has been found to be 3210 mils, the range 1875 yds. The velocity of the wind is 10 M.P.H. from 3 o'clock. What is the correction for drift and wind?

Answer: From Table I, drift is 24 mils to the right = Left 24 mils.
From Table II, wind correction should be 13 mils to the right.
Therefore 24 left - 13 mils right = 11 mils left.
3210 - 11 = 3199 mils magnetic azimuth.

Example No. 4. The range is 2000 yards and magnetic azimuth 2310. The wind is a head wind from 12:00 o'clock at 8 M.P.H. What is the corrected range and correction for drift?

Answer: From Table III, 2000 + 65 = 2065 yds.
From Table I, 2310 - 25 = 2285 mils magnetic azimuth.

Example No. 5. The range is 1900 yds., magnetic azimuth 1300, wind 15 M.P.H. from 5 o'clock. What corrections?

Answer:

From Table V. Range 1900 - 75 = 1825 yds. Range.
From Table I. Magnetic Azimuth 1300 - 23 = 1277 mils for drift.
From Table V. 1277 + 15 = 1292 mils magnetic azimuth.

17. a. The shell are packed in boxes containing two complete rounds including fuze and bursting charge. In each box there is a sealed container in which are packed two complete propellant charges consisting of two No. 12 gage cartridges and 16 bundles of disc powder. This allows one cartridge and 8 bundles of powder for each shell. Thus packed, the boxes are delivered to the mortar ammunition dump.

b. For purpose of safety as well as economy of effort, the preparation of ammunition should be conducted under competent supervision, in an orderly sequence of operations which should be strictly adhered to, as follows:-

(1) Open boxes and propellant containers.
(2) Remove outside nut from cartridge container. Clean the shell by removing all rust prevention compound and dirt from guides, body, cartridge container and flash outlet holes. Remove any rust or paint from guides by means of emery cloth.
(3) Examine guides for burrs which would cause the shell to stick in the barrel. Burrs should be filed or hammered down.
(4) Place the necessary number of bundles of disc powder on the cartridge container and replace the outside nut so as to secure the powder in a firm compact bundle. Unused powder discs will be salvaged for future use.
(5) Insert cartridge in cartridge container taking care that base flange of cartridge is firmly seated against the cartridge container.
(6) When necessary the split pin of the safety pin may be straightened with a pair of pliers, to facilitate rapid removal by the gun squad.
(7) The shells are now ready for delivery to the firing point.

c. (1) Immediately before firing and at no other time, remove safety pin from fuze. The shell is now ready for firing.
(2) To fire the shell, drop the assembled round into the muzzle of the mortar.
(3) Remove hand quickly from muzzle of the mortar after dropping the shell.

d. As the round nears the bottom of the barrel, the primer of the cartridge strikes the striker pin and fires the cartridge. The flames from the explosion of the cartridge pass through the holes in the cartridge container and ignite the disc powder. The shell, carrying the cartridge case with it, is projected from the barrel and the mortar is ready for another shell.

18. a. Misfires may be due to any of the following causes:

(1) Defective cartridge.
(2) Loose, worn or bent striker pin.
(3) Dirty shell guides.
(4) Dirty bore.
(5) Burst cartridge container from previous rounds.
(6) Bent or crooked cartridge container.

(7) Primer from propellant cartridge of previous round stuck to the striker pin.

b. (1) In case of a misfire all personnel should remain at a safe distance for one minute. The base of the mortar is raised and tilted so that the misfired shell will slide out easily into the hands of a member of the gun crew. Immediately, on receiving the shell, the safety pin should be replaced in the fuze and the shell carefully examined for defects. If shell and cartridge are found correct, an inspection must be made of the inside of the barrel to determine the cause of misfire. In removing the shell, no member of the gun crew should be directly in front or directly in rear of the mortar.

(2) As the fuze is not armed until the shell leaves the muzzle after positive discharge, a misfire normally presents no hazard to the safety of the gun crew, unless a heated barrel or sparks should ignite the disc powder during unloading.

19. Precautions. For safe and proper operation of the mortar, the following precautions should be observed at all times:

a. Be sure to remove the hand quickly from the muzzle of the mortar after dropping the shell.

b. Always see that the upper and lower guides (head and base) of the shell are clean.

c. Be sure that the cartridge end of the shell is pointed forward when firing and that the shell is dropped into the mortar cartridge end first.

d. See that the cartridge fits closely in cartridge container.

e. Before firing make sure that all oil is removed from the bore of the mortar. If the bore is oily, smoke will be given off and the position disclosed.

f. The position of the mortar should be checked after the first round as the initial charge always tends to seat the baseplate in the ground, thus causing a change in the setting of the mortar.

20. Disassembly and assembly. In assembling and disassembling the mortar no other tools than those issued with the outfit should be used.

a. To dismount barrel from bipod. (1) Lift out the traversing screw shaft locking pin.

(2) Withdraw the traversing screw shaft assembly, which locks the barrel and bipod together.

(3) Lift out the barrel.

(4) Replace the bolt and traversing screw shaft locking pin.

b. To replace the barrel on biped. Lift out the traversing screw shaft locking pin, withdraw the traversing screw shaft assembly, and proceed in the reverse order to that outlined in "a" above.

c. To remove base cap. Use special wrench provided for this purpose applying the wrench to the radial pins on base cap. Light blows on the handle of the wrench may be necessary to start the threads.

d. To replace base cap. Use special wrench for replacing base cap. Care should be taken to insure a tight fit between the base cap and the barrel, to avoid gas leaks.

e. To remove striker pin. Remove base cap from barrel and apply combination wrench to flat milled section of the striker pin. The base cap may be held against rotation, during the operation, by means of the base cap wrench.

f. To replace the striker pin. Proceed in reverse order to that described above. Put a drop of oil on the threads before screwing the striker pin firmly into the base cap.

g. The personnel will have no difficulty in dismounting parts of the remaining mechanism. Care should be taken in dismountingbolts, etc., not to batter them by driving them out with a hammer. A piece of hardwood or a copper drift should be interposed.

IV

CARE AND MAINTENANCE

21. a. The bore of the barrel and all unpainted surfaces should be kept clean and free from rust. The bore should always be kept slightly oiled with a light oil when not in actual use and the muzzle covered with the muzzle cover. The use of the muzzle cover is especially important in rainy weather, as water, in addition to causing rust, seriously affects the range of the mortar. The muzzle cover should be held in place by means of its cord.

b. If the mortar is to remain unused for some time, all bright or unpainted parts, such as the bore, striker pin, screws, gears, threads, etc., after being first thoroughly cleaned should be protected by a light coat of rust-preventing compound as issued. The rust preventing compound is easily removed by the use of burlap or waste dipped in gasoline.

c. The striker pin should be examined from time to time, and if found so worn, bent or defective as to cause misfires, it should be re-placed, care being taken that the new striker pin is tightly screwed in-to the base cap.

d. Examine and tighten the nuts and screws occasionally.

22. It is important that proper attention be given to the cleaning and inspection of the mortar before, during and after firing.

a. Before firing. (1) Remove all oil from the bore. Also remove any excess oil on the outside of the barrel and the bipod.

(2) See that the striker pin is firmly screwed home in the base cap and that the base cap is tightly screwed on to the barrel, insuring a gas-tight fit. Use the base-cap wrench for tightening the base cap.

(3) See that all nuts, bolts, and screws are in position and securely tightened.

b. During firing. (1) The barrel should be swabbed out after every five rounds, except when firing rapid bursts.

(2) The base cap and firing pin should be examined at every opportunity and cleaned and tightened.

c. After firing. (1) Unscrew the base cap and clean and sponge out the barrel, removing all residue. Lightly oil the bore.

(2) Clean the striker pin and then oil lightly.
(3) Clean the base cap and oil.
(4) Examine, clean, and oil all working parts of the bipod.
(5) Clean the baseplate.
(6) Tighten all nuts and screws.

23. Painting. a. All parts of the materiel, with the exception of the bore and bearing surfaces, should be kept well painted as a protection against rust. Clean and wash the materiel thoroughly to remove all dirt and grease and allow to dry before applying the paint. If the weather is cold, warm the materiel before applying the paint.

b. The following parts will be painted in accordance with instructions on drawings and specifications:

(1) The barrel, complete, with sleeve and clamps, except traversing screw and bore.

(2) The bipod, except the gear teeth, elevating screw, and bearing surfaces.

(3) The baseplate.

V.

ACCESSORIES AND SPARE PARTS.

24. Only the tools issued with the mortar will be used in making repairs and adjustments, and they must not be used for any other purpose. When not in use, they should be stored in their proper place in the receptacle provided for them.

25. The mortar packing box is a strongly braced wooden box fitted with a hinged lid secured with metal hasps and a padlock. The inside of the box is provided with partitions for holding the various mortar components, accessories and spare parts. The box is 55 inches long, 18 inches wide and 13⅓ inches high, has a displacement of 7.7 cubic feet and weighs 263 pounds packed.

26. Accessories and spare parts are as follows:-

Accessories -

12 bags, sand, O.D. duck,
1 brush, striping, 1/8"
1 chest, packing
*6 cloth, emery, No. 00, sheets
1 cover, muzzle
1 lanyard, complete
*1 oil, engine, No. 1, qt. can
1 pick-mattock
1 sight, chemical mortar, complete
1 roll, tool, gunners
Consisting of:
1 handle, traversing screw, complete w/locking pin
1 oiler, ½ pt.
1 pin, striker
1 screw, traversing
*1 washer, copper, 2" dia. 1-3/16" hole
*½# waste
1 pliers, combination, 8"
1 wrench, base cap
2 wrenches, combination
1 roll, tool, ammunition
Consisting of:
*6 cloth, emery, No. 00, sheets
2 files, flat, mill, 8"
1 hatchet
*½# waste
1 wrench, fuze
1 spade
3 stakes, aiming, 1¼x1¼x3'
1 swab
2 washers, copper, 2" dia. 1-3/16" hole
*1 waste, bag, 1#

*Expendable

Spare parts -

*1 nut, 3/8", U.S. standard hexagonal for cross-stay center bolt
*1 nut, $\frac{1}{2}$", U.S. standard, hexagonal for bevel pinion stud
*1 nut, $\frac{1}{4}$", U.S. standard, hexagonal for cross-stay bolt.
*1 nut, $\frac{1}{4}$", U.S. standard, hexagonal for tie rod
*1 nut, 0.825" pitch dia., U.S. standard hexagonal for elevating screw
*1 nut, 3/8", U.S. standard, hexagonal for clamping bolt
*2 pins cotter, 1/8" x 1"
*2 pins, cotter, 3/16" x 1-1/8"
1 pin, striker, 3.718, short, w/nipple
*2 pins, cotter, 3/16" x 2"
*1 pin, taper, #1, $1\frac{1}{2}$" long
*1 pin, taper, #2, 1" long
*1 pin, yoke
*1 screw, cap, 5/16" for bevel gear cover

*Expendable.

VI.

THE HAND CART.

27. The 4.2" Chemical Mortar and its accessories and ammunition is transported by means of two wheeled man drawn carts. The carts are constructed of steel and fitted with wire wheels and pneumatic tires, 27 inches in diameter. A detachable draw bar is provided for pulling the carts and handles are attached to the frame for use in lifting the carts onto motor trucks, transport wagons or other vehicles. The over-all length of the cart including the draw bar is 6 feet $9\frac{1}{2}$ inches. The tread of the cart is $31\frac{1}{4}$ inches; the inside width of frame is $25\frac{1}{4}$ inches; the inside length of frame is $32\frac{1}{4}$ inches. The cart complete weighs 167 pounds.

28. The carts are so designed that they may be used interchangeably for carrying either the mortar and accessories or the ammunition. The dimensions of the inside of the frame are such that five shell boxes may be carried thus allowing ten rounds of ammunition for each cart. The shell boxes are carried with sides resting on the frame and are held in place by means of straps running diagonally across the cart.

29. In transporting the mortar and accessories, two metal frames are used. These frames fit inside the cart frame proper and are known as the barrel frame and baseplate frame. To pack the mortar on the cart, the barrel frame is placed in position on the cart frame proper. The mortar barrel, bipod, pick and spade are then placed on the barrel frame and fitted into the indentations or projections provided in the frame for carrying each item. The baseplate frame is then placed on the cart and held in place by means of lugs which register with slots in the barrel frame. The baseplate is then fitted into its frame and the whole load is made secure by means of straps passing diagonally across the cart.

30. The new cleaning rod is carried in the bore of the mortar. The old cleaning rod may be carried with the aiming stakes, or may be shortened by cutting off and rethreading pipe shaft in which case, it can be carried in the mortar.

VII

DRILL, THE MORTAR SQUAD

31. The mortar squad consists of one corporal and eight privates. No. 2 is the gunner and in the absence of the corporal commands the squad. Two hand drawn carts are furnished each squad, one for the transportation of the mortar with accessories and spare parts and one for the transportation of ammunition.

32. The normal depth of one cart including lead ropes, is 12 feet.

33. The normal distance between carts in column is 2 paces.

34. The normal interval between carts in line is 6 paces.

35. To Form the Squad. -- a. Formation. The chemical squad is formed in double rank as follows: Numbers 2, 4, 6 and 8 in front rank, in order from right to left; numbers 1, 3, 5 and 7 in the rear rank, in order from right to left. No. 1 covering No. 2. The squad forms with forty (4Ø) inches between ranks.

b. To Form. The corporal places himself three (3) paces in front of and facing the point he desires the center of the squad to rest when formed and commands: "FALL IN".

At this command the men assemble at attention, the corporal then commands: "CALL OFF". Commencing at the right the men call off alternately rear and front rank 1,2,3,4,5,6,7,8. The command CALL OFF, may be given at any time during the drill. At this command, the members of the squad call off their numbers to indicate the positions they held at the time the command is given.

c. Pistols, if carried, are then inspected at the command of the corporal, as prescribed in TR 50-55.

36. To Procure Carts. -- The squad being formed as described in Par. 35 above, the corporal directs the squad (or designates certain men of the squad) to procure the two carts and gives instructions for placing them.
(NOTE - Carts are usually placed as described in Par. 33, with the mortar cart in front.) After the carts have been properly placed, the corporal reforms the squad three paces in rear of and facing the carts.

37. To Take Posts. The squad being formed and the carts placed as described in Par. 36, the corporal places himself one pace in front of and facing the carts and commands "POSTS". At that command, the squad executes "RIGHT BY TWOS", at double time, halting without command when they have reached their respective positions, which are as follows:

Nos. 2 and 4 lead ropes of mortar cart, No. 2 on the right.
" 1 and 3 handles " " " , " 1 on the right.
" 6 and 8 lead ropes of ammunition cart, No. 6 on the right.
" 5 and 7 handles " " " , " 5 on the right.

The corporal then takes post to the right of and on line with No. 2, facing to the front.

38. To Procure Equipment. -- The mortar squad being formed at the command "(1) SECURE (2) EQUIPMENT", the men fall out and secure the following:

Corporal - Compass and dispatch case, containing mil rule, notebook, range table, flashlight and protractor.

No. 1 - Aiming stakes, sight and clinometer.
No. 2 - Tool roll, gunners
No. 3 and 4 - Baseplate
No. 5 and 6 - Barrel
No. 7 - Bipod
No. 8 - Pick-mattock, spade and sand bags.

No. 1 passes to right of cart and grounds aiming stakes and bag containing sight and clinometer on line with right wheel, points even with end of cart handle, and takes post by center of stakes facing to rear.

No. 2 passes to right of cart, grounds tool roll on line with rear of cart and one pace to the right thereof and then removes baseplate rack and grounds same one pace from right wheel, and takes post facing cart.

Nos. 3 and 4 pass to left of cart and ground baseplate one pace to left of cart, then face toward cart.

Nos. 5 and 6 pass to left of cart and ground barrel between baseplate and cart muzzle to the front. They then face the barrel.

No. 7 halts one pace in rear of cart and grounds bipod on line with right wheel. Then faces the front.

No. 8 halts one pace in rear of cart and grounds pick-mattock, spade and sand bags, in line with right wheel. Then faces front. The corporal halts three (3) paces in rear center of cart.

39. To Load Mortar Carts. -- The command is "(1) BY DETAIL (2) LOAD (3) BARREL (4) BIPOD (5) BASEPLATE RACK (6) PICK AND SPADE (7) BASEPLATE (8) TOOL ROLL (9) AIMING STAKES (Note: If lanyard is carried, it is loaded by No. 1 at this point.) (10) SAND BAGS (11) SECURE LOAD" At the commands from (3) to (11) inclusive, the carts are loaded as follows:-

BARREL. At this command Nos. 5 and 6 place barrel on cart in grooves provided for holding barrel, muzzle to the front. They then proceed to the ammunition dump of the mortar squad if ammunition has been removed from cart. If no ammunition is to be handled, No. 5 takes post at right handle of ammunition cart, No. 6 at right lead rope of ammunition cart.

BIPOD. At this command, No. 7 places bipod on cart, in grooves provided for same, yoke forward. He then assists in loading ammunition, if required, otherwise, he takes post at left handle of ammunition cart.

BASEPLATE RACK. At this command No. 2 places rack on cart, and after baseplate is in place, places tool roll in hollow of baseplate. He then stands fast to assist Nos. 1 and 3 to strap load to cart, after which he takes post at right lead rope of mortar cart.

PICK-MATTOCK AND SPADE. At this command, No. 8 places pick-mattock and spade in grooves provided for same on rack, handles to the front and folds the sand bags in half. He remains at the cart until he later places the sand bags in position.

BASEPLATE. At this command, Nos. 3 and 4 place baseplate on rack; then No. 3 stands fast to assist Nos. 1 and 2 to secure load. No. 4 takes post at left lead rope.

TOOL ROLL. At this command, No. 2 places tool roll on top of baseplate and stands fast to assist Nos. 1 and 3 in securing load.

AIMING STAKES. At this command, No. 1 places aiming stakes points to the front on tool roll and sight case and, after No. 8 loads sand bags, assists Nos. 2 and 3 to secure load.

SAND BAGS. At this command No. 8 having folded sand bags in half places them firmly over center of load. He then assists in loading ammunition, if required, otherwise he takes post at left lead rope of ammunition cart.

SECURE LOAD. At this command, No. 2 goes to rear of cart and pases rear straps to Nos. 3 and 1 who connect same with forward straps, pulling load tight and fastening buckles. They then take posts as described above.

40. To Load Ammunition Carts. -- Carts are habitually loaded from the right by Nos. 5,6,7 and 8. At the command "LOAD AMMUNITION", No. 5 places one box of ammunition on front of cart. He then takes post on left of cart and holds boxes in place until the remaining 4 boxes are loaded by Nos. 6,7 and 8. When all boxes are in place, Nos. 5 and 6 place baseplate boards on top of boxes, after which the whole load is secured by cart straps, Nos. 5 and 6 handling front straps and Nos. 7 and 8 handling rear straps.

41. The commands for and execution of movement and change of direction, mounting mortar, and inspection are similar to those prescribed in TR 415-20, Drill, The Chemical Squad, Platoon and Company.

42. The duties in the service of the mortar in firing are as prescribed in TR 415-20 and 415-35, Technique of Chemical Weapons.

43. Loading and Unloading of Carts from Motor Trucks. -- In loading hand carts on motor trucks, the loading is done by squads, which approach the truck from the rear and are halted. The squads being halted as stated, the corporal commands: "(1) LOAD (2)CARTS". At the command "LOAD", Nos. 2 and 4 climb into rear of truck and grasp handle of cart which is handed up to them by Nos. 1 and 3. Nos. 5,6,7 and 8 ground handle and lead ropes of ammunition cart and take a position behind mortar cart. At the command "CARTS", Nos. 1 and 3 grasp forward grips and Nos. 6 and 8 rear grips of cart, Nos. 5 and 7 grasp back of cart. All then lift cart to level of truck floor, when it is pulled in truck by Nos. 2 and 4. Ammunition cart is then loaded in like manner. The reverse method is used in unloading. NOTE: Care should be taken that spokes of wheels are not used in lifting carts.

THE PLATOON

44. The platoon is formed in line or column.

45. The normal distance between sections in column is 5 paces.

46. Commands for execution of movement and change of direction are similar to those prescribed in TR 415-20.

47. To Form Line to Flank. -- The platoon being in column of carts. The command: "(1) CARTS RIGHT (Left) (2) MARCH". At the command "MARCH", the men on cart handles pivot cart on inside wheel and take up the half step until men on lead ropes have made the turn, which they do at double time. All then take up the quick time.

48. To Deploy the Platoon. -- The platoon is habitually deployed in section column, the section extending in depth only. The movement requires two separate commands, unless the platoon is already in line of sections.

For the first movement, the command is "(1) LINE OF SECTIONS (2) RIGHT (left) (3) MARCH (4) PLATOON (5) HALT." At the command "MARCH", the leading section continues to march to the front, the second section obliques until it has gained an interval of 25 paces, then marches to the front.

For the second movement, the command is "(1) EXTEND ON REAR CART (2) MARCH". At the command "MARCH", corporals place themselves 5 paces in front of their leading carts and carts follow at 5 paces; and platoon sergeant follow in the rear interval between sections.

VIII

SAFETY PRECAUTIONS

49. In all firing in time of peace, thorough precautions will be taken, to preclude all possibility of accident.

50. Safety in firing is the responsibility of the officer in immediate command of the unit or units firing, who may be assisted if necessary by a range officer.

51. In time of peace firing with this weapon over the heads of any personnel is prohibited.

52. Before firing, signs will be placed at appropriate points to warn persons approaching the range. Guards, properly instructed as to their duties, will be posted so as to cover all approaches to the danger area.

53. The danger area shall consist of a rectangle 5000 yds. long and 600 yds. wide, extending from the gun position in the direction of fire and bisected by the line of fire.

54. Observers should be to windward of the line of fire.

55. When chemical ammunition, other than smoke, is fired, all personnel will be provided with gas masks.

56. When white phosphorus or toxic chemical shell are fired, the lanyard will be used, and no person except the man handling the lanyard shall be within 50 yards of the mortar.

57. When the mortar is fired, no person will be allowed directly in rear of the piece.

58. In case of misfire, the mortar will not be touched until at least one minute has elapsed. When the projectile is removed, all persons should be at the sides of the mortar.

59. Signs, warning persons of the danger from duds, will be posted in the vicinity of the firing area at all times. For the removal of duds see TR 1370-A.