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HANDBOOK OF

12-INCH HOWITZER RAILWAY MOUNT.

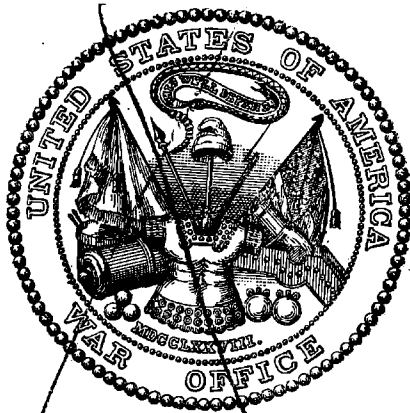
MODEL OF 1918.

(THIRTY-SEVEN PLATES)

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War Department
Office of the Chief of Ordnance
Washington, , 1919.

This Manual is published for the information and guidance
of the Army of the United States.

By Order of The Secretary of War.

C. C. Williams,
Maj. Gen., Ord. Dept., U.S.A.
Chief of Ordnance.

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12-Inch Howitzer Railway Mount

Model of 1918

Section A. - General Description.

(a) Description.

Refer to plates I, II, III, IV, V and VI for list of parts with their piece marks and the material of which they are made, see page _____.

The mount is designed to permit the Howitzer to be traversed through 360 degrees, elevated from minus 5 to plus 60 degrees and fired from 20 to 60 degrees.

The principal parts of the mount are the base plate, which is a part of the car proper, racer, distance ring and traversing rollers, side frames, cradle, recoil system, recuperator system, traversing and elevating mechanisms, elevation quadrant, panoramic sight, loading tray, loading and working platforms, and car proper, including body, trucks, brakes and couplers together with outriggers, floats, jacks and foundation details.

The base plate is a one piece casting used as the center section of the car proper and bolted to the car frame on each end. The lower roller path is machined on the upper side and a pintle surface is machined on the outer side of the vertical annular flange, on the inner side of this flange the traversing rack is bolted.

The racer is cast in one piece and has its lower surface machined, forming the upper roller path, corresponding to the lower roller path on the base plate. The inner vertical surface is machined to form the female part of the pintle. The outer vertical surface is machined and graduations are engraved forming an azimuth circle.

There are 640 divisions of 10 mils each, the 0 graduation being on the left side of the racer 45 degrees left of rear. The azimuth pointer is of german silver graduated from 0 to 10 mils and is fastened to a built up bracket bolted to the base plate. Five clips, engaging the under side of the base plate flange and bolted to the racer prevent any relative vertical movement of the racer with the base plate. Dust guards are bolted to the outer surface of the racer preventing dust and dirt from entering the traversing roller system and pintle bearing.

The traversing roller system consists of forty conical rollers, held in a radial position by the distance ring and kept concentric with the pintle by flanges on the inner edges of the rollers in contact with the inner edge of the roller path on the base ring. Handy oilers are located on the outside vertical surface of the racer with oil tubes leading to continuous oil gutters cut in the distance ring, for the distribution of oil to the rollers.

The side frames are bolted to the upper surface of the racer and held together by the front and rear transom; this unit supports the tipping parts of the mount.

The cradle supported in the side frames by its trunnions serves as a slide way for the howitzer when recoiling and carries the recoil and recuperator systems. The loading platform of structural steel extends to the rear of the mount and is held in place by supports fastened to the rear transom and side frames. The platform is constructed with an opening in the center for the howitzer to recoil through. This opening is covered by a folding platform in two sections connected

together and to the loading platform by hinges. This platform is down when loading and folded back when firing. On the right side of the mount is the elevating platform which is folded in when traveling. A loading tray built up of structural steel is bolted to the loading platform, and is constructed to carry three projectiles at a time. Cranes on the rear of the loading platform hoist the projectiles from the ammunition table on the car floor to the loading tray. A shell trough placed in the breech of the Howitzer and resting on the loading tray is used to slide the projectile and powder into the Howitzer. The car has a cast steel center which serves as a base plate and roller path for the traversing parts of the mount and structural steel ends all mounted on standard six wheel trucks. The car serves as a firing platform and transport vehicle; when in transport the entire weight rests upon the trucks in the ordinary way, but in firing the car is raised by jacks; beams and cross-ties then placed underneath and the car lowered thereon, relieving the weight from the trucks. The outriggers are then set out against the wooden floats backed by the earth to resist the recoil when the howitzer is fired.

An ammunition trough and table are located on the car floor and ammunition is brought from the ammunition car to the trough and slid down to the table which holds seven projectiles.

The recoil mechanism, recuperator, elevating and traversing mechanism, anti-friction device, crane, jacks, outriggers, trucks, car proper, air brakes, draft gear and ammunition table will each be described in detail later.

(b) Operation.

The piece is laid in azimuth by the combined use of the panoramic sight or azimuth circle, and the traversing mechanism. Elevation is obtained by setting the quadrant at the elevation required and rotating the piece in elevation by the elevating mechanism.

Upon firing, the Howitzer recoils in the cradle a maximum distance of 37.5 inches, carrying with it the recoil band and piston, pull rods and plunger of the recuperator. The energy of recoil of the howitzer is absorbed by the resistance which the fluid in the hydraulic cylinders offers in being forced through the openings past the pistons. A portion of the energy of recoil sufficient to return the howitzer into battery is absorbed by compressing the air in the recuperator cylinder. The return of the piece into battery is eased by the action of the counter recoil buffers, which force the fluid from the cylinder heads through the small clearance past the cylinder head bushings.

SECTION B - RECOIL MECHANISM

Refer to Plate VII.

For list of parts with their piece marks and the material of which they are made, see page

The recoil system operates on the principle of the hydraulic brake and is designed to limit the distance and regulate the velocity with which the howitzer moves to the rear when fired.

A small portion of the recoil energy is taken up by compressing the air in the recuperator cylinder, but the greater portion is taken up by the resistance the liquid in the recoil cylinder offers to being forced through the orifices formed by the throttling grooves. The width

of these grooves is uniform; but the depth is proportioned so that the areas of the orifices, varying with the position of the piston during recoil, will be such as to give, with the air in the recuperator, a constant resistance throughout the length of recoil.

In front of the piston, the piston rod is extended to form a buffer. This buffer is flatted so that the escape of liquid, during counter-recoil, through the varying clearances between this and the recoil cylinder head bushing, will offer such resistance as will control the motion of the howitzer during its return to battery. When the recoil piston is in normal recoil position the end of the buffer is back in the cylinder a distance about 17.375 inches from the cylinder head bushing. As the recoil piston travels towards the cylinder head during counter recoil, it pushes some of the liquid ahead of it into the cylinder head; and when the buffer reaches and begins to enter the cylinder head bushing, the cylinder head is filled with the liquid.

The recoil mechanism consists of two cylinders fitted in and locked to cylindrical bosses on the under side of cradle by special nuts. Each is closed at the front end by a cylinder head and at the rear end by a stuffing box. The throttling grooves, above referred to, are three in number, symmetrically located with respect to the longitudinal axis of the cylinder. The piston rod projects through the rear of the cylinder and is held in the recoil band by two nuts. The rear nut should be screwed up lightly to allow the piston rod to adjust itself in the recoil band. When the piece is fired, the piston and piston rod move to the rear with the recoil band which is attached to the howitzer while the cylinders remain stationary in the cradle. A stuffing box with packing and follower is used to make a tight joint between the piston rod and rear end of cylinder.

In front of the stuffing box there is a leather washer which prevents the liquid in the cylinder from leaking through the threads of the stuffing box and also during recoil keeps the pressure of the liquid from acting directly on the packing in the stuffing box. The cylinder head is screwed into the front end of the recoil cylinder. A bushing is screwed into the opening of the head to insure proper clearance for the buffer. A tongue and groove with a leather washer makes a tight joint between the cylinder and head.

SECTION C - RECUPERATOR

Refer to Plates VIII, IX and X.

For list of parts with their piece marks and the material of which they are made, see page.

The recuperator consists of an air chamber, a piston and its packings; a plunger and its yoke and pull rods. The piston and plunger slide in the cylindrical part of the air chamber. The piston rod has a bearing in the front end of the plunger. At this end of the plunger a yoke connects it with the pull rods, which in turn are fastened in the front by a bracket and in the rear direct to the recoil band.

The air chamber consists of a hollow cylindrical forging open in the front and closed in the rear. The cylindrical part in front, in which the piston and plunger moves, is fitted with a lining of special watertight bronze. The plunger is of the same material as the liner and is machined to take the piston rod, liquid, and stuffing box. The plunger, screwed to the yoke and secured by set screws, is driven at recoil by the two pull rods, which are fastened to the recoil band and travel with it. The pull rods have bearings in bushings fixed in lugs on the cradle. The

joint between the plunger and the liner is made tight by a leather packing held in place by a stuffing box. Flax packing held in the stuffing box by a gland makes the joint between the plunger and the stuffing box tight. A felt washer held by a steel ring and screwed to the gland, prevents sand or grit from entering the plunger packings.

The air chamber, or recuperator cylinder, is locked in a cylindrical boss on the top part of the cradle by a cylinder clamp lock. Flattened places on the pull rod bushings matching up with similar ones on the shoulder prevent the recuperator cylinder from rotating.

The piston consists of a head of special watertight bronze screwed on a steel rod. The front part of the rod is fitted with a bronze casing and slides in a bearing in the plunger. Its threaded end beyond the casing is fitted with a nut and washer limiting in the rear, the displacement of the piston with respect to the plunger. Tallowed flax packing held by a bronze ring, and piston washer held against this ring by a follower make a tight joint between the piston and cylinder liner. A spring held in place by a nut, pinned to the rod, presses the follower to the rear against the piston washer.

The joint between the piston rod and plunger is similar to that between the plunger and the cylinder liner.

The space in front of the piston and in the plunger is filled with a solution of glycerine and water, the same as in the recoil cylinders. This liquid acts as a seal for the joint between the piston and the liner, and a stop between piston and plunger at counter-recoil.

An air valve body, fitted with two needle valves, one for filling and one for emptying, is screwed in the rear end of the recuperator cylinder and connected by tubing to the air pipe connection on the cradle. Another

tube runs from this to the pressure gauge. An opening in the pipe connection is used to attach the coiled tube when charging the cylinder with air. The opening is closed with a plug when not in use.

At the front end of the recuperator cylinder a liquid valve is bolted and connected by copper tubing to the liquid pipe connection on the cradle. Another tube runs from this to the pressure gauge and a third to the liquid pump. Liquid is poured into the pump through the opening in the top and pumped through the tubing into the plunger.

The liquid pump is fastened to a steel plate support, to which is also fastened the two pressure gauges. This support is bolted to the upper part of the cradle on the left side.

The pump consists of a pump case, or reservoir, for the solution of glycerine and water, in the bottom of which is fixed the body of the pump. This contains the inlet valve, the outlet valve, and the relief valve, and the pump body nut. A plunger operated by a lever, crank, and link, with bearings in the cover and body nut, operate in the pump body. (See Plate X).

The relief valve screwed in the top of the pump body has a valve stem, relief spring, and cap. The relief spring is designed to allow the liquid to blow off at from 2200 to 2500 lbs. and insures no damage to the pump from excess back pressures. This spring should never be tampered with as it is adjusted by the manufacturer and tested to function at the proper pressure. If the liquid pump fails to function and there is practically no resistance offered when the pump lever is operated, it shows that there is a back pressure of air in the mechanism. To overcome this disconnect the liquid pipe where it joins the three way connection on the

side of the cradle, and operate the lever for a few strokes until liquid begins to flow. Reconnect the liquid pipe to the three way connection and pump liquid into the recuperator plunger until the piston rod washer just clears the rear gland.

SECTION D - ELEVATING MECHANISM

Refer to Plate XI and XII.

For list of parts with their piece marks and the material of which they are made, see page.

The elevating mechanism consists of an elevating rack, attached to right side of the cradle, meshing with a pinion, which is operated by a handwheel through spur gears. The spur gearing is supported by the gear plate and side frame provided with bronze bushings. A band brake with foot control is provided to prevent any movement of the tipping parts when the gun is fired. One turn of the handwheel clockwise elevates the gun 1.92 degrees.

SECTION E - TRAVERSING MECHANISM

Refer to Plate XIII

For list of parts with their piece marks and the material of which they are made, see page

The traversing mechanism consists of a circular rack fastened to the base ring and meshing with a pinion, which is operated by a handwheel through a worm and worm wheel. The pinion, meshing with the rack, is keyed to the lower end of the vertical traversing shaft. This shaft has its lower bearing in the traversing shaft bracket, which is bolted to the racer, and its upper bearing in the traversing gear case, which is bolted to the left side frame. The worm wheel, keyed to the upper end of the shaft

is in mesh with the worm which is keyed to the worm shaft. The worm shaft has both of its bearings in the gear case and a handwheel on one end. The worm wheel, worm, and worm shaft are inclosed in the gear case. The gear case cover has a lug to take the leveling screw bearing pin of the sight.

SECTION F - ANTI-FRICTION DEVICE.

Refer to Plate XIV.

For list of parts with their piece marks and the material of which they are made, see page

The anti-friction device is designed to relieve the load of the tipping parts from the main trunnion and ease the elevating and depressing of the gun. It consists of two small trunnions, bearing supports, adjusting screws, and Belleville springs.

The weight of the tipping parts is supported on the small trunnions and transmitted to the Belleville springs by the bearing supports and seats. The adjusting screws are tightened up until the cradle trunnions have a clearance in the side frame bearings at all points. This makes the entire elevating load come on the small trunnions and reduces the handwheel load. When the Howitzer is fired the Belleville springs are compressed and the firing load comes on the side frame bearings.

SECTION G - AMMUNITION CRANE.

Refer to Plate XXVII.

For list of parts with their piece marks and the material of which they are made see page

Two ammunition cranes are bolted to the rear corners of the loading platform for use in hoisting ammunition from the ground or ammunition table, to the loading tray.

For hoisting the 700-pound projectile, the shot tongs should be pinned directly to the open socket at the end of the wire rope. For use with a heavier projectile an extra sheave block with a crane hook attached, is provided. The wire rope with the open socket attached, may be passed through the block, by removing one of the plates, and pinning to the mast. The shot tongs should then be placed on the crane hook. These two arrangements are shown on plate XXVII.

A section through the drum, gearing and friction safety device, is shown on plate XXVII. The cranks may be released with the load in any position, and by virtue of the friction safety device, the mechanism will not overhaul. The pawl should at all times be left in mesh with the ratchet. To insure proper functioning, this mechanism, should be kept well lubricated. The cranks and the mechanism housed in the drum bracket should, under no circumstances, be dismantled in the field.

SECTION H. - CAR PROPER.

Refer to Plate XVIII.

For list of parts with their piece marks and the material of which they are made, see page

The car proper serves as a transport for the traversing parts of the mount, outrigger floats, foot plates and for the crossties and built up H-beams of the foundation platform. When lowered on the foundation platform, it serves as an emplacement.

The car proper consists of a drop frame type of body, with ends built up of structural steel plates and shapes with a cast steel center, mounted on two six-wheel railway trucks. It is equipped with four screw jacks, which are used first to raise the car sufficiently to allow the ground platform to be placed in position under it, and then to lower the

car until its weight rests on the crossties and through them to the built up H-beams which are spiked to the rail ties. There are also eight outriggers which are set out against wooden floats sunk in pits and backed by earth. The outriggers serve to keep the mount stationary during firing.

The over-all dimensions of the car body ends, which as stated above, are built up of structural steel shapes and plates, are, length 12 feet 7.5 inches, width 8 feet, 5.5 inches. The underframe is composed of two center sills, four intermediate sills, and four side sills connected to a base plate in the center of the car, which forms the lower level of the car body. These sills are tied together at each end by channel and sills, and cross braced by a body bolster 5 feet. 9.5 inches from each end. The floor plate covering the sills consists of four steel plates. A step and a hand hold or grab iron is provided at each corner.

SECTION I - Trucks.

Refer to Plate XXXII.

For list of parts with their piece marks and the material of which they are made, see page

The trucks, of which there are two, are of built up type, the frame being made up of plates and steel castings. The center portion of the frame is a steel casting forming a bolster and is riveted to the side pieces. Separate M.C.B. center plates are riveted to the top of the bolsters. Side bearings, consisting of steel plates held in position by cast recesses, are placed on 45-inch centers. The vertical distance from the side bearing surface to the center plate is 2.75 inches. Steel castings are riveted to the side plates which form the pedestals.

The journals are standard M.C.B., $5\frac{1}{2}$ x 10", and 28-inch wheels of rolled steel are pressed on the axles.

The loading on the trucks is transmitted to the journals by semi-elliptic springs and equalizers. The equalizers bear on the journal boxes and their outer ends are supported by coil springs held in place by the pedestal castings.

Inside hung brakes are applied on four wheels of each truck. The brake beams are M.C.B. No. 4, trussed type, with shoes keyed to heads. The beams are hung from brackets cast on the truck frames. Separate cast steel lugs are rivoted on both sides of the bolster for connecting the dead lever guides on one side and the live lever guides on the other.

SECTION J - BRAKES.

Refer to Plates XIX, XX, XXI, XXII, XXIX, XXX, XXXI, XXXIII.

For List of parts with their piece marks and the material of which they are made, see page

The car is equipped with both hand and airbrakes operated by the same system of levers and so arranged that either can be applied independently. It is necessary to apply the handbrakes at each end separately. The airbrakes are connected by the train line pipe and operated simultaneously. Detached brake cylinders and reservoirs, Westinghouse type D, 10 x 12", (See plates XXIX and XXX) are provided with K-2 triple valves (See plate XXXIII). There is also a centrifugal dirt collector (See plate XXXI) and the necessary pipes, valves and connections for freight car equipment.

Plates XIX and XX show the arrangement of brake parts at either end of the mount. From these plates it will be seen that the handbrakes

can be applied without disturbing the piston in the brake-cylinder- the piston rod being made up of tubing in which the cylinder push rod slides. It will be further noted that the handbrake staff is connected to a horizontal lever by means of a pull rod and chain. The horizontal lever is connected to the brake cylinder on one end and to the truck live lever on the other end by means of rods and levers.

The reservoirs are equipped with a valve operated by a rod which can be pulled to release the air brakes quickly when desired.

The triple valve governs the flow of air, allowing air to pass from the train line into the reservoir and from the reservoir to the cylinders. When pressure in the train line is reduced, the triple valve admits air from the reservoir into the cylinder, and when pressure in the train line is again raised, the triple valve closes the passage of air from the reservoir to the cylinder, and at the same time allows the air in the cylinder to escape into the atmosphere. This automatically releases the brakes. The reservoir is again recharged from the train line to the required pressure. These operations are effected by opening or closing of ports in the triple valve by variations in the air pressure.

A dirt collector, located between the triple valve and the train line collects dirt from the air before it passes into the triple valve. The dirt thus collected may be blown out of the dirt collector by opening a valve at its bottom.

SECTION K - DRAFT GEAR AND FRENCH COUPLERS.

(a) Draft Gear. Refer to plate XXXVII.

For list of parts with their piece marks and the material of which they are made, see page_____.

The draft gear is known as the Westinghouse Friction Type.

The Westinghouse friction parts are enclosed in a drum which is so applied between cast steel draft lugs to receive the buffing and pulling shocks.

The coupler is Gould Coupler Company's pattern Z-201.

(b) To Couple the Car.

One man required.

Tools needed, none.

Car pusher can be used if locomotive is not available.

(1) Set the handbrakes on car enough to keep it from moving easily when bumped.

(2) Open the knuckle on car by lifting the handle of the uncoupling lever. This movement will first unlock the knuckle so it can be pulled open, but continuing the movement of uncoupling lever will throw the knuckle open without the necessity of going in front of or between the cars. When the knuckle of either car is open, it is only necessary to bring the cars together until the open knuckle closes, and it will lock automatically.

(c) To uncouple car.

(1) Raise the uncoupling lever on one car enough to release the knuckle and the cars may be pulled apart.

(d) French Coupler. - Refer to Plates XXXV and XXXVI.

For list of parts with their piece marks and the material of which they are made see page _____.

The bumper blocks are of white oak, each secured to the end sill channels by six 1-inch diameter and two 1.5-inch diameter bolts. To these blocks, the buffers, safety chains and parts of the draft hooks are

fastened as shown on Plate XXXV.

The screw couplers, safety chains and buffers conform to the standard now adopted for U.S. Government freight cars in France. With this arrangement and when the car is connected to the ammunition car or some other car, the couplers draw them together, producing compression in the buffer springs.

At each end of the car there are two different types of buffers, one with a flat buffing surface and the other with a curved surface. Similar buffers are located diagonally opposite on the car in order that when the cars are coupled together, the flat buffer of one car will butt against the curved buffer of the next car. This is done to prevent damage to buffers when train is rounding a curve.

The buffer housing, which contains the compression spring and acts as a guide for the buffer, is bolted to the bumper block by four bolts. A buffer plate however, is placed between the buffer housing and the bumper block to give a better bearing surface. The large end of the spring referred to above rests against a circular plate and the small end against the buffer. In order to prevent the spring from pushing these two apart, a 1.875-inch diameter pin is provided which has a head at one end and at the other end a key projecting through the pin and a collar. The above mentioned circular plate sets up into the buffer housing far enough to allow clearance between the bumper block and the buffer plate for the collar and key, but it is prevented from being pushed back by a cast steel ring bolted to the buffer plate.

The draft hook projects through the bumper block, end sill, and cast steel draft spring stop, to a cast steel block which is held to it by a nut and split pin. This latter block is guided by lugs on the center

sill and takes the thrust of the compression spring which is seated at its large end on the draft spring stop riveted to the center sill of car. The draft hook is also guided by another cast steel block resting against the draft hook plate and bolted to a bumper block. The shoulders of the draft hook butt up against this block when released, thus stopping its inward motion.

The screw coupling is fastened by a pin, with cotter, to a hole in the draw hook. It consists of the yoke attached to the draw hook, a clevis for hooking to the next car, and a right and left hand screw to draw the yokes and clevis together. Attached to the middle of the screw is an arm with a ball at the end which is used as a handle to operate the screw. The right hand threads on one side of this handle screws through a pin holding the yokes together. The left hand threads on the other side of the handle screw through a similar pin connected to the clevis. These pins are held in place by cotter pins. A screw coupling is provided at each end of the car, but when the train is made up, only one coupling is used at each connection. When not in use, the loose end of the coupling is swung on a hook attached to the draft hook plate under the bumper blocks.

Safety chains, one on either side of the draft hook, serve as a coupling in case the screw coupling or draw hooks are out of order. These consist each of a chain and hook fastened to car by an eye bolt. The eye bolt passes through the bumper block and end sill, and are held in place by nuts with a split pin. To allow a little give to the chain, four spring washers are inserted between the end sill channel and the nut. A cast steel guide bolted to the bumper block acts as a stop and guide for the

eye bolts and chain.

(e) To Couple Cars. Refer to Plate XXXVI.

One man required.

Tools needed, none.

Car pusher can be used if locomotive is not available.

(1) Set hand brake on stationary car (not completely, but enough so that car will move only slightly if bumped), and bring the cars as close together as buffers will allow.

(2) Standing between cars, inside of buffers, lift one of the screw couplings from the hook under bumper block and hook staple on draft hook of other car. (If the staple does not reach the hook, the coupling will have to be lengthened by turning the screw with handle.)

(3) Tighten screw until there is just enough compression in the draft hook and buffer springs to make cars ride easily. The screw can be turned easily by raising the ball attached to end of handle in the proper direction until it will fall by its own weight, thus completing one turn. By repeating above operations, the required amount of turns can be made.

(4) Hook the safety chains of one car to the chains of the other car.

(5) Connect air hose and open angle cock.

(6) Release handbrake.

(f) To Uncouple Cars.

Reverse the process of coupling described above, taking care that the screw coupling is screwed all the way out before the staple is hung on the hook.

SECTION L. - JACKS

Refer to Plate XXV.

(a) For list of parts with their piece marks and the material of which they are made, see page _____

Four built in jack screws are located in the corners of the base plate, directly above the rails of a standard gauge track.

Each jack consists of a ram, screw, nut, screw gear, pinion, pinion stud, ratchet pawl, ratchet housing and lever.

The ram carries a nut into which the screw works. On the upper end of the screw is a screw gear meshing with a pinion on the pinion stud. A ratchet meshing with the pinion is turned by a ratchet pawl attached to the ratchet housing, which in turn is operated by a long hand lever.

There are two jack blocks, 9 inches wide, 8 inches high and 5 feet 6 inches long, provided with each car. These blocks placed across the rails act as bearings for the jacks. In order to raise the car, the jack blocks are placed across the rails so that the two jackscrews at each end will rest upon them.

Four 20-inch, 25-ton auxiliary jacks having a total rise of 9 inches, are carried on each railway car and weigh approximately 95 pounds each. They can be used for emergency purposes or in case the regular jacks are out of order.

(b) To raise mount with screw jacks, refer to plate XXV.

Two men required on each set of jacks (four if both ends of car are to be raised)

Tools needed.

4 Jack levers.

(1) Place jack blocks across rails under jacks. The faces of the block with the bearing surfaces should be next to the rail and jack screws.

(2) Turn jack lever until ends of jack screw bear on the jack blocking. Be sure the jack blocking is correctly placed so as to give good bearing on rails and continue turning levers until car is high enough to permit the foundation stringer to be placed under the base plate, then put in the foundation cross beams.

(c) To Lower Car. Refer to plate XXV.

Reverse procedure as outlined in (b) above.

(d) To Raise mount with auxiliary jacks. Refer to plate XXV.

Two men required.

Tools needed:

4 Auxiliary Jacks.

4 Wood blocks about 4 x 4 x 4.

(1) Arrange blocking directly under seats of tie rod bracket castings. The top of this blocking should be about 9 inches below the top of the rail in order to get the jacks under the mount.

(2) Place auxiliary jacks on these blocks; arrange pawl so that jack will raise when handle is lowered; insert handle in socket and raise by pumping until jack engages with lower surface of base plate. Operate jacks until mount is raised sufficient to place foundation.

(3) Remove jacks after foundation is placed.

SECTION M - FOUNDATION

(a) Description. Refer to Plate XXIV.

The foundation is intended to take the load off the car trucks and transfer it directly to the ground through rail ties.

It is made up of four cross beams which support the side, intermediate and center sills of the car, and which in turn transmit the load to two lines of H-beams placed parallel to and outside of the rails on each side of the track. Each line of beams is composed of two separate channel irons bolted to each other and spiked with screw spikes to the rail ties in order to prevent movement.

The material for the foundation platform is stored on car in front of ammunition tray. On the car the H-beams are placed at right angles to the track. In back of the beams, the crossties are placed. These beams and crossties are blocked in front by the outrigger brackets, in back by the loading tray, and on the sides by the outriggers. On top of the crossties the jack blocks are placed. These are held in place by fastening the rope attached to them, to the loading tray legs.

(b) To place for firing. - Refer to Plate XXIV.

men needed.

Tools required:

- 3 - 2 x 4" timbers about 3' long, for carrying H-beams.
- 1 - Wrench, double, 0.625 and 0.75, U43F.

The track at the location where the gun is to be placed should be previously prepared. The rails should be leveled up and the ballast tamped well under the ties.

(1) Remove foundation jack block from car platform and place across the rails with center lines directly under the screw jacks.

(2) Raise the car by means of the screw jacks. (See Sect. L Division

b.

(3) Remove foundation stringers from car platform, two to be placed on either side of the track.

(4) Place the stringers under the flange of the base plate as near the rail as possible and parallel to the track with the ends of the stringers on either side of the track approximately opposite each other.

(5) Connect the stringers at the center by four .75 x 1.375 bolts.

(6) Remove the cross beams from the car platform.

(7) Place the cross beams under the side sills of the car, resting on the foundation stringer.

(8) Lower the car by means of the screw jacks until the center portion of the base plate rests on the foundation stringers and the ends of the side, intermediate and center sills rest on the cross beams.

(9) Screw up jacks until they clear blocking by at least one half inch before firing.

(c) To Disassemble foundation and load for carrying.

8 men required.

Tools needed:

- 1 wrench, double .625 and .75, U43F
- 2 Track wrenches, 4712C
- 1 Crowbar, 1243A.

To disassemble, reverse procedure outlined in (b) above.

To load the material on car platforms for carrying, proceed as follows:

(1) Place crossties on car platform against ammunition table.

The ends of the crossties should be perpendicular to the tracks.

(2) Place H-beams with webs vertical next to crossties.

(3) Place jack blocks on crossties and lash to legs of ammunition table.

SECTION N. - OUTRIGGERS.

(a) Description Refer to Plate XXIII.

For list of parts with their piece marks and the material of which they are made see page_____

There are eight outriggers furnished with each mount which form braces to prevent the mount from tipping over or from sliding on the foundation platform when the gun is being fired.

The four end outriggers, which are fastened, both when and when not in use, to a socket on the side of the car, should be used when the gun is fired within the sector, 45 degrees to the right or to the left of the longitudinal center line of the car. They are each made up of 6-inch hot drawn Shelby steel tubing with an adjusting screw on one end and an eye and pin on the other. The adjusting screw has a ball on the end and can be screwed in or out of the nut strut end with a steel rod, which fits into holes provided, next to the ball. The fixed end of the outrigger rests in a socket casting on the car side and the ball of the adjusting screw rests in the foot plate used to distribute the load over the wooden float. From the nut strut end to a bracket on the car, directly below the outrigger bracket, is a tie rod. As the center line of the outrigger strut does not pass through the trunnions of the gun, there is an overturning tendency when the gun is fired normal to track. The purpose of the tie rod is to counteract this tendency.

The four side outriggers, which are also fastened to a socket on the side of the car, should be used when the gun is fired within the sector 45 degrees to the right or left of a cross center line of the car.

They are the same in every respect as the end outriggers.

The footplates are of cast steel and are used to transmit the thrust from the struts to the floats. Their lower surfaces are smooth and the upper parts have sockets to receive the ball ends of the struts.

Each float is built up of two layers of blocking so as to distribute the load from the strut over 20 square feet of ground surface. The lower layer is composed of fine white oak blocks and the upper layer of three blocks, all bolted together. There are two angle guides bolted to the upper surface of the floats for guiding the foot plates.

When not in use, the floats and footplates are placed on the car platform. The floats are piled in an inclined position against the ammunition trough in the rear of the car. The footplates are piled on the front platform of the car and lean against the ammunition table.

The float lashing, for holding the floats in position (See Plate XXVI) while in transit, is composed of five wire ropes fastened together by steel rings and turnbuckles. When the floats are loaded in traveling position, two of the wire ropes, held together by a turnbuckle, are passed around the lower part of the floats and secured to the ammunition table by steel rings. At the upper part of the float two more wire ropes are passed around, also held together by turnbuckles, and secured to the ammunition table by steel rings. The upper lashing is held in place by the angles on the sides and by another wire rope in the rear fastened to the platform. Turning the turnbuckles tightens the ropes and holds the floats in place.

The footplate lashing for holding the foot plates in position while in transit is composed of one wire rope with a hook on one end and

a turnbuckle on the other. When the plates are loaded in traveling position, the rope is fastened to the lower angle of the ammunition table and run diagonally along the foot plates, from the bottom rear to the top front. They are prevented from sliding forward by an angle at the front. Turning the turnbuckle tightens the rope and holds the plates in place.

The struts and end tie rods are fixed permanently to the sockets on the mount and when not in use are swung around and hung on the side of the mount. The center tie rods are taken off and placed on top of the loading platform in back of the front ammunition table.

(b) To Place an End Outrigger for Firing.

Six men required.

Tools needed:

- 2 - 2. x 6. inch boards, 8 ft. long.
- 1 - sling of rope about 30 ft. long.
- 2 - Shovels, 8819A
- 2 - Picks, U51A
- 1 - Long handled shovel
- 1 - Axe, U51D
- 1 - 0.875 diameter x 24" rod to turn strut adjusting screw.
- 1 - Crowbar, 1243A
- 1 - Hammer, U48F
- 1 - 2 x 4 timber, about 5' long, for stamping earth
- 1 - Rule
- 1 - Tape measure
- 4 - Stakes
- 1 - 1 x 2. board, exactly 90 inches long.

(1) Move tie if necessary and lay off oblong on ground 60" x 35" so that one corner of the long side is 56" from center of mount, and 28" from center line of trucks and the other corner will be 108" from center line of mount and 68" from center line of trucks.

(2) Dig a V shaped pit until sides meet at a depth of 90" from top of car platform.

(3) Loosen up turnbuckle of footplate lashing, and remove all foot plates from platform and place them on ground in a convenient place.

(4) Unhook float lashing and throw to one side away from floats. Fasten sling around upper float. Slide it down skids to ground and place it in pit with its under surface resting on rear or sloping part of pit, and with angles still horizontal.

(5) Place a foot plate with its under surface bearing in the center and between angles on the float.

(6) Lift outrigger strut out of carrying bracket and swing it around on the socket casting and turn adjusting screw up in the strut so as to make it as short as possible. If it is difficult to turn the adjusting screw, the .875 inch diameter rod should be used which fits in the holes next to the ball¹-end. Swing end of outrigger around until the ball is right over socket of foot plate and turn adjusting screw out until the ball bears against socket and causes compression in the strut.

(7) Remove tie rod from car and fasten to strut. Turn the turnbuckle until rod is tight.

(8) Pile earth against the part of under surface of float which projects above the ground level, tamping well to give a good bearing for the whole under surface of float.

(c) To Place a Side Outrigger for Firing. Refer to Plate XXIII.

Six men required.

Tools needed:

Same as for (b) above.

(1) Lay off oblong on ground 60" x 55" so that one corner of the long side is 100" from center line of mount and 128" back from center line

of trucks, and the other end is 155" from center line of mount and 128" back from center line of trucks.

(2) Dig a V shaped pit until sides meet in the center of the pit at a distance of 90" from the top of car platform.

(3) Place floats and foot plates in the same manner as for end outriggers.

(4) Swing outrigger from mount, and turn adjusting screw out until the ball end bears against socket and causes compression in the strut.

(5) Remove center tie rods from car platform and connect to tie rod studs, allowing rod to drop down to lugs on lower part of outrigger beam and adjust turnbuckle until pin can be inserted in the holes in lugs.

(6) Pile earth against part of under surface of float which projects above the ground level, tamping well to give a good bearing for the whole surface of float.

(7) Remove remaining floats, if there are any, from end car platform and place them in a convenient place out of the way.

(d) To Adjust Screw on Outriggers. Refer to Plate XXIII.

One man required.

Tools needed:

.875 diameter by 24-inch rods, 106B

After the gun has been fired it may be found that the outriggers have packed the earth under the float and that the struts do not bear firmly against the foot plates. After every firing, the adjusting screws should be turned out if necessary, in order to make firm bearing. As stated above, the adjusting screw should be turned out by means of the .875-inch rods which fit in holes next to the ball end of the strut.

(e) To Adjust Floats. Refer to Plate XXIII.

Four men required.

Tools needed:

.875 diameter by 24-inch rod, 106B
1 Crowbar, 1243A

If the movement of earth under the floats continues, as the firing goes on until the adjusting screws have reached their outward limit, earth or blocking will have to be placed under the float to give a new bearing surface. To do this, proceed as follows:

(1) Turn adjusting screw up in the struts as far as it will go.

(2) With crowbars, move the foot plates and floats up toward the car keeping their inclination the same as before.

(3) Hold the floats in this position by means of wedges and fill in the back of floats with earth or blocks until the whole under surface of the floats have a firm bearing.

(4) Turn adjusting screw out again to give compression in the strut. It may be necessary also to adjust the length of tie rod on side outriggers which can be done by turning turnbuckle.

(f) To Place End Outrigger strut for Carrying. Refer to Plate XXIII

Four men required.

Tools needed:

0.875 diameter by 24-inch rods 106B
Hammer, U48F.

(1) Remove pin with split pin holding end tie rod to outrigger strut, swing tie rod around and hang it on bracket on side of the mount.

(2) Turn adjusting screw up on the strut as far as it will go. Swing free end of strut around and hang it on bracket on side of mount.

(g) To Place Side Outrigger for Carrying. Refer to Plate XXIII.

Four men required.

Tools needed:

1 Hammer, U48F
.875-inch by 24-inch rod, 106B

(1) Remove pin connecting side tie rod to outrigger strut; remove tie rod from bracket and place on car platform. (see Plate XXIII).

(2) Turn adjusting screw of strut up as far as it will go, thus allowing strut to swing free of foot plate.

(3) Lift free end of strut and swing around on to top of base plate inside of outrigger support.

(h) To Place Floats and Foot plates for carrying. - Refer to Plate XXVI.

Six men required.

Tools needed:

1 sling of 1-inch rope about 30 ft. long
1 wrench, double, 0.625 and 0.75, U43F
1 pinch bar
1 crowbar, 1243A

(1) Lay foot plates to one side, raise first float with crowbar and then slide float up skids on to rear platform of car. Place float with long side against ammunition trough, and angle side out, angles being vertical. (See Plate XXVI)

(2) Place second float as above with the under surface of same resting against the angles of the first float.

(3) Continue loading floats as in (2) until the last one has been placed on the mount.

(4) Last floats together as described in (a).

(5) Place foot plate on left front of car in inclined position resting against ammunition table.

(6) Continue loading remaining foot plates as in (5) until the last one has been placed on the mount.

(7) Lash foot plates together as described in (a).

SECTION O. - AMMUNITION HANDLING

Refer to Plates XV and XXVII

A triplex block lowers the ammunition from the ammunition car, in the rear of the mount, to the ammunition trough bolted to the platform of the Howitzer car. The upper surface of the tray is built on an incline so that the ammunition can be slid on to a table. This table will hold seven projectiles. The crane (See Sect. G) hoists the ammunition from the table to the loading tray on the traversing part of the mount. An incline trough extends from this tray to the breech of the Howitzer. Two men then push the projectile down the inclined surface into the breech of the howitzer.

SECTION P. - MUZZLE SUPPORT

(a) Description. Refer to Plates I and II.

For list of parts with their piece marks, and the material of which they are made, see page _____

The gun when traveling, is held firmly to the mount by a muzzle support and band. The muzzle of the gun rests on the muzzle support which in turn is supported by the ammunition trough. A wire rope is passed over the muzzle and to the ammunition trough by a band latch and hinge. On one end of the wire rope a stud is fastened in an open socket. This stud fits in a hole in the band latch and has a nut on it. By tightening this

nut the rope holds the muzzle of the gun on the muzzle block.

(b) To Place Muzzle Support.

One man required.

Tools needed:

1 - 7-inch pliers

1 - wrench, double, 0.375 and 1., U43G

(1) Depress gun to 0 degrees elevation and traverse to 0 degrees azimuth, having muzzle support block in place.

(2) Place gun band over muzzle of gun and fasten to band hinge on one side and band latch stud on other side.

(3) Screw up nut on band latch stud until band is tight on muzzle of gun.

SECTION Q. - CHESTS

One tool chest and two armament chests are carried with each mount. They are made of .062-inch steel, reinforced by angles on the outside. The plates are flanged at the corners to connect to adjacent plates. Two flat straps riveted to the bottom by countersunk rivets serve to protect the bottom of the chest.

The covers are hinged to the back of the chests and have catches on either side to hold them open. The covers are locked by a lock bolt at each side and by Yale lock in the middle. The chests are equipped with handles on each end.

The tool chest is 40-inches long, 20-inches wide and 24-inches high. It is equipped with one tray which rests on shelf angles. This chest is carried on the right end platform of the mount alongside of the loading trough when traveling. Lug angles bolted to the floor plates prevent it from shifting.

The armament chests are 40-inches long, 20-inches wide and 12-inches high. They are equipped with two trays placed on top of each and supported on the chest bottom.

When the mount is traveling, these chests are placed on the front of the car platform just in back of the ammunition table. They are held in this position with angles which are bolted to the floor plates.

The chests should be removed from mount when in firing position, and placed in some convenient place.

SECTION R - CAMOUFLAGE.

(a) Description. Refer to Plate XXXIV.

The mount may be camouflaged, using the five color system following the foliage design, with color key in black and white shown on Plate XXXIV.

The object of this method of painting is to break up the large surfaces into a number of small sections so as to produce the appearance of a cluster of shrubbery with patches of light and shadow.

To completely camouflage the mount, it should be covered with a semi-transparent camouflage canopy of tent form similar to that used for the 12-inch Gun Railway Carriage shown on drawings Class 86, Division 22, Drawings 1, 2, and 3.

(b) Paints.

The paints to be used are the U.S. Government Camouflage Paints prepared for the five color system and in the proportion as follows: applied over a coat of Ordnance Grey and never on bare metal.

1	Brown	No. 4041	-10 parts
2	Yellow	4042	3 "
3	Cream	4043	5 "
4	Green	4044	10 "
5	Mauve	4046	2 "
6	Black	4045	1 "

The paint numbers referred to above are the U.S. Government Paint numbers. The parts referred to indicate the relative amounts of paints of the different colors which will be required to camouflage one 12-inch Howitzer Railway Mount.

Each color, for convenience, should be furnished for use in one gallon "friction top" cans with handle. Paints should be furnished in the cans, mixed ready for use. When paint becomes too thick and it is necessary to thin, use linseed oil and turpentine for that purpose, being careful not to use too much turpentine.

(c) To Apply the Paint.

To apply the paint the surface should be free of all sand, cinders, dirt and oil. Paint formerly applied and adhering firmly to the surface need not be removed. The section to which the different colors are to be applied are then laid off in accordance with the design shown on Plate.

After the mount has been properly marked off into the different sections, the colors should be carefully applied, care being taken to insure an even smooth coat. After the different colors have been applied the lines where the colors meet should be covered with a black band about one and one quarter inches wide. Precautions should be taken to see that the paint is dry and hard before permitting anything to come in contact with the painted surface.

(d) To Remove Paint.

The paint may be removed by turpentine or by the use of a paint torch if care is taken in the use of the flame.

PART II - INSPECTION AND MAINTENANCE OF THE MOUNT.

SECTION A - Care of Recoil Mechanism.

(a) The recoil cylinder should be emptied and refilled once every three months and thoroughly cleaned once every six months or oftener if conditions require it.

The liquid in the recoil cylinder is a solution of equal parts glycerine and water. The density of the liquid should be 1.15 and should have a neutral or alkaline reaction, caused by adding caustic soda or caustic potash, chemically pure. A hydrometer, which is kept in the armament chest when not in use, is furnished to test the solution for density. This liquid should be filtered through a clean piece of muslin or linen before using. The glycerine should be kept in closed cans, provided for the purpose, and be carefully protected from dirt, sand and grit. Liquid drawn from cylinders and containing sediment must not be used again until it has been allowed to settle for not less than 24 hours.

(b) To dismount recoil mechanism. Refer to Plate VII.

The dismounting of the recoil mechanism should never be undertaken in the field.

Four men required, one cylinder at a time.

Tools needed:

Wrench, double 0.625 and 0.75, U43F
Buckets
Can
Screw driver, U45W
Wrench, single 4.25 nuts, U596D
Spanner wrench, recoil cylinder follower, U596A
Wrench, stuffing box and cylinder head, U596C
Wrench, recoil cylinders, U596B

(1) Elevate the Howitzer 5 degrees, remove drain plug and drain liquid from cylinder into buckets, 16.25 gallons in both cylinders.

(2) Remove locking screws from piston rod nuts and take off piston rod nuts, rear.

(3) Remove air from recuperator by unscrewing emptying valve on rear end of recuperator cylinder.

(4) Slide Howitzer back until the lug on the recoil band clears the end of piston rod by about 6 inches and take off piston rod nut, front.

(5) Unscrew stuffing box; draw it off piston rod; remove follower, gland, and packing, and screw follower and stuffing box back into the cylinder.

(6) Remove cylinder head, weight 174 pounds.

(7) Draw piston rod with piston out through cylinder head end of cylinder. The weight of piston rod with piston is approximately 392 pounds; care should therefore be used in handling it.

(8) Unscrew recoil cylinder and slide cylinder out. The cylinder weighs 628 pounds.

(9) Stuffing box, follower and leather washer may be removed. Locking screw need not be removed.

(c) To Assemble Recoil Mechanism. Refer to Plate VII.

The assembling of the recoil mechanism should never be undertaken in the field.

Four men required.

Tools needed:

Wrench, recoil cylinders, U596B

Screw driver, U45S

Wrench, recoil cylinders, U596B

Wrench, stuffing box, and cylinder head. U596C

Wrench, single, 4.25 nuts, U596D
Screw driver, U45W
Wrench, double, 0.625 and 0.75. U43F
Hand mallet. U47AN
Brass rod 0.312 (5/16) diameter by 12 inches.
Glycerine and water solution (either new or used)
Hydrometer (if solution is new)
Filling funnel.
Can
6 rings of 0.375 inch Garlock packing.

(1) Insert recoil cylinder in cradle and push it through until threads on cylinder come in contact with threads on cradle. Turn cylinder with wrench on flats at stuffing box end until cylinder flange bears firmly on cradle and notch in flange at stuffing box end lines up with hole in cylinder for locking screw.

(2) Screw locking screw in cradle.

(3) Insert piston rod in cylinder and place leather washer; stuffing box, washer; stuffing box, with gland and follower in place, and piston rod nut (front) on rod when it is pushed through stuffing box end of cylinder. Screw stuffing box in place and push piston rod to rear through recoil band, advancing piston rod nut, until the distance from the end of the threaded end of rod to the rear end of cylinder equals 24.375 ± 0.01 inches.

(4) Lock the front and rear piston rod nuts.

(5) Pack the stuffing box as per instructions section A, division e.

(6) With leather washer and recoil cylinderhead bushing in place, screw on cylinder head.

(7) Fill cylinder with the glycerine and water solution, using filling funnel prescribed as per instructions section A, division d.

(d) To Fill recoil cylinders. Refer to Plate VII.

Two men required.

Tools needed:

Wrench, double 0.625 and 0.75 U43F
Filling Funnel.
Glycerine and water solution (either new or used)
Hydrometer (if solution is new)

(1) Set Howitzer at 0 degree with recoil band against stops on cradle and remove filling plugs.

(2) Insert filling funnel and fill to overflowing with solution of glycerine and water. Allow escape of air, refill, remove funnel, and screw filling plugs tight.

(e) To Pack Stuffing Box. Refer to Plate VII.

One man required.

Tools needed:

Spanner wrench, stuffing box follower. U596A
Hand mallet, U47AN
60 rings of 0.375-inch Garlock packing.
Screw driver, U45W
Wrench, single, 4.25 nuts, U59D
Wrench, box. U423D
Brass rod, 0.312 (5/16) diameter by 12 inches.
Can
Wrench, double 0.625 and 0.75 U43F

(1) Elevate Howitzer 5 degrees, remove drain plugs, and drain liquid from cylinders to buckets, 16.25 gallons in both cylinders. Elevate Howitzer to 0 degree elevation.

(2) Allow air to escape from recuperator cylinder by unscrewing exhaust stem in valve rear end of cylinder.

(3) Remove locking screws from piston rod nuts and take off piston rod nuts, rear.

(4) Slide Howitzer back until the lug on the recoil band clears the end of the piston rod by about 6 inches and take off piston rod nuts, front.

(5) Unscrew stuffing box; draw it off piston rod; remove follower, gland, and packing; screw stuffing box back into cylinder and discard any of the packing that is unfit for use. If any is used to repack, it should be put in after new.

(6) To repack, put on the piston rod, one ring of the packing and force it well to the bottom of the stuffing box by brass rod and mallet. Treat each ring of packing in the same manner, being careful to break joints, until three rings of new packing or an equal amount of new and old packing have been inserted. Enter the gland and follower in the box and screw up tight.

(7) Screw piston rod nuts (front) on rods, slide Howitzer forward, put piston rod nuts (rear) on, and add locking screws.

(8) Fill recoil cylinder as prescribed in section A. division (d)

(9) Fill recuperator cylinder with air as prescribed in section B, division (d).

The addition of the leather washer around the piston rod in front of the stuffing box allows less force to tighten the follower than if it were the plain packing.

The follower should be tightened up from time to time. If it is screwed into the stuffing box too tightly, an unnecessary amount of friction will be produced on the rod. When the follower is screwed ~~in~~ until the flange strikes the box, it should be repacked.

(f) To Clean Recoil Cylinders.

This operation should not be undertaken in the field.

Three men required.

Tools needed:

Wrench, double, 0.625 and 0.75 U43F
Buckets.
Can
Spanner wrench, recoil cylinder follower. U596A
Screw driver, U45W
Wrench, single, 4.25 nuts, U596D
Wrench, stuffing box and cylinder head. U596C
Plumbers hand force pump with hose.

- (1) Elevate Howitzer 5 degrees, remove drain plugs, drain liquid into buckets, and elevate Howitzer to 0 degree.
- (2) Remove locking screws from piston rod nuts and take off piston rod nuts, rear.
- (3) Release followers a few turns, remove cylinder heads, weight 174 pounds each, and draw out piston rods as prescribed in section A, division (b)
- (4) Thoroughly clean cylinders with kerosene oil forced into both ends with pump and wipe the interiors dry with clean waste. Clean the piston rod and cylinder heads.
- (5) Replace piston rod cylinder heads and tighten follower. Screw nuts in place on piston rod and lock.

SECTION B - Care of Recuperator.

- (a) In general. Refer to plate VIII.

The recuperator cylinder and plunger should be emptied and re-filled once every three months and thoroughly cleaned once every six months, or oftener if conditions require it.

The liquid in the plunger is the same as that in the recoil cylinder. (See section A, division (a), second paragraph)

The initial pressure of the air, with Howitzer in battery, should be 1550 pounds per square inch and of the liquid 1700 pounds per square inch. The pressures are indicated by the pressure gauges, on the support

with the pump. If the pressure of the air is not sufficient to return the howitzer to battery at maximum elevation 60 degrees and if the plunger is not full of liquid, pump glycerine solution into plunger until either normal pressure or a full plunger is obtained, provided that the variation from 1550 pounds per square inch is small.

If this variation is large, connect the compressed air tank and raise the pressure in the air chamber. The amount of space between the rear face of the washer, on the front end of the piston rod and the front face of the stuffing box gland, indicates the amount the piston has moved toward the plunger, caused by leakage of the liquid. When this distance equals approximately 5.875 inches, the piston is resting against the plunger, the plunger must be refilled with liquid before this condition exists or serious damage will be done. There should always be a space between the rear face of the washer and the front face of the gland, even when plunger is full of liquid. Because if the washer is against the gland, there is nothing to indicate that the liquid pressure is balanced by the air pressure and any excess liquid pressure may damage the piston rod.

The pull rod bearings in cradle should always be well lubricated.

(b) To Dismount Recuperator. Refer to Plate VIII.

This operation should never be done in the field unless it becomes absolutely necessary. The Howitzer must not be elevated while the recuperator is dismantled.

Five men required.

Tools needed:

Wrench, box U423D
Spanner wrench. U423E
Wrench, double, 1.25 and 1.5. U433A
Screw driver, U45AN

Socket wrench, U422G
Handle, U422H
Socket wrench, U422D
Wrench, double 0.875 and 1. U43G
Wrench, U423A
Monkey wrench, 6-inch. U45DA
Screw driver, U45AE
Socket wrench, U422C

(1) With the Howitzer at 0 degrees, open upper stem on liquid valve until liquid begins to escape, then close.

(2) Depress the Howitzer to -5 degrees and secure by means of the muzzle support.

(3) Empty air from recuperator cylinder by unscrewing both stems in air valve at rear end of cylinder. It is very important that all the air be allowed to escape before removing any parts.

(4) Slack off the front nuts on the large stuffing box at front end of recuperator cylinder in order to take the pressure off of the plunger, caused by the packing.

(5) Push plunger and piston to the rear with its yoke until pull rod bushings are uncovered, holding pull rods in their original position.

(6) Block up under plunger at a point just behind the yoke to support plunger.

(7) Remove lock screw in each yoke bushing.

(8) Unscrew yoke bushings.

(9) Remove pull-rod bracket.

(10) Push pull rods to rear.

(11) Remove yoke bushings.

(12) Pull out the plunger, piston rod, and yoke, which weigh about 500 pounds, care being taken to have these parts centered at all times and to protect the outer surface of plunger.

- (13) Remove piston-rod nut, washer, gland, and stuffing box, small, with packing and plunger leather.
- (14) Draw out piston.
- (15) Disconnect air and liquid piping and remove liquid valve.
- (16) Remove plunger protection ring, felt washer, gland, stuffing box, large, with packing and plunger leather packing.
- (17) Remove set screw in cylinder clamp lock, unscrew cylinder clamp lock and slide cylinder out to rear, weight about 895 pounds.

(c) To Assemble Recuperator. Refer to Plate VIII.

This operation should never be undertaken in the field unless it becomes absolutely necessary.

Five men required.

Tools needed:

- 3 rings flax packing, 30D
- Piston washer, leather. 30B
- Spanner wrench, U423G
- Socket wrench, U422C
- Socket wrench, U422D
- Screw driver, U45AN
- Monkey wrench. 6-inch, U45DA
- Wrench. U423A
- Wrench, double, 0.875 and 1. U43G
- Socket wrench. U422G
- Handle, U422H
- Screw driver, U45AE
- Wrench, double, 1.25 and 1.5. U43BA
- Wrench. U423D
- 10 ring flax packing. 27N and 28M
- 2 leather packing. 27H and 28K
- Brass rod, 0.437 (7/16) diameter by 12 inches.
- Filling funnel
- Can
- 2 tanks of compressed air.

(1) Slide cylinder into housing in cradle, screw cylinder clamp lock on front end of cylinder and lock with set screw. Cylinder weighs 1040 pounds.

(2) Place stuffing box, gland, leather packing, and felt washer on plunger and slide to front.

(3) Assemble packing, gland, and washer to piston and place piston rod in place in plunger.

(4) Push piston and plunger into cylinder.

(5) Pack stuffing box, large, and put nuts on studs, care being taken to tighten up nuts alternately so packing bears properly. (See division (e).)

(6) Push plunger to the rear, screw yoke bushings on pull rods, and slide pull rods in place.

(7) Put leather packing and stuffing box, small, in plunger and put nuts on studs.

(8) Pack stuffing box, small, place gland in place and screw nuts on studs, care being taken to tighten up nuts alternately so packing bears uniformly. (See division (e).)

(9) Place washer on end of piston rod and screw nut against shoulder.

(10) Bolt liquid valve to cylinder and connect up air and liquid piping.

(11) Fill the plunger with liquid, connect up the air tank, and fill the cylinder with air.

(d) To fill recuperator cylinder. Refer to Plate VIII.

Five men required.

Tools needed:

Box wrench, U423A.
Wrench. U423D.
Can
Glycerine and water solution
Two tanks of compressed air.

(1) Fill plunger with glycerine and water solution, by means of the pump, and at the same time letting compressed air into the air chamber, being careful to keep the liquid and air pressures balanced as indicated by projection of piston rod forward from stuffing box.

When plunger is full, there should be only a small space between front face of stuffing box gland and rear face of washer at front end of piston rod. Never allow these two to come together.

(2) To fill the air chamber, the following has to be done: Connect up the air tank with the air pipe connection by the copper tubing, open the valve on the tank, then open the valve on the air cylinder. Two tanks are usually sufficient to run the air pressure in recuperator cylinder up to 1700 pounds per square inch; others or parts of others may be used, if necessary.

(e) To pack stuffing boxes. Refer to plate VIII.

One ring of packing is placed in stuffing box and forced well to bottom with brass rod and mallet. Treat each ring of packing in the same manner, being careful to break joints until the five rings have been inserted. Nuts on studs should be screwed tight against glands.

When repacking these stuffing boxes, recuperators must be dismounted (see section B, division (b)) sufficiently to get the packing out. Any of the old packing that is unfit for use should be discarded. If any of the old is used to repack, it should be put in after the new.

The addition of the leather washers around the piston rod and plunger in the rear of the stuffing boxes allows less force to tighten

the glands than if it were the plain packing.

The nuts around the glands should be tightened from time to time. If the glands are pressed too tightly into the stuffing boxes, an unnecessary amount of friction will be produced on the plunger and rod. When the glands are pushed in until they strike the stuffing boxes, they should be repacked.

- (f) To clean recuperator cylinder and plunger. Refer to Plate
See Section B, division (b).

This should never be undertaken in the field except in case of absolute necessity.

Dismount the recuperator, thoroughly clean the cylinder and plunger with kerosene oil forced into them with plunger's force pump. Wipe the interiors dry with clean cotton waste. Clean the piston and piston rod.

SECTION C - CARE OF ELEVATING MECHANISM.

- (a) To Dismount the elevating mechanism. Refer to plates XI and XII.

Three men required.

Tools needed:

Wrench, double, 0.875 and 1. U43G
Wrench, double, 1.25 and 1.5 U43BA
Wrench, double, 2. and 2.25 U43AW
Wrench, pinion shaft and nut 3.5 U82H
Screw driver, U45AN
Screw driver, U45AE
Machinist's hammer, U48F
Pin punch, U47AF
Blocks of wood.

- (1) Take hand wheel off and remove brake band.
(2) Remove pinion shaft gear from elevating pinion shaft, and

remove elevating pinion shaft.

(3) Take off intermediate pinion shaft nut and washer, and remove intermediate pinion shaft, care being taken to see that intermediate gear is blocked up.

(4) Remove elevating gear plate with bearings fastened to it.

(5) Remove intermediate gear.

(6) Take off handwheel shaft.

(7) Remove rack.

(b) To assemble elevating mechanism.

Reverse the operations, as outlined in above, for dismounting.

SECTION D - CARE OF TRAVERSING MECHANISM.

(a) To dismount traversing mechanism. Refer to Plate XIII.

Three men required.

Tools needed:

Wrench, double, 0.625 and 0.75 U43F

Wrench, double, 1.25 and 1.5, U43BA

Wrench, double, 0.375 and 0.5, U43C

Hammer, machinists. U48F.

Punch, pin, U47AF

Wrench, double, 2. and 2.25, U43AW

(1) Screw out side leveling screw, remove sight with sight bracket from cradle trunnions.

(2) Take off gear case cover.

(3) Remove pin and collar from end of worm shaft and draw it out.

(4) Knock out pins in lower part of vertical traversing shaft and take off traversing pinion.

(5) Draw shaft with worm wheel up through case; push worm to side of case when starting

(6) Worm may then be removed from case, and case taken off side of frame; worm wheel may also be driven off shaft.

(b) To Assemble traversing mechanism. Refer to plate XIII

Three men required.

Tools needed:

Wrench, double, 0.375 and 0.5, U43J
Wrench, double, 0.625 and 0.75, U43F
Wrench, double, 1.25 and 1.5, U43BA
Wrench, double, 2. and 2.25, U43AW
Hammer, machinists, U48F
Punch, pin, U47AF

(1) Bolt gear case to side frame and place worm in pocket in case.

(2) Drive worm wheel on shaft and place shaft in position.

Worm must be held against wall of case when assembling wheel and shaft,

(3) Drive pinion on shaft and pin in place.

(4) Slide worm shaft in place and lock it with pin and collar.

(5) Bolt cover on case, and bolt sight assembled, or sight bracket to trunnions.

(6) Connect up leveling screw.

SECTION F - CARE OF AMMUNITION CRANE

(a) To dismount ammunition crane. Refer to Plate XXVII

Men required.

Tools needed:

1 Hammer, U48F
1 pin punch
1 screw driver, U45AN
1 Wrench, double, 0.375 and 0.5, U43C
1 Wrench, double, 0.625 and 0.75, U43F
1 Wrench, double, 0.875 and 1. U43C

(1) Remove bolt fastening hoisting rope to end of crane mast, and place bolt back in socket on rope. This removes sheave block plate,

sheave and crane hook.

(2) Remove intermediate rope guard and sheave from crane mast.

(3) Remove lower sheave bracket from crane mast and leave sheave and rope guard attached to sheave bracket.

(4) Unpin crank shaft collar and unscrew crank shaft nuts.

(5) Remove left crank and left crank bushing. The crank shaft may now be withdrawn to the left and the pinion, ratchet and friction box, and friction disc be lifted out. The right crank may also be withdrawn.

(6) Remove split pins, drive out drum shaft and lift out drum and gear.

(7) Remove drum bracket from crane mast.

(8) Remove crane mast from crane mast pedestal and unbolt pedestal from platform.

(b) To Assemble Ammunition Crane.

Men Required.

Tools needed:

- 1 Hammer, U48F
- 1 Pin punch
- 1 Screw driver, U45AN
- 1 Wrench, double, 0.375 and 0.5, U43C
- 1 Wrench, double, 0.625 and 0.75, U43F
- 1 Wrench, double, 0.875 and 1., U43G

Reverse procedure as outlined above for dismounting in (a).

Note:- Care should be taken to see that the bronze and steel friction discs are assembled in their proper order.

SECTION E ANTI-FRICTION DEVICE.

(a) To Dismount anti-friction device. Refer to Plate XIV.

Four men required.

Tools needed:

Wrench, single, 1.75. U43V

Wrench, spanner, U596E

Screw driver, U45AE

- (1) Unscrew locknut on adjusting screw.
 - (2) Remove split pin and nut from bearing support.
 - (3) Unscrew adjusting screw until bearing; support is clear of bearing seat.
 - (4) Remove roller and bearing seat.
 - (5) Remove upper trunnion pin bearing and key.
 - (6) If tipping parts are out of side frame bearing, the bearing support can be drawn up through the hole in side frame.
 - (7) Belleville springs and washers can not be removed.
 - (8) Unscrew adjusting screw nut with lockwasher attached to it.
- (b) To assemble anti-friction device.

Reverse the operation as outlined in above, for dismounting.

SECTION 8 - CARE OF TRUCKS.

- (a) To remove trucks from Mount, refer to Plate XXXII.

~8 Men required.

Tools needed:

4 Auxiliary jacks.

1 Crowbar, 1243A

1 Pinch bar

1 - 7-inch pliers, U47AQ

- (1) Remove split pin from live lever pin and remove live lever pin from rear truck lever connection. Place live lever pin in hole in live lever and insert split pin.
- (2) Lift center pin from center plate hole, using pinch bar to separate.

same, if necessary.

(3) Raise mount with jacks as described in Part I, Section (L), Division (d) until mount is clear of trucks.

(4) Shove trucks along until they are clear of mount.

(b) To Disassemble and Assemble Trucks. Refer to Plate XXXII.

Three men required.

Tools needed:

- 1 Wrench, double, 1.25 and 1.5 nuts, U43BA
- 1 Wrench, double, .875 and 1-inch, U43G
- 1 - 7-inch Pliers, U47AQ
- 2 Crowbars, 1243A
- Blocking
- 1 - 16-inch Monkey wrench, U45DA
- 1 Car Box Jacking screw, with levers, 1022C
- 4 Jacks, 25-ton
- 1 Combination Hook and Packing tool
- 1 Hammer, U48F
- 1 Pinch bar.

(1) Remove pedestal tie from both sides of truck replacing bolts in ties with nut locks and nuts.

(2) Remove cotters from equalizer pins (put cotters in a convenient place so they can be replaced in pin when same are later removed).

(3) Place jack screw on secure blocking under inside pedestal castings of outer wheels and raise truck frame until springs and equalizers are released sufficiently for removing.

(4) Remove semi-elliptic spring keys which will allow spring to be removed.

(5) Remove pins from equalizers and replace pins in same, also replace cotters. (Refer to Art. 2).

(6) Remove cotters and nuts from Helical spring bolts, then remove bolts and replace nuts and cotters. Also remove springs and spring seats.

(7) Place car jack on secure blocking under semi-elliptic spring seat and raise truck frame sufficient to remove wheels and journal boxes. (Small jack screws and blocking can now be removed).

(8) Push end wheels with journal boxes away from truck frame.

(9) Disconnect bottom connection rod from both front and rear truck levers and replace connection pins in their respective places in rods.

(10) Remove rear truck lever from brake beam and replace connection pin in hole from which it was taken in brake beam.

(11) Disconnect front truck lever from dead lever bracket and replace connection pin in dead lever bracket.

(12) Disconnect dead lever bracket from dead lever fulcrum bracket and replace connection pin in dead lever bracket.

(13) Remove front truck lever from brake beam and replace connection pin in hole in brake beam.

(14) Pull out brake shoe keys and remove brake beams and brake shoes.

(15) Remove brake shoe hangers from side frames and replace hanger bolts with keys in hangers.

(16) Place blocking under pedestal casting of end wheels at either end of truck most convenient and remove the car jacks near the end so blocked by unscrewing jacks so as to allow frame to rest on blocking. This will permit moving center wheel with boxes, interposition formerly occupied by end wheels.

(17) Replace car jacks under semi-elliptic spring seats as before and raise this end so as to release load of frame from blocking at end.

(18) Remove end blocking and push wheels away from frame.

(19) Open journal box doors and remove journal box packing with hook and packing tool.

(20) Tilt the outer ends of the boxes up until bearing wedge and bearings can be removed; remove wedges and take bearings out. Then remove boxes.

(21) To Assemble Trucks. Reverse the process just described.

(c) To Pack Journal Boxes.

One man required.

Tools needed:

1 Hook and Packing Tool.
Bucket or Tin can of 3 to 5 gallons capacity
Galena Oil
Wool or Cotton Waste

(1) With hook and packing tool remove waste, also all particles of sand and grit from journal boxes.

(2) In the bucket or tin can place enough waste to pack the number of journal boxes to be packed; wool waste is preferable, but cotton waste will do and saturate with Galena Oil.

(3) With hook and packing tool pack the oil saturated waste firmly into the lower section of the Journal Boxes. Note: - The life of the journal bearings will be considerably lengthened and the trouble arising from burned out bearings will be reduced to a minimum if regular inspections be made of the journal box packing. If the car is to be moved a considerable distance, especially after having stood in one place for any length of time, it is well to see that all boxes are well packed with oil saturated waste. Care should be taken to see that the covers are kept closed and promptly replaced where broken or lost in order to keep out, as much as possible, all sand and grit.

(d) To Replace Journal Bearings.

Two men required.

Tools needed:

- 1 Pinch Bar
- 1 Car Box Jacking Screw
- 1 Hook and Packing Tool

- (1) With car body jacks raise car body about two inches.
- (2) With car box jacking screw raise the journal box, from which the bearing is to be removed, about two inches.
- (3) Raise journal box cover and remove bearing wedge with hook, withdraw bearing.
- (4) Put new bearing in position and replace bearing wedge; pack journal box packing firmly around lower half of journal and be certain that journal bearing and wedge are properly seated.
- (e) To Place Trucks under car.

Reverse procedure outlined in Part II, Section G, Division (a).

SECTION H - CARE OF TRUCKS

- (a) To Disassemble Air Brake. Refer to plates XIX and XX.

Two men required.

Tools needed:

- 1 Hammer, U48F
- 1 - 7-inch Pliers, U47 AQ
- 1 Pinch Bar
- 1 Wrench, double, .75 and 1-inch nuts, U153G
- 1 Wrench, monkey, 6-inch, U45DA
- 1 Stillson Pipe wrench, .25 and 2.5-inches, 637D
- 1 Wrench, double, 0.875 and 1-inch nuts, U433
- 1 Wrench, double, 0.625 and 0.75-inch nuts, U43F
- 1 Wrench, double, 0.375 and 0.5-inch nuts, U434C

- (1) Disconnect hand brake pullrod and brake cylinder lever connection from brake cylinder lever and replace connection pin in end of pullrod.
- (2) Disconnect floating lever connection from floating lever and replace connection pin in floating lever connection.

- (3) Disconnect live lever from floating lever and replace pin in live lever.
- (4) Unbolt and remove cylinder lever fulcrum from center sill and replace bolts in their respective holes in center sill and remove cylinder lever from cylinder lever fulcrum.
- (5) Disconnect brake cylinder pushrod from cylinder lever and replace connection pin in end of pushrod, disconnect floating lever from floating lever fulcrum and replace pin in floating lever.
- (6) Unbolt and remove floating lever fulcrum from under side of floor plate and replace bolts in fulcrum.
- (7) Disconnect union on cross pipe between cylinder and reservoir and remove pipe.
- (8) Unbolt and remove brake cylinder from support and replace bolts in support.
- (9) Disconnect pipes and ells from reservoir that connect with cross pipe to cylinder.
- (10) Unbolt triple valve from reservoir.
- (11) Unbolt and remove reservoir from support, replacing bolts.
- (12) Remove triple valve.
- (13) Unscrew pipe "BA"
- (14) Remove centrifugal dirt collector.
- (15) Remove elbow and pipe "GA"
- (16) Unscrew pipe "AA" from cut out cock and remove self-locking cut-out cock No. 2135 with upper pipe "AA" from 1.25 tee.
- (17) Remove upper pipe "AA" from cut out cock.

- (18) Remove V bolt in end sill and unscrew self-locking angle cock No. 22413.
- (19) Unscrew pipe "R" from coupling leaving coupling on pipe "S".
- (20) Remove pipe hanger and unscrew pipe "S" from 1.25 ell and leave ell on pipe "T".
- (21) Remove pipe "T" from 1.25 tee and leave tee on pipe "U".
- (22) Unscrew pipe "U" from ell and leave ell on pipe "W".
- (23) Remove pipe hanger and unscrew pipe "W" from elbow and leave elbow on pipe "X".
- (24) Unscrew pipe "X" with drain cock from pipe "Z".

Note:- If it is desired to disassemble the complete air brake equipment on mount, repeat the above operation for disassembling the mechanism under the other end of the mount.

(b) To Disassemble and Assemble Handbrakes. Refer to Plate XIX and XX.

Two men required.

Tools needed:

- 1 Hammer, U48F
- 1 - 7-inch pliers, U47AQ
- 1 Wrench, double, 0.375 and 0.5-inch nuts, U43G
- 1 Wrench, double, 0.625 and 0.75-inch nuts, U43F

- (1) Disconnect handbrake pull rod from cylinder lever and replace connection pin in end of rod.
- (2) Remove handbrake sheave from handbrake pull rod, take chain from around sheave and fasten sheave back in rod jaws with pin.
- (3) Unbolt and remove pull rod hanger and replace bolts in hanger.
- (4) Remove pull rod.
- (5) Disconnect handbrake chain from brake mast step and brake mast.

- (c) (6) Unbolt and remove brake mast step and replace bolts on mast step.
(7) Remove brake mast with handwheel and ratchet attached.
To Assemble Air Brake. Refer to Plates XIX and XX.

Three men required.

Tools needed:

- 1 Hammer, U48F
- 1 7-inch pliers, U47AQ
- 1 Pinch bar.
- 1 Wrench, double, .75 and 1-inch, U153G
- 1 Wrench, monkey, 6-inch, U47DA
- 1 Stillson Pipe Wrench, .25 to 2.5 inches, 637D
- 1 Wrench, double, 0.625 and 0.75-inch nuts, U43F
- 1 Wrench, double, 0.375 and 0.5-inch nuts, U43C
- 1 Wrench, double, 0.875 and 1-inch nuts, U43G

Reverse procedure as outlined in Section H, division (a).

- (d) To clean and Oil Brake Cylinder. Refer to plate XXIX

Two men required.

Tools needed:

- 1 - 7-inch pliers, U47AQ
- 1 Hammer, U48F
- 1 Pinch bar
- 1 Wrench, double, .625 and 0.875-inch nuts, U153E
- 1 Wrench, monkey, 6-inch, U47DA

- (1) Disconnect pushrod from cylinder lever.
 - (2) Remove bolts connecting cylinder to brake cylinder brake and remove pipes connecting cylinder to reservoir.
 - (3) Remove piston head.
 - (4) With kerosene oil, thoroughly clean and remove all particles of sand and grit from piston, piston ring and inside of cylinder.
 - (5) Oil piston leather in piston with heavy oil or light grease.
 - (6) Put piston back in cylinder and replace whole on car.
- (e) To clean and oil triple valve K-2. Refer to Plate XXXIII.

Two men required

Tools needed:

- 1 Stillson Pipe Wrench, .25 to 2.5-inches, 637D
- 1 Hammer, U48F
- 1-7-inch pliers, U47AQ
- 1 Wrench, double, .75 and 1-inch nuts, U153G
- 1 Wrench, monkey, 6-inch, U47DA
- 1 Wrench, double, .375 and .5-inch nuts, U153B

- (1) Disconnect branch pipe union and remove branch pipe from triple valve.
- (2) Disconnect triple valve from auxiliary valve.
- (3) Unscrew union nut 17 and remove strainer 16.
- (4) Unscrew graduating stem nut 20 and remove graduating spring 22.
- (5) Remove nut from bolts 24 and take off cylinder cap 19 and cylinder cap gasket 23.
- (6) Withdraw piston and slide valve from casing.
- (7) Remove cap screws 25 and take off check valve case 13 and emergency valve 9.
- (8) Remove piston 8.
- (9) Remove emergency valve 10 and check valve 15.
- (10) Unscrew retarding device 29 and remove retarding spring 33 and stem 31.
- (11) Clean all parts thoroughly with kerosene oil. Using oil sparingly, oil triple piston and surface between slide valve and slide valve seat. Also surface between graduating valve and slide valve.
- (12) Assemble by reversing procedure, as outlined above, and replace triple valve in position.

(f) To Clean Centrifugal Dirt Collector. Refer to Plate XXXI

One man required.

Tools needed: None

- (1) Open cock at bottom of collector until all particles of sand, dirt and water are blown out.

(g) To Take Up Shoe Wear.

One man required.

Tools needed:

1 Pliers, U47AQ
1 Hammer, U48F
1 Pinch bar.

(1) Release brakes, both hand and air.

(2) Disconnect front truck lever from dead lever bracket, move front truck lever out until the rear truck lever will not go back to less than 1.5-inches from the truck bolster and remake connection in proper hole in dead lever bracket.

(3) If necessary the shoes can be set up tighter by moving the front truck lever to the end holes of the bottom connection rod.

(m) To Replace Brake Shoes. Refer to Plate XXXII.

One man required.

Tools needed:

1 Hammer, U47AM
1 Pinch Bar.

(1) Release brakes, both hand and air.

(2) Withdraw brake shoe keys, take out worn shoes and replace with new ones.

SECTION I. - CARE OF JACKS

(a) To Disassemble screw jacks. Refer to Plate XXV

Two men required.

Tools needed:

1 Hammer, U48F
1 Pin punch
1 Wrench, double, 1.25 and 1.5, U43G
1 Wrench, double, 0.625 and 0.75, U43F

- (1) Unscrew lower jack pinion stud nut and remove ratchet and pawl with housing.
- (2) Remove upper jack pinion stud nut and take out jack pinion stud with jack pinion attached.
- (3) Remove jack screw nut and let jack and ram rest against guide.
- (4) Take washers and screw gear off of screw.
- (5) Remove stop from ram and guide from base plate.
- (6) Remove screw and ram.

Note:- In order to remove screw and ram it is necessary to run the mount over a pit or dig a hole in the ground.

(b) To Assemble screw jacks reverse the operations outlined above for disassembling

(c) Care and Oiling of Jacks.

The jacks should be lubricated frequently. To do this a steel compression grease cup is screwed into the stop on the ram. This cup should never be without grease in it. The jack levers should be removed and placed in some convenient place on the platform.

(d) Care of Auxiliary Jacks.

When not in use the auxiliary jacks should be placed under the ammunition table. The bearings of the jack should be kept well oiled and the main lifting screw and the teeth of the gears should be lubricated with heavy grease when necessary to make jacks work easily.

PART III.

SECTION A. PRECAUTIONS TO BE OBSERVED BEFORE FIRING.

(a) This carriage is designed to be fired from 20 to 60 degrees elevation; do not fire it below 20 degrees.

(b) Fold up platform at breech of Howitzer.

(c) Take reading at liquid pressure gauge; this reading should be 1700 pounds per square inch, a small amount of liquid will leak out each round and is replaced by means of the pump.

(d) Take reading at air pressure gauge; this reading should be 1550 pounds per square inch.

(e) The distance the recuperator piston rod moves indicates liquid leaking at the packing and the rod should never be allowed to stand out past the gland more than 5.875 inches.

(f) Traverse gun through entire allowed movement to make sure that all parts work freely.

(g) Elevate Howitzer through entire range of elevation to see that all parts work freely.

(h) Make sure that all nuts, tap bolts, and screws on elevating mechanism, traversing mechanism panoramic sight, and elevation quadrant are set up properly.

(i) Make an inspection of recoil and counter recoil systems to see that they are properly assembled, especially after the Howitzer has been dismounted from the cradle.

(k) See that the outriggers are set securely.

(l) See that the underframing of the mount has a uniform bearing on the ground platform.

(m) Make sure that the recoil cylinder is properly filled.

(n) All brakes should be released.

SECTION B - PRECAUTIONS TO BE OBSERVED BEFORE TRAVELLING.

- (a) See that all equipment to be carried on the mount is properly secured and that none of it projects out past the clearance line.
- (b) Depress gun to 0 degree elevation and traverse it to 0 degrees azimuth and fasten gun with travelling lock.
- (c) Remove panoramic telescope, place it in carrying case and store in secure place.
- (d) An inspection should be made of journal boxes to see that they are properly packed and that the bearings have not worn down too much.
- (e) An inspection should be made also of the brake shoes and mechanism. If there is too much play between the brake shoes and wheels, the wear should be taken up in the brake mechanism or the brake shoes replaced with new ones.
- (f) Be sure that the complete set of tools are on hand.
- (g) See that buffers and couplings are in proper working condition.

PART V.

TABLE OF WEIGHTS AND DIMENSIONS OF 12-INCH
HOWITZER RAILWAY MOUNT, MODEL OF 1918.

Length of recoil normal 36" max. 37.5

Angle of Elevation (firing ~~+~~20 to ~~+~~60

" " Depression - 5° loading

" " Traverse 360°

Weight of recoiling parts (empty) - 49,188

" " tipping " " 64,533 (Loaded 65,333)

Weight of Car including base plate 102,880.

Length over draft Gear - 42 ft. 2 in. approx.

Total weight of trucks (two) 30,000 lbs.

Type of trucks 6-wheel - 5.5 x 10 journals.

Diameter of wheels 28 in.

Weight of traversing parts with gun (Empty) 92,363

Total weight on track - 195,243.

Weight of gun including recoil band & breech mech. 47,239

Muzzle Velocity 1950 f.s.

Range 21,600 yds (Approx.)

Wt. Projectile 700 lbs.

Wt. Powder 95 , "

Chamber pressure 37,000 lbs.

Muzzle energy 18,474 ft. tons

Total rod pull at 60° - 348,766 lbs.

Weight per axle at track (front) 35,931 lbs.

" " " " " (rear) 29,150 "

PART IV. - LIST OF PARTS
12-INCH HOWITZER CARRIAGE, MODEL OF 1918.
CRADLE & DUST GUARD

1.

No. for one carriage	Piece Mark	Drawing Class Div.	No.	Name of Piece	Material	Remarks
1	16A	10	26	16 Cradle	Cast Steel No. 2	With 9-0.625x0.625 Rowen (or equal) style "C" oil cups With 3- spring lock steel grease cups, 0.5 pipe thread, Bowen No. 4 (or equal)
1	18A	10	26	18 Pull Rod Bracket	Cast Steel No. 2	
4	18B	10	26	18 Bolts 1		1.5 x 4.625 snug with 4-0.25x1.437 (1-7/16)
2	18H	10	26	18 Pull Rod Bracket Bushing	Bronze	Bronze pins, driven
2	18C	10	26	18 Rings	Sheet Steel	0.125 thick
2	18D	10	26	18 Fillers	Leather	0.187(3/16) thick
12	18E	10	26	18 Tap Bolts 2		0.5 x 1.375
SIDE FRAMES, TRANSOMS AND TRUNNION CAPS						
1	23A	10	26	23 Side Frame (Right)	Cast Steel No. 2	With 3-0.5 Handy Oilers
17	23B	10	26	23 Bolts 1		1.5 x 5.625 snug
1	23C	10	26	23 Seamless Tube	Brass	0.375 O.D. x 0.064 thick, 17.5 long
1	23D	10	26	"	"	0.375 O.D. x 0.064 thick, 7.5 long
1	23E	10	26	"	"	0.375 O.D. x 0.064 thick, 6.5 thick
1	24A	10	26	24 Side Frame (Left)	Cast Steel No. 2	
17	23B	10	26	24 Bolts 1		1.5 x 5.625
1	14A	10	26	14 Transom (Rear)	Cast Steel No. 2	
16	14B	10	26	14 Bolts 1		1.25 x 5.125 snug
1	15E	10	26	15 Transom (Front)	Cast Steel No. 2	
14	15F	10	26	15 Bolts 1		1.25 x 5.625 snug
1	15A	10	26	15 Trunnion Cap (right)	Cast Steel No. 2	With 1-0.5 Handy Oiler
1	15B	10	26	" (Left)	"	With 1-0.5 Handy Oiler
4	15C	10	26	15 Tap Bolts 2		1.5 x 7.125 snug thread, 2.25 long
1	15G	10	26	15 Name Plate		
2	15H	10	26	15 Screws	Bronze	0.25 x 0.5 round head
1 with nuts and lock washers. 2 with lock washers only. 23176						

ANTI-FRICTION

No. for one carriage	Piece Mark	Drawing Class	Div. No.	Name of Piece	Material	Remarks
12	A396A	15	OK	396 Belleville Springs	Spring Steel	Two sets of six each
4	A396B	15	OK	396 Washers	Forged Steel	
2	A396C	15	OK	396 Lock Nuts	"	
2	A396E	15	OK	396 Adjusting Screw Bushings	"	With 2-.25x.75 Dowel Pins, Driven
2	A396F	15	OK	"	"	
2	A396G	15	OK	Bearing Supports	Forged Steel "B"	
2	A396H	15	OK	" Nut	"	With 2-.203 (13/64) x 2.75 split pins
2	A395A	15	OK	Trunnion Pin Bearing (Lower)	Bronze No. 3	
8	A395B	15	OK	Bearing Screws	Steel	
1	A395C	15	OK	Trunnion Pin Bearing (Upper)	Right Bronze No. 3	With 1-.25 Steel Grease Cup No. 1 Plain Compression, Bowen Mfg. Co.
1	A395D	15	OK	"	Left	" Ditto
1	A395E	15	OK	395 Pipe	Wrot. Iron	.25x3.125 long right side
1	A395F	15	OK	"	"	.25x2.625 " left
2	A395G	15	OK	395 Key	Forged Steel	
2	A395H	15	OK	395 Bearing Seat	"	
2	A395K	15	OK	395 Roller	Forged Steel #3	
BASE PLATE, RACER, DISTANCE RING, TRAVERSING ROLLERS AND DUST GUARDS						
1	8A	10	26	8 Base Plate	Cast Steel #2	
2	48E	10	26	8 Drain Plugs	Vulcanized Fibre	
2	48F	10	26	8 Gaskets	Cast Steel No. 2	With 12-0.5 Handy Oiler
1	11A	10	26	11 Racer	Brass	0.375 (O.D., A.W.G. No. 14, 0.064 thick) x
4	11B	10	26	11 Seamless Tubes	"	14, 0.064 thick) x 15.375 long
4	11C	10	26	11 "	"	0.375 (O.D., A.W.G. No. 14, 0.064 thick) x 14. long
4	11D	10	26	11 "	"	0.375 (O.D., A.W.G. No. 14, 0.064 thick) x 3.5 long
4	11E	10	26	11 Grease Cups	Steel	0.5 No. 4 Plain Compression with leather packing, Bowen Mfg. Co. or equal.
4	11F	10	26	11 Couplings	Wrought Iron	0.5x1.0x1.0x3. long

No. for one carriage	Piece Mark	Drawing Class	Div.	No.	Name of Piece	Material	Remarks
4	11G	10	26	11	Pipe	Wrought iron	.5 x 10, long
1	10E	10	26	10	Distance Ring	Cast Steel	
40	10A	10	26	10	Traversing Roller Pins	Steel Shafting	With 40-0.25x2.75 split pins
40	10C	10	26	10	Traversing Roller	Forged Steel #3	
80	10D	10	26	10	Bushings	Bronze No. 3	Force & Finish
2		10	26	73	Center Dust Guard (Side)		
2	73A	10	26	73	Plates	Steel	6.875x0.187 (3/16) x 96
2	73B	10	26	73	Strips	Felt	1.062 (1-1/16) x 0.375 x 93.5
2	73C	10	26	73	Bands	Steel	0.875x0.187 (3/16) x 92.75
36	73D	10	26	73	Screws	Steel	0.5 x 0.875 c'sunk head
34	73E	10	26	73	Screws	"	0.375 x 1.125 countersunk head
34		10	26	73	Nuts		0.375
2		10	26	73	Center Dust Guard (Front & Rear)		
2	73F	10	26	73	Plates	Steel	6.875 x 0.187 (3/16) x 93
2	73B	10	26	73	Strips	Felt	1.062 (1-1/16) x 0.375 x 93.5
2	73C	10	26	73	Bands	Steel	0.875 x 0.187 (3/16) x 92.75
32	73D	10	26	73	Screws	"	0.5 x 0.875 countersunk head
34	73E	10	26	73	Screws	"	0.375 x 1.125 c'sunk head
34		10	26	73	Nuts		0.375
1	73M	10	26	73	Azimuth Pointer	German Silver	0.125 thick
4	73T	10	26	73	Pointer Screw	Steel	With 4-0.375 lock washers
1		10	26	73	Pointer Bracket	Steel	
1	73P	10	26	73	Angle	"	0.25 x 2.5 x 2.5 x 6.5 long
1	73R	10	26	73	Plate	"	0.25 x 4. x 7.125 long
2	73S	10	26	73	Tap Bolts ²	"	0.625 x 1.25
<u>RECOIL MECHANISM</u>							
1	20A	10	26	20	Recoil Cylinder (Right)	Forged Steel #3	
1	20B	10	26	20	Recoil Cylinder (Left)	"	
2	20G	10	26	20	Gaskets	Leather	10.75 x 9.875x0.187(3/16) thick
2	20C	10	26	20	Locking Screw	Steel	
2	20D	10	26	20	Filling & Drain Plugs	"	
2	20E	10	26	20	"	"	
4	20F	10	26	20	Gaskets	Vulcanized Fibre	0.125 thick
2	21A	10	26	21	Recoil Piston	Bronze #3	
2	21H	10	26	21	Screws	Bronze	0.375 x 0.75 c'sunk head
2	21B	10	26	21	Recoil Piston Rod	Forged Steel #2	
2 with lock washers only							

No. for one carriage	Piece Mark	Drawing Class	Div.	No.	Name of Piece	Material	Remarks
2	21C	10	26	21	Piston Rod Nut (Rear)	Forged Steel #2	
2	21D	10	26	21	Piston Rod Nut (Front)	Ditto	
2	21E	10	26	21	Nut Locking Screw	Steel	
2	21G	10	26	21	Nut Locking Bolt	"	
2	22AA	10	26	22	Gland	Bronze No. 3	6-Ring Garlock's Hydraulic Waterproof 0.375 square
1	22B	10	26	22	Packing		
2	22C	10	26	22	Cylinder Head Bushings	Bronze #2	
2	22D	10	26	22	Screws	Steel	0.375 x 0.625 headless Force, finish, flush, prick punch ends.
2	22E	10	26	22	Recoil cylinder head	Forged Steel No. 2	0.375
2	22L	10	26	22	Pipe Plugs		
2	22F	10	26	22	Follower	Bronze #3	
2	22G	10	26	22	Stuffing Box	"	
2	22H	10	26	22	Stuffing Box Washer	"	
2	22K	10	26	22	Packing	Leather	

12. INCH HOWITZER CARRIAGE MODEL OF 1913
ELEVATING GEAR

5.

No. for one carriage	Piece Mark	Drawing Class Div.	No.	Name of Piece	Material	Remarks
1	A33A	10	33	Elevating Gear Plate	Steel	
8	A33P	10	33	Bolts 1		1.25 x 4.125 snug
1	A34A	10	34	Elevating Rack	Cast Steel #3	110 teeth in 3600 , 1 per in.d., (3.1416P)55.P.R. 200 involute (Nuttall Stub Tooth) 1.5 x 4.813 (8-13/16) Drive Fit.
7	A34B	10	34	Bolt 1		
1	A388A	15	388	Handwheel Shaft Bearing	Bronze	
1	A388B	15	388	Pipe	Steel Pipe	.375 x 5-5 long and 1-.5 Handv Oiler
1	A388C	15	388	Handwheel Shaft Bushing	Bronze	
1	A388D	15	388	Headless Screw	Bronze	.375x.625, Force and Rivet with 1-.5 Handv Oiler
1	A388E	15	388	Intermediate Shaft Bearing	Bronze	
1	A388F	15	388	Intermediate Shaft Bushing	Bronze	
1	A388G	15	388	Headless Screw	Bronze	.375 x .625, Force & Rivet with 1-.5 Handv Oiler
1	A388H	15	388	Pinion Shaft Bearing	Bronze	
1	A388K	15	388	Pinion Shaft Bushing	Bronze	
1	A388L	15	388	Headless Screw	Bronze	
12	A388M	15	388	Shaft Bearing Bolt 1	Forged Steel	
6	A388P	15	388	Shaft Bearing Stud 1	Forged Steel	
1	A389A	15	389	Elevating Pinion Shaft	Forged Steel "A"	
1	A389B	15	389	Pinion Shaft Nut	Steel	
1	A389C	15	389	Washer	Steel	
1	A390A	15	390	Intermediate Gear	Cast Steel #3	66 teeth, 3 per inch (1.0472P.) 22 P.D., 200 involute Nuttall Stub Tooth With 1-.5 x 7, Split Pin
1	A390B	15	390	Intermediate Pinion Shaft	Forged Steel "A"	66 teeth, 3 per inch (1.0472P.) 22 P.D., 200 involute Nuttall Stub Tooth 12 Teeth, 2 per inch (1.5708P.) 6 P.D., 200 involute Nuttall stub tooth

No. for one car-plate	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
1	A390C	15 OK 390	Nut	Steel	With .203 (13/64) x 2.25 split pin
1	A391A	15 OK 391	Hand Wheel Shaft	Forged Steel #3	14 Teeth, 3 per in. (1.0472P.) 4.666 P.D. 20° involute
1	A391B	15 OK 391	Pinion Shaft Gear	Cast Steel #3	Nuttall Stub Tooth 52 Teeth, 2 per in. (1.5708P.) 26 P.D. 20° involute Nuttall Stub Tooth
1	A391C	15 OK 391	Washer	Steel	
1	A391D	15 OK 391	Nut	Forged Steel	With 1-.25 x 3.5 split pin
1	A392A	15 OK 392	Depressing Direction Plate	Bronze	
4	A392R	15 OK 392	Countersunk Head Screws	Brass	.25 x .625
1	A392G	15 OK 392	Elevating Direction Plate	Bronze	
1	A392F	15 OK 392	Elevating Hand Wheel	Cast Steel	
1	A392F	15 OK 392	Brake Band Bracket	Cast Steel	
4	A392G	15 OK 392	Bolts	Cast Steel	.625 x 2.75, Fitted
1	A392K	15 OK 392	Handle Stem	Forged Steel #2	
1	A392L	15 OK 392	Handle Tube	Seamless Brass	1.375 x 6.25 x .187 (3/16) thick
1	A392M	15 OK 392	Handle Bushing	Tube	
1	A392P	15 OK 392	Nut	Steel	.75 x .5 thick Drill for .156 (5/32) x 1.5 split pin.
1	A392R	15 OK 392	Brake Spring	Spring Steel	
1	A393A	15 OK 393	Brake Rod	Forged Steel	
1	A393B	15 OK 393	Adjusting Nut	Forged Steel	With 1-.203 (13/64) by 2.25 split pin.
1	A393C	15 OK 393	Brake Rod Nut	Forged Steel	With 1-.203 (13/64) x 2. split pin
1	A393D	15 OK 393	Washer	Forged Steel	
1	A393F	15 OK 393	Brake Band	Steel	.187 (3/16) thick x 51.45 long
1	A393G	15 OK 393	Brake Band Lining	Raybestos or equal	.25 thick x 41.52 long
1	A393H	15 OK 393	Brake Band End Pin Washer	Steel	
1	A393I	15 OK 393	Brake Band End Pin	Forged Steel	With 2-.625 Crown Nuts
1	A393K	15 OK 393	Brake Band End Pin (Lower)	Forged Steel	
1	A393L	15 OK 393	Brake Band End Pin (Upper)	"	
1	A393M	15 OK 393	Brake Band End Pin (Upper)	"	

No. for one carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks.
1	A39 ¹ / ₄ A	15 OK	Pedal Bracket	Cast Steel	.625 x 1.625
4	A39 ¹ / ₄ B	15 OK	Bolt 1	Steel	.625 x 3.75 & 1-.625 crown nut
1	A39 ¹ / ₄ C	15 OK	Brake Pedal	Forged Steel	With 2-.156 (5/32) x 1. split pin
1	A39 ¹ / ₄ D	15 OK	Bolt	"	
1	A39 ¹ / ₄ E	15 OK	Push Rod	"	
1	A39 ¹ / ₄ F	15 OK	Link	"	
1	A39 ¹ / ₄ G	15 OK	Link Pin	"	
1	A39 ¹ / ₄ H	15 OK	Push Rod Pin	"	
<u>TRAVERSING MECHANISM</u>					
4	44A	10 26	Clip	Cast Steel #2	
12	44B	10 26	Bolts 1	Bronze #3	1.25 x 5. snug fit with 2-.187 (3/16) x 1.25 bronze pins, driven
1	44E	10 26	Pushing		1.25 x 5. snug fit.
1	44F	10 26	Traversing Shaft Fracket	Cast Steel #2	
4	44G	10 26	Bolts 1	Cast Steel #2	
1	44H	10 26	Front Clip 2	Cast Steel #2	
3	44K	10 26	Tap Bolts 2	Forged Steel	1.25 x 3.375
1	45A	10 -26	Traversing Pinion	No. 2	12 teeth, (2.P) 7.639 P.D.200 involute. Nuttall Stub Tooth .398 x 4.75
2	45B	10 26	Taper Pins	Forged Steel #2	140 teeth in 360° (2.P) 89.126 P.D., 200 involute Nuttall Stub Tooth.
1	45C	10 26	Traversing Rack	Steel	.625 x 1.5
56	45D	10 26	Fillister Head Screw	Forged Steel #3	1.375 pitch, 1.375 lead R.H.
1	46A	10 26	Worm	Forged Steel #3	
1	46B	10 26	Key	Forged Steel #3	
1	46C	10 26	Vertical Traversing Shaft	Forged Steel #2	Type "B" staked with key, .687 (11/16)x.437 (7/16)x3.437 (3-7/16)
1	46D	10 26	Crown Nut	Steel	2. tap, 1.5 thick
1	46E	10 26	Washer	Forged Steel #2	2.Ream, 4 O.D.x .375 thick
1	46G	10 26	Worm Wheel	Forged Steel #2	1.375 pitch, 1.375 lead, 30 teeth in 360° Hob to suit worm with .75 crown nut
1	47A	10 26	Worm Shaft	Forged Steel #3	.75 Ream x 2.25 O.D.x.187 (3/16)
1	47B	10 26	Washer	Steel	
1	47C	10 26	Collar	Steel	
1	47D	10 26	Taper Pin		15 x 3.
1 with nuts and lockwashers 2 with lock washers					

No. for one carriage	Piece Mark	Drawing Class	Div. No.	Name of Piece	Material	Remarks
1	47E	10	26	Traversing Handwheel	Cast Steel	
1	47F	10	26	Handle Stem	Forged Steel #2	
1	47G	10	26	Handle Tube	Seamless Brass Tube	1.375x6.25
1	47H	10	26	Handle Pushing	Steel	
1	47K	10	26	Traversing Handwheel Direction Plate	Bronze	.190 x .5
3	47L	10	26	Countersunk Head Screws	Bronze	1.25x 4.625 snug, and 3-.5 Handy Oilers
1	48A	10	26	Traversing Gear Case Bolt	Cast Steel	.125 thick
1	48B	10	26			
1	48C	10	26	Drain Plug	Steel	.5x 1.5, thread .75 long, and 1.5 Handy Oilers
1	48D	10	26	Gaskets	Vulcanized Fibre	with 2-.25 xl.375 bronze pins driven
1	49A	10	26	Cover	Cast Steel	with 2-.25 xl.125 bronze pins, driven
8	49B	10	26	Tap Folts 2		with 2-.25xl.332(1-5/16) bronze pins, driven.
1	49C	10	26	Worm Gear	Bronze #3	
1	49D	10	26	Worm Gear, Case Pushing, Outer	Bronze #3	
1	49F	10	26	Worm Gear Case Pushing, Inner	Bronze #3	

1 With nuts and lockwashers
2 With lock washers.

RECUPERATOR AND LIQUID PUMP

No. for one car-riage	Piece Mark	Drawing Class	Div.No.	Name of Piece	Material	Remarks
1	26A	10	26	Recuperator Cylinder	Forged Steel #2	
1	26B	10	26	Recuperator Cylinder Liner	Phosphor Bronze	Watertight Mechanical
1	27A	10	27	Recuperator Plunger	Phosphor Bronze	"
2	27B	10	27	Locking Screw	Steel	"
1	27C	10	27	Stuffing Box (Small)	Phosphor Bronze	"
1	27D	10	27	Packing 5 Rings Garlocks Silver Brand	Flax Coil	.375 Square, Style #32 very soft.
4	27E	10	27	Stud 3	Forged Steel #3	.562 (9/16)
1	27F	10	27	Gland	Phosphor Bronze	Watertight Mechanical
1	27H	10	27	Flange Packing	Leather	
1	27K	10	27	Gasket	Leather	
1	27L	10	27	Reducing Ring	Phosphor Bronze	Watertight Mechanical
1	27M	10	27	Packing Ring	"	"
1	28A	10	28	Cylinder Retaining Ring	Forged Steel #2	
1	28B	10	28	Ring Locking Screw	Steel	
1	28C	10	28	Stuffing Box, large	Phosphor Bronze	Watertight Mechanical
1	28D	10	28	Gland (Large)	"	"
1	28E	10	28	Packing 5 rings Garlock Silver Brand	Flax Coil	.375 Square, Style #32, very soft
1	28F	10	28	Washer	Felt	
8	28G	10	28	Stud	Forged Steel #3	With 8-.625 Nuts
8	28H	10	28	Nuts	"	.875 x .5 thick
1	28K	10	28	Packing	Leather	
1	28L	10	28	Ring	Steel	
8	28M	10	28	Screws	Steel	.25x.875 Countersunk head
1	29A	10	29	Recuperator Piston Rod	Forged Steel #2	
1	29B	10	29	Piston Liner	Phosphor Bronze	Watertight Mechanical
1	29C	10	29	Piston Rod Washer	Steel	
1	29D	10	29	Piston Rod Nut	"	Make from 1.5 standard Crown Nut
1	29E	10	29	Yoke	Forged Steel #3	
2	29F	10	29	Yoke Bushing	" #2	
2	29G	10	29	Bushing Retainer	" #2	
1	30A	10	30	Piston	Phosphor Bronze	Watertight Mechanical
1	30B	10	30	Piston Washer	Leather	
1	30C	10	30	Piston Ring	Phosphor Bronze	Watertight Mechanical
1	30D	10	30	Packing 3 Rings, Garlocks Silver Brand	Flax Coil	.5 square, style #32, very soft
1	30E	10	30	Piston Spring	Spring steel	
1	30F	10	30	Piston Rod Nut 3 with nuts	Forged Steel #2	with 1-.312(5/16)x3.5 split pin.

REFRIGERATOR AND LIQUID PUMP (CONTINUED)

No. for one carriage	Piece Mark	Class	Drawing Div. No.	Name of Piece	Material	Remarks
1	30G	10	26	30 Piston Screw	Steel	
1	30H	10	26	30 Packing Retainer	Phosphor Bronze	Watertight Mechanical
2	31A	10	26	31 Pull Rod	Forged Steel #2	
4	31B	10	26	31 Pull Rod Bushings	Bronze No. 3	
16	31C	10	26	31 Tap Bolts ²		.5 x 1.375, thread .75 long
2	31D	10	26	31 Pull Rod Nut	Forged Steel #3	With 2-.375x3.75 split pin
2	31E	10	26	31 Pull Rod Guard	Steel	
2	31F	10	26	31 Pull Rod Bushing (Rear)	Bronze	
1	A236A	15	OK	236 Pump Case Bolts ¹		0.625x1.75
2	A236N	15	OK	236 Bolts		0.625x2.
2	A236P	15	OK	236 Bolts		
1	A236B	15	OK	236 Gland		0.5 x 1.5
2	A236L	15	OK	236 Tap Bolts	Bronze	
1	A236C	15	OK	236 Filling Cap	Bronze	
1	A236D	15	OK	236 Pump Case Cover	"	
1	A236H	15	OK	236 Pump Case Side Plate	"	
6	A236K	15	OK	236 Tap Bolts 2	Forged Steel	0.312 (5/16) x 0.75
4	A236F	15	OK	236 Pump Case Cover Stud 1	Bronze wire	
1	A236G	15	OK	236 Filling Cap Loop	Bronze	No. 12 Brown & Sharpe gage
1	A236M	15	OK	236 Drain Plug	Phosphor Bronze	Watertight Mechanical
1	A237A	15	OK	237 Pump body	Do	0.25
4	A237B	15	OK	237 Pipe Plug	Paper	
1	A237C	15	OK	237 Body Nut	Hemp	
1	A238A	15	OK	238 Side Plate Gasket	Leather	
2	A238B	15	OK	238 Case, Stuffing Box Packing	Paper	
2	A238C	15	OK	238 Body Washer	Bronze	
1	A238D	15	OK	238 Body Gasket	"	
1	A238E	15	OK	238 Plunger	Forged Steel	
1	A238F	15	OK	238 Link	"	
1	A238G	15	OK	238 Pin	"	
1	A238H	15	OK	238 "	"	
1	A239A	15	OK	239 Body Gland	Bronze	
1	A239B	15	OK	239 Body Nut	"	
1	A239C	15	OK	239 Plunger Leather	Leather	
1	A239H	15	OK	239 Pellet Valve Stem	Bronze	
				2 with lock washers		
				1 with nuts and lockwashers		
						With 10.125x1.062(12/16) bronze pin
						23176

No. of one Piece Drawing Mark Class Div. No.	Name of Piece	Material	Remarks
1	A239K 15 OK 239 Relief Valve Body	Bronze	
2	A239D 15 OK 239 Suction Valve Stem	"	
1	A239E 15 OK 239 Suction Valve Seat	"	
1	A239F 15 OK 239 Strainer	Sheet Brass	Perforated No. 27 stubs
1	A239G 15 OK 239 Strainer Ring	Spring Brass Wire	No. 10 Brown & Sharpe Gage
1	A239L 15 OK 239 Relief Valve Cap	Bronze	
1	A239M 15 OK 239 Relief Valve Spring	Spring Phosphor Bronze	
1	A240F 15 OK 240 Pump Lever	Forged Steel	
1	A240A 15 OK 240 Lever Shaft	do	
1	A240C 15 OK 240 Lever Shaft Collar	do	
1	A240B 15 OK 240 Lever Shaft Nut	do	
1	A240D 15 OK 240 Crank	do	with 10.x.125x1 split pin with 1 0.107 (3/16)x2 split pins
1	74A 10 26 74 Recuperator Guard, Lower Section	Structural Steel	10.75 (Approx) x .187 (3/16) x 51.5
1	74B 10 26 74 " " " " " "	Left Structural Steel	Ditto
1	74C 10 26 74 " " " " " "	Right	5. (Approx) x .187 (3/16) x 7.
1	74D 10 26 74 " " " " " "	Left	Ditto
37	74E 10 26 74 Tap Polts 2	"	.375 x .875 thread .75 long
1	74F 10 26 74 Recuperator Guard Upper Section	"	31. (Approx) x .187 (3/16) x 1.5
1	74G 10 26 74 " " " " " "	"	10.5 (Approx) x .187 (3/16)
1	74H 10 26 74 " " " " " "	Right	2.75 (Approx) x .187 (3/16) x .5
1	74K 10 26 74 " " " " " "	Left	2.75 " " "
1	74J 10 26 74 " " " " " "	Angle	1.5 x 1.5 x .125 x 31. (Approx) long
22	74M 10 26 74 Bolts 1	"	.375 x .937 (15/16) thread .5 "
1	60A 10 26 60 Tube	Copper Tubing	.25 ID x 55 OD. (Richard Dudgeon or equal) 45. long Approx.
1	60B 10 26 60 " "	"	.25 ID x 55 OD. (Richard Dudgeon or equal) 25. long
1	60C 10 26 60 " "	"	.25 ID x 55 OD. (Richard Dudgeon or equal) 33. long
1	60D 10 26 60 " "	"	.25 ID x 55 OD. (Richard Dudgeon or equal) 25. long
1	60E 10 26 60 " "	"	.25 ID x 55 OD (Richard Dudgeon or equal) 90. long
2- With lock washers			
1- With nuts & lockwashers			

No. for one car- piece	Piece Mark	Drawing Class	Div. No.	Name of Piece	Material	Assembly
1	60F	10	26	60 Tube	Copper Tubing	.25 ID x .5 OD (Richards Pidgeon or equal) 216" long approx.
1	61A	10	26	Gauge Bracket	Steel Plate	27 x 12.062 (12-1/16) x .25 thick
2	61B	10	26	Tap Bolts ²	Steel Plate	.625 x 1.312 (1-5/16)
1	61C	10	26	Brace	Steel Plate	13.10 x 1.187 (10-3/16) x .25 thick
2	61D	10	26	Tap Bolts ²	Phosphor Bronze	.625 x 1.312 (1-5/16)
1	A102A	15	OK	Pipe Connection Body	Phosphor Bronze	.0625 x 0.562 thread tinned for watertight joint 0.5 x 0.625 thread
1	A102B	15	OK	Screw, headless	Phosphor Bronze	1.0 D. x 0.5 I.D. x 0.125 thick
3	A105B	15	OK	Tap Bolts ²	Leather #2	1.0 D. x 0.5 I.D. x 0.125 thick
3	A105C	15	OK	Gaskets (air pipe connection)	Bronze #3	Do.
12	A104K	15	OK	Pipe Connecting Nuts	Phosphor Bronze	Do.
10	A101B	15	OK	Pipe Collars	Leather	Do.
1	A103A	15	OK	Valve Body	Garlock Packing	1.45 O.D. x 0.75 I.D. x 0.45 thick
1	A105C	15	OK	Gasket (liquid valve)	of equal	
2	A103B	15	OK	Tap Bolts ²	Bronze #2	
3	A103C	15	OK	Packing ring (liquid valve)	Soft Lead	
2	A104G	15	OK	Gland Follower	Bronze #3	
2	A104H	15	OK	Gland	Steel	
1	A108C	15	OK	Gasket for Valve Body	Standard Chain	6 long, approximately
1	A104A	15	OK	Air Pipe Connection inlet plug	Co's #3 or equal	
2	A104B	15	OK	Screw Eyes, inlet plug fastener	Steel Plate	0.093 (3/32) thick
2	A104C	15	OK	Rings, inlet plug fastener	Steel	0.242, 0.375 long
1	A104D	15	OK	Chain	Bronze #3	
10	A107C	15	OK	Pipe Clips	Do	
20	A107E	15	OK	Round Head Screws	Forged Steel #1	
2	A104F	15	OK	Valve supply stem (liquid valve)	Do	
2	A104F	15	OK	Valve exhaust stem (liquid valve)	Phosphor Bronze	watertight
1	A107F	15	OK	Coupling	Do	do
1	A107G	15	OK	Coupling Nut	Phosphor Bronze	0.437 (7/16) x 0.5 thread tinned for air tight joint
1	A109A	15	OK	Body (Air Valve)	Do	
1	A105A	15	OK	Body (air pipe connection)	Bronze	
1	A105D	15	OK	Headless screw		

2 With lock washers

No. for one car-riage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
4	A105C	15	OK 105 Gasket (air valve)	Leather	1.0 D.O. x 1.5 I.D. x 0.125 thick
3	A103C	15	OK 103 Packing Ring (Air Valve)	Garlock Packing	1.25 O.D. x 0.75 I.D. x 0.25 thick or equal
<u>PRESSURE GAUGE</u>					
2	A111A	15	OK 111 Gauge complete		4 5 inch-Ashcroft Mfg. Co.'s type SF form C or equal
6	A111B	15	OK 111 Round head screws	Bronze	0.216 x 0.312 (5/16)
2	A111C	15	OK 111 Connection	Phosphor Bronze	Water-tight Mechanical
2	A105C	15	OK 105 Gasket	Leather	1.0 D.O. x 1.5 I.D. x 0.125 thick
2	A112A	15	OK 112 Cover	Sheet steel	0.125 thick
4	A112B	15	OK 112 Hinge	do	do
2	A112C	15	OK 112 Hinge Pin	Forged Steel	with 2 S.O. (3/32) x 0.5 split pin
2	A112D	15	OK 112 Chains, seven links each	Steel	
4	A112E	15	OK 112 Chain rings	"	
2	A112F	15	OK 112 Chain Rivets	"	
2	A112H	15	OK 112 Latch Pin	Forged Steel	
<u>CRANE</u>					
2	A408A	15	OK 408 Bushing (Upper)	Bronze	with 4-.25 x 1.25 bronze pins
2	A408B	15	OK 408 " (Lower)	"	4-.25 x 1.25 "
2	A408C	15	OK 408 Crane Mast Pedestal	Cast Steel #2	with 2-.5 Handy Oilers
16	A408D	15	OK 408 Bolts		.75 x 2.5
2	A408E	15	OK 408 Taper Pins, Driven		.279 x 2.75
2	A408F	15	OK 408 Thrust Bearing	One Bronze	
2	A408G	15	OK 408 Crane Mast	Cast Steel #2	with 4-.5 x 5.25 steel pins & 2-.5 Handy Oilers.
2	A408H	15	OK 408 " Shafts	Forged Steel #2	
2	A409A	15	OK 409 Drum Bracket	Cast Steel	
4	Q409	15	OK 409 Std. Oil Plugs		.25
8	A409B	15	OK 409 Bolts		.75 x 2.5, Head .625 thick, Thd. 1.1.
2	A409C	15	OK 409 Crank Bushing (Right)	Bronze	with 4-.125 x .625 Bronze Pins
2	A409D	15	OK 409 " (Left)	"	Long, Snug.
8	A409E	15	OK 409 Tap Bolts	Cast Steel #2	.25 x .625, Force
2	A410A	15	OK 410 Crank (Left)		
4	Q410	15	OK 410 Std. Oil Plugs		.25
2	A410B	15	OK 410 Crank (Right)	"	"
4	Q410	15	OK 410 Std. Oil Plugs		.25
2	A410C	15	OK 410 Coller	Bronze	

No. for one carriage	Piece Mark	Drawing Class	Div. No.	Name of Piece	Material	Remarks
2	A410D	15	OK	Taper Pin		.208x2.25
2	A410E	15	OK	Handle Stem	Forged Steel #2	
2	A410F	15	OK	Sleeve	Seamless Brass Tube	1.125x6.25x.149 thick
2	A410G	15	OK	Bushing	Steel	
2	A410H	15	OK	Nut	Forged Steel	.5 thick
2	A410K	15	OK	Rod Cap	"	
2	A410L	15	OK	Lock Rods	Bronze	
2	A410M	15	OK	" Shoe	Forged Steel	
2	A410N	15	OK	" Screw	"	
2	A410P	15	OK	" Nut	Cast Steel	
2	A411A	15	OK	Sheave Bracket	Bronze	.625x2.125, Thd. .875 long
8	A411B	15	OK	Bolts 1	Cast Steel	With 12--.125x.75 bronze pins
6	A411G	15	OK	Sheave Bushing	Bronze	
6	A411D	15	OK	Sheave	Cast Steel	
2	A411E	15	OK	Drum Bushing	Bronze	With 4--.125x.625 bronze pins
2	A411F	15	OK	Drum	Cast Steel	
2	A411G	15	OK	" Bushing	Bronze	With 4--.125x.625 bronze pins
2	A411H	15	OK	Crank Shaft	"	
4	A411K	15	OK	Sheave Pin	Forged Steel	With 4--.25x.625 Steel Pin
2	A411L	15	OK	Drum Shaft	"	
2	A411M	15	OK	Crank Shaft Nut	Steel	
4	A411N	15	OK	Rope Guard	"	
16	A411P	15	OK	Tap Bolts	Forge d Steel #2	.375 x .75
2	A411Q	15	OK	Gear		.5x1.562(1-9/16) Thread
8	A411R	15	OK	Bolts 1		.625 long, snug
2	A411S	15	OK	Rope Clamp	Forged Steel	
8	A411T	15	OK	Screws, Flat Filister Head	Steel	.312(5/16) x .875
2	A412A	15	OK	Ratchet and Friction Box	"	With 12--.125x.625 bronze rivets
2	A412E	15	OK	Box Disc	Bronze	
2	A412C	15	OK	Pawl Pin	Forged Steel	With 2--.156(5/32)x1.5 split pin.
2	A412D	15	OK	Pawl	"	
4	A412E	15	OK	Friction Disc (Male)	Steel	
4	A412F	15	OK	" (Female)	Bronze	
2	A412G	15	OK	Pinion Disc	Steel	
2	A412H	15	OK	Pinion	Forged Steel #3	

1 With nuts and lockwashers.

No. for one carriage	Piece Mark	Class	Drawing Div.	No.	Name of Part	Material	Remarks
4	A413A	15	OK	413	Sheave 3, Block Plate	Steel	
4	A413B	15	OK	413	Bolts 3, snug		.625 x 2.5
4	A413C	15	OK	413	Bolts 3		.5 x 2.375
4	A413D	15	OK	413	Std. Pipe		.5 x 1.25 $\frac{1}{4}$.01 long
2	A413E	15	OK	413	Sheave Bolt 3	Steel	
2	A413F	15	OK	413	Crane Hook Block	Forged Steel	
2	A413G	15	OK	413	" " Nut	Steel	
2	A413H	15	OK	413	Half Ton Crane Hook	Forged Steel	
2	A413K	15	OK	413	Extra. Pliable Hoisting Rope.	Plough Steel	.25 Dia., 8 strands, 19 wires to the strand. J. A. Roeblings Co. or equal, With 2-.25 Open sockets, American Wire Co's or equal.

3 With Nuts

SHELL TROUGHS

No. for one carriage	Piece Mark	Class	Drawing Div.	No.	Name of Piece	Material	Remarks
1	54A	10	26	54	Shell Trough	Steel Plate	
1	54B	10	26	54	Trough Stop	Bronze	
1	54C	10	26	54	" Support	"	
JACKS							
4	113A	10	26	113	Stop	Steel	3/4-Steel No. 1 Plain Compression Grease Chps., .25 Pipe Thread, Bowen Mfg. Co., or equal.
4	113B	10	26	113	Ram	Forged Steel No. 3	Standard Machinery Co.'s or equal
4	113C	10	26	113	Roller Thrust Bearing	Forged Steel "A"	
4	113D	10	26	113	Screw Gear	Forged Steel No. 3	
4	113E	10	26	113	Plug	Forged Steel "C"	With 4-.375 Handy Oilers
4	113F	10	26	113	Screw	Forged Steel "C"	
4	113H	10	26	113	Nut	Bronze No. 4	.375 x 1.875
8	113K	10	26	113	Headless Set Screws	Steel	.208 x 2.
4	113L	10	26	113	Screw Nut	"	.625 x 1.812 (1-13/16) Thread
4	113M	10	26	113	Taper Pins	"	1. long
4	113N	10	26	113	Guide	"	
16	113P	10	26	113	Tap Bolts (2)	"	
4	113Q	10	26	113	Screw Bushing	Bronze No. 2	
4	114A	10	26	114	Jack Pinion	Forged Steel "A"	With 4-.187(3/16)x.531(17/32) Bronze Pins
4	114B	10	26	114	" Bushing	Bronze No. 1	W/4-1.25 Nuts and 4-.375 Handy Oilers
4	114D	10	26	114	" Stud	Forged Steel "A"	.208 x 2.
4	114E	10	26	114	Taper Pins	Steel	
4	114F	10	26	114	Jack Pinion Stud Nut	Steel	
4	114G	10	26	114	Taper Pins	Bronze No. 1.	
2	114H	10	26	114	Washer	Forged Steel No. 3	
4	115A	10	26	115	Ratchet	Spring Steel	
4	115B	10	26	115	Spring	Spring Steel	
4	115C	10	26	115	Regulating Pin for Pawl	Steel	

No. for one carriage	Drawing	Class	Div.	No.	Name of Piece	Material	Remarks
4	115D	10	26	115	Ratchet Housing	Cast Steel No. 3	
4	115E	10	26	115	Pawl	Forged Steel "A"	
4	115F	10	26	115	Pin for Ratchet Pawl	" " No. 3 3/4 - 1.56 (5/32) x 1.25	Split Pins
4	115G	10	26	115	Jack Lever	" "	
<u>LOADING TRAY</u>							
1	51A	10	26	51	Angle Right	Structural Steel	2 x 2 x .25 x 39.25 Long
1	51B	10	26	51	" Left	"	2 x 2 x .25 x 39.25 Long
1	51C	10	26	51	" Front	"	3 x 2 x .25 x 40 Long Approx.
1	51D	10	26	51	" Rear	"	2 x 2 x .25 x 40 Long Approx.
1	51E	10	26	51	Plate	"	.25 x 40 x 43.25
1	51F	10	26	51	" Front	"	.25 x 8.75 x 33.5
1	51G	10	26	51	" Rear	"	.25 x 8.75 x 33.5
2	51H	10	26	51	Angle	"	2 x 2 x .25 x 5 Long Approx.
2	51K	10	26	51	"	"	2 x 2 x .25 x 40 Long
2	51L	10	26	51	Plate	"	.25 x 40 x 39.25
18	51M	10	26	51	Bolts (1)	"	.625 x 1.625
1	52A	10	26	52	Angle	"	2 x 2 x .25 x 21.5 Long
1	52B	10	26	52	" Right	"	2 x 2 x .25 x 35.25 Long
1	52C	10	26	52	" Left	"	2 x 2 x .25 x 35.25 Long
1	52D	10	26	52	Plate	"	.25 x 21.5 x 39.25
6	52F	10	26	52	Bolts (1)	"	.625 x 1.375
1	52A	10	26	52	Angle	"	2 x 2 x .25 x 21.5 Long
1	52G	10	26	52	" Right	"	2 x 2 x .25 x 35.25 Long
1	52H	10	26	52	" Left	"	2 x 2 x .25 x 35.25 Long
1	52K	10	26	52	Plate	"	.25 x 21.5 x 39.25
6	52F	10	26	52	Bolts (1)	"	.625 x 1.375
2	52M	10	26	52	Door	Steel	.125
2	52F	10	26	52	Yale Lock No. 840		1.75
2	52G	10	26	52	Clevis		
2	52H	10	26	52	Clevis Rivets		
2	52I	10	26	52	Chairs		
2	52J	10	26	52	Chain Rivets		
4	52K	10	26	52	Chain Rings		
4	52P	10	26	52	Door Hinge Female	Cast Steel	
4	52R	10	26	52	" Male	"	
2	52S	10	26	52	Staple	Steel	
					lock washers		231.75
6. Long, Std. Chain Cos No. 3							

No. for one carriage	Piece Mark	Drawing Class	Div. No.	Name of Piece	Material	Remarks
2	52Y	10	26	Latch Handle	Cast Steel	
2	52U	10	26	Latch	"	w/ 2-.125 x 1.125 Steel Pins
4	52W	10	26	Hinge Pin	Steel	w/ 8-.093(3/32 x .5 Split Pins

AMMUNITION TABLE

4	77A	10	26	Ammunition Table	Structural Steel	2. x 2. x .25 x 105.5 Long Approx.
2	77B	10	26	Angle	"	2. x 2. x .25 x 105.5 Long Approx.
2	77C	10	26	" (Front)	"	2. x 2. x .25 x 57.75 Long
2	77D	10	26	" (Front)	"	2. x 2. x .25 x 57.75 Long
2	77E	10	26	" (Rear)	"	2. x 2. x .25 x 48.375 Long
2	77F	10	26	" (Rear)	"	2. x 2. x .25 x 48.375 Long
24	77G	10	26	"	"	2. x 2. x .25 x 36. Long
2	77H	10	26	" (Front)	"	2.5 x 2.5 x .25x101. Long
2	77K	10	26	" (Rear)	"	2.5 x 2.5 x .25x101. Long
8	77L	10	26	" (Front)	"	2.5 x 2.5 x .25 x 38 Long
8	77M	10	26	" (Front)	"	2.5 x 2.5 x .25 x 38 Long
2	77N	10	26	" (Front)	"	2.5 x 2.5 x .25 x 38 Long
2	77P	10	26	" (Front)	"	2.5 x 2.5 x .25 x 38 Long
8	77Q	10	26	" (Rear)	"	2.5 x 2.5 x .25 x 38 Long
8	77R	10	26	" (Rear)	"	2.5 x 2.5 x .25 x 38 Long
2	77S	10	26	" (Rear)	"	2.5 x 2.5 x .25 x 38 Long
2	77T	10	26	" (Rear)	"	2.5 x 2.5 x .25 x 38 Long
2	77U	10	26	Plate	"	.25 x 9.125 x 101.
2	77W	10	26	"	"	.375 x 4.25 x 101.
2	77X	10	26	"	"	.25 x 9.5 x 101.
2	77Z	10	26	"	"	.25 x 33. x 109 (Approx.)
2	77AA	10	26	" (right)	"	.25 x 33. x 12.75 (Approx.)
2	77BA	10	26	" (left)	"	.25 x 33. x 12.75 (Approx.)
20	77CA	10	26	"	"	.25 x 6.125 x 22.
4	77DA	10	26	" (front)	"	.25 x 6.125 x 6.375
2	77EA	10	26	"	"	.25 x 6.125 x 27.
4	77FA	10	26	"	"	.25 x 6.125 x 6.375
2	77GA	10	26	" (Rear)	"	.25 x 6.125 x 27.
8	77HA	10	26	"	"	.25 x 6.125 x 9.
2	77KA	10	26	Filler Plate	"	.25 x 3. x 101.25
12	77LA	10	26	"	"	.25 x 3. Dia.
32	77MA	10	26	Bolts (1)	"	.875 x 3.75, Thread 1.25 Long
32	77NA	10	26	Bolts (2)	"	.875 x 2.25, Thread 1.25 Long

(1) with nuts and lock washers.

No. for one carriage Piece Mark Drawing Class Div. No. Name of Piece Material Remarks

AMMUNITION TROUGH

No. for one carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
2	78A	10 26 78	Ammunition Trough	Structural Steel	2. x 2. x 25 x 7. Long
2	78B	10 26 78	Angle Right	"	2. x 2. x .25 x 46.375 Long
2	78C	10 26 78	" Left	"	2. x 2. x .25 x 46.375 Approx.
4	78D	10 26 78	" Right	"	2. x 2. x .25 x 44. Long Approx.
4	78E	10 26 78	" Left	"	2. x 2. x .25 x 44. Long Approx.
2	78F	10 26 78	" Right	"	2.5 x 2.5 x .25 x 43. Long Approx.
2	78G	10 26 78	" Left	"	2.5 x 2.5 x .25 x 43. Long Approx.
2	78H	10 26 78	" Right	"	2.5 x 2.5 x .25 x 41. Long Approx.
2	78K	10 26 78	" Left	"	2.5 x 2.5 x .25 x 41. Long Approx.
2	78L	10 26 78	"	"	2.5 x 2.5 x .25 x 26.5 Long
2	78M	10 26 78	" Right	"	2.5 x 2.5 x .25 x 37. Long
2	78N	10 26 78	" Left	"	2.5 x 2.5 x .25 x 37. Long
2	78P	10 26 78	" Right	"	2.5 x 2.5 x .25 x 11.5 Long Approx.
2	78Q	10 26 78	" Left	"	2.5 x 2.5 x .25 x 11.5 Long Approx.
2	78R	10 26 78	Plate	"	.25 x 68.375 x 13.5 Approx.
2	78S	10 26 78	" Right	"	.25 x 8.5 x 11.
2	78T	10 26 78	" Left	"	.25 x 8.5 x 11.
2	78U	10 26 78	"	"	.25 x 6.5 x 8.5
2	78V	10 26 78	" Right	"	.25 x 6.5 x 10.5 Approx.
2	78X	10 26 78	" Left	"	.25 x 6.5 x 10.5 Approx.
2	78Z	10 26 78	" Right	"	.25 x 6.5 x 10.5 Approx.
2	78AAA	10 26 78	" Left	"	.25 x 6.5 x 10.5 Approx.
2	78BAA	10 26 78	"	"	.25 x 9.75 x 26.5
2	78CAA	10 26 78	" Front	"	.25 x 8.75 x 13.5
2	78DAA	10 26 78	" Rear	"	.25 x 8.75 x 13.5
2	78EAA	10 26 78	" Right	"	.25 x 11.25 x 12.5
2	78FAA	10 26 78	" Left	"	.25 x 11.25 x 12.5
4	78GAA	10 26 78	Filler Plate	"	.375 x 3. x 40.5
2	78HAA	10 26 78	"	"	.375 x 3. x 20.75
4	78KAA	10 26 78	"	"	.25 x 3. Dia.
20	78LAA	10 26 78	Bolts (1)	"	.875 x 2.25, Thread 1.25 Long
6	78MAA	10 26 78	Tap Bolts (2)	"	.875 x 2. Thread 1.25 Long
26	78NAA	10 26 78	Bolts (1)	"	.625 x 1.75 Thd. 1. Long
8	78PAA	10 26 78	Bolts (1)	"	.625 x 1.5 Thd. 1. Long
2	78QAA	10 26 78	Plate Left	"	.25 x 6.5 x 8.5

with nuts & lockwashers (2) with lockwashers

No. for one carriage	Piece Mark	Drawing	Cross	Dim.	No.	Name of Piece	Material	Remarks
<u>PLATFORMS</u>								
1	59A	10	10	26	59	Pumping Platform	Steel	.25 Thick
4	59B	10	10	26	59	Tap Bolts (2)		.5 x 1.052 (1-1/16)
1	59C	10	10	26	59	Pipe Hoop	Sheet Steel	(No. 13 Gage).095 Thick, developed length 38.75 App. .25x.875 thread
1	59D	10	10	26	59	Bolt(1)		.75 long
1	65A	10	10	26	65	Platform Plate	Structural Steel	.25 x 53.625 x 112,
6	65B	10	10	26	65	Bolts (1)		.625 x 2.375
6	65C	10	10	26	65	Bolts Ctsk. Head (1)		.625 x 2.375
1	65D	10	10	26	65	Platform End	Structural Steel	.25 x 6. x 112,
1	65E	10	10	26	65	Angle		2.5 x 2. x .25 x 107 long
4	65F	10	10	26	65	Filler Plate	Structural Steel	.25 x 2.25 x 3.
2	65G	10	10	26	65	Crane Pedestal	Filler Plate Steel	.25 x 2.25 x 16.
2	66A	10	10	26	66	Platform Support (Inner) Plate		.25 x 15. x 50.625
1	66B	10	10	26	66	Angle (Right)	Structural Steel	2. x 2. x .25 x 48.375 Long
1	66C	10	10	26	66	" (Left)	"	2. x 2. x .25 x 48.375 Long
2	66D	10	10	26	66	"	"	2. x 2. x .25 x 45. Long
1	66E	10	10	26	66	" (Right)	"	2. x 2. x .25 x 5.5 Long
1	66F	10	10	26	66	" (Left)	"	2. x 2. x .25 x 5.5 Long
1	66G	10	10	26	66	" (Right)	"	2. x 2. x .25 x 15. Long
1	66H	10	10	26	66	" (Left)	"	2. x 2. x .25 x 15. Long
10	66K	10	10	26	66	Bolts (1)		.625 x 2.625
2	66L	10	10	26	66	Platform Support (Rear) Plate		.25 x 15. x 30.
1	66M	10	10	26	66	Angle (Right)	"	2. x 2. x .25 x 27.75 Long
1	66N	10	10	26	66	" (Left)	"	2. x 2. x .25 x 27.75 Long
1	66P	10	10	26	66	" (Right)	"	2. x 2. x .25 x 25. Long
1	66Q	10	10	26	66	" (Left)	"	2. x 2. x .25 x 25. Long
1	66R	10	10	26	66	" (Right)	"	2. x 2. x .25 x 15. Long
1	66S	10	10	26	66	" (Left)	"	2. x 2. x .25 x 15. Long
2	66T	10	10	26	66	" (Right)	"	2. x 2. x .25 x 7. Long
2	66U	10	10	26	66	" (Left)	"	2. x 2. x .25 x 7. Long
2	66W	10	10	26	66	"	"	2. x 2. x .25 x 23.25 Long

No. for one carriage	Piece Mark	Drawing Class	No.	Name of Piece	Material	Remarks
2	66X	10	26	Platform Support (Outer)	Structural Steel	.25 x 15. x 56.625
2	66Z	10	26	Angles	"	2. x2. x.25x45.25 Long
1	66AAA	10	26	" (Right)	"	2. x2. x.25 x 49.5 Long
1	66BA	10	26	" (Left)	"	2. x2. x.25 x 49.5 Long
1	66E	10	26	" (Right)	"	2. x2. x.25 x 5.5 Long
1	66F	10	26	" (Left)	"	2. x2. x.25 x 5.5 Long
10	66EA	10	26	Bolts (1)	"	.625 x 2.625
8	66FA	10	26	Bolts (1)	"	.625 x 2.375
1	66GA	10	26	Side Platform Support (Right) Plate	"	.25 x 28. x 29.
1	66HA	10	26	Angle	"	2. x2. x.25 x 25.5 Long
1	66KAA	10	26	"	"	2. x2. x.25 x 28. Long
1	66LA	10	26	"	"	2. x2. x.25 x 29. Long
1	66MA	10	26	"	"	2. x2. x.25 x 15.25 Long
7	66NAA	10	26	Bolts (1)	"	.625 x 2.625
1	67AA	10	26	Side Platform (Left) Plate	"	.25 x 27.875 x 36.125
5	67B	10	26	Bolts Ctsk head (1)	"	.625 x 2.625
1	67C	10	26	Side Platform Support (Left) Plate	"	.25 x 27. x 28.
1	67D	10	26	Angle	"	2. x2. x.25 x 24. Long
1	67E	10	26	"	"	2. x2. x.25 x 22.375 Long
1	67F	10	26	"	"	2. x2. x.25 x 8. Long
1	67G	10	26	"	"	2. x2. x.25 x 7. Long
6	67H	10	26	Bolts (1)	"	.625 x 2.625
1	67K	10	26	Platform Angle (Left)	"	2.5x2. x.25 x 89.625 Long
1	67L	10	26	Platform Side (Left) Plate	"	.25 x 8. x 89.625
1	67M	10	26	Angle	"	2. x2. x.25 x 89.375 Long
1	67N	10	26	"	"	2. x2. x.25 x 85.125 Long
1	67P	10	26	"	"	2. x2. x.25 x 6. Long
2	67Q	10	26	Platform Transom Plate	"	.25 x 7.875 x 29.75
2	67R	10	26	Angles	"	2.5x2. x.25 x 24.25 Long
1	67S	10	26	" (Right)	"	2.5 x 2.5x.25 x 7.375 Long
1	67T	10	26	" (Left)	"	2.5 x 2.5x.25 x 7.375 Long
1	67U	10	26	" (Right)	"	2.5x2.5x.25x5.593 (5-19/32) Long
1	67W	10	26	" (Left)	"	2.5x2.5x.25x5.593 (5-19/32) Long
2	67X	10	26	Transom Filler Plate (outer)	"	.25 x 2. x 2.25
2	67Z	10	26	" (inner)	"	.25 x 2.25 x 5.75
1	68A	10	26	Platform Angle (Right)	"	2.5 x 2. x.25 x 98. Long
1	68B	10	26	Platform Side (Right)	"	.25 x 8. x 98.
1	68C	10	26	Angle	"	2. x2. x.25 x 95.75 Long
1	68D	10	26	"	"	2. x2. x.25 x 93.5 Long

(1) With nuts and lock washers.

PLATFORMS, (Continued)

No. for one carriage	Piece Mark	Drawing	Class	Div.	No.	Name of Piece	Material	Remarks
1	68E	10 26	10	26	68	Angle	Structural Steel	2. x 2. x .25 x 6. Long
1	68F	10 26	10	26	68	Platform Angle (Rear)	"	2.5 x 2.5 x .25 x 11.5 Long
1	68G	10 26	10	26	68	Side Platform (Right) Plate	"	.25 x 27.375 x 44.5
2	68H	10 26	10	26	68	Bolts Ctsk Head 1	"	.625 x 2.625
2	68K	10 26	10	26	68	Filler Plate	"	.25 x 3.75 x 4.5
2	68L	10 26	10	26	68	"	"	.25 x 2. x 3.75
1	69A	10 26	10	26	69	Folding Platform (Front) Plate	"	.25 x 18.25 x 56.
1	69B	10 26	10	26	69	Angle	"	2. x 2. x .25 x 51.5 Long
4	69C	10 26	10	26	69	Folding Platform Hinge (Female)	Cast Steel	
2	69D	10 26	10	26	69	" (Male)	"	
2	69E	10 26	10	26	69	"	"	With holes for .625 C Sunk Head Screws
4	69F	10 26	10	26	69	Screws Ctsk head	"	With .640(41/64) D. Drilled holes for .625 Ctsk Head rivets
1	69G	10 26	10	26	69	Folding Platform (Rear) Plate	Structural Steel	.625 x 1.75
1	69H	10 26	10	26	69	Angle	"	.25 x 26. x 56.
4	69K	10 26	10	26	69	Hinge Pin	Forged Steel	3. x 3. x .25 x 51. Long
1	71A	10 26	10	26	71	Elevating Folding Platform Plate	Forged Steel	With 8-.125x.75 Split Pins
1	71B	10 26	10	26	71	Angle	Structural Steel	.25x16.5 x 61.25
1	71C	10 26	10	26	71	Elevating Platform Plate	"	2.5x2. x .25 x 57.5 Long
1	71D	10 26	10	26	71	Angle	"	.25 x 24.75 x 77.25
1	71E	10 26	10	26	71	"	"	2.5 x 2. x .25 x 24.75 Long
1	71F	10 26	10	26	71	"	"	2.5 x 2. x .25 x 18.75 Long
4	72A	10 26	10	26	72	Hinge Lock Rings	Steel	2.5 x 2.5x.25x.42.25 Long
2	72B	10 26	10	26	72	Chain Fasteners	"	.625 I.D.
2	72C	10 26	10	26	72	Pin Locks	"	
2	72D	10 26	10	26	72	Chains	"	16. Long Std. Chain Co's. No. 3. or equal
2	72E	10 26	10	26	72	Elevating Folding Platform Bracket-Cast Steel	Cast Steel	
2	72F	10 26	10	26	72	Pins Type A	"	.984x3.375(A#2.562(2-9/16)
2	72G	10 26	10	26	72	Elevating Platform Bracket	Cast Steel	
20	72H	10 26	10	26	72	Bolts 1	"	.625 x 3.25 Smug Fit
12	70A	10 26	10	26	70	Stanchion Socket	"	
1	70E	10 26	10	26	70	Stanchion	Forged Steel	A - 22.5

1 with nuts and lock washers

PLATFORMS (Continued)

No. for one carriage	Piece Mark	Drawing Class Div.	No.	Name of Piece	Material	Remarks
11	70F	10	26	Stanchion	Forged Steel	Without Rivet Hole
1	70G	10	26	Chain Fastening	Cast Steel	With 1-1/2" x 1/16" x 1.75 Steel Rivet
6	70L	10	26	Hooks	Steel	
6	70M	10	26	Links	"	
1	70N	10	26	Twisted Link Machine Chain		No. 5-0, A=5/16" = 4. Ft. 2. In. (Approx.)
1	70P	10	26	"	"	No. 5-0, A=7/16" = 6. Ft. 4. In.
1	70Q	10	26	"	"	No. 5-0, A=1 1/4" = 8. Ft. 3. In.

1 With Nuts & Lock Washers.

CAR DETAILS

No. for One Carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
4	81A	10 26 81	Side Sill Plates	Structural Steel	.75x40x183x75
2	81B	10 26 81	Plates Right	"	.75x7.5x152.
2	81C	10 26 81	" Left	"	.75x7.5x152.
2	81D	10 26 81	" Right	"	.75x9.5x119. Approx.
2	81E	10 26 81	" Left	"	.75x9.5x119. Approx.
2	81F	10 26 81	" Right	"	.75x7.5x58.5
2	81G	10 26 81	" Left	"	.75x7.5x58.5
2	81H	10 26 81	" Right	"	.5x7.5x31.
2	81K	10 26 81	" Left	"	.5x7.5x31.
2	81L	10 26 81	Angles Right	"	.6x6x.75x152. Long
2	81M	10 26 81	" Left	"	.6x6x.75x152. Long
2	81N	10 26 81	" Right	"	.6x6x.75x161.5 Long
2	81P	10 26 81	" Left	"	.6x6x.75x161.5 Long
4	82A	10 26 82	Intermediate Sill Plates	"	.75x10x81.
4	82B	10 26 82	Plates	"	.75x20.5x102.5 Approx
4	82C	10 26 82	"	"	.5x38x85.
4	82D	10 26 82	"	"	.5x13x20.5
4	82E	10 26 82	Angles Right	"	.5x3.5x.75x85. Long
4	82F	10 26 82	" Left	"	.5x3.5x.75x85. Long
4	82G	10 26 82	" Right	"	.5x3.5x.75x95. Long Approx.
4	82H	10 26 82	" Left	"	.5x3.5x.75x95. Long Approx.
2	83A	10 26 83	Center Sill Plates	"	.75x22x152
2	83B	10 26 83	Plates	"	.75x34x95.5 Approx.
4	83C	10 26 83	"	"	.5x38x152.
2	83D	10 26 83	"	"	.5x13x34.
2	83E	10 26 83	Angles Right	"	.5x3.5x.75x152. Long
2	83F	10 26 83	" Left	"	.5x3.5x.75x152. Long
2	83G	10 26 83	" Right	"	.5x3.5x.75x161. Long Approx.
2	83H	10 26 83	" Left	"	.5x3.5x.75x161. Long
2	83K	10 26 83	" Right	"	.5x3.5x.75x56. Long
2	83L	10 26 83	" Left	"	.5x3.5x.75x56. Long
2	84A	10 25 84	End Sill Channel	Steel	15x40#
2	84B	10 25 84	Strut Clip	"	
2	84C	10 25 84	Tie Rod Clip	"	

CAR DETAIL (continued)

No. for One Carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
4	85U	10 26	Angles - Top Left	Structural Steel	.5x3.5x5.x31.5 Long
4	85D	10 26	Angles - Bottom Right	"	.5x3.5x5.x31.5 Long
4	85E	10 26	Angles - Bottom Left	"	.5x3.5x5.x31.5 Long
2	85F	10 26	Palster Cover Plates (Bottom)	Steel	23.x39.5x.75
4	85G	10 26	Palster & Side Sill Clip Plates	Structural Steel	4.x12.5x.75
8	85H	10 26	Angles	"	6.x6.x.5x14. Long
4	85K	10 26	Bolster and Center Sill Clip Plates	Structural Steel	7.x12.5x.75
8	85L	10 26	Angles	"	6.x6.x.5x16. Long
2	85M	10 26	Bolster Cover Plate (Top)	Steel	23.x101.5x.75
2	86A	10 26	Body Bolster Center Plate	Cast Steel	.5x90.75x101.5
4	86B	10 26	Body Side Bearing	"	.375x57.75x101.5
2	86C	10 26	Center Pin	Steel	5.x3.5x.5x33.25 Long
2	86D	10 26	Bolster Center Filler	Cast Steel	5.x3.5x.5x33.25 Long
2	86E	10 26	Draft Spring Stop	"	.75x5.x24.5
2	87A	10 26	Floor Plate	Steel	6.x6.x.5x34.25 Long
2	87B	10 26	End Floor Plate	"	6.x6.x.5x34.25 Long
4		10 26	Base Ring & Intermediate Sill Clip Angles Right	Steel	75x5.875x21.875
4		10 26	Angles Left	Steel	5.x3.5x.5x14. Long
8		10 26	Plates	"	5.x3.5x.5x14. Long
2		10 26	Base Ring & Side Sill Clip Angles Right	Steel	7.x9.x.5
2		10 26	Angles Right	"	4.75x4.75x.75
4	88E	10 26	Bolster & Interm. Sill Clip Angles Right	Steel	55x3.5x.5x33.25 Long
4	88F	10 26	Angles Left	"	5.x3.5x.5x33.25 Long
8	88G	10 26	Plates	Steel	.75x5.x24.5
8	88H	10 26	Plates	"	
2		10 26	Base Plate & Center Sill Clip Angles Right	Steel	
2		10 26	Angles Right	"	
4		10 26	Angles Left	Steel	
4		10 26	Plates	"	

CAR DETAILS (continued)

No. for Carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
2		10 26 88	Center Sill & End Sill Clip		
2		10 26 88	Angles Right		6.5x6.5x16. Long
4		10 26 88	Angles Left		6.5x6.5x16. Long
2		10 26 88	Plates	Steel	.75x5.875x7.
2		10 26 88	Side & End Sill Clip		
2		10 26 88	Angles Right		6.5x6.5x14. Long
4		10 26 88	Angles Left		6.5x6.5x14. Long
2		10 26 88	Plates	Steel	.75x4.5.875
4	89A	10 26 89	Uncoupling Rod	"	
4	89B	10 26 89	" "		
2	89C	10 26 89	Clevis	Malleable Iron	
4	89D	10 26 89	Clevis Link	"	
2	89E	10 26 89	Uncoupling Pin	Steel	With 4.25x1. Split Pins
8	89F	10 26 89	" Rod Bracket	Cast Steel	
4	89G	10 26 89	Handhold	Forged Steel	
		10 26 89	Step	"	

END SILL & DETAILS FOR FRENCH COUPLER

No. for One Carriage	Piece Mark	Drawing Class Div. No.	Name of Piece	Material	Remarks
2	119A	10 26 119	End Sill Channel	Steel	15.40 lbs.
4	119B	10 26 119	Buffer Plate	"	.5x19.5x29.75
8	119C	10 26 119	Sq. Hd. Bolts 2		.75x16.25 with 8-.75 Sq.Nuts
16	119D	10 26 119	Sq. Hd. Bolts 3		.75 x 14.75
2	119E	10 26 119	Buffer Block	White Oak	
4	119F	10 26 119	Bolts		1.5x16. With 4-1.5 Cast Iron Washers
4	119G	10 26 119	Bolts		1. x15. With 4-1. Cast Iron Washers
8	119H	10 26 119	Bolts 1		.625x11.625 with 8-.625 Washers
8	119K	10 26 119	Bolts		1. x14.5 With 8-1. Cast Iron Washers
2	119L	10 26 119	Draw Hook Plats ²	Steel	.5x10.5x29.75
4	119M	10 26 119	Sq. Hd. Bolts 1		.75x16.25 with 4-.75 Sq.Nuts
4	119N	10 26 119	Bolts		.75x12.25 With 4-.75 Washers
4	119P	10 26 119	Draft Spring Seat Guide	Steel	
2	119R	10 26 119	Center Sill & End Sill Clip Angle Right		
2	119S	10 26 119	Angle Left		6. x6. x.5x16. Long
4	119T	10 26 119	Plates	Steel	6. x6. x.5.16. Long .75x5.875x7.

¹ With Nuts and Lock Washers

² With Lock Washers

³ With Nuts

No. for Carriage	Piece Mark	Drawing Class Div.	No.	Name of Piece	Material	Remarks
2	100A	10	26	Goild Freight Coupler		2201 Commercial
2	100B	10	26	Friction Draft Gear Cylinder Body		PC#42292 W.A.B.Co. (C)
2	100C	10	26	Release Springs		Pc.#5662 W.A.B.Co. (C)
2	100D	10	26	Preliminary Spring		Pc.#5663 W.A.P.Co. (C)
2	100E	10	26	Auxiliary Release Spring		Pc.#5664 W.A.B.Co. (C)
2	100F	10	26	Auxiliary Preliminary Spring		Pc.#5665 W.A.B.Co. (C)
2	100G	10	26	Nut for Release Pin		Pc.No.5666 W.A.B.Co. (C)
2	100H	10	26	Release Pin		Pc.#5667 W.A.B.Co. (C)
2	100I	10	26	Rivet for Securing Release Pin Nut		Pc.#5668 W.A.B.Co. (C)
2	100J	10	26	Wedge		Pc.#5669 W.A.B.Co. (C)
2	100K	10	26	Female Segment		Pc.#5670 W.A.B.Co. (C)
2	100L	10	26	Male Segment		Pc.#5671 W.A.B.Co. (C)
2	100M	10	26	Friction Strip		Pc.#5672 W.A.B.Co. (C)
2	100N	10	26	Carry Iron	Cast Steel #2	
8	100O	10	26	Lock Plate	Steel	
4	100P	10	26	Bolts 3		1.x3.625
4	100Q	10	26	Bolts 3		1.x3.
2	100R	10	26	Support Strip	Forged Steel	
4	100S	10	26	Double Lock Plate	Steel	
8	100T	10	26	Bolts 3		.875x2.75
2	100U	10	26	Coupler Yoke	Steel	
2	100V	10	26	" " Filler	"	
4	100W	10	26	Follower Plate	"	
2	100X	10	26	Cheek Plate Right	Cast Steel #2	
2	100Y	10	26	Cheek Plate Left	" " "	
2	100Z	10	26	Striking Plate	" " "	

3 With Nuts

Air Brake Details

No. for 1 Car.	Piece Mark	Drawing Class	Div.	Drq.	Name of Piece.	Material	Remarks
2					Freight Brake Cylinder	Type D 10 x 12	Pc.No. 4868 W.A.B.Co.
2					Freight Auxiliary Reservoir	Type D	Pc.No. 2446 W.A.B.Co.
2					Centrifugal Dirt Collector	Pc.No. 37069	W.A.B.Co.
2					Triple Valve	K2Pc No. 28968	W.A.B.Co.
2					Self Locking Out Out Cock	Pc.No. 2135	W.A.B.Co.
2					Reservoir Release Valve	Pc.No. 2416	W.A.B.Co.
2					Self Locking Angle Cock	1.25 Pc.No. 22413.	
1					Pipe	1.25 x 10.	Long "A" Commercial
1					"	1.25x70.	Long "B"
1					"	1.25x5.25	Long "C"
1					"	1.25x69.	Long "D"
1					"	1.25x7.25	Long "E"
1					"	1.25x14.5	Long "F"
1					"	1.25x9.5	Long "G"
1					"	1. x 5.	Long "H"
2					"	1. x 3.25	Long "K"
1					"	1.x 9.25	Long "L"
1					"	1.x22.25	Long "M"
1					"	1. x 13.25	Long "N"
1					"	1. x 23.	Long "P"
1					"	1.x17.75	Long "Q"
1					"	1.25 x 10.	Long "R"
5					"	1.25x65.25	Long "S"
1					"	1.25 x 13.5	Long "T"
1					"	1.25x19.25	Long "U"
1					"	1.25x25.75	Long "V"
1					"	1.25 x 34.	Long "X"
1					"	1.25 x 166.	Long "Z"
2					"	1. x 5.	Long "AA"
1					"	1.x3.25	Long "EA"
1					"	1 x 22.25	Long "CA"
1					"	1 x 13.25	Long "DA"
1					"	1 x 20	Long "EA"
1					"	1.x17.75	Long "FA"
1					"	1.x8.25	Long "GA"

Air Brakes Details (Cont'd)

No. for 1 Car.	Piece Mark	Class Div.	Drg.	Name of Piece	Material	Remarks
2				Union		1. Commercial
8				Elbow		1.25-45° "
1				"		1.25-90° "
2				"		1.45° "
4				"		1.90° "
2				Pushing Coupling		.25 x .5 "
2				Tap		1.25 "
2				Union Cocks		1.25 x 1.25 xl. "
4				Fulcrum Plate (Bottom)	Steel	.25Fe No.41814 W.A.B. Co.
2	94A	10	26	Fulcrum Plate (Top)	"	.5xl.x27.5
2	94B	10	26	Washer	"	.5xl.x27.5
2	94C	10	25	Washer	"	
2	94D	10	26	Filler	"	
2	94E	10	26	Filler	"	
2	94F	10	26	Lever Pin	"	With 2-.25xl.75 Split Pins
8	94G	10	26	Bolts 3	"	.5xl.625.
8	94H	10	26	Tap Bolts 2	"	.875 x 3.
4	94I	10	26	Brake Cylinder Bracket Plates	"	.5xl5.187(15-3/16)xl8.5
12	94K	10	26	Bolts 1	"	.625 x 2.
12	94L	10	26	Bolts 3	"	.75 x 1.875
4	94M	10	26	Auxiliary Reservoir Bracket Plates	"	.5x7.x26.25
8	94N	10	26	Bolts 1	"	.75 x 4.
16	94L	10	26	Bolts 3	"	.75 x 1.875
8	94P	10	26	Thimbles, Pipe	Wrot.Iron	.75xl.5 Long
4	95A	10	26	Cylinder Lever Fulcrum Plates	Forged Steel	6x5.437(5-9/16) x .5
8	95B	10	26	Bolts 3	"	.75 x 1.875
2	95C	10	26	Cylinder Lever Fulcrum Pin	Forged Steel	With 2-.25x2(5/16)xl.5 split pins
2	95D	10	26	Cylinder Lever	"	
2	95E	10	26	Push Rod Pin	"	With 2-3/2(5/16)xl.5 split pins
2	95F	10	26	Push Rod	"	
2	95G	10	26	Floating Lever	"	
2	95H	10	26	Live Lever Pin	"	
2	95K	10	26	Live Lever & Floating lever Connection	"	With 2-.25xl.5 Split Pins
4	95L	10	26	Floating and cylinder lever pin	"	With 6-.25xl.5 split pins 23176

Air Brake Details Cont.

No. for Piece	1Cer. Mark	Class.	Div.	Drp.	Name of Piece	Material	Remarks
2	95M	10	26	95	Cylinder Lever and Floating Lever Connection	Forged Steel	
2	96C	10	26	96	Pipe Hanger Plates	Steel	.375x2.x20.812(20-3/16)
2	96D	10	26	96	Plates 3	"	.375 x 2. x 6.75
4	96E	10	26	96	Bolts 3		.625 x 1.625
4	96F	10	26	96	Bolts 3		.625 x 1.5
					3 with Nuts, 2 with Lock Washers 1 with nuts and Lock Washers		
2	96K	10	26	96	Pipe Hanger Plates	Steel	.375x2.x22.25.
2	96L	10	26	96	Plates	"	.375x2.x24.187(24.3/16)
4	96D	10	26	96	" 3	"	.375x2.x6.75
4	96E	10	26	96	Bolts 3		.625 x 1.625.
8	96F	10	26	96	Bolts 3		.625 x 1.5
4	96M	10	26	96	Bolts		.625 x 1.875
2	96N	10	26	96	Pipe Hanger	Steel	With 4 .5 Nuts
2	96P	10	26	96	Pipe Support	Forged Steel	With 2 - .875 Nuts
2	96Q	10	26	96	Release Valve Rod	"	A = 69
2	96R	10	26	95	Release Valve Rod	"	A = 35

Hand Brake Details.

No. for 1 Car.	Piece Mark	Class	Div.	Drg.	Name of Piece.	Material	Remarks.
2	97A	10	26	97	Brake Mast Step Plates	Steel	.5 x 5. x 31.5
2	97B	10	26	97	Plates	"	.5 x 6. x 6.5
8	97C	10	26	97	Bolts 3		.75 x 2.
4	97D	10	26	97	Bolts 3		.75 x 1.875
2	97E	10	26	97	Brake Chains	Wrot Iron or Steel	44 - .437 (7/16) links.
2	97F	10	26	97	Special links	"	.562 (9/16)
2	97G	10	26	97	"	"	.562 (9/16)
2	97H	10	26	97	Upper Clevises	"	.5 x 3.
2	97K	10	26	97	Lower Clevises	"	.5 x .375 thick.
2	97L	10	26	97	Lock Bolts	"	.75 x 2.5 with 2-.75 Crown Nut.
2	97M	10	26	97	Nuts	"	
2	97N	10	26	97	Clevis Bolts	"	
2	97P	10	26	97	Hand Brake Sheave	Steel	
2	97Q	10	26	97	Hand Brake Pull Rod	Forged Steel	
2	97R	10	26	97	Sheave Pin	"	
2	97S	10	26	97	Pull Rod Pin	"	With 2-.25 x 1.5 Split Pins.
2	97T	10	26	97	Pull Rod Hanger Bar	"	With 2-.25 x 1.5 Split Pins.
2	97U	10	26	97	Bars	Steel	.375 x 2. x 36.875
2	97W	10	26	97	Bars	"	.375 x 2. x 8.25
2	97X	10	26	97	Bolts 3	"	.375 x 2. x 6.5
8	97Z	10	26	97	Bolts 3	"	.625 x 1.875
2	98A	10	26	98	Brake Pawl Carrier	Malleable Iron	.625 x 1.5
2	98B	10	26	98	Bolts 3		.625 x 3.125 with 2-.625 Plain Washers.
2	98C	10	26	98	Bolts 1		
2	98D	10	26	98	Brake Ratchet Wheel	Cast Iron	
2	98E	10	26	98	Brake Hard Wheel	Malleable Iron	
2	98F	10	26	98	Brake Pawl	Cast Iron	
2	98G	10	26	98	Brake Mast	Forged Steel	With 2-.25 x 2 Split Pins, 4 -.25 x 1.5 Split Pins, and 2 - .875 Square Nuts.

3 With nuts 1 With nuts and Lock Washers.

Outriggers.

No. for Car.	Piece Mark	Class	Div.	Drq.	Name of Piece.	Material	Remarks.
2	104A	10	26	104	Outrigger Bracket (Right)	Cast Steel No. 3	
2	104B	10	26	104	Outrigger Bracket (Left)	" " No. 3.	
56	104C	10	26	104	Bolts 1		1.25 x 6.125 Skug fit.
16	104D	10	26	104	Bolts 1		1.26 x 5.125 " "
4	104E	10	26	104	Bolts 1		1.25 x 4.875 " "
8	104G	10	26	104	Outrigger Hinge	Forged Steel No. 3	
8	104H	10	26	104	Hinge Pin	" " "	
8	104K	10	26	104	" " Nut	" " "	
16	107A	10	26	107	Blocking	White Oak	with 8 - .51 x 5. Split Pins
8	107B	10	26	107	Blocking	White Oak	As shown without holes "A"
16	107C	10	26	107	Angles	Structural Steel	With holes "A" only
32	107D	10	26	107	Lag Screws		3. x 2.5 x .25 x 51 long.
16	107E	10	26	107	Blocking	White Oak	.5 x 3.
24	107F	10	26	107	" "	" "	(as shown)
8	107H	10	26	107	Foot Plate	Cast Steel.	(without holes "A" & "B")
8	106A	10	26	106	Adjusting Screw	" "	
8	106B	10	26	106	Steel	Cast Steel No. 3	.875 x 24.
8	106C	10	26	106	Nut Strut End	Steel	
8	106D	10	26	106	Tie Rod Pin	" "	
8	106E	10	26	106	Split Pin	" "	(Commercial, Bend as shown)
8	106F	10	26	106	Pin fastenings, Rings "A"		
8	106G	10	26	106	Pin fastenings, Clips "B"		Pcs No. 8 Jack or .125, 7 long
8	106H	10	26	106	Twisted Link Chain		" " " " " "
8	106K	10	26	106	" "		.5 x .75, thread full length.
8	106S	10	26	106	Tap Bolts	Cast Steel No. 3	
8	106L	10	26	106	Eye Strut End	Steel	.398 x 5.5
8	106M	10	26	106	Eye Strut Pin		
8	106R	10	26	106	Taper Pins	Steel Tubing	6 O.D. Hot Drawn Shelby
8	106N	10	26	106	Strut	Steel	.75 x 6.75
24	106P	10	26	106	Pins	Cast Steel No. 3	
8	105A	10	26	105	Tie Rod Bracket	Steel	American Steel & Wire Co. or equal
8	105B	10	26	105	Turnbuckle		
8	105C	10	26	105	Tie Rod	Forged Steel	Threaded R. H.
8	105D	10	26	105	Tie Rod	Forged Steel	Threaded L. H.
8	105E	10	26	105	Tie Rod Stud Nut	" "	

No. for Piece	Class	Div.	Drg.	Name of Piece	Material	Remarks.
1 Car.	Mark.					
8	105F	10	26	105 Tie Rod Stud Nut	Forged Steel	No. 2 with 8 - .375 x 3.25 Split Pins.
4	105G	10	26	105 Screws, Flat Filister Head (Snug)	Forged Steel	.75 x .637 (11/16)
8	105H	10	26	105 Bracket Pin	"	with 8 - 1.5 Crown Nuts
8	105K	10	26	105 Tie Rod, Pin	"	with 8 - .25 x 2 Split Pins.
2	59E	10	26	59 Outrigger Support	Cast Steel	
8	59F	10	26	59 Bolts		.75 x 4.

1 With Nuts and Lockwashers

2 With Lockwashers.

Foundation Details

No. for 1 Car	Piece Mark	Drawing Class	Div.	No.	Name of Piece	Material	Remarks
8	110A	10	26	110	Foundation Stringer Channels	Steel	12. - 20.5 lbs.
8	110B	10	26	110	Plates		8 x .5 x 80.
24	110C	10	26	110	Angles		2.5 x 2.5 x .25 x 9.5 long.
4	110E	10	26	110	Bolts 3		.75 x 1.375
4	110F	10	26	110	Foundation Cross Beam	White Oak	
8		10	26	110	Manila Rope		1. x 144. Commercial.
4	110H	10	26	110	Foundation Jack Block Channels		8. - 11.25 lbs.
4	110J	10	26	110	Blocks	Cast Steel.	
4		10	26	110	Manila Rope		1. x 112. Commercial.
4		10	26	110	Thimbles	Galvanized Iron	1. Commercial.
					Equipment Fastings.		
10	121A	10	26	121	Stop Angle		3. x 3. x .5
20	121B	10	26	121	Tap Bolts &		.875 x 1.125
1	121C	10	26	121	Foot Plate Stop (Front) Angle		4. x 4. x .5
2	121B	10	26	121	Tap Bolts ²		.875 x 1.125.
6	121D	10	26	121	Lash Ring	Steel	
6	121E	10	26	121	Eye Bolts	Forged Steel	With 6-.75 Nuts & 6-.75 Lock Washers.
1		10	26	121	Foot Plate Lashing Eye Hook	"	$\frac{1}{2}$ ton, Vulcan or Equal.
1		10	26	121	Rope	Galvanized Wire	.5 x 107 Long.
2		10	26	121	Thimbles	Galvanized Iron	.5 Commercial.
1		10	26	121	Turnbuckle	"	.5 With Hook & Eye Commercial.
1	121D	10	26	121	Block Lashing Tie Ring.	Steel	
1	121E	10	26	121	Eyebolt	Forged Steel.	
1		10	26	121	Rope	Galvanized Wire	.5 x 60 Long.
2		10	26	121	Thimbles	Galvanized Iron	.5 Commercial.
1		10	26	121	Block Lashing Rope	Galvanized Wire	.5 x 96 Long.
1		10	26	121	Rope	"	.5 x 86. Long.
2		10	26	121	Rope	"	.5 x 126. Long.
8		10	26	121	Thimbles	Galvanized Iron	.5 Commercial.
4		10	26	121	Eye Hooks	Forged Steel	$\frac{1}{4}$ Ton, Vulcan or Equal.
2		10	26	121	Turnbuckles	Galvanized Iron	.5 With two eyes commercial.

Articles in Armament Chest for 12" Howitzer Mark II

No. for One Carriage.	Piece Mark.	Class	Div.	Drawing.	Name of Piece.
1		76	7	377	Box for Firing mechanism.
3	U47BC	15	5	47	Brushes, cleaning, primer seat.
1	A13WA	15	5	47	Cloth, emery, 1 quire, No. 00.
1	U47AC	15	OK	13	Collar operating pin.
1	U47AB	15	5	47	Drift, bronze (large)
1	U47X	15	5	47	Drift, bronze (small)
1		15	5	47	Drill, gunners.
1	U47AR	15	5	47	File, card, commercial.
1	U47AS	15	5	47	File, flat dead smooth, 8 inch.
1	U47BH	15	5	47	File, round 2nd cut, 8 inch.
4	U47AU	15	5	47	File, 3 cornered, 8 inch.
3	U47AW	15	5	47	File, half round, smooth, 8 inch.
3	U47AV	15	5	47	File, pillar, No. 6, 6 inch.
3	U47A7	15	5	47	File, 3 cornered No. 4, 6 inch.
1	U48F	15	5	47	File, round, smooth 8 inch.
1	U47AG	15	5	48	Hammer, ballpeen.
1	U195A	15	5	47	Hammer, copper.
1	U47An	15	5	196	Lanyard, Gunner, (complete).
1	U47AP	15	5	47	Mallet, hand.
1	U47AQ	15	5	47	Mallet, long handle.
1		15	5	47	Pliers, cutting, 7 inch, 1 pair.
1		15	5	233	Pouch, gunners.
1	U47U	15	5	47	Punch, Gunners.
1	U47AF	15	5	47	Punch, pin.
1	U595AA	15	5	595	Reamer, primer seat cleaning.
1	U47AE	15	5	47	Scraper, metal.
1		64	1	27	Scraper, socket to fit sponge staff.
1	U45P	15	5	45	Screw driver, bar.
3	U47AX	15	5	47	Sponge, wagon 6 inch.
4	U47AY	15	5	47	Twine, balls assorted.
1		73	0	1	Wrench for point detonating fuse, mark II, & adapter and booster Mark II.
1	U47AZ	15	5	47	Waste, cotton, 10 pounds.
1	U47BA	15	5	47	Wire, copper No. 12, 2 pounds.
1	U47BB	15	5	47	Wire, copper No. 16, 2 pounds.
1	U44M	15	5	44	Wrench, dummy pressure plugs
1	U45L	15	5	45	Wrench, monkey, 21 inch.
1	U44Q	15	5	44	Wrench, obturator clamping screw.
1	U44Y	15	5	44	Wrench, teat obturator spindle.

No. for one Carriage.	Piece Mark	Class	Div. Drawing	Drg.	Name of Piece.
1	U44K	15	5	44	Wrench, obturator nut.
1	U595B	15	5	595	Wrench, for firing mechanism.
1		15	5	422	Filling funnel.
1	U314Q	15	5	314	Hydrometer.
2	U46J	15	5	46	Oiler, half pint.
1	U45AN	15	5	45	Screw Driver, Commercial.
1	U45AE	15	5	45	Screw Driver, Commercial.
1	U43C	15	5	43	Wrench, double, .375 and .5
1	U43F	15	5	43	Wrench, double, .625 and .75
1	U43G	15	5	43	Wrench, double, .875 and 1.
1	U43BA	15	5	43	Wrench, double, 1.25 and 1.5
1	U43AW	15	5	43	Wrench, double, 2. and 2.25.
1	U423D	15	5	423	Wrench, box, valve stems.
1	U596B	15	5	596	Wrench, recoil cylinders.
1	U596C	15	5	596	Wrench, stuffing box, cylinder head.
1	U45DA	15	5	45	Wrench, monkey, 6 inch.
1	U596D	15	5	596	Wrench, piston rod nuts.
1	U82H	15	5	82	Wrench, pinion shaft nut, 3.5 inch.
1	U82P	15	5	82	Wrench, single, 3 inch.
1	U422C	15	5	422	Wrench, socket, recuperator packing.
1	U422D	15	5	422	Wrench, socket, recuperator packing.
1	U422G	15	5	422	Wrench, socket, recuperator packing.
1	U423G	15	5	423	Wrench, spanner, recuperator piston rod nut.
1	U596A	15	5	596	Wrench, spanner, recoil cylinder follower.
1	U423E	15	5	423	Wrench, spanner, pull rod yoke bushing.
1	U423AA	15	5	423	Wrench, pipe, connecting nut.
1	U422H	15	5	422	Wrench, handle.
1	U596E	15	5	596	Wrench, spanner, anti-friction lock nut.
1	U43V	15	5	43	Wrench, single, 1.75 anti-friction adj. screw.
2	U56C	15	5	56	Crow Bar (not in chest).

Reservoir for Compressed Air.

No. for 1 Car.	Piece Mark.	Class	Div.	Drq.	Name of Piece	Material	Remarks
1	U319C	15	5	319	Reservoir	Seamless Steel	
1	U319A1	15	5	319	Reservoir cap	Malleable iron	
1	U319B1	15	5	319	Reservoir Cap flange	"	
1	U319D	15	5	319	Needle valve	Toil Steel A.	
1	U319E	15	5	319	Follower	Forged Steel No.3	
1	U319F	15	5	319	Gland	Tobin Bronze.	
1	U319L	15	5	319	Packing	Derf-tins.	
1	U319G	15	5	319	Adapter	Forged Steel No. 3	
2		15	9	16	Shot Tongs. Shot tongs, Gilmartin.		
4		15	5	39	Water buckets. Water buckets.		
1	U51D	15	5	51	Ax		
2	U51A	15	5	51	Ax, Pick.		30#
1	1243G				Bar, Claw		30#
1	1243A				Bar, Crow Pinch Point		Hose & Coupling to be assembled 2 complete
4	46100				Coupling, Air Brake Hose		
1	3717DF				Chisel, Railroad with handle		
1	2172D				Carrier, Oil (Filled with Galena Journal Box Oil)		10 Gallon Capacity. Size Z
1		76	15	19	Chest		
2	3717F				Forks, Rail		
1	U48F	15	5	48	Hammer, Machinist, Ball Peen		2# Commercial. W.A.B. Cos.
2	FP5				Hose, Air Brake		
2	U51A	15	5	51	Handle, Pick Ax.		25 tons capacity Height 20. Style N.A.
4	1026B				Jack		One quart.
1	U46L	15	5	46	Oiler, Locomotive (Filled)		
1	4951D				Pusher, Car		Journal Box Lbs. Commercial.
25					Packing		

Tools and Accessories for Car Cont'd.

No. for One Carriage	Piece Mark	Class	Div.	Drg.	Name of Piece.	Remarks.
1	4951G				Puller, Spike	
1	4951F				Replacer, Car Inside	
1	4951E				Replacer, Car, Outside.	
1					Rings, Auger, With Handle	No. ER $\frac{1}{2}$ Simmons
1	1022C				Screw, Car Box Jacking with Levers	10" High 20 ton Capacity
2	8819A				Showels, Railroad.	
1	3370C				Sledge	20#
3	3717E				Tongs, R.R. Track	
1					Tool, Combination Hood & Packing	Commercial.
2	4712C				Wrench, Track	Double End No. 188.
1	U153B	15	5	153	Wrench	Double End
1	U153E	15	5	153	Wrench	Double End.
1	U153G	15	5	153	Wrench	Double End.
1	637D				Wrench, Stillson Pipe	For .25 to 2.5 Pipe.

Chest Tray. A - A.

No. for I Carr.	Piece Mark.	Class	Drawing Div. No.	Name of Piece	Material	Remarks
1	QH2A	76	OA	2 Bottom and Sides	Flange Steel	.062(1/16) thick, Comm.
2	QH1D	76	OA	1 Partition "A"	Flange Steel	.062(1/16) "
4	QH1E	76	OA	1 Partition "B"	"	" "
1	QH1K	76	OA	1 Partition "C"	"	" "
4	QH1B	76	OA	1 Tray Handle	Steel	.062(1/16) "
8	QH1A	76	OA	1 Handle Bracket	Flange Steel	.062(1/16) "
Chest Tray C-C						
1	QH4F	76	OA	4 Bottom and Sides	Flange Steel	.062(1/16) thick "
1	QH4D	76	OA	4 Partition	"	.062(1/16) "
4	QH4B	76	OA	4 Tray Handles	Steel	" "
8	QH4A	76	OA	4 Handle Brackets	Flange Steel	.062(1/16) "
Chest Tray F-F						
1	QH5E	76	OA	5 Bottom and Sides	Flange Steel	0.062(1/16) thick
5	QH5C	76	OA	5 Tray Supports	Wrought Iron	0.75
5	QH5D	76	OA	5 Screws	Steel.....	0.75 by 3.25 filister head with 10.75 washers and 50.75 nuts
4	QH5A	76	OA	5 Tray Handle	do.	
8	QH5B	76	OA	5 Handle bracket	Flange Steel	0.062(1/16) thick
Chest Tray H-H						
1	QH7E	76	OA	7 Bottom and Sides	Flange Steel	0.062(1/16) thick
1	QH7A	76	OA	7 Partition	"	0.062(1/16) thick
1	QH7B	76	OA	7 Partition	"	0.062(1/15) thick
1	QH7C	76	OA	7 Partition	"	0.062(1/16) thick
1	QH7D	76	OA	7 Partition	"	0.062(1/16) thick
4	QH5A	76	OA	5 Tray Handle	Steel	
8	QH5B	76	OA	5 Hand bracket	Flange Steel	0.062(1/16) thick
Chest Tray K-K						
1	QH8E	76	OA	8 Bottom and sides	Flange Steel	0.062(1/16) thick
2	QH8A	76	OA	8 Partitions	Flange Steel	0.062(1/16) thick

No. for 1 Car.	Piece Mark	Drawing Class. Div. No.	Name of Piece	Material	Remarks
			Chest Tray K-K		
1	QH8B	76 OA	Partition	Flange Steel	0.062(1/16) thick
1	QH8C	76 OA	Partition	"	0.062(1/16) "
1	QH8D	76 OA	Partition	"	0.062(1/16) "
4	QH5A	76 OA	Tray Handle	Steel	
8	QH5B	76 OA	Handle Bracket	Flange Steel	0.062(1/16) "
			Chest Tray L-L		
1	QH14B	76 OA	Bottom and Sides	Structural Steel	0.062(1/16) "
1	QH14A	76 OA	Partition	"	0.062(1/16) "
4	QH15E		Tray Handle	Steel	
8	QH15B		Handle Brackets	Structural Steel	0.062(1/16) "
			Plate		
			Test Tools.		
1		29 0	Racer Pintle Caliper	Steel	A - 96.75
1		29 0	"	"	A - 96.76
1		29 0	Base Ring Pintle Caliper	"	A - 96.70
1		29 0	"	"	A - 96.71.
1		29 0	Distance Ring Across Faces	Caliper	A - 100.98
1		29 0	"	"	A - 100.97
1		29 0	Thread Ring	Tool Steel	1.125
1		29 0	" Plug	"	1.125
1		29 0	Traversing Roller Gage	Steel	With bearing full length of Roller, A-4.3755, B- 4.9731.
			"	"	As Shown A-4.3745, B-4.9721
1		29 0	Base Ring Roller Path Gage	"	A-15.5645
1		29 0	Racer Roller Path Gage	"	A-15.5605
1		29 0	"	"	

List of Grease Cups and Handy Oilers

Position	Number of Grease Cups, Handy Oilers	Size.
Rever	4	.5
Trunnion Cap	12	.5
Cradle	3	.5
Side Frame Right	3	.5
Elevating Handwheel Shaft Bearing	1	.5
" Intermediate "	1	.5
" Pinion "	1	.5
Traversing Gear Case	3	.5
" " Cover	1	.5
Trunnion Pin Bearing (Upper) Right	1	.25
" " Left	1	.25
Jack Stop	4	.25
Jack Screw	4	.375
Pinion Stud	4	.375
Crane Mast Pedestal	1	.5
Crane Mast	1	.5
Crane Drum Bracket		2 Ltd., .25 Oil Plugs
Crane Crank Right		2 Ltd., .25 Oil Plugs
Crane Crank Left		2 Ltd., .25 Oil Plugs

Gaylord Bros.
Makers
Syracuse, N Y.
PAT. JAN 21, 1908