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# DESCRIPTION

OF

# MODERN GUN MOUNTS

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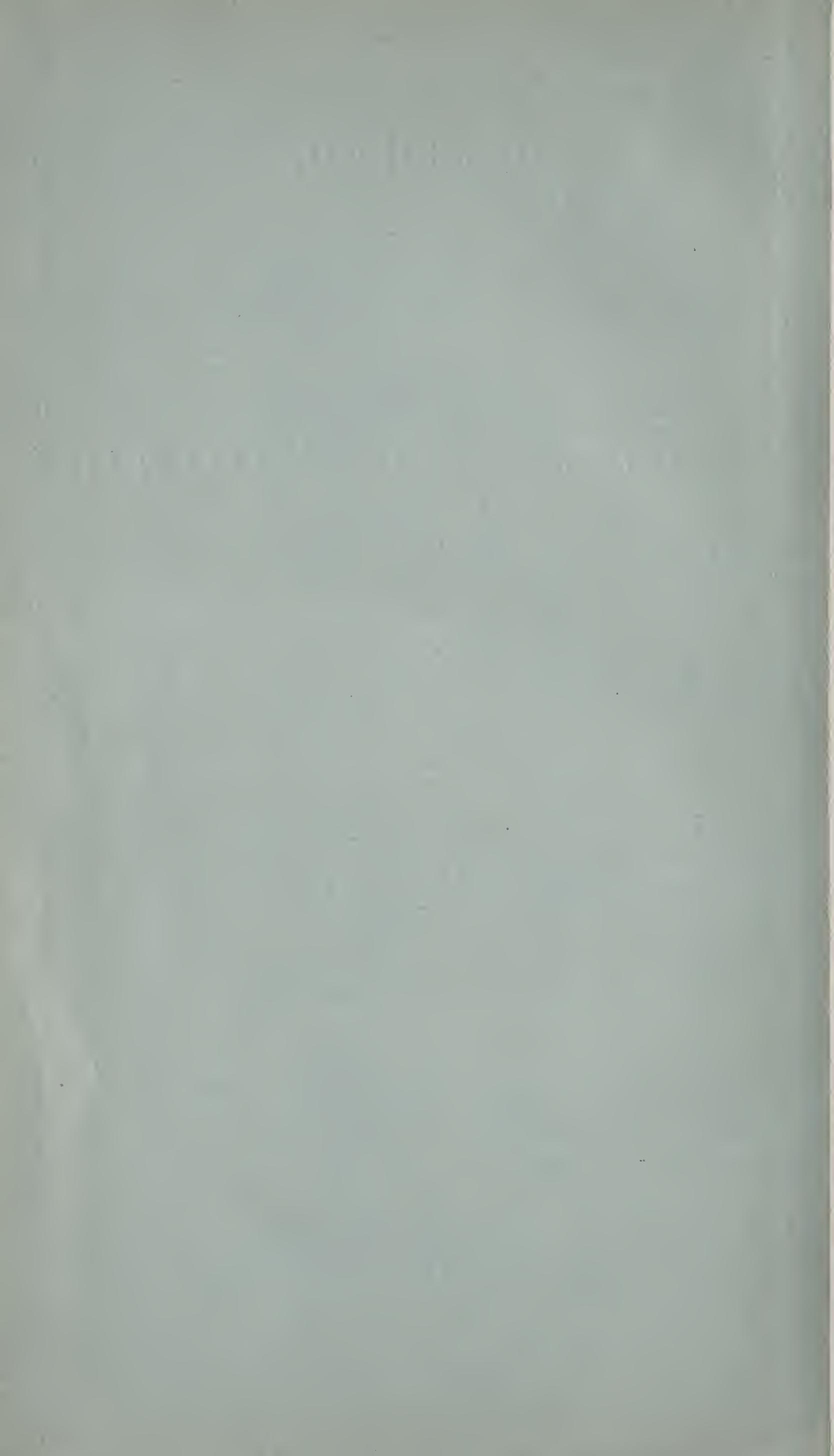
# UNITED STATES NAVY.

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BUREAU OF ORDNANCE,  
NAVY DEPARTMENT,  
1894.

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WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1894.



# DESCRIPTION

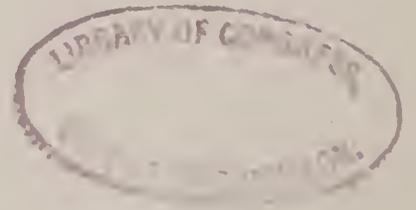
OF

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391

# MODERN GUN MOUNTS

IN THE

# UNITED STATES NAVY.



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49 BUREAU OF ORDNANCE,  
NAVY DEPARTMENT,  
1894.

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## U. S. NAVAL MOUNTS FOR RAPID-FIRE GUNS.

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The mounts for 4-inch, 5-inch, and 6 inch R. F. guns now in service are the 4-inch mounts, Marks II and III; 5-inch mounts, Marks II and III, and 6-inch mount, Mark V.

The general features of these mounts are as follows:

The gun recoils in the line of fire and moves in and out in a slide which is itself supported by trunnions resting on the top carriage. The top carriage is central-pivoted on a stand which is bolted to the deck. Training is effected by suitable gearing, actuating pinions on the top carriage working in a training circle on the stand. The elevating gear is bolted to the top carriage, its pinion working in an arc on the slide, and, therefore, does not recoil with the gun and can be kept in hand at the instant of firing.

The recoil is taken up by a piston bolted to the slide traveling in a cylinder, which is cast in one, with the sleeve on the gun. The cylinder is rifled with 3 grooves of varying cross-sectional area. The widest part of the grooves is at the beginning of the recoil. The depth of the grooves is 0.15 inch.

The cylinder is usually filled with a nonfreezing mixture of glycerin and water in the proportion of four to one, but either water or oil could be used in an emergency. The piston has sufficient clearance to move easily in the cylinder, and the liquid passes freely around the piston head through the grooves. The cylinder is filled through the filling hole (20) by means of a funnel supplied with the mount and emptied through the drain hole.

Strong counter-recoil springs of tempered steel return the gun to the firing position. Compressors are furnished by which the springs are put in place under an initial tension. The compressor is also used in removing the springs when it becomes necessary to run the gun in for cleaning and inspection.

Counter-recoil bumpers are fitted on the slides to take up the shock of running out.

Steel clips are bolted to the top carriage and fit under a clip circle on the pivot stand to prevent jump of carriage, the front ones when firing, the rear ones when the carriage is returned to battery by the counter-recoil springs.

A steel ratchet lever is furnished each mount for raising the top carriage off the rollers. It ships on the head of the pivot bolt, on the shank of which is chased a screw thread.

By this means the rollers can be removed and the roller path cleaned. In doing this, however, care must be taken to block up under the carriage as it rises, in order to prevent deforming the pivot bolt.

In the mounts already issued to service the oscillating slides are of bronze, but as these have shown signs of spreading under fire in future these slides will be made of cast steel.

The principal parts of the quick-firing mounts are (*a*) pivot stand, (*b*) top carriage, (*c*) oscillating slide, (*d*) combined sleeve and recoil cylinder, (*e*) training gear, (*f*) elevating gear.

*4-inch mount, Mark I.*—Only one carriage of this type was built. It was never issued to service.

*4-inch mount, Mark II.*—The directing-bar mount, Plate XIV.

*Pivot stand.*—This is a steel casting, the principal parts of which are the deck circles for holding-down bolts (36), the clip circles (62), the roller path (17), the training circle (13), and the pivot bolt (14).

*Top carriage.*—The top carriage is a steel casting, consisting of a base and 2 brackets. It rests on steel rollers (16), which travel in the roller path (17) of the pivot stand. These rollers are kept at a fixed distance from one another by a bronze roller bearing (33). There is a central pivot bolt (14), with nut and washers. The top carriage is bored out for the trunnion seats, pivot-bolt holes, and elevating and training shaft bearings. The clips (5), cap squares (3), and the bearing (45) for vertical training shaft are bolted to the top carriage. A protecting band of sheet iron, called the guard (56, Plate XV), made in three pieces, which abut under the clips, is bolted to the top carriage. Two securing clamps are fitted to the top carriage.

*Oscillating slide.*—This is a solid bronze casting, the principal parts of which are the vertical brackets, the trunnions (8), the elevating arm, and the transom (9), to which is bolted the piston rod. The upper edge of the slide rails has a guide lip (57, Plate XV), while the lower guide rail has dovetailed in it the steel strips (63).

A bronze elevating arc (10) is bolted on the left and underneath.

Stop lugs (6) bring up against the rear face of the top carriage when the gun is at extreme elevation.

*Combined sleeve and recoil cylinder.*—This is a bronze casting, comprising the sleeve (38) and the recoil cylinder (19).

The sleeve screws on the cylinder of the gun at its center of gravity with a left-handed thread. This is kept from turning by a steel key (39) held in place by the key screw (40). The guides of the sleeve move in and out in the guide rails on the slide.

The principal parts of the recoil cylinder are the bonnet (21), the stuffing box (23), and the filling hole (20). Leather packing is used under the bonnet and Selden's packing in the stuffing box.

The cylinder is rifled, as already described. The counter recoil spring (27), which is in two sections, separated by the bronze disk (28), surrounds the piston rod (25) in the recoil cylinder. There are no bumpers between the oscillating slide and the recoil cylinder. The recoil cylinder has no drain hole.

*Training gear.*—The steel training shaft (42) is supported by the directing arm (29) and the training and elevating shaft brackets (50), both of which are bronze castings bolted to the top carriage. The shaft carries a worm (46) gearing into the worm wheel (52). This worm wheel and the miter gear (58), by which the vertical training shaft (60) is actuated, are on the training cross shaft (51). The vertical shaft carries the training pinion (59) gearing into the training circle (13) on the pivot stand.

The worm wheel is not keyed to the cross shaft, but is held in place by the friction disks. These disks are slotted to receive the feather on the cross shaft and turn with it. The outer disk has a long collar, which passes through a hole in the bracket of the top carriage and is threaded to receive a bronze nut. The training cross shaft projects beyond the collar and has a threaded handle on the end.

In training by the handwheel the bronze nut is unscrewed so as to clear the boss on the top carriage. The friction disks are then set firmly in their seats in the training worm wheel by the handle of the cross shaft. The use of the bronze nut is to pull the friction disk out of its seat in case it jams. To do this it is only necessary to ease off the cross handle and to screw the bronze nut hard up against the side of the carriage. For rapid training the friction on the training-arm wheel can be relieved by slacking up the bronze nut and cross handle and the gun trained by means of the directing bar.

In late designs the bronze nut and cross handles have been replaced by a friction clutch. This consists of a bronze bracket (*a*), carrying a collar (*b*) threaded on the outside to receive the steel lever (*c*). The lever has a cylindrical base threaded on the inside and carries a lip (*d*) working in the groove (*e*) on the shank of the friction disk. A frictionless washer (*f*) is placed on the cross shaft between the faces of the lever and disk. With the lever in a vertical position the friction disk is clear of the training worm wheel; but when the lever is thrown down through an angle of 45 degrees the disk and worm wheel are bound firmly together.

*Elevating gear.*—The elevating shaft (43) is concentric with the training shaft, the latter being bored out to receive it. The elevating cross shaft (49) carries a worm wheel (53) and pinion (48), the former gearing into the worm of the elevating shaft and the latter into the elevating are (10) on the oscillating slide.

A thrust spring (44), the ends of which are ground flat, is placed on the elevating shaft between the elevating worm and the thrust cap, the latter being held against the bracket on the inside of the top carriage by nuts (37) and washers. The elevating shaft is turned by the handwheel (34). The elevating worm wheel is fitted with friction disks (55, 56) similar to those on the training worm wheel. The inner disk is held in its seat by a cup spring (54); the outer disk has a bronze nut and a cross handle (57). As the object of these disks is to relieve any unusual strain that might be brought on the worm wheel, they may be set up for a full due.

*4-inch Mount, Mark III, Plate XV.*—This mount is identical with Mark II. with the following exceptions:

(*a*) It has no directing bar, and the training is effected by a handwheel suitably geared on the outside of the bracket.

(*b*) The elevating are is on the left bracket.

(*c*) The gun sights are mounted on the slide, and therefore do not recoil with the gun.

The training gear consists of a pinion (59) on a vertical shaft (60), which passes through the bottom of the top carriage. The pinion is driven by gearing arranged in this way: A transverse shaft (42) passes through the side brackets of the top carriage, on each side of which, outside the brackets, is a pinion (32) actuated by a driver (31) on the axle of the handwheel (41). On the shaft inside and close to the right bracket is a worm (46), which gears into a worm wheel (52) keyed to the upper end of the vertical shaft (60) on the lower end of which is the small pinion (59) gearing in the training circle (13) of the pivot stand.

The elevating gear is the ordinary service type fitted with a recoil spring. It is supported by a bronze bracket (50) bolted on the left of the top carriage. The elevating shaft (43) carries a worm (47) and the recoil spring (44). The worm wheel (53) is on a short transverse shaft (49), which also carries a pinion (48) gearing in the elevating are (10). The latter is bolted to the oscillating slide.

*The 5-inch mount, Mark II, Plate XVI.\**—The 5-inch mount, Mark II, is similar to 4-inch mount, Mark II, but differs from it in having two counter-recoil spring cylinders cast on the sleeve, and also in having the recoil cylinders pierced with drain holes. The transom (9) of the slide is bored with 3 holes for 3 rods, which are secured with nuts and washers (26). The middle rod (25) carries the recoil-cylinder piston (24); the 2 side rods are for the counter-recoil spring cylinders. Each of these cylinders contains 3 spiral steel springs, which are compressed in recoil by the disks (28) on the rods. Between the forward ends of the spring cylinders and the transom of the oscillating slide are the bumpers, formerly made of rubber, but now replaced by small spiral steel springs.

*5-inch mount, Mark III.*—Same general design as Mark II. The slide is made of steel; the center of recoil cylinder is raised 1 inch to reduce the metal between the sleeve and cylinder; the top carriage is cut out, front and rear, and a friction clutch is fitted to the training gear.

*6-inch mount, Mark V, Plate XVII.†*—Similar to 4-inch, Mark III. The sleeve casting comprises only the sleeve and recoil cylinder. The cylinders for counter-recoil springs are of lap-welded locomotive tubing, bolted to the sleeve at the forward end and supported by a bronze yoke with eyes, which fits around the gun. The tubing is about  $5\frac{1}{2}$  feet long and 7 inches diameter; there is one on each side of the recoil cylinder, and each one contains 4 springs.

The elevating gear is fitted with a friction disk. The friction brake consists of a curved steel arc bolted to the oscillating slide and passing through an adjustable clamp on the right side of the top carriage.

The recoil mounts for 6, 3, and 1 pounder rapid-fire guns are as follows:

*The 6-pounder recoil mounts.*—There are three varieties of 6-pounder mount in service—Mark I (Plate I), Mark II (Plate II), and Mark III (Plate III).

All parts having the same name bear the same numbers.

Mark I, which is no longer issued, differs from Mark II in having the counter-recoil spring placed outside the recoil cylinder, and in using two springs, one inside of the other, instead of one. Marks I and II are used with all 6-pounder guns having trunnions; Mark III with 6-pounder trunnionless guns.

The following description of Mark II (Plate II) applies equally to Mark I (Plate I):

The gun rests in a bed (17) called the combined cylinder and trunnion bearing, and is rigidly secured there by the gun cap squares and bolts (14). Upon the under side and cast in one with the trunnion bearing is the recoil cylinder (19), fitted with bonnet (21), piston (24), piston rod (25), piston-rod nuts (26), head-gland nuts, and stuffing box (23). Upon the inside of the cylinder are the recoil-cylinder grooves (37), tapering rapidly from a wide opening at the normal position of the piston to nothing, when the gun is at the limit of recoil. Upon the upper and rear end of the recoil cylinder is the filling plug (20).

Within the recoil cylinder is the piston rod (25) and the counter-recoil spring (27), one end resting against the head of the recoil cylinder, the other against the front face of the piston (24).

\* 5-inch mount, Mark I, is a gravity-return mount for use with guns of ordinary type.

† 6-inch mounts, Marks I, II, III, IV, are gravity-return mounts for use with guns of ordinary type.

The combined cylinder and trunnion bearing rests upon slides called the slide guides (16), worked on the inner sides of the oscillating slide (7).

The oscillating slide is fitted with trunnions (8), resting in bearings on the Y-shaped saddle (1), and there secured by the saddle cap square (3) and saddle cap-square bolts (4).

The slide transom (9) is bored through in line with the axis of the piston rod (25), which passes through the hole and is secured by the piston-rod locking nuts.

Inside the oscillating slide, and at the extreme limit of recoil, are the recoil stops (13), secured by screws.

Upon the outer sides of the oscillating slide, and open to the rear, are the shoulder-bar dovetails (30). In one of the shoulder-bar dovetails, and secured by a set screw, is the shoulder bar (29), fitted with a deflector (33) and a wooden shoulder piece (34), padded with rubber tubing.

The shoulder bars and shoulder pieces for the Driggs-Schroeder and Hotchkiss guns differ slightly in shape. The former is fitted on the right side of the oscillating slide and is provided with a pistol grip and trigger pull; the latter is fitted on the left side.

The saddle and saddle pivot is a Y-shaped bronze casting having trunnion bearings on its arms for the trunnions of the oscillating slide and for lugs (51) for shield supports (31). It is bored and tapped to take the slide clamp screw (12), which may be placed on either the right or left side of the saddle. The bottom of the saddle pivot for 3 and 6 pounder mounts is bored and tapped to receive the securing bolt (36). Under the pivot on 3 and 6 pounder mounts is a frictionless washer (35).

The shield on the 6 and 3 pounder mounts is supported by 4 stout shield supports (31), which are bolted to the shield and are secured in the lugs of the saddle by nuts.

The recoil cylinder is filled with a mixture of four parts of glycerin to one part of water. In the absence of glycerin, either oil or water may be used.

The 6-pounder, Mark III (Plate III), differs essentially from the Mark II in having a combined sleeve and cylinder (17, Plate III), instead of a combined cylinder and trunnion bearing (17, Plate II). The gun, which is threaded on the outside, screws into the sleeve (39) and is secured by means of the key (40), the key being held by the key screw (41). This mount can be used for either Driggs-Schroeder or Hotchkiss guns.

*The 3-pounder recoil mounts.*—There are three styles of 3-pounder mounts—Mark I, Mark II, and Mark III. (See Plate IV.)

The Mark I mount had two recoil cylinders, instead of one, as in the Mark II mount. The counter-recoil springs were placed in the rear of and surrounding the hydraulic recoil cylinder, instead of inside of it, as in the Mark II and Mark III mounts. The shield was held by a casting which did duty as a saddle cap square and shield support combined. The general principle was the same as in the 6-pounder, Mark II, already described.

The Mark II mounts are fitted to the Hotchkiss 3-pounder guns, the Mark III mounts to the Driggs-Schroeder guns; otherwise the two mounts are identical. They differ from the 6-pounder, Mark II, mounts previously described in dimensions only, and the description of that mount refers equally to these.

*The 1-pounder recoil mounts, Plate V.*—Plate v shows a Mark I mount mounted on a Mark II steel cage stand and deck circle.

The Mark II mount is manufactured by the Hotchkiss Ordnance Company, and differs from the Mark I in length of recoil cylinder, strength of counter-recoil spring, length of recoil allowed, and in other minor points. The general construction and mode of working is the same.

These mounts, with the exception of the shape of the saddle pivot (2) and the absence of the frictionless washer and securing bolt, are similar to the 6-pounder, Mark III, mounts previously described.

The spare parts furnished with 1, 3, and 6 pounder mounts are one combination wrench for dismounting or assembling with every two mounts, and one spare counter-recoil spring for each mount. All parts of mounts of the same type are interchangeable.

To assemble a hydraulic recoil mount 1 pounder, Mark I, or 6-pounder, Mark III:

Remove recoil-cylinder bonnet; withdraw piston and piston rod; screw the sleeve of combined sleeve and recoil cylinder upon the gun; insert key, and screw in the key screw. Place the saddle pivot in a pivot socket; remove the saddle cap squares, and place the trunnions of the oscillating slide in the bearings. Replace saddle cap squares and screw home the bolts.

Remove recoil stop; slide the combined sleeve and recoil cylinder in on the slide guide; and set up slide clamp screw.

Replace recoil stops; insert counter-recoil spring in recoil cylinder, having first cleaned it from dust. Insert piston rod and piston. Screw home the locking nuts on front side of slide transom. Screw on the bonnet, being careful that the leather washer lays fair on its seat. Slack slide clamp screw and give the gun extreme depression, then set up clamp screw. Unscrew the filling plug, screw in the funnel, and fill the recoil cylinder with a mixture of 4 parts of glycerin to 1 of water. Unscrew funnel and screw in filling plug. Level the gun and set up, if necessary, to prevent leakage, on the head gland nut. Care must be taken to keep the recoil cylinder full of liquid.

*Care and preservation.*—Avoid absolutely the use of emery, bath brick, or other powders for cleaning purposes. Use mineral oil or vaseline. Lard oil is to be avoided. A liberal allowance of oil should be used on saddle pivot so that the frictionless washer may be kept well lubricated. The drain holes in the bottom of the pivot socket in cage stand should be kept open and not allowed to become clogged with oil or dirt. Use the combination wrench for dismounting or assembling, and not a monkey wrench. Before target practice, see that the slide guides are clean, free from dust, and well lubricated; that the recoil cylinder is full; if any leakage shows about the head gland, set up on head gland nut to correct it; and that the locking nuts on the piston rod are set up.

Should the gun recoil violently against the stops, it will be because the cylinder is not full. It should be filled at once, as the shock is liable to carry away the stops and bend the cheeks of the oscillating slide.

*Nonrecoil mounts for R. F. guns.*—Nonrecoil mounts are furnished for the light 1-pounder gun, the 37 mm. and 47 mm. revolving cannon, and the Gatling gun.

They are Y-shaped saddle pivots, and differ from the saddle pivots of the recoil mounts already described only in having the saddle clamp

screw removed, the clamping of the gun being obtained by setting up a clamp screw through the cap square, thus compressing the trunnion.

As the saddle pivots of the Gatling gun are smaller than the pivot sockets of 1-pounder mounts, adapters are furnished so that they may be used in the sockets issued to the service.

The Tower mount for 3 and 6 pounders, Plate VI, consists of a pivot socket called the carriage (1), fitted with trucks (3) and pivot tail (4), through whose deck-pivot socket (5) passes the deck pivot. (7) The trucks rest on the truck circle (17), bolted to the truck-circle shelf. (20) In addition to the usual fittings of pivot sockets there is a compressor (12), compressor lever (11), and compressor screw. (13)

This arrangement permits the mount to travel on the truck circle and to be secured by means of the compressor at any desired point, giving addition train.

*Cage stands for 3 and 6 pounders, Plate VII.*—The 6 and 3 pounder cage stands are identical. They are made of cast steel and bolt solidly to the deck. They consist of a pivot socket (1), cage head (2), cage body (3), cage legs (4), and cage deck plate (5), clamp screw (6), clamp (7), and drain holes (8).

The saddle pivot of the 3 and 6 pounder mounts rests in the pivot socket and is there held by the securing bolt, which passes from down up through the bottom of the socket and through the center of the frictionless washer, and screws into the saddle pivot.

*Rail sockets for 3 and 6 pounders, Plate VIII,* are simply pivot sockets made of bronze cast with flanges, drilled to receive rivets or bolts, which secure them to brackets, and consist of the pivot socket (1), clamp screw (2), clamp (3), drain holes (4), securing-bolt hole (5), and boss (6).

*Rail sockets for 1-pounder and 37 mm., Plate IX,* are made of bronze cast with flanges, drilled to receive rivets or bolts, which secure them to the rail, and consist of the flanges (1), pivot socket (2), clamp screw (3), clamp (4), and boss (5). A side view of pivot saddle for short 1-pounder or 37 mm. revolving cannon is shown.

*Cage stands for 1-pounder and 37 mm., Plate V.*—The 1-pounder and 37 mm. cage stands of Mark II are conical steel or bronze stands, and are secured by a bayonet joint and locked by a stop pin to deck circles of either steel or bronze, bolted to the deck. A short cage stand made of bronze and using the same deck circles is issued for use in boats. (See Plate X.) They consist of the cage head A, the cone legs D, cone foot H, pivot socket 2, clamp screw B, clamp C. The deck circle is a steel or bronze circle having 4 clips G, a stop pin I, stop-pin spring K, stop-pin chain L. The deck circle is secured to the deck by 4 through bolts with nuts and washers.

The Mark I stand and deck circle are cast steel and differ from the present standard Mark II in the method of securing the stand to the deck circle and in the shape and position of the clamp screw.

*Boat cage stand, Plate X.*—A boat bronze cage stand in all respects except height, identical with the standard Mark II stand, is issued for use in boats.

*Top mounts, Plate XI.*—The Mark II, top mount, is a pivot socket (2) fitted with a roller (12) which travels on the angle iron on the interior of the top rim. The trail (1), which is cast in one with the pivot socket, has bolted to it the rail clips (5). The outer and movable clip is journaled to receive the axle (7) of the truck (3); the inner and immovable clip is chased to receive the thread on the end of the axle (7); a trail compressor (4) is keyed to the axle; by setting up this the

clips are made to grip the web of the trolley rail (8), a hooked compressor (6), recessed to pass over the pivot head and roller and hooking over the half round on the outer edge of the top rims, is fitted with a clamp screw and lever and draws the pivot socket solidly against the top.

A trolley mount traveling on 4 trucks, resting on 2 tracks, has been issued. This mount is secured in any desired position by setting up a compressor, which bears on the under side of the trolley rails.

A top mount of shelf pattern (Plate XII) is also issued. The top mount and shelf are cast of bronze and are clearly shown in the plate.

Owing to the difference in the size of the saddle pivots of the Gatling gun and 1-pounder bronze sleeves, called adapters, which slip over the saddle pivots, are furnished.

#### NOMENCLATURE FOR HYDRAULIC RECOIL MOUNT, MARK I.

*For 6-pounder Hotchkiss gun.*

##### PLATE I.

- |   |  |
|---|--|
| 1. Saddle.                                  | 20. Recoil-cylinder filling plug. (Not shown.)         |
| 2. Saddle pivot.                            | 21. Recoil-cylinder bonnet and stuffing box.           |
| 3. Saddle cap square.                       | 22. Recoil-cylinder-bonnet gland nut.                  |
| 4. Saddle cap-square bolts.                 | 23. Recoil-cylinder head, gland nut, and stuffing box. |
| 5. Lugs for shield supports.                | 24. Piston.  |
| 6. Clamping lug.                            | 25. Piston rod.  |
| 7. Oscillating slide.                       | 26. Piston-rod nut.                                    |
| 8. Slide trunnions.                         | 27. Counter-recoil springs.                            |
| 9. Slide transom.                           | 28. Counter-recoil-spring backer.                      |
| 10. Slide arc.                              | 29. Shoulder bar.                                      |
| 11. } Slide clamp screw.                    | 30. Shoulder-bar dovetail and set screw.               |
| 12. }                                       | 31. Shield supports, nuts and bolts.                   |
| 13. Recoil stop and screw.                  | 32. Shield.  |
| 14. Gun cap squares and bolts.              | 33. Deflector.   |
| 15. Gun trunnion seats.                     | 34. Shoulder piece.                                    |
| 16. Slide guides.                           |  |
| 17. Combined cylinder and trunnion bearing. |  |
| 19. Recoil cylinder.                        |  |

#### NOMENCLATURE FOR HYDRAULIC RECOIL MOUNT, MARK II.

*For 6-pounder Hotchkiss gun.*

##### PLATE II.

- |   |  |
|---|--|
| 1. Saddle.                                  | 19. Recoil cylinder.                                   |
| 2. Saddle pivot.                            | 20. Recoil-cylinder filling plug.                      |
| 3. Saddle-cap square.                       | 21. Recoil-cylinder bonnet.                            |
| 4. Saddle-cap-square bolts.                 | 23. Recoil-cylinder head, gland nut, and stuffing box. |
| 5. Lugs for shield supports.                | 24. Piston.  |
| 6. Clamping lug.                            | 25. Piston rod.  |
| 7. Oscillating slide.                       | 27. Counter-recoil spring.                             |
| 8. Slide trunnions.                         | 29. Shoulder bar.                                      |
| 9. Slide transom.                           | 30. Shoulder bar dovetail and set screw.               |
| 10. Slide arc.                              | 31. Shield supports, nuts, and bolts.                  |
| 11. } Slide-clamp screw.                    | 32. Shield.  |
| 12. }                                       | 33. Deflector.   |
| 13. Recoil stop and screw.                  | 34. Shoulder piece.                                    |
| 14. Gun-cap squares and bolts.              | 35. Frictionless washer.                               |
| 15. Gun-trunnion seats.                     | 36. Securing bolt.                                     |
| 16. Slide guides.                           | 37. Recoil-cylinder grooves.                           |
| 17. Combined cylinder and trunnion bearing. | 38. Locking nuts.                                      |
| 18. Slide groove.                           |  |

## NOMENCLATURE FOR HYDRAULIC RECOIL MOUNT, MARK III.

*For 6-pounder Driggs-Schroeder and Hotchkiss guns.*

## PLATE III.

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Saddle.</li> <li>2. Saddle pivot.</li> <li>3. Saddle-cap square.</li> <li>4. Saddle-cap-square bolts.</li> <li>5. Lugs for shield supports.</li> <li>6. Clamping lug. (Not shown.)</li> <li>7. Oscillating slide.</li> <li>8. Slide trunnions.</li> <li>9. Slide transom.</li> <li>10. Slide arc.</li> <li>11. } Slide-clamp screw.</li> <li>12. }</li> <li>13. Recoil stop and screw.</li> <li>16. Lower-slide guides.</li> <li>17. Combined sleeve and cylinder.</li> <li>18. Upper-slide guides.</li> <li>19. Recoil cylinder.</li> <li>20. Recoil-cylinder filling plug.</li> <li>21. Recoil-cylinder bonnet.</li> </ol> | <ol style="list-style-type: none"> <li>23. Recoil-cylinder head, gland nut, and stuffing box.</li> <li>24. Piston.</li> <li>25. Piston rod.</li> <li>26. Piston-rod nut.</li> <li>27. Counter-recoil spring.</li> <li>29. Shoulder bar.</li> <li>30. Shoulder-bar dovetail and set screw.</li> <li>31. Shield supports, nuts, and bolts.</li> <li>32. Shield.</li> <li>33. Deflector.</li> <li>34. Shoulder piece.</li> <li>35. Frictionless washer.</li> <li>36. Securing bolt.</li> <li>37. Recoil-cylinder grooves.</li> <li>38. Locking nuts.</li> <li>39. Sleeve.</li> <li>40. Key.</li> <li>41. Key screw.</li> </ol> |
|--|---|

## NOMENCLATURE FOR HYDRAULIC RECOIL MOUNTS, MARKS II AND III.

*For 3-pounder Driggs-Schroeder and Hotchkiss guns.*

## PLATE IV.

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Saddle.</li> <li>2. Saddle pivot.</li> <li>3. Saddle cap square.</li> <li>4. Saddle cap square bolts.</li> <li>5. Lugs for shield supports.</li> <li>6. Clamping lug. (Not shown.)</li> <li>7. Oscillating slide.</li> <li>8. Slide trunnions.</li> <li>9. Slide transom.</li> <li>10. Slide arc.</li> <li>11. } Slide clamp screw.</li> <li>12. }</li> <li>13. Recoil stop and screw. (Not shown.)</li> <li>14. Gun cap squares and bolts.</li> <li>15. Gun trunnion seats.</li> <li>16. Slide guides.</li> <li>17. Combined cylinder and trunnion bearing.</li> </ol> | <ol style="list-style-type: none"> <li>18. Slide groove.</li> <li>19. Recoil cylinder.</li> <li>20. Recoil-cylinder filling plug.</li> <li>21. Recoil-cylinder bonnet.</li> <li>23. Recoil-cylinder head, gland nut, and stuffing box.</li> <li>24. Piston.</li> <li>25. Piston rod.</li> <li>27. Counter-recoil spring.</li> <li>29. Shoulder bar.</li> <li>30. Shoulder-bar dovetail and set screw.</li> <li>31. Shield supports, nuts, and bolts.</li> <li>32. Shield.</li> <li>34. Shoulder piece.</li> <li>35. Frictionless washer.</li> <li>36. Securing bolt.</li> <li>37. Recoil-cylinder grooves.</li> <li>38. Locking nuts.</li> </ol> |
|---|--|

## NOMENCLATURE FOR HYDRAULIC RECOIL MOUNT, MARK I.

*With cage stand Mark II, for heavy 1-pounder Driggs-Schroeder and Hotchkiss guns.*

## PLATE V.

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Saddle.</li> <li>2. Saddle pivot.</li> <li>3. Saddle cap square.</li> <li>4. Saddle cap-square bolts.</li> <li>7. Oscillating slide.</li> <li>8. Slide trunnions.</li> <li>9. Slide transom.</li> <li>10. Slide arc.</li> <li>11. } Slide clamp screw.</li> <li>12. }</li> <li>13. Recoil stop and screw.</li> <li>16. Slide guides.</li> <li>17. Combined sleeve and cylinder.</li> <li>19. Recoil cylinder.</li> <li>20. Recoil-cylinder filling plug. (Not shown.)</li> </ol> | <ol style="list-style-type: none"> <li>21. Recoil-cylinder bonnet.</li> <li>23. Recoil-cylinder head, gland nut, and stuffing box.</li> <li>24. Piston.</li> <li>25. Piston rod.</li> <li>26. Piston-rod nut. (Not shown.)</li> <li>27. Counter-recoil springs.</li> <li>29. Shoulder bar.</li> <li>30. Shoulder-bar dovetail and set screw.</li> <li>34. Shoulder piece.</li> <li>38. Locking nuts.</li> <li>40. Key.</li> <li>41. Key screw.</li> </ol> |
|--|---|

## NOMENCLATURE FOR TOWER MOUNT.

## PLATE VI.

- |                         |                                    |
|-------------------------|------------------------------------|
| 1. Carriage.            | 11. Compressor lever.              |
| 2. Truck lugs.          | 12. Compressor.                    |
| 3. Trucks.              | 13. Compressor screw.              |
| 4. Pivot tail.          | 15. Compressor lug.                |
| 5. Pivot socket (deck). | 16. Compressor washer.             |
| 6. Pivot socket (tail). | 17. Truck circle.                  |
| 7. Deck pivot.          | 18. Axle.                          |
| 8. Flanges.             | 19. Compressor angle iron.         |
| 9. Clamp screw.         | 20. Truck-circle shelf.            |
| 10. Pivot socket.       | 21. Truck-circle-shelf angle iron. |

## NOMENCLATURE FOR 3-POUNDER AND 6-POUNDER CAGE STAND, MARK II.

## PLATE VII.

- |                  |                     |
|------------------|---------------------|
| 1. Pivot socket. | 5. Cage deck plate. |
| 2. Cage head.    | 6. Clamp screw.     |
| 3. Cage body.    | 7. Clamp.           |
| 4. Cage legs.    | 8. Drain holes.     |

## NOMENCLATURE FOR 3-POUNDER AND 6-POUNDER RAIL SOCKET.

## PLATE VIII.

- |                 |                        |
|-----------------|------------------------|
| 1. Rail socket. | 4. Drain holes.        |
| 2. Clamp screw. | 5. Securing-bolt hole. |
| 3. Clamp.       | 6. Boss.               |

## NOMENCLATURE FOR 1-POUNDER RAIL SOCKET.

## PLATE IX.

- |                  |           |
|------------------|-----------|
| 1. Flanges.      | 4. Clamp. |
| 2. Pivot socket. | 5. Boss.  |
| 3. Clamp screw.  |           |

## NOMENCLATURE FOR GATLING GUN TURTLE-BACK MOUNT, ON BRONZE BOAT CAGE STAND.

## PLATE X.

- |                       |                 |
|-----------------------|-----------------|
| 1. Cage head.         | 4. Clamp screw. |
| 2. Deck circle.       | 5. Stop pin.    |
| 3. Deck-circle clips. | 6. Cage foot.   |

## NOMENCLATURE FOR 1-POUNDER, TOP MOUNT, MARK II.

## PLATE XI.

- |                                 |  |
|---------------------------------|--|
| 1. Trail.                       | 8. Trolley rail.                               |
| 2. Pivot socket.                | 9. Compressor screw and lever.                 |
| 3. Trucks.                      | 10. Clamp-screw boss. (Clamp screw not shown.) |
| 4. Trail compressor.            | 11. Roller axle.                               |
| 5. Rail clips.                  | 12. Roller.                                    |
| 6. Compressor.                  |  |
| 7. Trail-compressor screw axle. |  |

## NOMENCLATURE FOR 37 MM. HOTCHKISS TOP MOUNT, MARK I.

## PLATE XII.

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Mount.</li> <li>2. Pivot socket.</li> <li>3. Trucks, with axles and nuts.</li> <li>4. Pawls.</li> <li>5. Holding-down clip.</li> </ol> | <ol style="list-style-type: none"> <li>6. Compressor, with clamp screw and handwheel.</li> <li>7. Truck rail and shelf (in one).</li> <li>8. Pawl ratchet.</li> </ol> |
|--|---|

## NOMENCLATURE FOR FIELD CARRIAGE FOR 1-POUNDER HOTCHKISS OR DRIGGS-SCHROEDER GUN.

## PLATE XIII.

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Brackets.</li> <li>2. Wheels.</li> <li>3. Axle.</li> <li>4. Brake screw.</li> <li>5. Brake.</li> <li>6. Axle bearing.</li> <li>7. Seat.</li> <li>8. Stay bolt.</li> <li>9. Trail shoe.</li> <li>10. Lunette.</li> <li>11. Trail wheel.</li> <li>12. Trail-wheel pin.</li> <li>13. Trail-wheel loop.</li> <li>14. Trail-wheel loop pin.</li> <li>15. Pintle hook, with cap square.</li> <li>16. Box rest.</li> <li>17. Box trunnion bearings.</li> </ol> | <ol style="list-style-type: none"> <li>18. Box axle bearing and cap squares.</li> <li>19. Box lugs. (Not shown.)</li> <li>20. Key lug and key.</li> <li>21. Box-rest check bolt.</li> <li>22. Linchpins, complete.</li> <li>23. Washer and eye.</li> <li>31. Pivot-rod socket, complete.</li> <li>32. Securing rod.</li> </ol> <p style="text-align: center;"><i>Ammunition boxes.</i></p> <ol style="list-style-type: none"> <li>25. Handles.</li> <li>26. Handle straps.</li> <li>27. Trunnions.</li> <li>28. Clinch hooks.</li> <li>29. Lock.</li> <li>30. Spare-article box.</li> </ol> |
|---|---|

## 4-INCH MOUNT, MARK II.

## PLATE XIV.

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Pivot stand.</li> <li>2. Top carriage.</li> <li>3. Cap squares.</li> <li>4. Cap-square bolt.</li> <li>5. Clips.</li> <li>6. Stop lugs.</li> <li>7. Oscillating slide.</li> <li>8. Slide trunnions.</li> <li>9. Slide transom.</li> <li>10. Elevating arc.</li> <li>11. Clamps.</li> <li>12. Clamping lever.</li> <li>13. Training circle.</li> <li>14. Pivot bolt with shoulder.</li> <li>15. Deck circle.</li> <li>16. Roller.</li> <li>17. Roller path.</li> <li>18. Recoil-cylinder grooves. (Not shown.)</li> <li>19. Recoil cylinder.</li> <li>20. Recoil-cylinder filling plug.</li> <li>21. Recoil-cylinder bonnet.</li> <li>22. Locking pin for piston.</li> <li>23. Recoil-cylinder head, gland, and stuffing box.</li> <li>24. Piston.</li> <li>25. Piston rod.</li> <li>26. Piston-rod nuts.</li> <li>27. Counter-recoil spring.</li> <li>28. Counter-recoil spring disks.</li> <li>29. Directing bar.</li> <li>30. Clip bolts and nuts.</li> <li>31. Shield supports.</li> <li>32. Shield.</li> <li>33. Roller bearing.</li> <li>34. Elevating wheel.</li> </ol> | <ol style="list-style-type: none"> <li>36. Holding-down bolt.</li> <li>37. Locking nuts for elevating shaft.</li> <li>38. Sleeve.</li> <li>39. Sleeve key.</li> <li>40. Sleeve-key screw.</li> <li>41. Training wheel.</li> <li>42. Training shaft.</li> <li>43. Elevating shaft.</li> <li>44. Elevating-shaft spring.</li> <li>45. Vertical training-shaft bearing.</li> <li>46. Training worm.</li> <li>47. Elevating worm.</li> <li>48. Elevating pinion.</li> <li>49. Elevating cross shaft.</li> <li>50. Training and elevating shaft bracket.</li> <li>51. Training cross shaft.</li> <li>52. Training-worm wheel.</li> <li>53. Elevating-worm wheel.</li> <li>54. Cup spring.</li> <li>55. Outer friction disk.</li> <li>56. Inner friction disk.</li> <li>57. Elevating clamp handle.</li> <li>58. Training miter wheels.</li> <li>59. Training pinion.</li> <li>60. Vertical training shaft.</li> <li>61. Pivot-bolt nut.</li> <li>62. Clip circle.</li> <li>63. Facing strip. <ol style="list-style-type: none"> <li>a. Bronze bracket.</li> <li>b. Collar.</li> <li>c. Steel lever.</li> <li>d. Lip.</li> <li>e. Grooves on shank of friction disks.</li> <li>f. Frictionless washer.</li> </ol> </li> </ol> |
|--|---|

## 4-INCH MOUNT, MARK III.

## PLATE XV.

- |  |                                      |
|--|--------------------------------------|
| 1. Pivot stand.                                    | 32. Training-shaft pinions.          |
| 2. Top carriage.                                   | 33. Roller bearing.                  |
| 3. Cap squares.                                    | 34. Elevating wheel.                 |
| 4. Cap-squares bolts.                              | 35. Pivot-bolt washer.               |
| 5. Clips.  | 36. Holding-down bolt.               |
| 6. Stop lugs.                                      | 37. Elevating-shaft nut.             |
| 7. Oscillating slide.                              | 38. Sleeve.                          |
| 8. Slide trunnions.                                | 39. Sleeve key.                      |
| 9. Slide transom.                                  | 40. Sleeve-key screw.                |
| 10. Elevating arc.                                 | 41. Training wheel.                  |
| 11. Sight bracket.                                 | 42. Training shaft.                  |
| 12. Sight.   | 43. Elevating shaft.                 |
| 13. Training circle.                               | 44. Elevating-shaft spring.          |
| 14. Pivot bolt with shoulder.                      | 45. Vertical training-shaft bearing. |
| 15. Deck circle.                                   | 46. Training worm.                   |
| 16. Roller.  | 47. Elevating worm.                  |
| 17. Roller path.                                   | 48. Elevating pinion.                |
| 18. Recoil-cylinder grooves. (Not shown.)          | 49. Elevating cross shaft.           |
| 19. Recoil cylinder.                               | 50. Elevating-shaft bracket.         |
| 20. Recoil-cylinder filling plug. (Not shown.)     | 51. Training-shaft bracket.          |
| 21. Recoil-cylinder bonnet.                        | 52. Training worm wheel.             |
| 22. Locking pin for piston.                        | 53. Elevating worm wheel.            |
| 23. Recoil-cylinder head, gland, and stuffing box. | 54. Front-sight mass.                |
| 24. Piston.  | 55. Front sight.                     |
| 25. Piston rod.                                    | 56. Roller guard.                    |
| 26. Piston-rod nuts.                               | 57. Slide guides.                    |
| 27. Counter-recoil spring.                         | 58. Sleeve rails.                    |
| 28. Counter-recoil spring disk.                    | 59. Training pinion.                 |
| 29. Training handwheel shaft.                      | 60. Vertical training shaft.         |
| 30. Clip bolts and nuts.                           | 61. Pivot-bolt nut.                  |
| 31. Handwheel pinions.                             | 62. Clip circle.                     |
|  | 63. Facing strip.                    |

## 5-INCH MOUNT, MARK II.

## PLATE XVI.

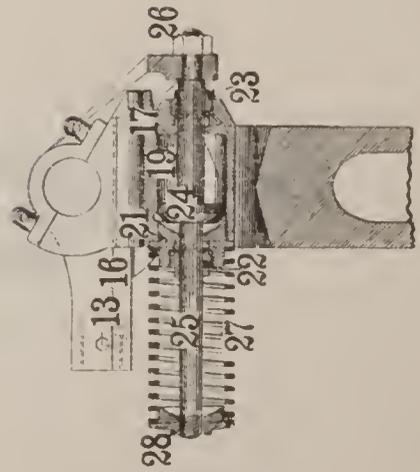
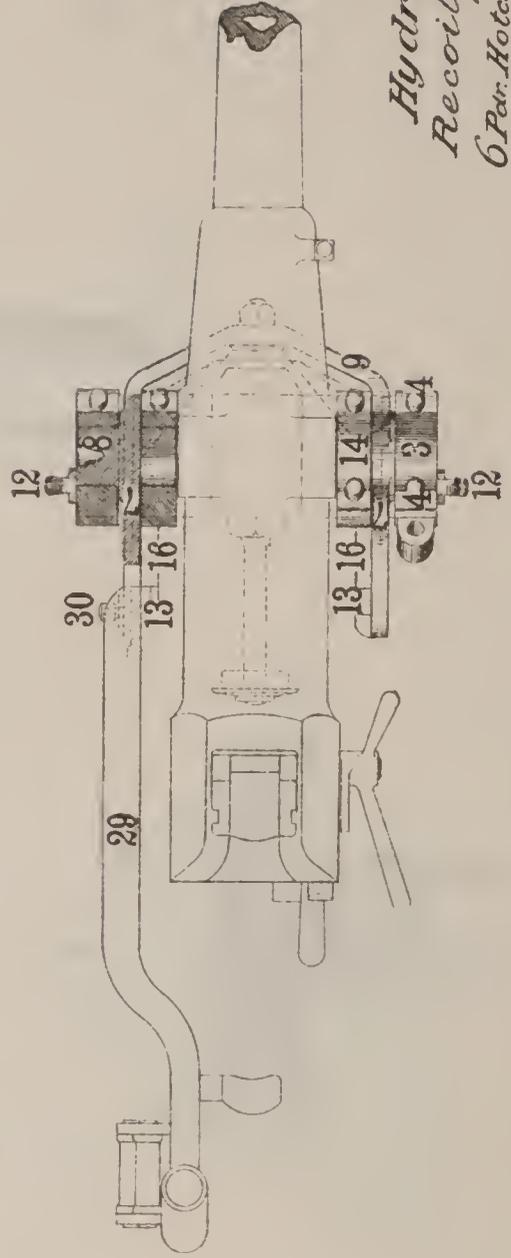
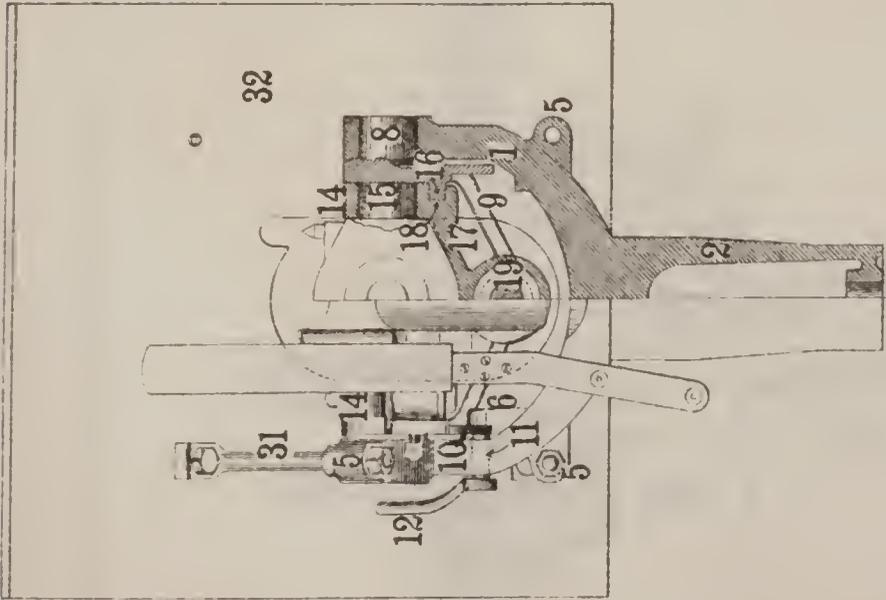
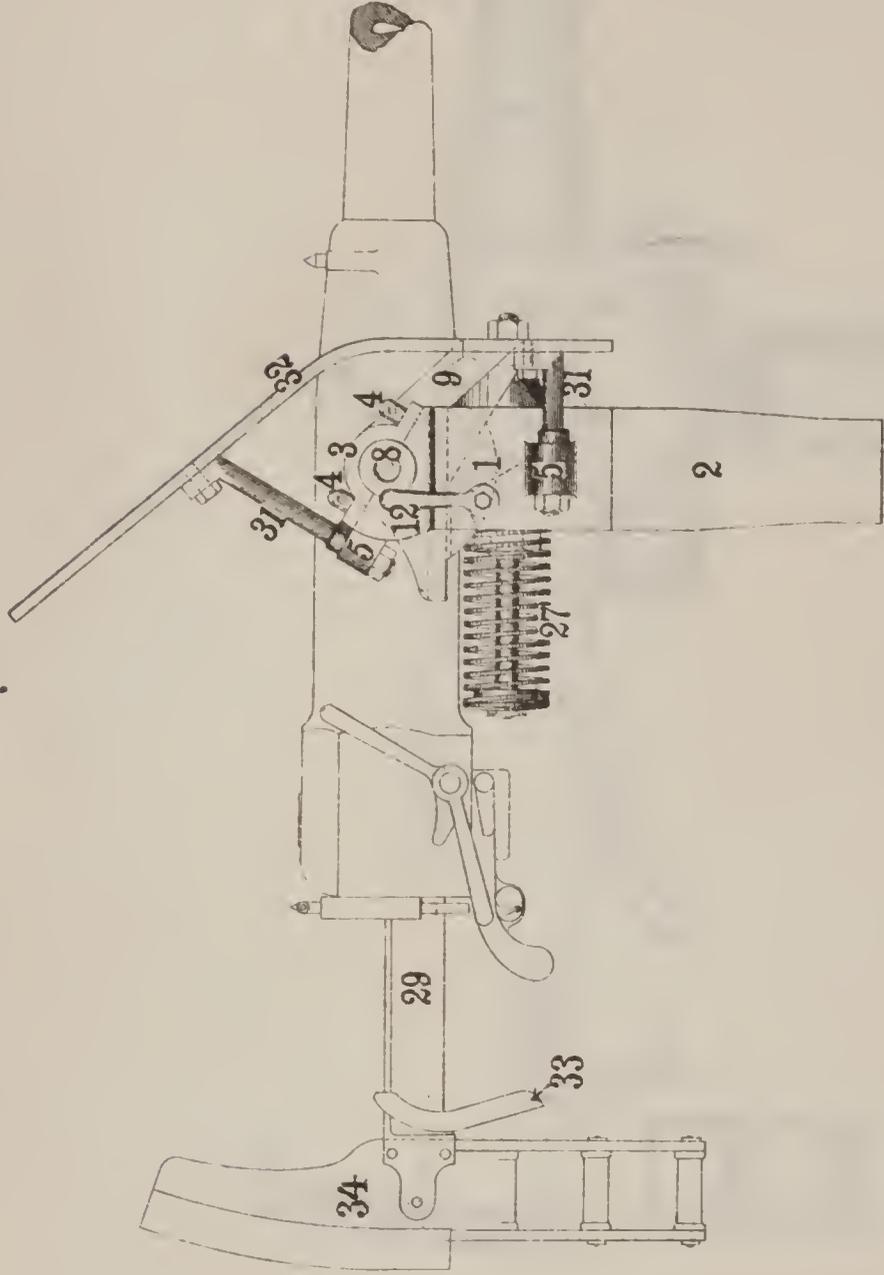
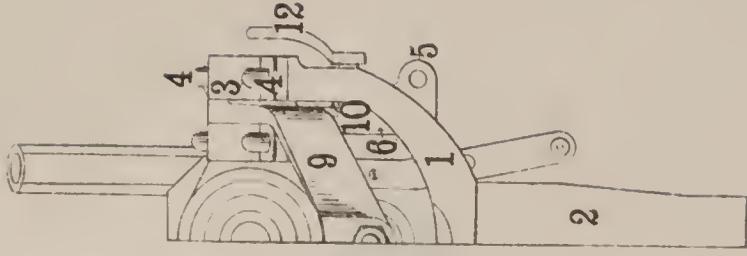
- |  |  |
|--|--|
| 1. Pivot stand.                                    | 32. Shield.                              |
| 2. Top carriage.                                   | 33. Roller bearing.                      |
| 3. Cap squares.                                    | 34. Elevating wheel.                     |
| 4. Cap-square bolts.                               | 35. Pivot-bolt washer.                   |
| 5. Clips.  | 36. Holding-down bolt.                   |
| 6. Stop lugs.                                      | 37. Locking nuts for elevating shaft.    |
| 7. Oscillating slide.                              | 38. Sleeve.                              |
| 8. Slide trunnions.                                | 39. Sleeve key.                          |
| 9. Slide transom.                                  | 40. Sleeve-key screw.                    |
| 10. Elevating arc.                                 | 41. Training wheel.                      |
| 11. Clamp.   | 42. Training shaft.                      |
| 12. Clamping lever.                                | 43. Elevating shaft.                     |
| 13. Training circle.                               | 44. Elevating-shaft spring. (Not shown.) |
| 14. Pivot bolt with shoulder.                      | 45. Vertical training-shaft bearing.     |
| 15. Deck circle.                                   | 46. Training worm.                       |
| 16. Roller.  | 47. Elevating worm.                      |
| 17. Roller path.                                   | 48. Elevating pinion.                    |
| 18. Recoil-cylinder grooves. (Not shown.)          | 49. Elevating cross shaft.               |
| 19. Recoil cylinder.                               | 50. Elevating-shaft bracket.             |
| 20. Recoil-cylinder filling plug. (Not shown.)     | 51. Training cross shaft.                |
| 21. Recoil-cylinder bonnet.                        | 52. Training-worm wheel.                 |
| 22. Locking pin for piston.                        | 53. Elevating-worm wheel.                |
| 23. Recoil-cylinder head, gland, and stuffing box. | 54. Cup spring.                          |
| 24. Piston.  | 55. Outer friction disk.                 |
| 25. Piston rod.                                    | 56. Inner friction disk.                 |
| 26. Piston-rod nuts.                               | 57. Elevating-clamp nut.                 |
| 27. Counter-recoil spring.                         | 58. Training miter wheels.               |
| 28. Counter-recoil spring disk.                    | 59. Training pinion.                     |
| 29. Directing bar.                                 | 60. Vertical training shaft.             |
| 30. Clip bolts and nuts.                           | 61. Pivot-bolt nut.                      |
| 31. Shield supports. (Not shown.)                  | 62. Clip circle.                         |
|  | 63. Facing strip.                        |
|  | 64. Bumper springs.                      |

## 6-INCH MOUNT, MARK V.

## PLATE XVII.

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Pivot stand.</li> <li>2. Top carriage.</li> <li>3. Cap-square</li> <li>4. Cap square bolts.</li> <li>5. Clips.</li> <li>6. Stop lugs. (Not shown.)</li> <li>7. Oscillating slide.</li> <li>8. Slide trunnions.</li> <li>9. Slide transom.</li> <li>10. Elevating arc.</li> <li>11. Clamp.</li> <li>13. Training circle.</li> <li>14. Pivot bolt with shoulder.</li> <li>15. Deck circle.</li> <li>16. Roller.</li> <li>17. Roller path.</li> <li>18. Recoil-cylinder grooves. (Not shown.)</li> <li>19. Recoil cylinder.</li> <li>20. Recoil-cylinder filling plug.</li> <li>21. Recoil-cylinder bonnet.</li> <li>22. Locking pin for piston.</li> <li>23. Recoil-cylinder head, gland, and stuffing box.</li> <li>24. Piston.</li> <li>25. Piston rod.</li> <li>26. Piston-rod nuts.</li> <li>27. Counter-recoil spring.</li> <li>28. Counter-recoil-spring disk.</li> <li>29. Training handwheel shaft.</li> <li>30. Clip bolts and nuts.</li> <li>31. Handwheel pinions.</li> <li>32. Training-shaft pinions.</li> </ol> | <ol style="list-style-type: none"> <li>33. Roller bearing.</li> <li>34. Elevating wheel.</li> <li>35. Pivot-bolt washer.</li> <li>36. Holding-down bolt.</li> <li>37. Elevating-shaft nut.</li> <li>38. Sleeve.</li> <li>39. Sleeve key.</li> <li>40. Sleeve-key screw.</li> <li>41. Training wheel.</li> <li>42. Training-wheel shaft.</li> <li>43. Elevating shaft.</li> <li>44. Elevating-shaft spring.</li> <li>45. Vertical training-shaft bearing.</li> <li>46. Training worm.</li> <li>47. Elevating worm.</li> <li>48. Elevating pinion.</li> <li>49. Elevating cross shaft.</li> <li>50. Elevating-shaft bracket.</li> <li>51. Training-shaft bracket.</li> <li>52. Training-worm wheel.</li> <li>53. Elevating-worm wheel.</li> <li>54. Bumper springs.</li> <li>55. Outer friction disk.</li> <li>56. Inner friction disk.</li> <li>57. Elevating-clamp handle.</li> <li>58. Yoke.</li> <li>59. Training pinion.</li> <li>60. Vertical training shaft.</li> <li>61. Pivot-bolt nut.</li> <li>62. Clip circle.</li> <li>63. Pivot bonching.</li> <li>64. Bronze pivot bearing.</li> </ol> |
|---|---|

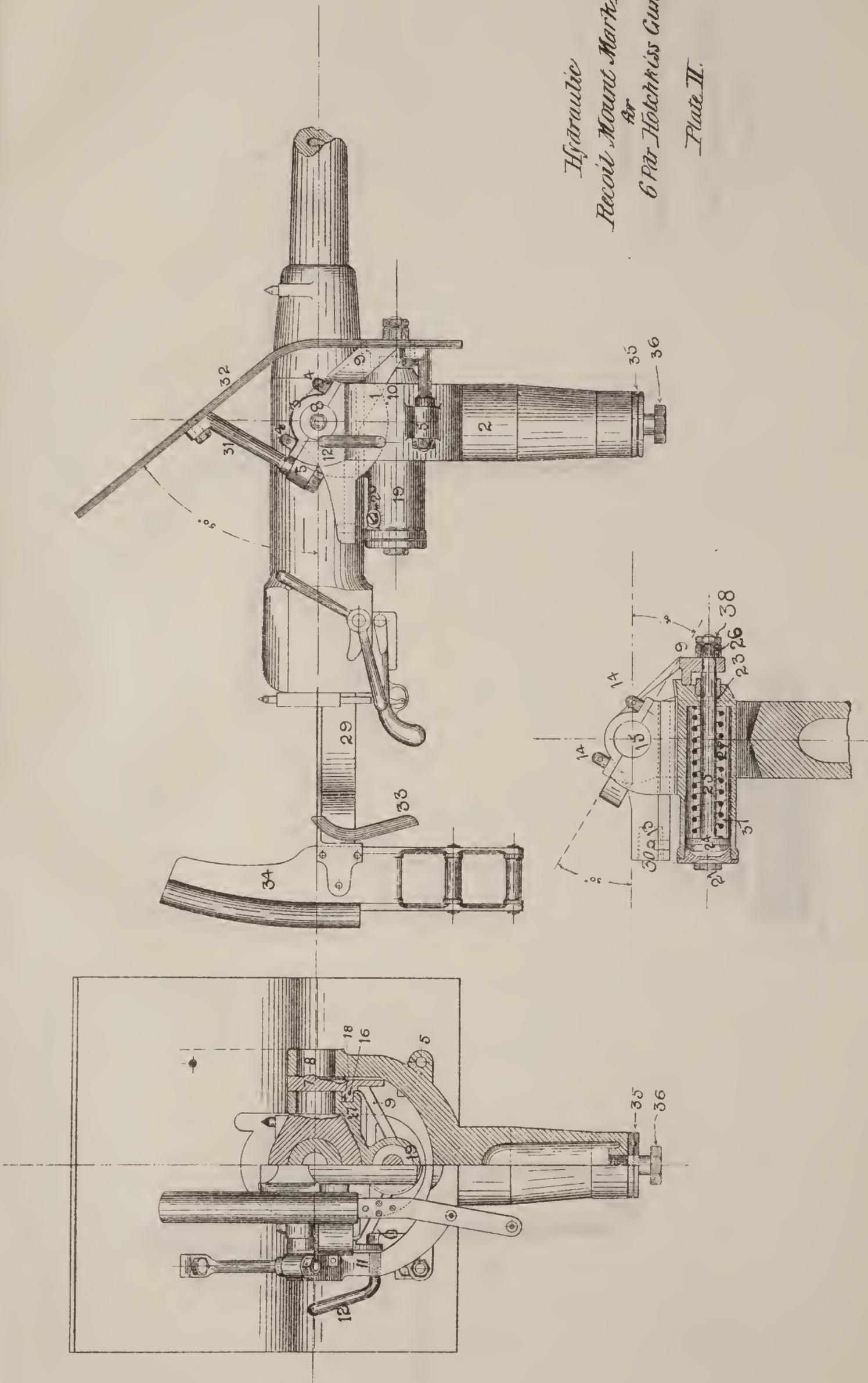




*Hydraulic  
Recoil Mount  
for  
Parrotkiss Gun.*



*Hydraulic  
Recoil Mount Mark II  
for  
6 Pdr Hotchkiss Gun  
Plate II.*



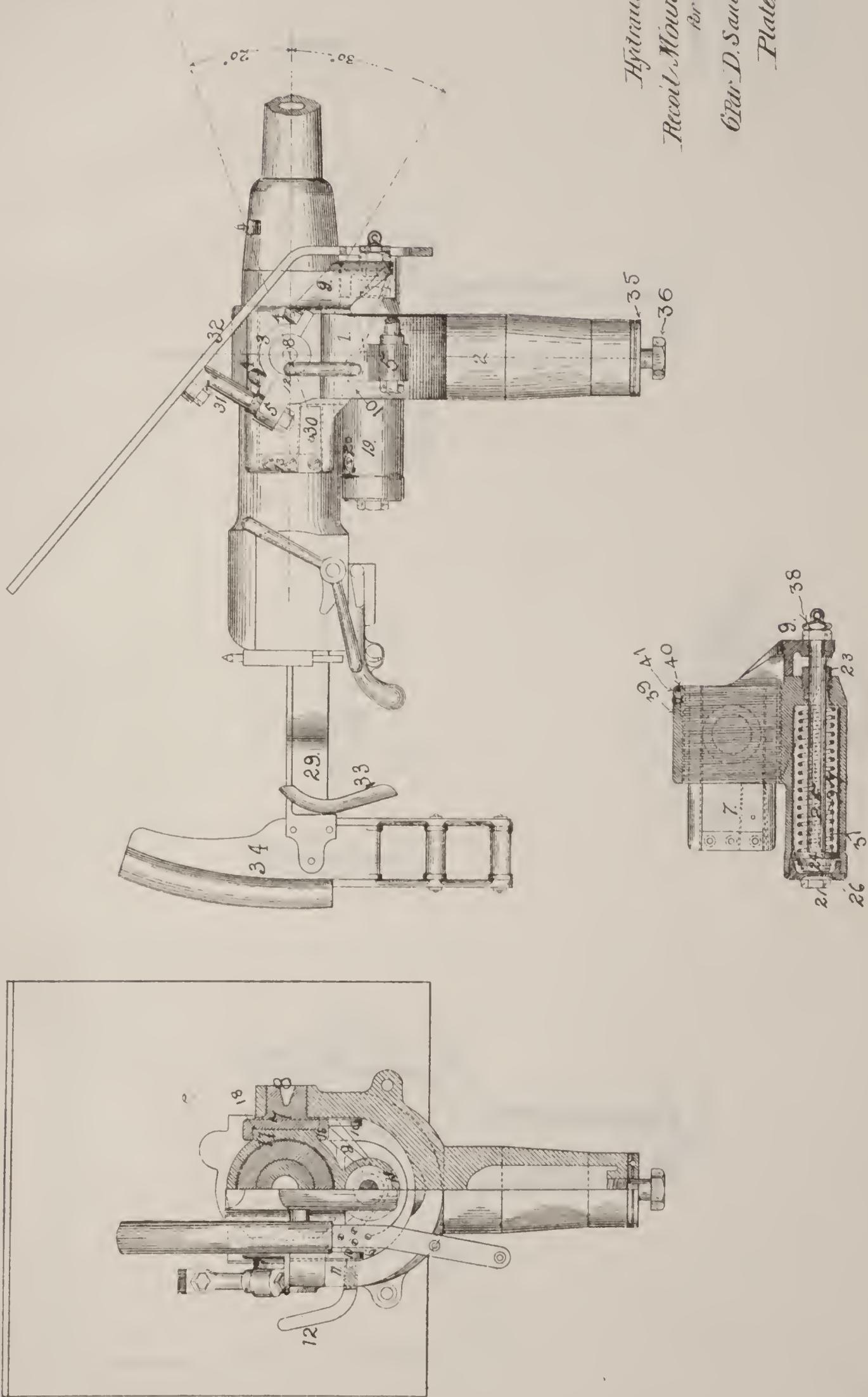


*Hydraulic  
Recoil Mount Mark III.*

*for*

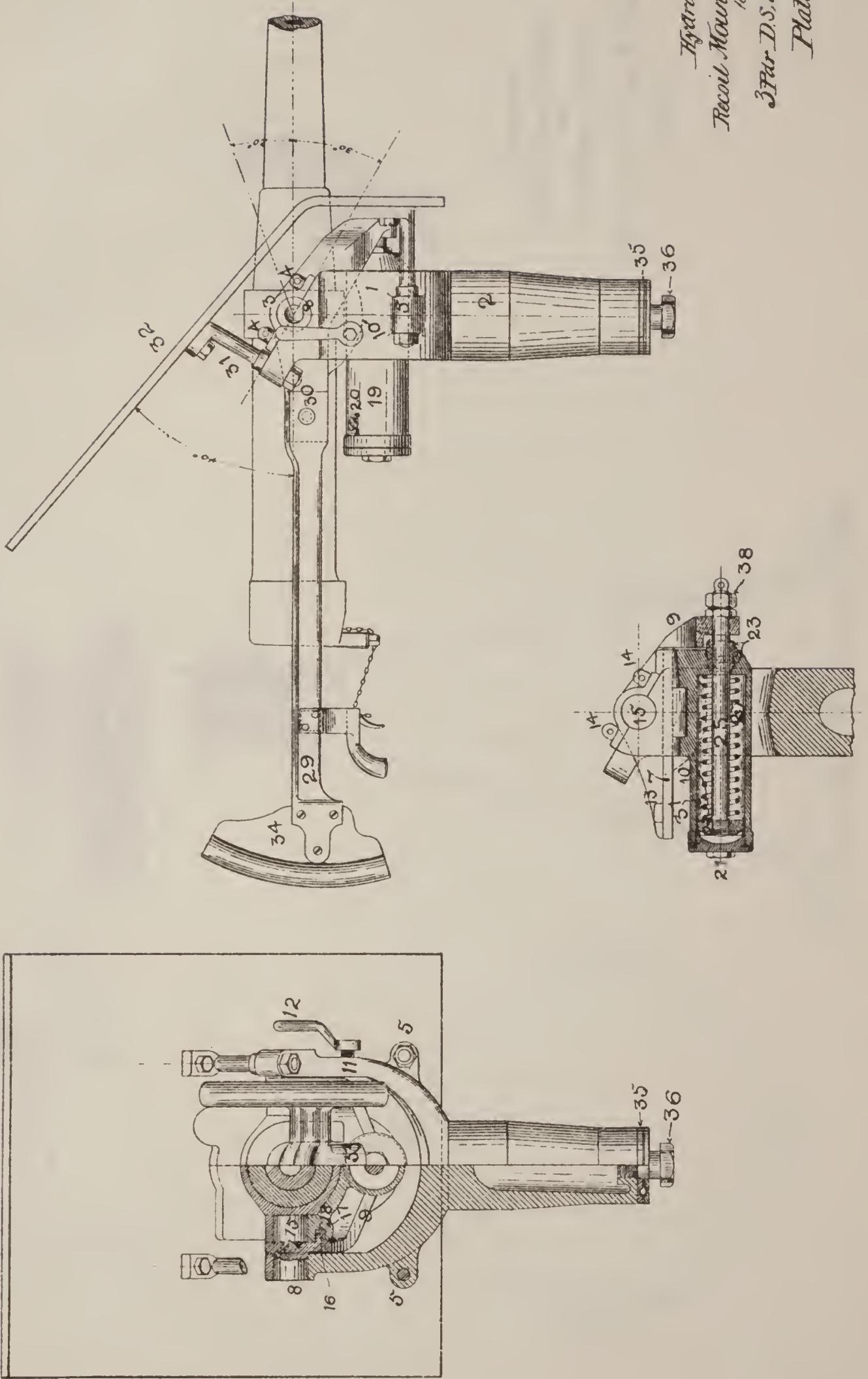
*6 In. D. S. and H. Guns*

*Plate III.*

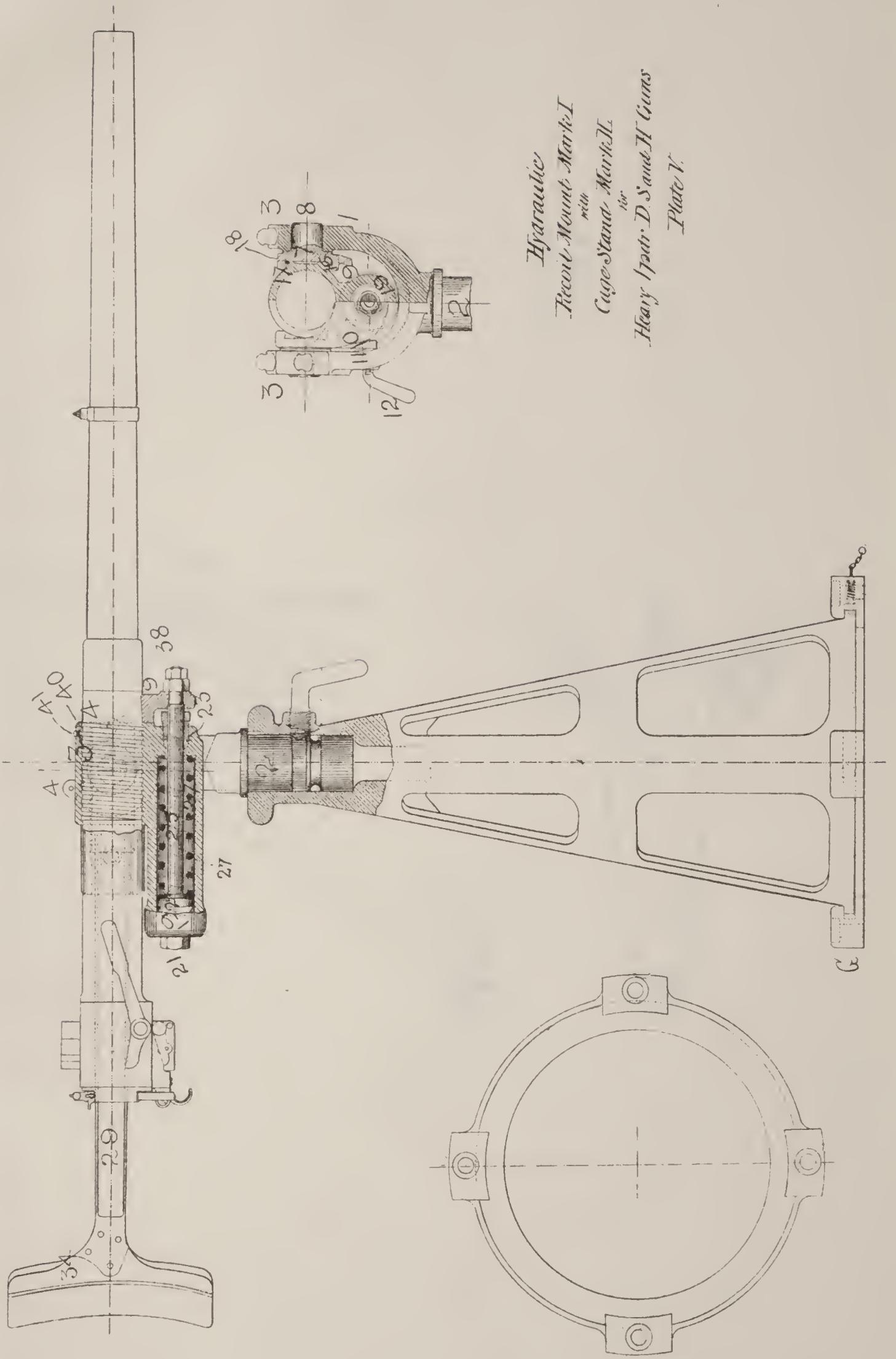




*Hydraulic  
Recoil Mount Mark III  
for  
3 Par D.S. and H Guns  
Plate II.*



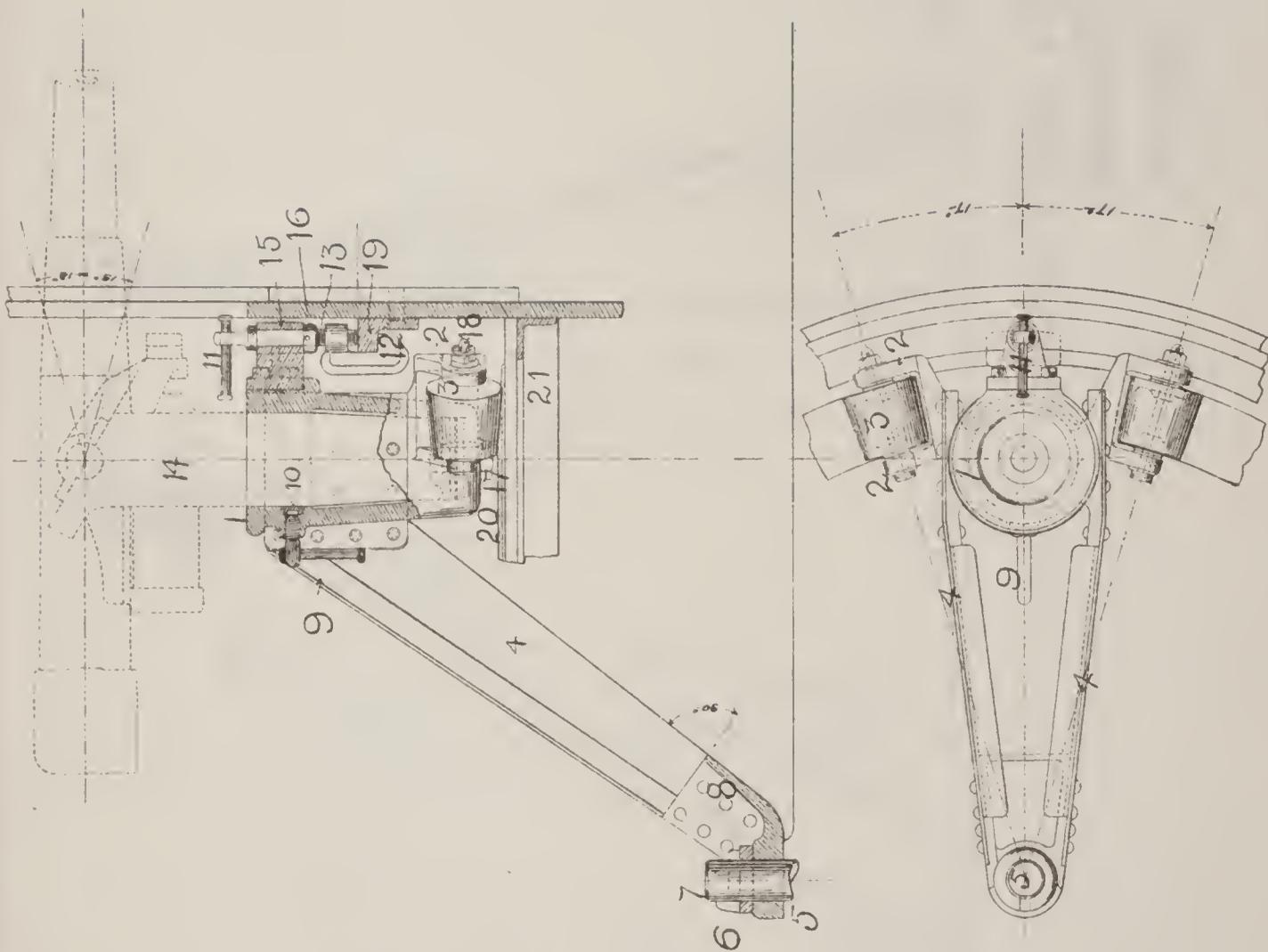




*Hydraulic  
Recoil Mount Mark I  
with  
Cage Stand Mark II.  
for  
Heavy 170 lb. D. and H. Guns  
Plate V.*



*Tower Mount*  
*Plate II.*

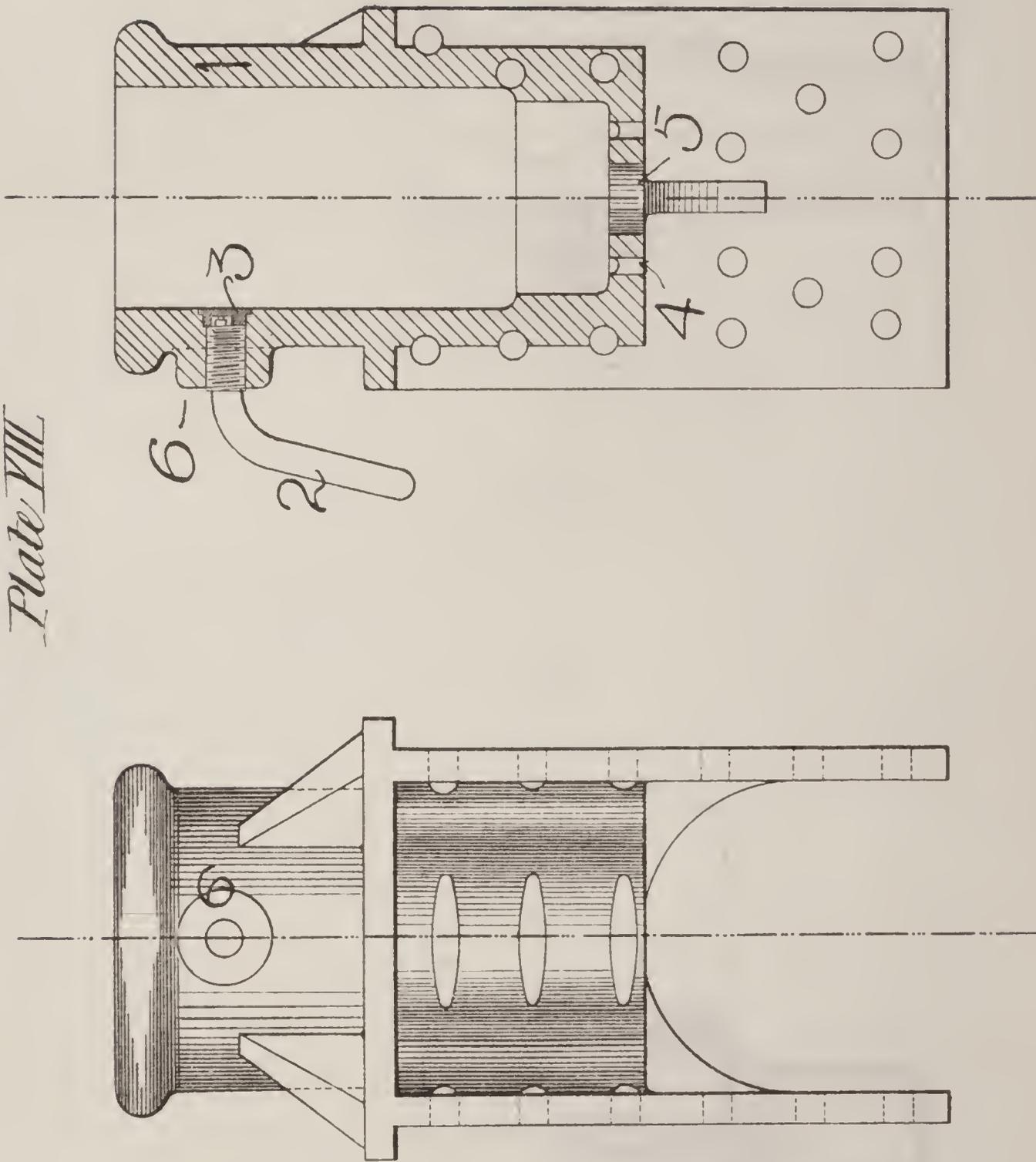


*For A. & L. z. z. z. z.*

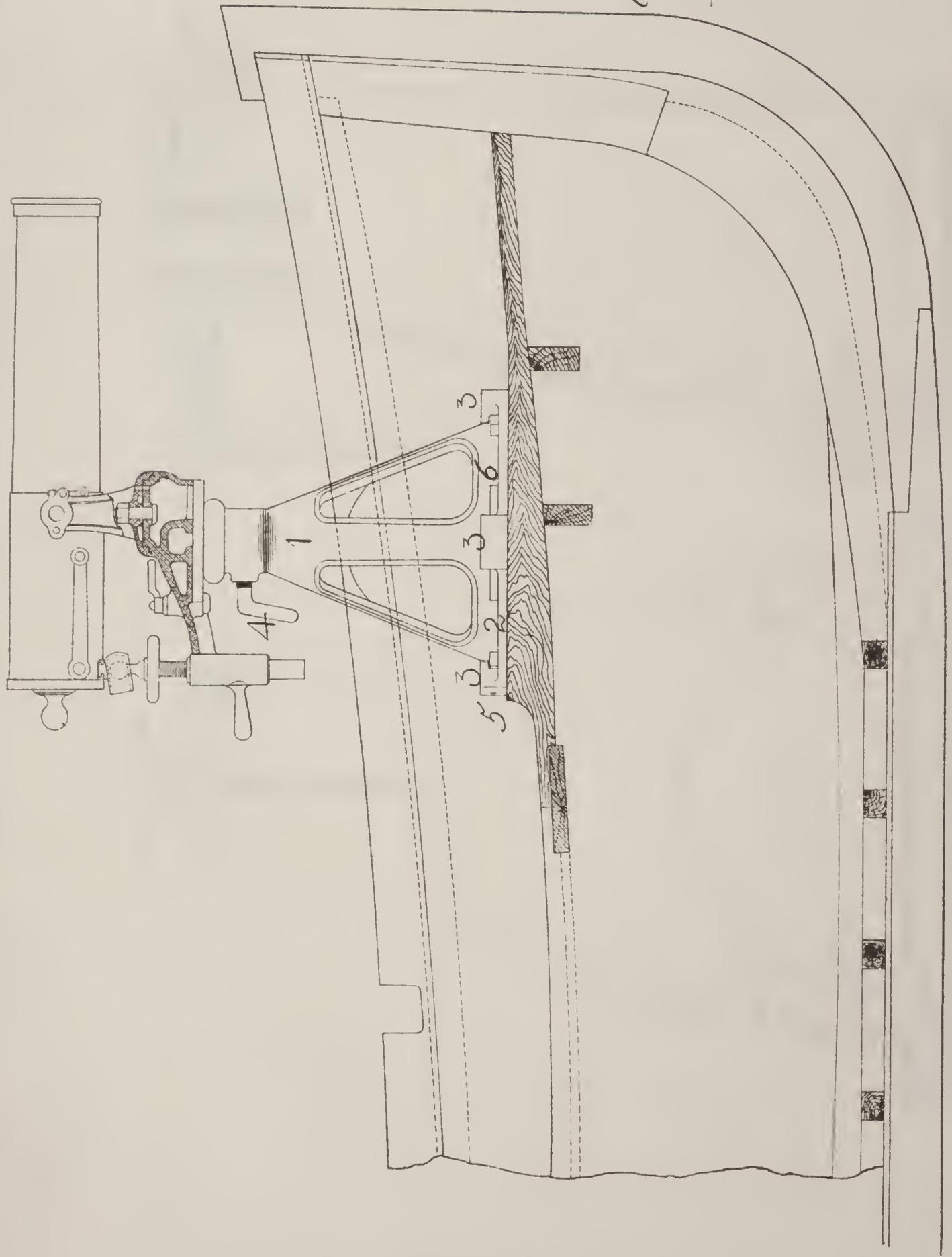


*3 and 6 inch Rail Socket.*

*Plate VIII.*







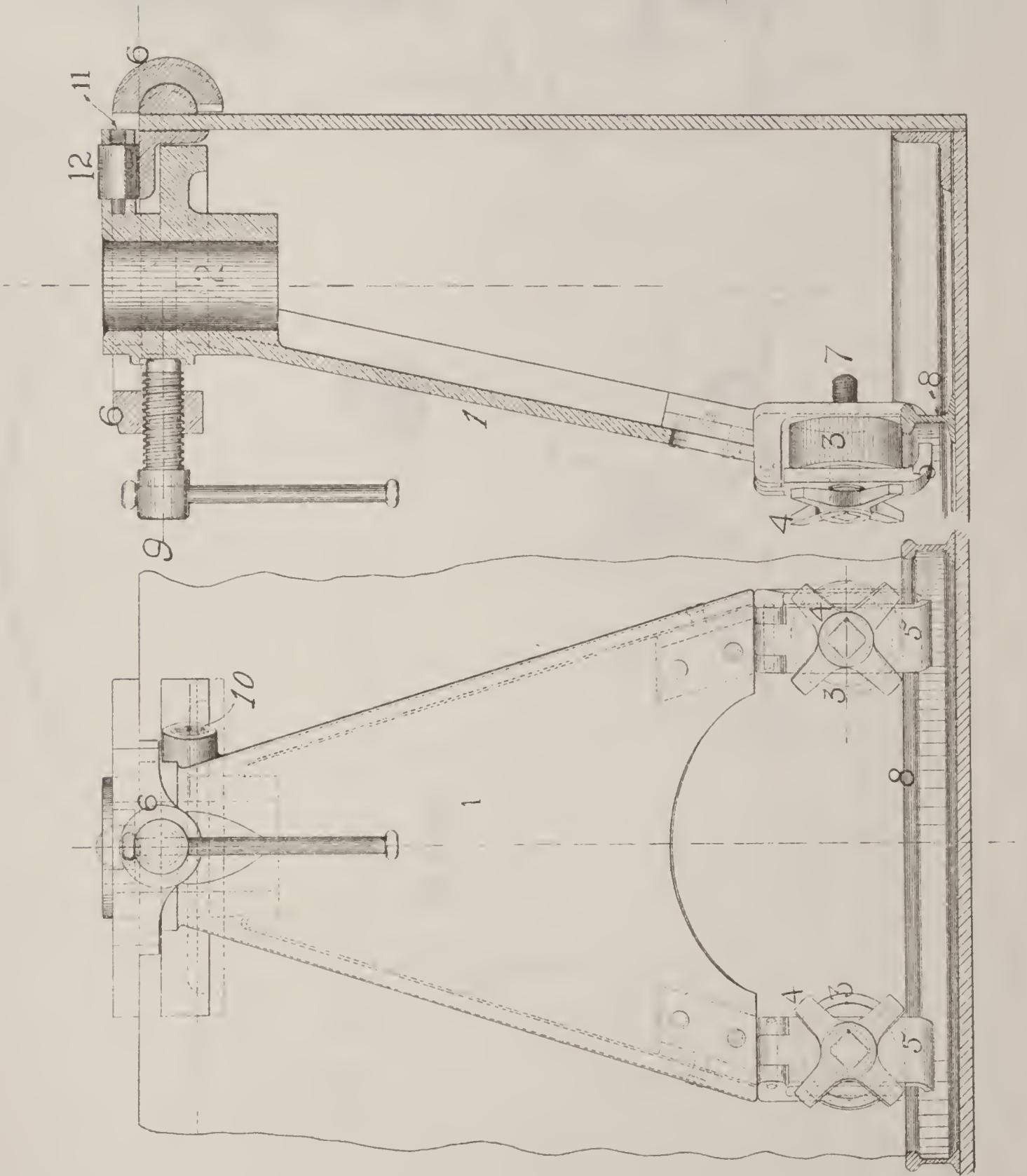
*Cutting Gun on the Back Mount*

*on*

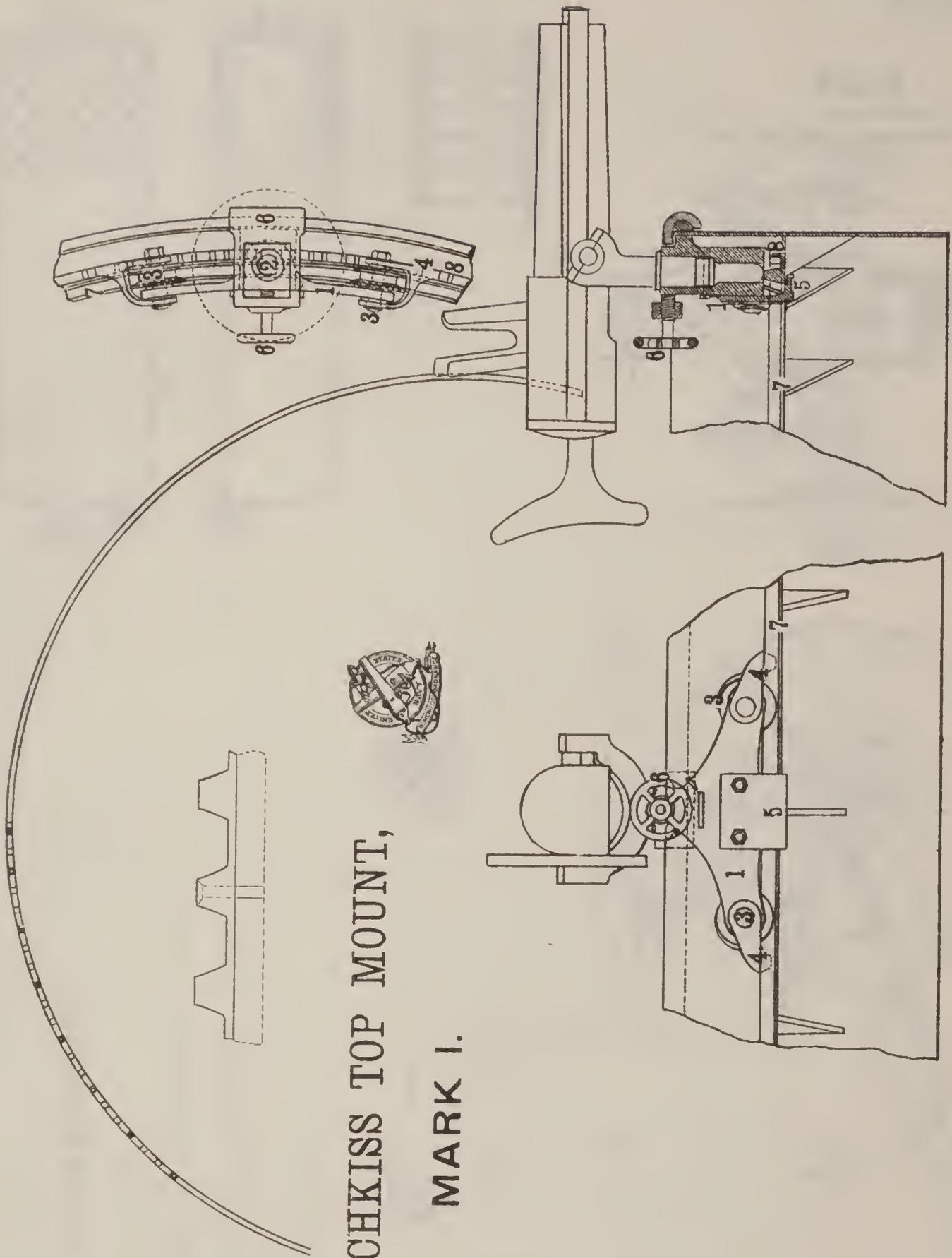
*Brass Boat Cage Stand*

*Plate X*







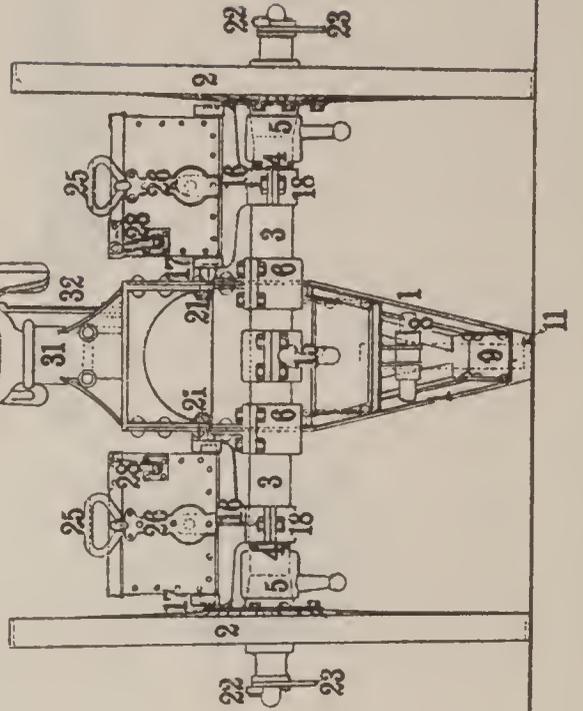
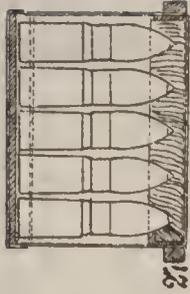
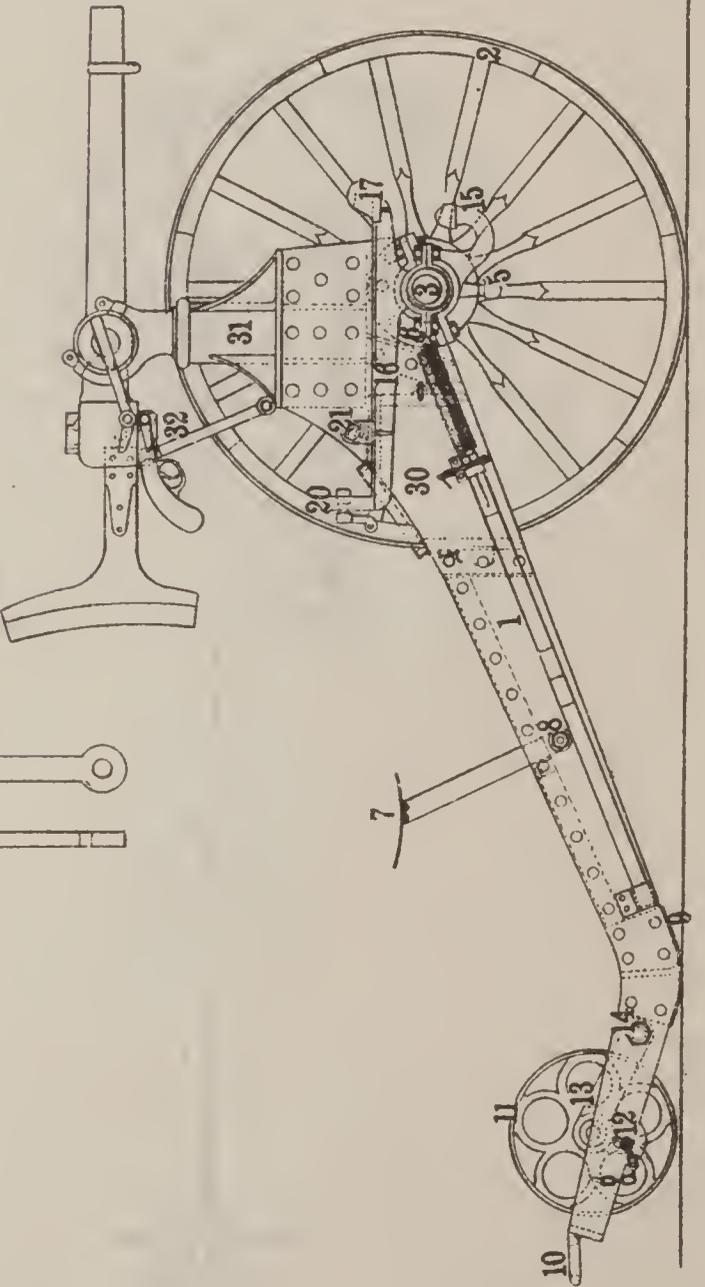
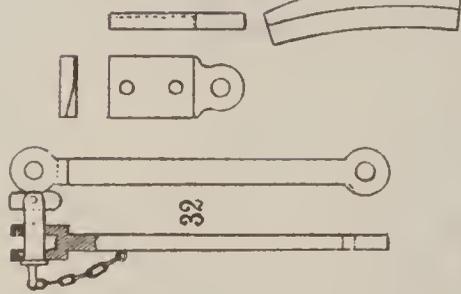
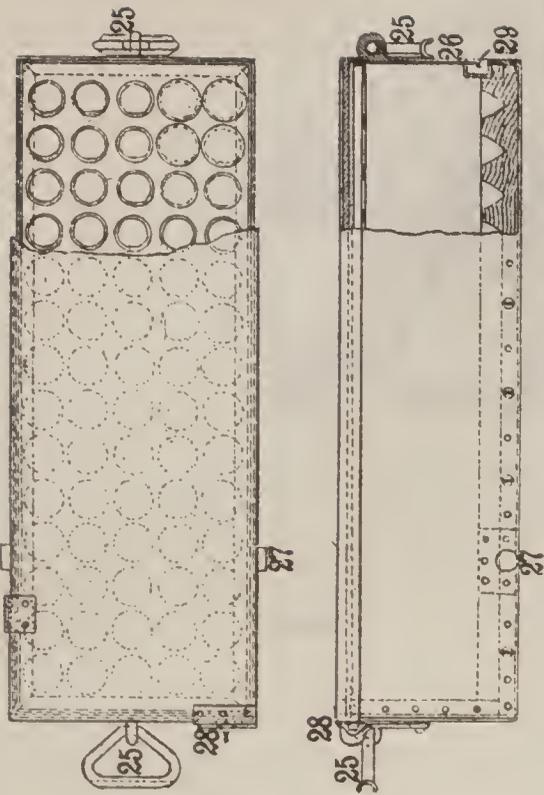


37 HOTCHKISS TOP MOUNT,

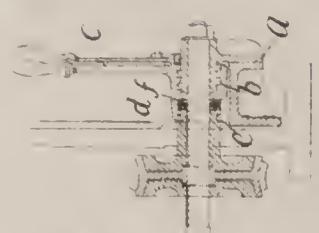
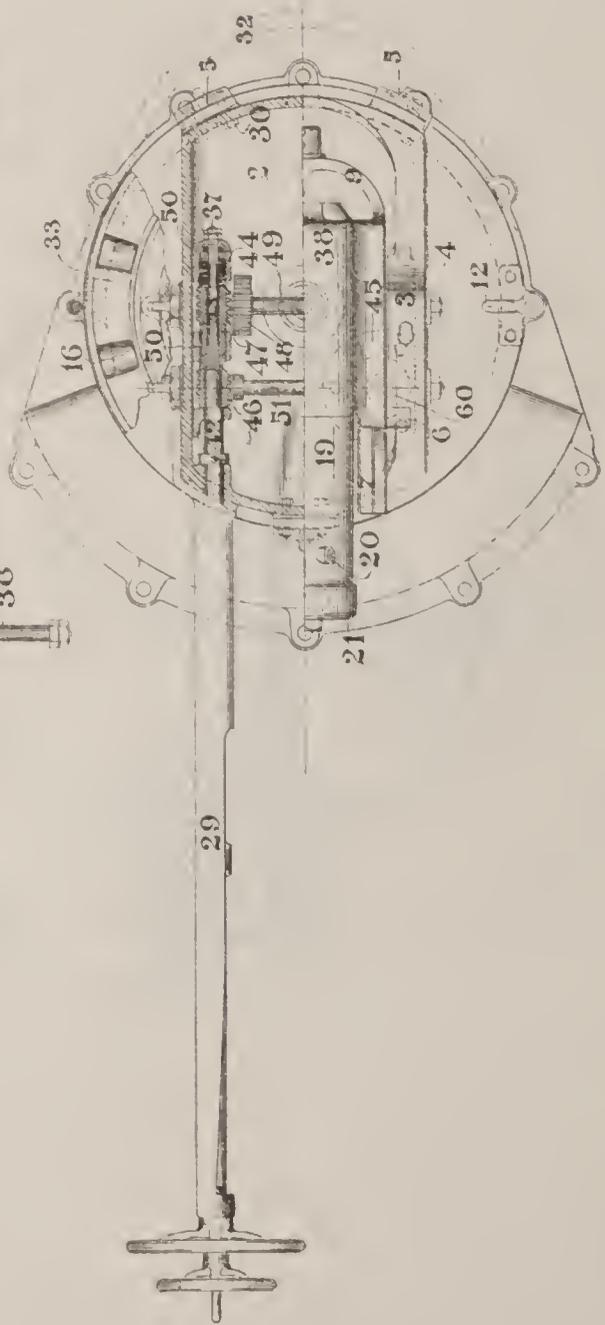
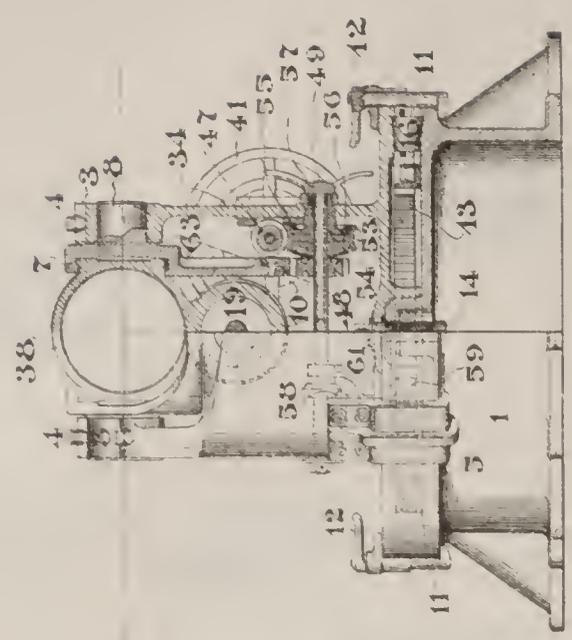
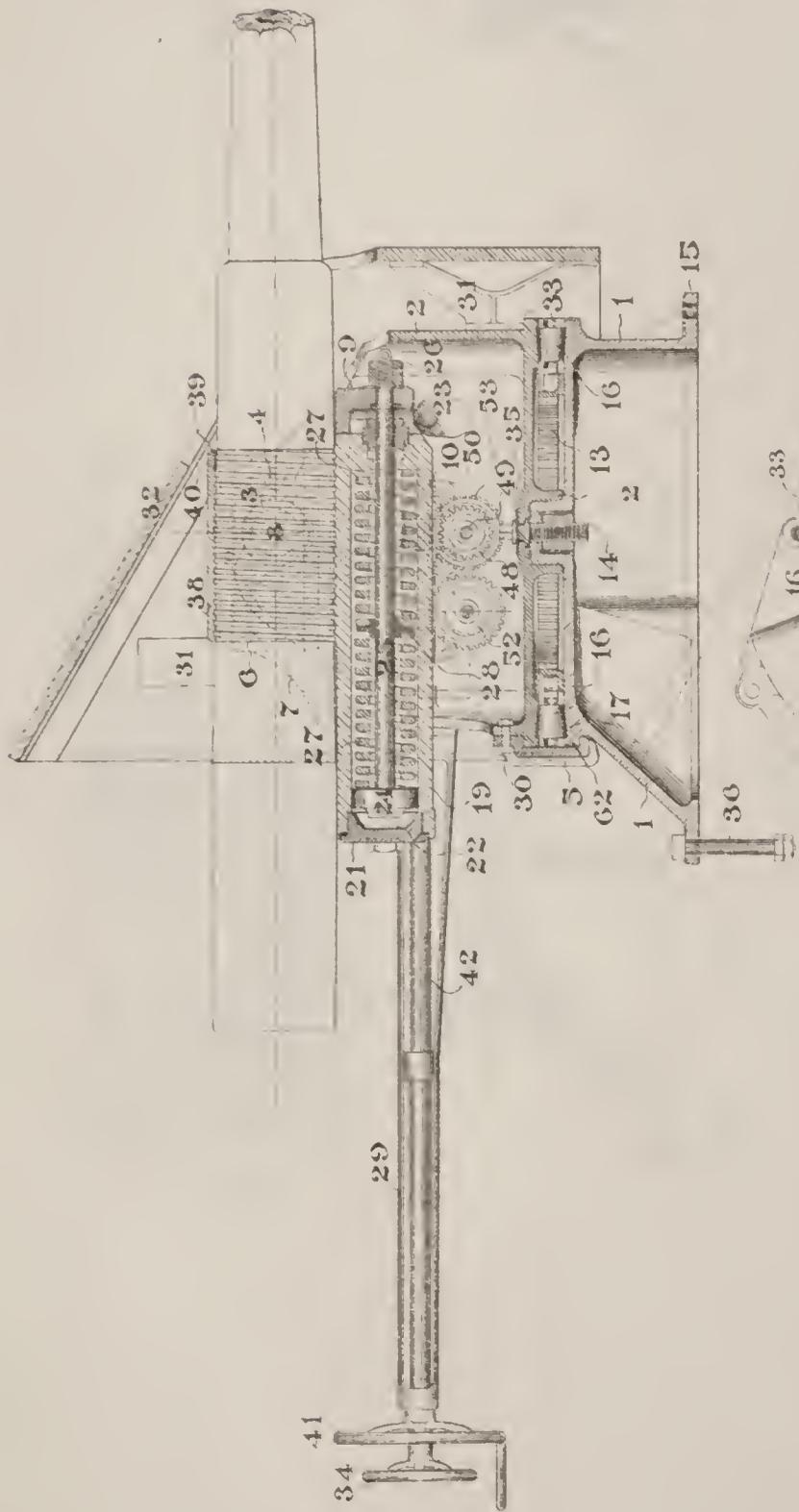
MARK I.



FIELD CARRIAGE  
 FOR  
 1-PDR. HOTCHKISS, OR  
 DRIGGS-SCHROEDER GUN.

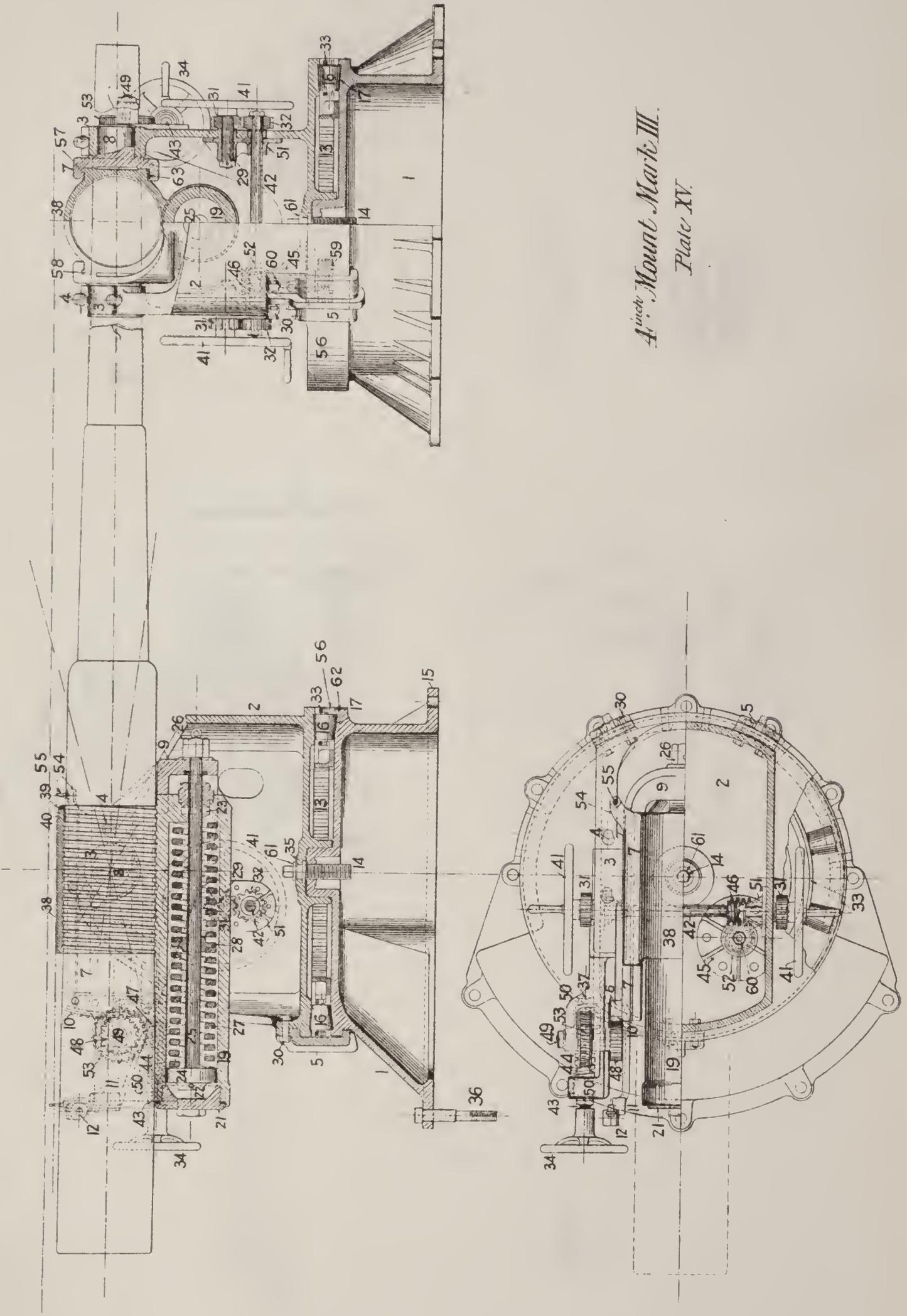






*A inch Mount Marli II.*  
*Plate XIV*

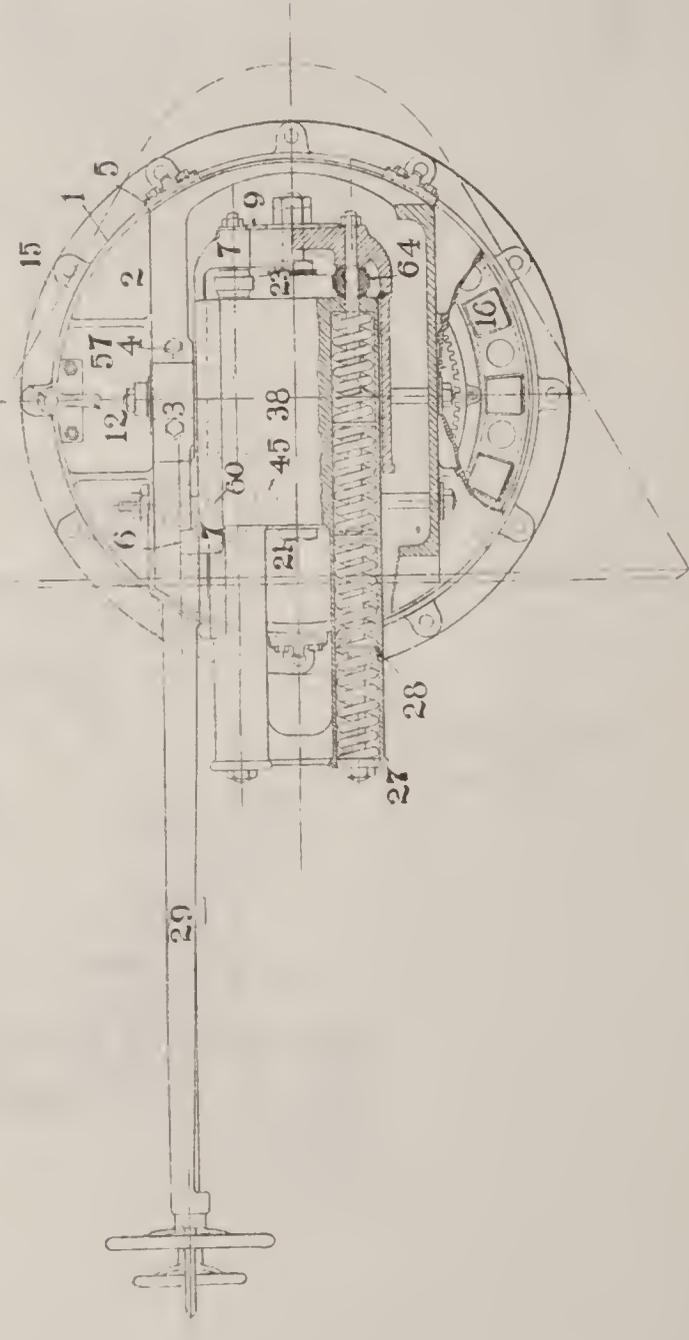
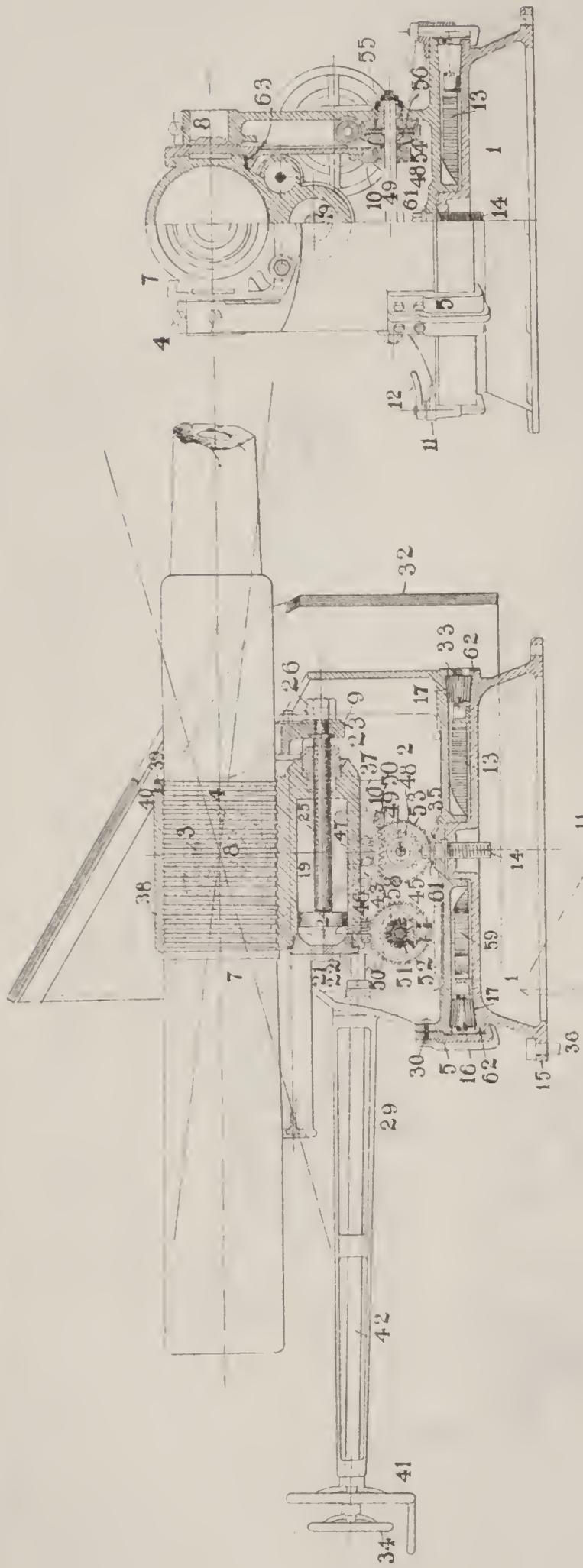




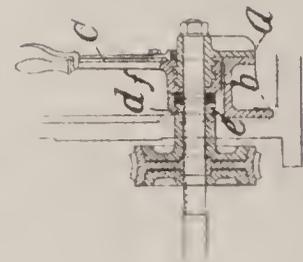
*4 inch Mount Mark III.*

*Plate XV.*

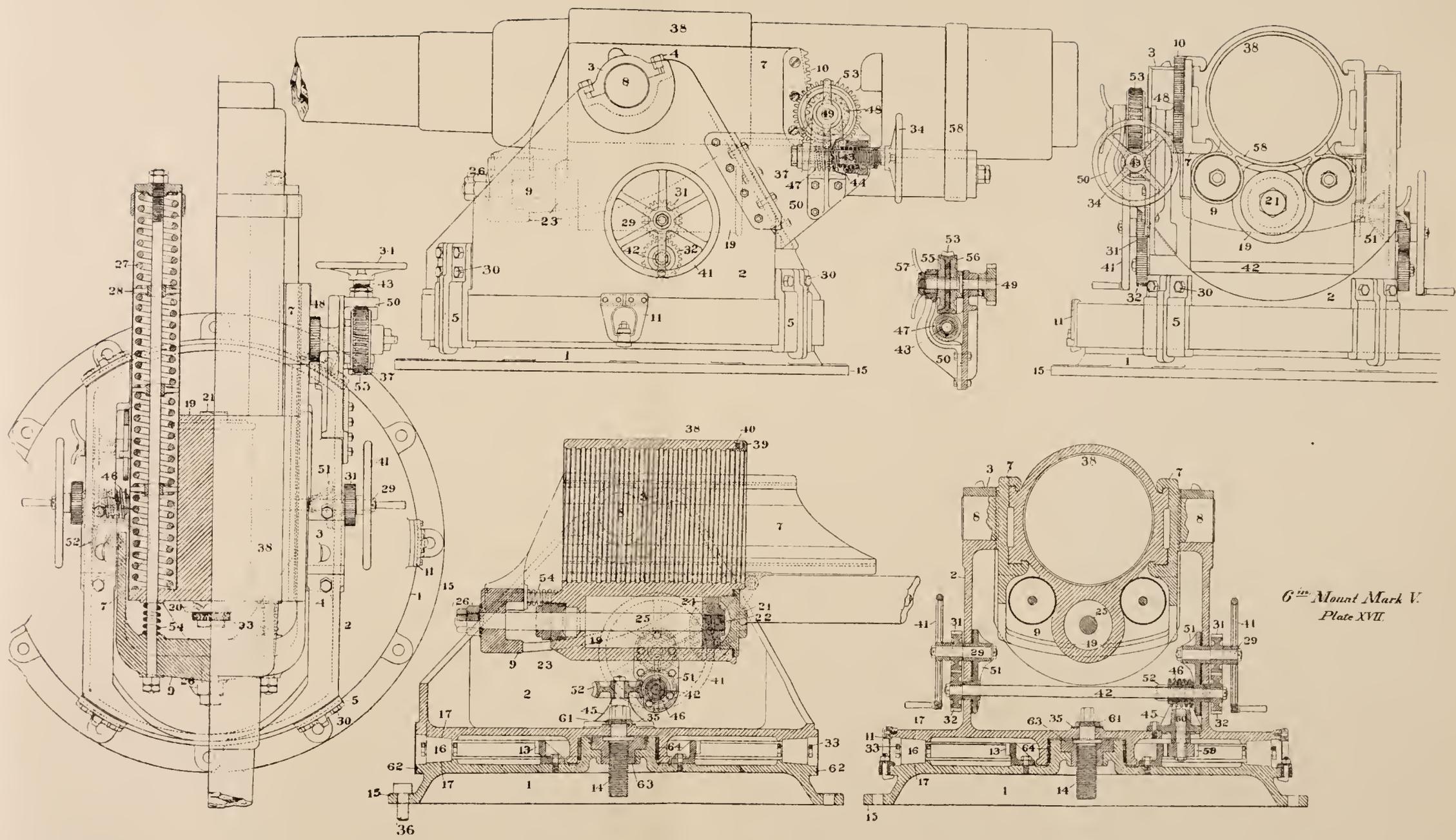




5 in Mount Mark II  
Plate XVI.







6<sup>th</sup> Mount Mark V.  
Plate XVII.



# 6-INCH AND 8-INCH CARRIAGES.

(ORDINARY TYPE.)

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## 6-INCH CARRIAGES.

The general design is that of a top carriage moving upon inclined rails, the recoil being controlled by a piston moving against a constant resistance in a closed cylinder, and the gun returned to battery by gravity.

### MARK I.

Only one carriage of this mark was built. It was a shifting pivot designed especially for the *Dolphin*. It has been withdrawn from service.

### MARK II.

This design embraces the gravity return shifting carriages, and the gravity return broadside carriages of the *Chicago*, *Atlanta*, and *Boston*. All of these carriages are muzzle-pivoting.

## GRAVITY RETURN SHIFTING CARRIAGE.

### PLATE I.

The principal parts are the slide, top carriage, and recoil cylinder.

The slide consists of two steel I girders or rails (1), inclined toward the front end at an angle of  $10^{\circ}$ . They are rigidly connected by front and rear transoms (2) and (24). The front transom is riveted between the rails and has cast upon its front face the coupling eyes (8). It is cut out to receive the flange (62) of the recoil cylinder (60), which is bolted to it. The rear end of this transom has bolted to it the T-shape cylinder transom (61), which supports the rear end of the cylinder.

The front transom has also secured to it by bolts and nuts the counter-recoil bumpers (3) and the breeching springs (81).

The rear transom (24) is U shape, and is riveted to the lower flanges of the slide rails. It carries the training truck bearings and has cut in it the pivot hole. Both ends of this transom are faced to receive the training-gear bracket, although this bracket is usually secured on the right end.

The front training truck bearings (6) are riveted to the front transom and to a projecting flange of the rails. The shifting truck bearings (74) are riveted on the outside of the rails in rear of the front truck bearing.

Two pivot lugs carrying the front clips (31) are bolted at the intersection of the rails with the front transom.

On the lower side of the rails, just in rear of the shifting-truck bearings, are placed the drum and axle bearings (22) and (23) of the holding-out clamp. One of these bearings (23) is fixed; the other is adjustable and provided with the clamp plate (17) and lever (18).

Double eyebolts (4) are riveted to the rails at forward ends for shifting and in-tackles.

A ribbed shelf (73) is secured to the side rails for the shield supports (70). The front shield supports (80) are bolted to the coupling eyes (8) by the pivot bolt (10).

The front trucks (5) and the shifting trucks (7) are plain. The rear training trucks are double and have mounted between them the pinion (27), which works in the rack of the rear training circle (71).

The rack pinion is driven by a pinion (29) on the shaft of the power wheel (33), which is itself actuated by a pinion (32) on the end of the crank pinion shaft.

The crank pinion shaft carries the pinion and crank handle at one end, and a cone (35) at the other. The cone is keyed on the shaft and has its bearing in the socket (36), cast in the training gear bracket. On the shaft between the pinion and the cone socket is a collar and a sleeve. The collar turns with the shaft; the sleeve is threaded and is keyed on. The lever is correspondingly threaded and turns on the sleeve. When thrown into action the sleeve is forced back against the casting, and the lever pressing against the collar forces the shaft to the rear, consequently bringing the cone firmly into its seat, thus producing the required friction.

Holding-down clips (25) are bolted to the rear training-trucks bearing. They have a lip that takes under the flange of the deck circle.

The holding-out clamp is for the purpose of holding the gun out in a seaway. It opposes sufficient friction to resist any inward motion due to motion of the ship, but offers no resistance to free recoil. It consists of a ratchet wheel (15) and a friction drum (16), mounted on the axle (14). Compression of the drum, and consequently of the axle and ratchet, is obtained by setting up on the lever (18), thus bringing the clamp plate (17) hard against the drum.

The recoil cylinder is secured, as already described, between the rails, and projects some distance beyond the front transom. It is rifled with three grooves, so cut that in recoil the liquid, flowing around the piston head through the grooves, presents a constant resistance. This liquid is usually a mixture of glycerin and water in the proportion of four parts of the former to one of the latter. If glycerin is not available, water or oil may be used. The cylinder has a filling and a draining hole, both of which are closed by steel screw plugs. The head of the cylinder is screwed in. The rear end is fitted with a stuffing box.

The carriage is pivoted to the port by a Y-yoke of forged steel. It is coupled to the carriage by the coupling bolts (10).

*Deck fittings.*—The deck circles are arcs of 180°. The rear circle is graduated for concentration of fire for 500, 1,000, 1,500, and 3,000 yards on the bow, beam, and quarter. A pointer which sweeps this graduated circle in training is fixed to the rear training transom at the center line to facilitate training for concentration.

The top carriage, which contains the trunnion seats (43), is built up of three castings riveted together, namely, the side brackets (41) and the transom (42). The latter is bent down toward the rear to permit elevation of the gun. At the angle of the bend a heavy lug is cast on the bottom of the transom, to which the end of the piston rod is secured

by the securing nuts (67) and the locking nut (68). On the left and also on the underneath side are cast the lugs for the steel pawl (20).

The top carriage has motion along the slide rails, friction being reduced by four rollers or trucks (48) under the front end of the carriage. The rear end rests on a dumb truck (49). These trucks are fitted under a shelf (46), which is bolted to the side bracket. Eyes are worked into the ends of the axles of the front and rear rollers (75) and (78) for the in-tackles and securing tackles.

A lug for securing shackle (45) is cast on the trunnion seats.

The elevating gears, of which there are two, one on each side, are bolted to the top carriage, and therefore recoil with the gun, a disadvantage which is overcome in later designs. An inside pinion (55), that works in the arc (53) on the gun, is driven by means of a worm and worm wheel arranged as shown in the plate. To prevent shearing the teeth of the arc and pinion a friction gear is introduced which takes, in part, the downward thrust of the gun at the instant of fire. The friction gear is arranged in this way: The arc pinion is coned to receive the cone on elevator axle; the other end of the axle is cut with a screw thread to receive a nut; on the left elevator a clamp wheel is put on the axle instead of a nut. The axle works in a steel sleeve which is flanged at the inner end, the flange bearing on the face of the arc pinion. When the nut or clamp wheel is set up it bears on the outer end of the sleeve, and the cone is thus drawn into its seat, exerting the necessary friction.

In service only one elevator is used. The nut on the left elevator is set up moderately tight with a wrench and remains undisturbed except when the gear is removed for overhauling. The object of two gears is to have one ready in case of accident to the other.

Wire breechings (79) are shackled to the top carriage and the front transom. They are provided to control the top carriage when for any reason the recoil is excessive. They are of such length as to check the recoil before undue strain is brought on any part of the recoil system or elevating gear.

#### 6-INCH GRAVITY RETURN BROADSIDE CARRIAGE.

##### PLATE II.

This carriage is the same as the shifting carriage, with the following exceptions:

- (1) There are no shifting trucks.
- (2) The front trucks are scored to receive the lip of the front training circle.
- (3) The front clips are hung on the axles of the front trucks and take under the flanges of the deck circle.
- (4) The rear holding-down clips are bolted on the forward side of the rear training truck bearings.

*Protection.*—A steel mantlet or shield 69 is bolted to the slide. The pattern is the same for both the shifting and broadside carriages.

*Securing for sea.*—The Mark II carriages are secured for sea by lashings and turn buckles, as shown in Plate II, and by small bronze chocking quoins fitted to the deck circle on each side of the rear training trucks. The shifting carriage may be secured either fore and aft or athwartships, but the broadside carriage is secured athwartships.

## MARK III.

## 6-INCH CENTRAL PIVOT CARRIAGE.

## PLATE III.

The 6-inch carriage No. 22 was the first central pivot mount, and all subsequent carriages have been of this design. The central pivot carriage differs radically in details and in deck fittings from those already described, but the essential features are the same in all designs. It consists of three principal parts—the box slide, top carriage, and the deck pivot and circles. The box slide is of cast steel and is built up of several pieces. It is composed of two brackets flanged and riveted together on the longitudinal center line of the carriage forming the sides and front vertical transom. The upper edge of the brackets are inclined at the front end at an angle of  $10^{\circ}$ . These edges are worked into the shape of T rails, upon which the top carriage moves. The brackets are stiffened by the training-gear transom and the rear transom, which are riveted between them.

The slide rests on six trucks. The inner bearings for the front and side trucks are cast on the brackets. The outer bearings are separate castings and are riveted on. The bearings for the rear trucks are riveted on the rear transom, as is also the rear bearing for the training pinion. Each truck has a holding-down clip on its axle.

Piston-rod lugs (9) are cast on the brackets. These lugs are provided with flanges (18), to which are bolted the shield top braces (74). Securing eyes (20) are cast on the "pads" of the piston-rod lugs.

On the front transom are secured with bolts and nuts the breeching springs (14), the counter-recoil bumpers (13), and the holding-out cone, etc. (7).

This cone compressor has the same function as the holding-out clamp on the Mark II carriages. A bronze casting (7) is bolted on the front transom. This casting has on its face a pair of lugs each of which is bored with a conical hole into which seat steel cones. One of the cones is rigidly fixed on the axle; the other is removable. A ratchet wheel is keyed on the axle between the lugs. It receives the pawl which is hung on the front transom of the top carriage. By setting up on a nut which screws on the free end of the axle, the cones are forced into their seats, thus giving the friction required to keep the ratchet wheel from turning freely.

The training gear which is fixed to the slide consists of a longitudinal pinion shaft (64), having a pinion (68) on the rear end and a worm wheel (62) on the front end. The pinion shaft has its bearings on the rear transom (65) and on the training transom. A cross shaft (58) carries the worm (61) and has its bearings (56) in the brackets. On the outer ends of the training worm shaft are spur wheels (60), which engage a second pair of spur wheels (57) on the training crank shaft. The spur wheels (57) and (60) are the same diameter, and therefore no power is gained by the second pair, but the point of application of the power is shifted to a more convenient position.

The top carriage is a bronze casting consisting of the brackets (2), trunnion seats (22), vertical transom (28), and the recoil cylinders (30). A guide with side clips (29) is planed out under each recoil cylinder to take the T rails of the box slide. The recoil cylinders are fitted with a bonnet at the rear end and a stuffing box at the front end. Each cylinder is rifled with three grooves of varying cross section and the

recoil is checked in the same manner as in the mounts already described. A small circulating pipe of copper (34) connects the cylinders at the front end. This pipe assures the same amount of liquid in each cylinder and hence the same pressure, a necessary consideration for a smooth and even recoil. The piston rods are secured to the lugs (9) by steel washers and nuts. The piston heads are of bronze and are screwed on the rod. They fit the cylinders loosely.

The cylinders are provided with filling and draining holes.

Lugs for preventer breechings are cast on the under side of the floor transom, and there is also a pair of heavy lugs for the holding-out pawl cast on the front vertical transom.

This transom is cut out to allow a depression of  $7^\circ$ . In later carriages a depression of  $10^\circ$  is provided for. A securing lug (26) and a securing eye (27) are cast on the recoil cylinder.

*The elevating gear.*—By attaching the handwheel and shaft to the slide instead of to the top carriage, as in the earlier mounts, vertical train may be continued to the instant of fire. Two longitudinal shafts, one on each side, have their bearings on the brackets, as shown in the plate. The front ends of the shaft carry the miter wheels (48), which gear into the miter wheels (52) on the ends of the transverse shaft (51). In this way motion of one handwheel gives simultaneous motion to the other.

The elevator brackets, which are dovetailed on the top carriage in rear of the recoil cylinder, are held in place by a small set screw. They are bronze castings, which form the bearing for the elevator axle. This axle carries the arc pinion (41) on one end and the worm wheel (44) on the other. A friction disk (42) is screwed and keyed on the axle and bears on the inner face of the worm wheel. A similar disk (44) bears on the inner face of the worm wheel. This outer disk is removable, but is kept from turning on the axle by the key just mentioned. These disks are brought to bear hard against the worm wheel by setting up on the nut which is screwed on the end of the axle. The elevator bracket on the side is shaped in two lugs, which form the bearing (46) of the elevator worm. The elevator worm shaft passes through the worm, as shown in the plate. This shaft is slotted its entire length to receive the feather on the worm. Motion of the handwheel (50) imparts vertical motion to the gun through the medium of the worm, worm wheel, and pinion. When the gun is fired the elevator bracket and worm recoil along the worm shaft.

Preventer wire breechings are shackled to the top carriage and box slide.

*Deck fittings.*—The deck pivot and circles upon which the central pivot carriage is mounted is a heavy steel casting consisting of the pivot, clip rail, and front deck circle. The circle is the path for the front and side trucks.

The rear deck-circle casting comprises the path for the rear trucks, the rack for the training pinion, and the path for the shield trucks. In the case of  $180^\circ$  deck circles the path for the shield trucks is continued around the pivot by the bronze circles (79).

Deck circles may be either  $180^\circ$  or  $360^\circ$ , and all circles, pivots, and carriages are interchangeable.

## MARK IV.

## 6-INCH CENTRAL PIVOT CARRIAGE.

## PLATE IV.

In this mark the box slide is a single casting. This mode of construction began with No. 44, and that carriage, therefore, marks the great improvement in the manufacture of steel castings. The slide of Mark I, built in 1884, was composed of twenty different pieces, while the slide of Mark IV combines in one casting all the truck bearings, transoms, shield shelves, and securing eyes. In later carriages of this mark it was found expedient to cast the piston-rod lugs separately and rivet them on. With the exception of the box slide being a single casting, Mark IV is identical in all respects with Mark III.

*Securing for sea.*—When secured for sea in fore-and-aft position, guns on C. P. mounts are secured by front and rear wire gripes, the front ones being set up by the turn-buckles and the rear ones by lashings. When secured athwartships the rear gripes are fitted with lashings. No forward gripes are used, but a turn-buckle is hooked in the securing lug on the top carriage and in a clip which takes under the flange of the deck circle.

*Shields.*—The shields for the C. P. carriages, Mark III and Mark IV, may be either inclined or vertical, with or without tops, 84 inches or 100 inches in diameter. The vertical shields are without tops and are designed for carriages placed in sponsons. They are of forged steel, with a port sufficient to allow 12° elevation and 10° depression. The inclined segmental shields, 100 inches in diameter, are built up and consist of a vertical plate (70), inclined top (71), wings (72), and a transom (73). These parts are riveted together.

Shields are secured to the slide by bronze braces riveted to the shields and set up with screw bolts to the slide. The spongers and rammers are secured under the top of the inclined shield and to the brackets of the slide when the carriage is fitted with vertical shields.

## 8-INCH CARRIAGES.

There are at present four marks, not including the turret mount and the recently designed spring return carriage. The same general features of the 6-inch mounts pertain to the mounts for the 8-inch guns. The method of controlling recoil, of holding the gun out in a seaway, and in a general way the elevating and training gears are almost identical. The first carriages were designed for the *Boston* and *Atlanta*, and from the manner of emplacement on deck are styled barbette carriages. The next design was the so-called half-turret carriage of the *Chicago*, and these were followed by the central pivot mounts at present installed on board the *Charleston* and *Baltimore*.

## MARK I.

## THE 8-INCH BARBETTE CARRIAGE.

## PLATE V.

The slide consists of two side brackets (1), front and rear vertical transoms (2) and (4), front and rear bottom transoms (3) and (5), and the pivot transom (6).

*Brackets.*—Each side bracket is built up of two rolled iron plates, between which is riveted a bronze frame. On the outside of the brackets are riveted the side truck bearings and platform (16) and the front shield side supports (80), also the side shelves (22), for the shield supports. On the top of each side bracket of the slide is riveted the rail casting (9), in which are mounted six rollers, upon which the top carriage recoils. This casting, which is called the roller bearing and guide, has flanged rails, which form a guide for the rails of the top carriage.

*Front transom.*—Between the side brackets forward is riveted the plate (2). It has cast on it the lugs for the piston rods, the bosses for the counter-recoil bumpers, and the combined clip and securing shackle (83). The holding out gear (11) and (12) is placed on the transom, as in 6-inch C. P. mounts. A securing eye is cast on the piston-rod lugs, and a training eye (17) on the side truck bearings.

Front bottom transom (3) is riveted to the front vertical transom and side brackets. The front truck bearings and the front bearing for the training shaft are in one with this casting.

The rear transoms are riveted between the side brackets and give additional stiffness to the carriage.

The pivot-socket casting has at the base a securing nut (78). At the head there is a flange which is set in the deck and bolted. The deck circle and rack casting is bolted to this flange. Inside the pivot socket casting is a hollow bronze pivot bolt (75), having a flange at the head and a pivot nut (77) at its base. Mounted on the pivot casting is the pivot transom (6), which carries the worm shaft backer (8) and the worm shaft bearings (7). The flanges of this transom are riveted to the side brackets.

The top carriage is built up and is in all respects similar to that of 6-inch Marks III and IV.

The elevating gear is the same as 6-inch Mark II.

*The training gear.*—The carriage may be trained either by hand or steam.

(a.) *Steam gear.*—Motive power is furnished by a simple duplex engine on the orlop deck. The main shaft of this engine has a bevel gear which drives a similar gear on a vertical hollow shaft which extends up through the central pivot of the carriage. The upper end of this shaft has a large bevel gear just over the pivot transom. This gear meshes into a small bevel gear on a transverse shaft, the latter having on each end a small pinion inside the side bracket. Each of these pinions gears into an intermediate spur wheel which actuates the large power wheel on the training worm shaft.

The transverse shaft carries a worm as shown. The shaft has its bearings in the brackets and is also supported by the worm bearings which are cast on the pivot transom.

The worm drives the worm wheel on the end of the training shaft (50). The training pinion (51) is keyed on the shaft about halfway between its bearing in the front transom and the worm wheel. The inner end of this training shaft has a bearing on the pivot transom and in the worm shaft backer (8).

On the transverse shaft (68) is a toothed clutch which is worked by a lever (69) extending to the rear of the carriage. The clutch is used for disconnecting the steam gear when it is desired to train by hand. This lever is pivoted in a bearing on one of the rear transoms. Training by steam is accomplished by the following gear: A long rod extending down through the hollow shaft (63) is connected at its

lower end with a system of levers which actuates the reversing link of the engine valve gear. This rod has its upper end fitted with a regulating screw, which works in a nut cast on the lower hub of the bevel gear (67), which is revolved by a bevel pinion (71) on an inclined hand-wheel shaft extending to the rear of the carriage and conveniently accessible. Vertical motion of the rod, by which the engine is started, stopped, or reversed, is obtained by the maneuvering gears (70), which work in this way: The bevel pinion on the end of inclined shaft revolves the nut on the bevel wheel, thus raising or lowering the rod. A slotted stop on the end of the rod limits its play.

The hand training gear is fitted on both sides of the carriage and consists of handwheels, shafts (59), and pinions (58). The pinions gear into the intermediate spurwheels of the steam gear. The handwheel shafts are supported in brackets (60) on the outside of the slide.

The shield is built up of a number of plates braced and supported as shown in the drawing.

*Securing for sea.*—The gun and carriage are secured with three sets of heavy gripes and lashings and a turn-buckle.

## MARK II.

### 8-INCH HALF TURRET CARRIAGE.

#### PLATE VI.

The brackets are composite, consisting of bronze and wrought iron plates riveted together. As in the barbette carriage, the vertical and front and rear training transoms are separate castings, which are riveted to the side brackets, the whole structure forming the slide. The front training transom has a boss which fits over the pivot socket, on which it is pivoted by a hollow bolt. This transom has cast on it three pairs of lugs for the front and side trucks.

The rear training transom is a curved casting with bearings for the after trucks and facings for the training-gear brackets. At the center is a socket for securing bolt.

The training gear is the same as that on the 6-inch shifting carriage.

The top carriage is similar in all respects to the top carriage of Mark I.

The elevating gear is similar to that on the 6-inch Marks III and IV, but differs in having the elevating crank handle on the transverse shaft instead of on the end of the longitudinal shaft. This arrangement is on account of the limited space.

*Deck fittings.*—These consist of a pivot socket and pivot bolt. The former has a flange to which is bolted the clip circle and roller path. The lower end of the pivot socket is fitted with a securing nut (72).

The deck circle (77) comprises the clip circle, rack and roller path, and the socket for the securing bolt.

## MARK III.

### 8-INCH CENTRAL-PIVOT CARRIAGE.

#### PLATE VII.

The side brackets are steel castings, of which the upper edge is flared in T-shape rails and inclined  $10^{\circ}$ , as in other mounts. The brackets are stiffened and held together by four transverse steel transoms. The

pivot transom has a circular boss which fits on the deck pivot. The truck bearings are riveted on.

The training-gear transom is riveted to the brackets. The gear is somewhat different in details from those previously described. It consists of two short transverse shafts carrying hand cranks and pinions. The pinions gear into spur wheels on the end of the worm shaft, which has bearings on the training-gear transom. The worm wheel is keyed on a short longitudinal pinion shaft. Both bearings of the pinion shaft are cast on the training-gear transom.

The top carriage is a single bronze casting comprising the recoil cylinders, trunnion seats, guide rails, and transom. The casting is provided with the usual securing eyes, lugs for preventer breechings, and lugs for holding-out pawl.

The elevator-gear brackets are dovetailed on the carriage in rear of the cylinder, and, with the exception that the handwheels are mounted on studs provided with spur wheels outside the main shaft and meshing into pinions on the end of the main shaft, the gear is the same as that on 6-inch Mark IV.

The shield is the segment of a cylinder with inclined top. It is bolted to the slide and has no trucks.

#### MARK IV.

##### 8-INCH CENTRAL-PIVOT CARRIAGE.

This carriage is the same in all details as Mark III, described above, except that the box slide is a single casting embracing all transoms-truck bearings, securing eyes, etc. There are two pairs of counter, recoil bumpers.

Shields for Marks III and IV consist of a vertical segmental plate, 2 inches thick, and a slightly inclined flat-top plate, 1 inch thick. These plates are riveted together and braced and secured to the slide as shown in Plate VII.

NOMENCLATURE 6 AND 8 INCH GUN MOUNTS, ORDINARY TYPE.  
 NOMENCLATURE OF 6-INCH GRAVITY RETURN SHIFTING CARRIAGE,  
 MARK II.

## PLATE I.

*Slide.*

1. Rails.
2. Front transom.
3. Bumpers (with bolts and nuts) counter recoil.
4. Forward double eyebolts (shifting).
5. Front training trucks, with axles and pins.
6. Front training-truck bearings.
7. Front shifting trucks, with axles and pins.
8. Coupling eyes.
9. Yoke with two coupling holes and one pivot hole.
10. Coupling bolts (2).
11. Pivot bolt.
12. Pivot socket.

 *Holding-out clamp.*

14. Axle.
15. Ratchet wheel.
16. Friction drum, with flange. (Not shown.)
17. Clamp plate (inclosing drum).
18. Lever.
19. Lever bolt.
20. Clutch.
21. Clutch bolt and nut.
22. Drum bearing.
23. Axle bearing.
24. Rear transom.
25. Rear holding-down clip.
26. Rear trucks, with axles and pins.
27. Rack pinions.
28. Rear training-gear standard (with hooking lugs and bolts).
29. Training pinion.
30. Training-pinion shaft and nut.
31. Front holding-down clip.
32. Crank-pinion shaft and nut.
33. Power wheel and pin.

 *Training gear.*

35. Cone brake.
36. Cone socket.
37. Sleeve.
38. Lever handle.
39. Crank-pinion cover (with guide slot for lever handle).
40. Crank.

 *Training gear—Continued.*

69. Shield.
70. Side supports of shield.
73. Shelf and ribs for side supports of shield.
74. Shifting-truck bearings.
76. In-tackle eyebolts.
77. Train-tackle eyebolts.
79. Breeching.
80. Front-shield supports.
81. Breeching springs.

 *Top carriage.*

41. Brackets.
42. Transom.
43. Trunnion seats.
44. Cap square and bolts.
45. Securing lugs and shackles.
46. Truck shelves with ribs.
47. Outside guide flanges.
48. Front trucks, with axles and nuts.
49. Rear (dummy) truck.
51. Clutch lugs.
53. Elevator arcs, with bolts.
54. Elevator arc guides and nuts.
55. Inside pinions.
56. Worm wheel, with cone axle, nut, and clamp wheel.
57. Worms and axles, with washers and nuts.
58. Elevator handwheels, with nuts.
59. Elevator gear covers, with lugs and bolts. (Not shown.)
75. In-tackle eyebolts.
78. Securing eyebolts.

 *Cylinder.*

60. Cylinder.
61. Cylinder transom.
62. Cylinder flange, with bolts.
63. Cylinder head.
64. Cylinder piston.
65. Cylinder piston rod.
66. Stuffing box or gland.
67. Piston-rod securing nuts and rear collar nut.
68. Locking nut.
71. Rear-training circle and rack.
72. Front-training circle.

NOMENCLATURE OF 6-INCH GRAVITY RETURN BROADSIDE CARRIAGE  
MARK II.

PLATE II.

*Slide.*

1. Rails.
2. Front transom.
3. Bumpers (with bolts and nuts), counter recoil.
4. Front double eyebolts (securing).
5. Front trucks, with axles and pins.
6. Front truck bearings.
7. Front and rear holding-down clips.
8. Coupling eyes.
9. Yoke, with 2 coupling holes and 1 pivot hole.
10. Coupling bolts (2).
11. Pivot bolt.
12. Pivot-bolt socket.

*Holding-out clamp.*

14. Axle.
15. Ratchet wheel.
16. Friction drum, with flange.
17. Clamp plate.
18. Lever.
19. Lever bolt.
20. Clutch.
21. Clutch bolt and nut.
22. Drum bearing.
23. Axle bearing.
24. Rear transom.
26. Rear trucks (4). } With axles and
27. Rack pinions (2). } pins.
28. Training-gear standard, with hooking lugs and bolts.
29. Training pinion.
30. Training-pinion shaft and nut.
31. Power wheel and pin.
32. Crank pinion.
33. Crank-pinion shaft and nut.
34. Cone brake.
35. Cone.
36. Cone socket (in training-gear casting).
37. Cone sleeve.
38. Lever handle.
39. Crank-pinion cover, with guide slot for lever handle.
40. Crank.

*Top carriage.*

41. Brackets.
42. Transom.
43. Trunnion seats.
44. Cap squares and bolts.
45. Securing lugs, with shackles.
46. Truck shelves, with ribs.
47. Outside guide flanges.
48. Front trucks (8), with axles and nuts.
49. Rear (dumb) trucks, axles, washers, and nuts.
51. Clutch lugs.
53. Elevator arcs (2), with bolts.
54. Elevator-arc guides (2), with nuts.
55. Inside pinions.
56. Worm wheels (2), with cone axle, nut, and clamp wheel.
57. Worms and axles (2), with washers and nuts.
58. Elevator handwheels (2), with nuts.
59. Elevator gear covers (2), with lugs and bolts. (Not shown.)

*Cylinder.*

60. Cylinder (rifled).
61. Cylinder transom.
62. Cylinder flange, with bolts.
63. Cylinder head.
64. Cylinder piston.
65. Piston rod.
66. Stuffing box or gland.
67. Piston-rod-securing nuts and collar nut.
68. Piston-rod-locking nut.
69. Shield.
70. Front training circle, with flange for holding-down clips.
71. Rear training circle and rack and, in some cases, holding-down clips.
72. Securing turn-buckles, with hooks, shackles, bolts, and nuts.
73. Side supports to shield.
74. Shelf for supports to shield, with ribs.
75. Front supports to shield.
76. Breeching.
77. Breeching springs.

## NOMENCLATURE OF 6-INCH CENTER PIVOT CARRIAGE, MARKS III AND IV.

## PLATES III AND IV.

*Slide.*

1. Braekets.
2. Front vertical transom.
3. Training transom, with shaft bearings.
4. Rear transom, with rear-truck bearings and training-shaft bearing.
5. Pivot transom, with front and side truck bearings.
6. Slide rails.
7. Holding-out cone clamp, axle, and nut.
8. Ratchet wheel.
9. Piston-rod lugs.
10. Front truck, with axle and pin.
11. Side trucks, with axles and pins.
12. Rear trucks, with axles and pins.
13. Counter-recoil bumpers, with bolts and nuts.
14. Breeching springs, with bolts and nuts.
15. Breeching.
16. Holding-down clips.
17. Lower braces for shield, with shield trucks, bearings, axles, and pins.
18. Lug for upper-shield braces.
19. Training eyebolts. (Not shown.)
20. Securing eye.

*Top carriage.*

21. Bracket.
22. Trunnion seat.
23. Cap square and bolts.
24. Breeching shackles, bolts, and nuts.
25. Holding-out pawl, box, and pin.
26. Securing lug.
27. Securing eye.
28. Top-carriage transom.
29. Top-carriage guide, with side clips.
30. Recoil cylinders.
31. Recoil-cylinder bonnet.
32. Recoil-cylinder filling plug.
33. Recoil-cylinder emptying plug. (Not shown.)
34. Recoil-cylinder circulating pipe.
35. Pistons. (Not shown.)
36. Piston rod.
37. Piston-rod stuffing box and gland nut.
38. Piston-rod securing nuts.
39. Piston-rod locking nuts.

*Elevating gear.*

40. Elevator arc and screw bolts (on gun).
41. Elevator pinion and nuts.
42. Friction disk, with axle, bearing, and nut.
43. Elevator worm wheel.

*Elevating gear—Continued.*

44. Friction disk.
45. Elevator worm.
46. Elevator-worm bearing.
47. Elevator-worm shaft.
48. Elevator-worm-shaft miter wheels, with nuts.
49. Elevator-worm-shaft bearings, front and rear, with bolts and nuts.
50. Elevator handwheels and nuts.
51. Transverse shaft.
52. Transverse shaft miter wheels and nuts.
53. Transverse-shaft bearings. (Not shown.)

*Training gear.*

54. Training crank, with keeper pin.
55. Training-crank shaft.
56. Training-crank-shaft journals.
57. Training-crank-shaft spur wheels.
58. Training-worm shaft.
59. Training-worm-shaft journals. (Not shown.)
60. Training-worm-shaft spur wheels.
61. Training worm.
62. Training-worm wheel.
63. Training-worm-wheel set screw.
64. Training-pinion shaft.
65. Training-pinion-shaft journals.
66. Training-pinion-shaft guide screw.
67. Training-pinion-shaft guide-screw groove.
68. Training pinion.
69. Training-pinion-shaft backing slot.

*Shield.*

70. Segmental shield.
70. (Mark IV.) Vertical shield.
71. Shield top.
71. (Mark IV.) Shield cross brace.
72. Shield wings.
72. (Mark IV.) Shield top brace.
73. Shield transom.
73. (Mark IV.) Shield port.
74. Shield top braces
75. Shield port.

*Deck fittings.*

76. (Mark IV, 74.) Combined pivot, clip rail, and front-truck circle.
77. (Mark IV, 75.) Pivot nut.
78. (Mark IV, 76.) Combined rear-truck circle, training rack, and clip rail.
79. (Mark IV, 77.) Shield-truck circle.
80. (Mark IV, 78.) Holding-down bolts and screws.

## NOMENCLATURE OF 8-INCH BARBETTE CARRIAGE, MARK I.

## PLATE V.

*Slide.*

1. Brackets.
2. Front vertical transom.
3. Front bottom transom, with front truck bearings.
4. Rear vertical transom.
5. Rear bottom transom.
6. Pivot transom.
7. Worm-shaft bearings.
8. Worm-shaft backer.
9. Roller bearing and guide.
10. Rollers, with axles and set screws (dumb trucks).
11. Holding-out cone clamp, axle, and nut.
12. Ratchet wheel.
13. Piston-rod lugs.
14. Front trucks, with axles and pins.
15. Side trucks, with axles and pins.
16. Side-truck bearings, with platform.
17. Training eyebolt.
18. Front bumpers, with bolts and nuts (counter recoil).
19. Breeching springs, with bolts and nuts.
20. Breeching.
21. Holding-down clips.
22. Side shelves for shield supports.

*Top carriage.*

23. Recoil cylinders.
24. Recoil-cylinder bonnet.
25. Recoil-cylinder guide, with side clips.
26. Recoil-cylinder filling plugs. (Not shown).
27. Top-carriage transom.
28. Piston. (Not shown.)
29. Piston rod.
30. Piston-rod stuffing box and gland nut.
31. Piston-rod securing nuts.
32. Piston-rod locking nuts.
33. Bracket.
34. Trunnion seat.
35. Cap squares.
36. Cap square bolts.
37. Breeching shackle bolts and nuts.
38. Holding-out pawl box and pin.

*Elevating gear.*

39. Stand for elevator gear.
40. Elevator arc.
41. Elevator-arc bolt.
42. Elevator-arc guide.
43. Elevator pinion.
44. Elevator worm.
45. Elevator-worm wheel.
46. Elevator-worm-wheel shaft and cone brake.
47. Elevator handwheel.
48. Elevator clamp wheel.

*Elevating gear—Continued.*

49. Elevator clamp nut.

*Training gear.*

50. Training shaft.
51. Training pinion.
52. Training circle.
53. Training-worm wheel.
54. Training worm.
55. Training-worm shaft.
56. Training power wheel.
57. Training idler wheel, stud, and nut.
58. Hand-training pinion, with nut.
59. Hand-training shaft and crank.
60. Hand-training-shaft bearing.
61. Training engine.
62. Lower bevel wheels and pillow block.
63. Vertical sectional shaft.
64. Vertical sectional shaft pedestal.
65. Shaft coupling.
66. Clutch couplings, with sleeves.
67. Upper bevel wheels.
68. Cross shaft, with connecting bevel coupling wheel.
69. Connecting coupling clutch, with lever.
70. Maneuvering gears.
71. Bevel pinion.
72. Link rod.
73. Rock shaft and arms (lower and upper).
74. Link connecting rods (lower and upper).

*Pivot.*

75. Pivot bolt.
76. Pivot socket.
77. Pivot nut.
78. Pivot-socket nut.

*Shield.*

79. Front shield.
80. Front-shield side supports.
81. Rear shield.
82. Rear-shield side supports.

*Securing gear.*

83. Securing shackle, with clip and screw bolts.
84. Securing socket.
85. Securing bolt.
86. Holding-out turn-buckle, connecting eyebolt on cylinder and one on piston-rod lug.
87. Side turn-buckle, connecting lug on cylinder to clevis bolt in deck.
88. Breech lashing.
89. Chase lashing.
90. Muzzle lashing.

## NOMENCLATURE OF 8-INCH HALF TURRET CARRIAGE, MARK II.

## PLATE VI.

*Slide.*

1. Brackets.
2. Front vertical transom.
3. Pivot transom, with truck bearings.
4. Rear transom, with rear and training truck bearings.
5. Slide rails.
6. Holding-out cone, clamp, axle, and nut.
7. Ratchet wheel.
8. Piston-rod lugs.
9. Front truck, with axle and pin.
10. Side trucks, with axles and pins.
11. Training and rear trucks, with axles and pins.
12. Counter-recoil bumpers, with bolts and nuts.
13. Breeching springs, with bolts and nuts.
14. Breeching.
15. Holding-down clips.
16. Side shelves for shield supports.
17. Lug for shield.
18. Training eyebolts.
19. Securing eye.

*Top carriage.*

20. Recoil cylinders.
21. Recoil-cylinder bonnet.
22. Recoil-cylinder guide, with side clips.
23. Recoil-cylinder filling plugs. (Not shown.)
24. Recoil-cylinder emptying plugs. (Not shown.)
25. Recoil-cylinder circulating pipe.
26. Top-carriage transom.
27. Piston. (Not shown.)
28. Piston rod.
29. Piston-rod stuffing box and gland nut.
30. Piston-rod securing nuts.
31. Piston-rod locking nuts.
32. Bracket.
33. Trunnion seat.
34. Cap squares.
35. Cap-square bolts.
36. Breeching shackle, bolts, and nuts.
37. Holding-out pawl, box, and pin.
38. Securing lug.
39. Securing eye.

*Elevating gear.*

40. Elevator arc and bolts.
41. Elevator pinion and nut.
42. Friction disk, with axle bearing and nut.

*Elevating gear—Continued.*

43. Friction disk. (Not shown.)
44. Elevating-worm wheel.
45. Elevating worm.
46. Elevating-worm bearing.
47. Elevating-worm shaft.
48. Elevating-worm-shaft miter wheels.
49. Elevating-worm-shaft bearings, front and rear.
50. Transverse shaft.
51. Transverse-shaft miter wheels.
52. Transverse-shaft bearings. (Not shown.)
53. Elevating crank.

*Training gear.*

54. Training-gear standard, with locking lugs and bolts.
55. Training pinion. (Not shown.)
56. Training-pinion shaft and nut. (Not shown.)
57. Power wheel and pin.
58. Crank pinion.
59. Crank-pinion shaft and nut.
60. Cone brake. (Not shown.)
61. Cone. (Not shown.)
62. Cone socket (in training gear casting). (Not shown.)
63. Cone sleeve. (Not shown.)
64. Lever handle.
65. Crank-pinion cover, with guide slot for lever handle.
66. Crank.

*Shield.*

67. Shield.
68. Shield side supports.
69. Shield lugs, front and rear, with nuts and bolts.
70. Shield transom.

*Deck fittings.*

71. Pivot socket.
72. Pivot-socket nut.
73. Pivot bolt.
74. Pivot nut.
75. Clip circle.
76. Pivot-truck circle.
77. Training circle, with rack and clip.
78. Securing pivot and socket.
79. Clevis bolts and sockets. (Not shown.)

## NOMENCLATURE OF 8-INCH CENTER PIVOT CARRIAGE, MARKS III AND IV

## PLATE VII.

*Slide.*

1. Brackets.
3. Front bottom transom, with front truck bearings.
4. Training transom.
5. Rear bottom transom.
6. Pivot transom.
7. Worm-shaft bearings.
8. Worm-shaft backer.
9. Guide.
11. Holding-out cone, clamp, axle, and nut.
12. Ratchet wheel.
13. Piston-rod lugs.
14. Front trucks, with axles and pins.
15. Side trucks, with axles and pins.
16. Side-truck bearings, with platform.
17. Training eyebolt.
18. Front bumpers, with bolts and nuts (counter recoil).
19. Breeching springs, with bolts and nuts.
20. Breeching.
21. Holding-down clips.
22. Side shelves for shield supports.

*Top carriage.*

23. Recoil cylinders.
24. Recoil-cylinder bonnet.
25. Recoil-cylinder guide, with side clips.
26. Recoil-cylinder filling plugs.
27. Top-carriage transom.
28. Piston. (Not shown.)
29. Piston rod. (Not shown.)
30. Piston-rod stuffing box and gland nut.
31. Piston-rod securing nuts.

32. Piston-rod locking nuts.
33. Bracket.
34. Trunnion seat.
35. Cap squares.
36. Cap-square bolts.
37. Breeching shackle bolts and nuts.
38. Holding-out pawl box and pin.

*Elevating gear.*

39. Stand for elevator gear.
40. Elevator arc.
41. Elevator-arc bolt.
42. Elevator power wheel and pinion.
43. Elevator pinion.
44. Elevator worm.
45. Elevator-worm wheel.
46. Elevator-worm wheel shaft.
47. Elevator handwheel.
48. Elevator shaft.
49. Elevator cross shaft.

*Training gear.*

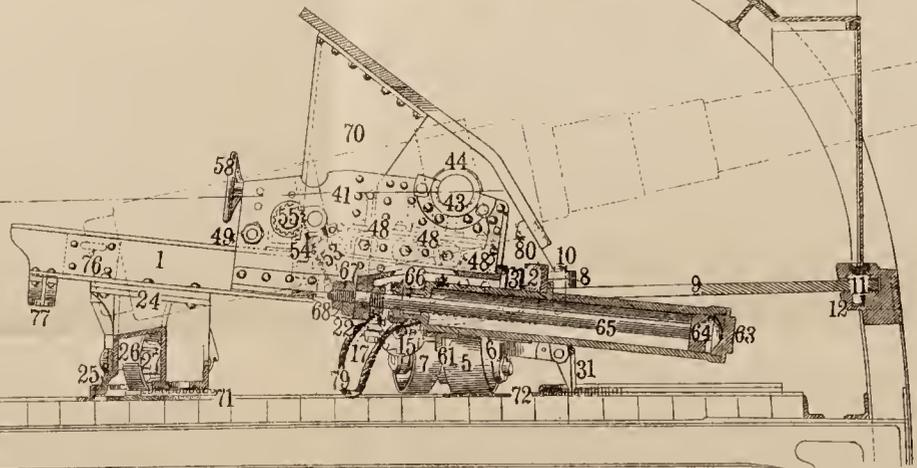
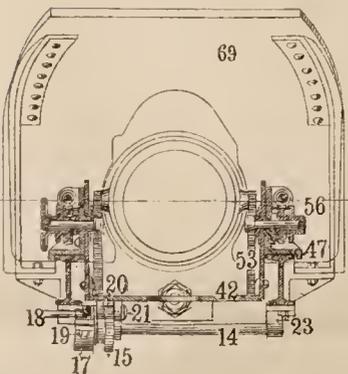
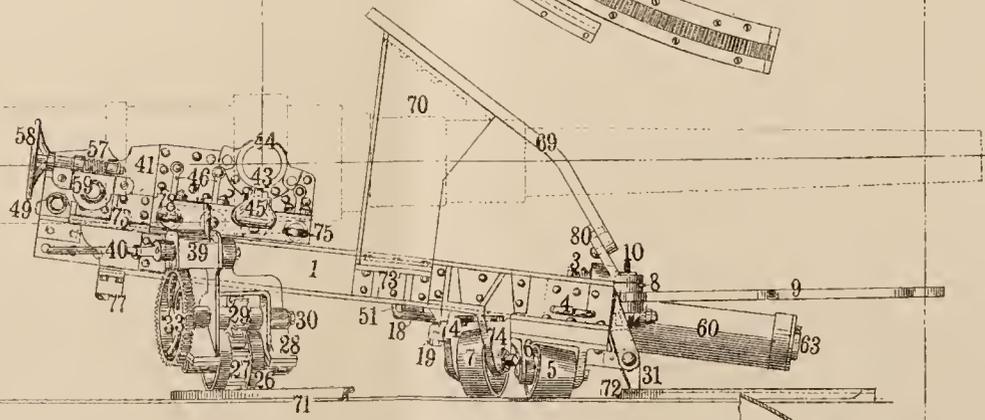
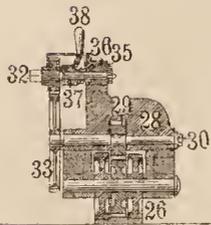
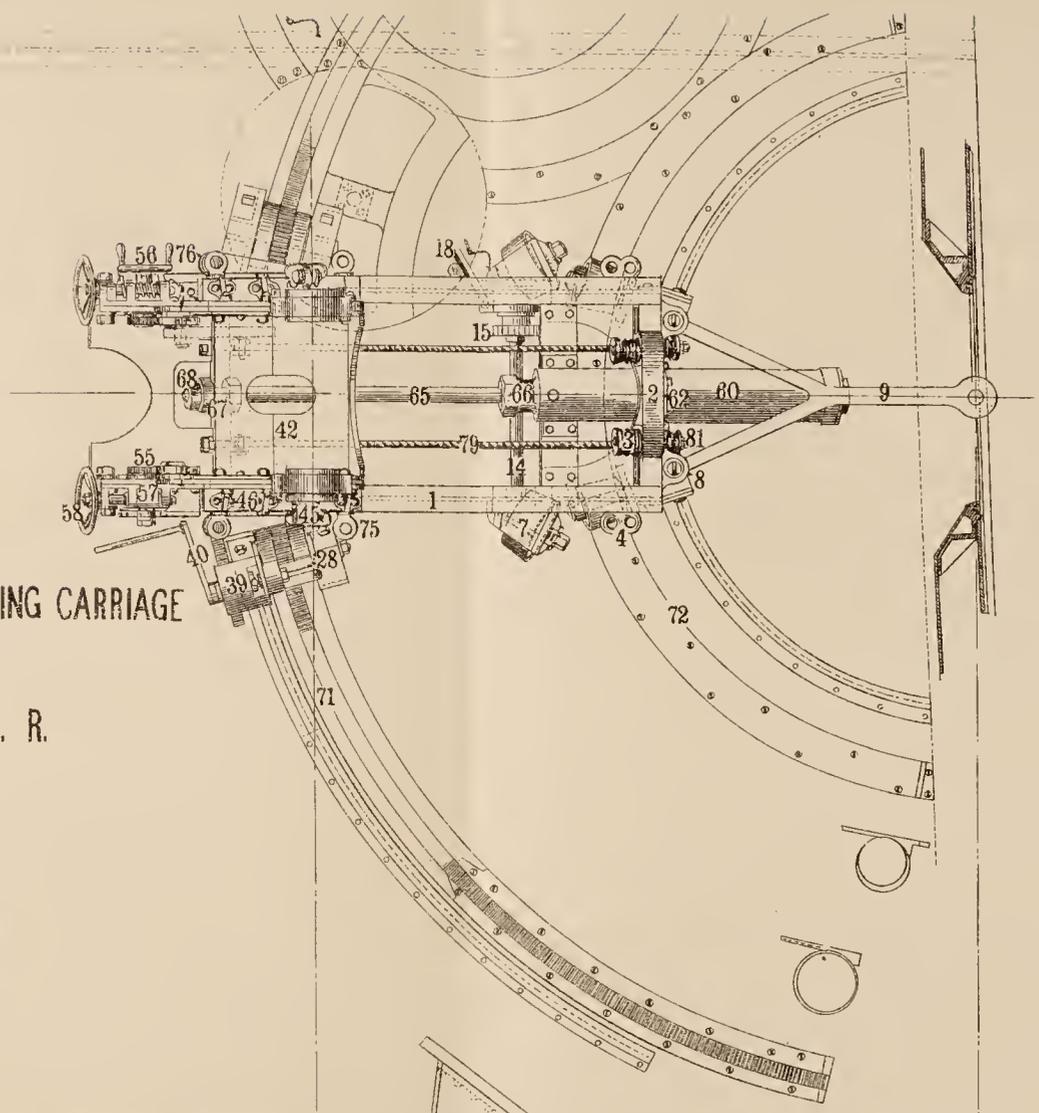
50. Training shaft.
51. Training pinion.
52. Training circle.
53. Training-worm wheel.
54. Training worm.
55. Training-worm shaft.
56. Training power wheel.
58. Training pinion, with nut.
59. Training shaft and crank.

*Shield.*

79. Front shield.
80. Front-shield side supports.
81. Top shield.
82. Top-shield side supports.



GRAVITY RETURN SHIFTING CARRIAGE  
FOR  
6-inch B. L. R.

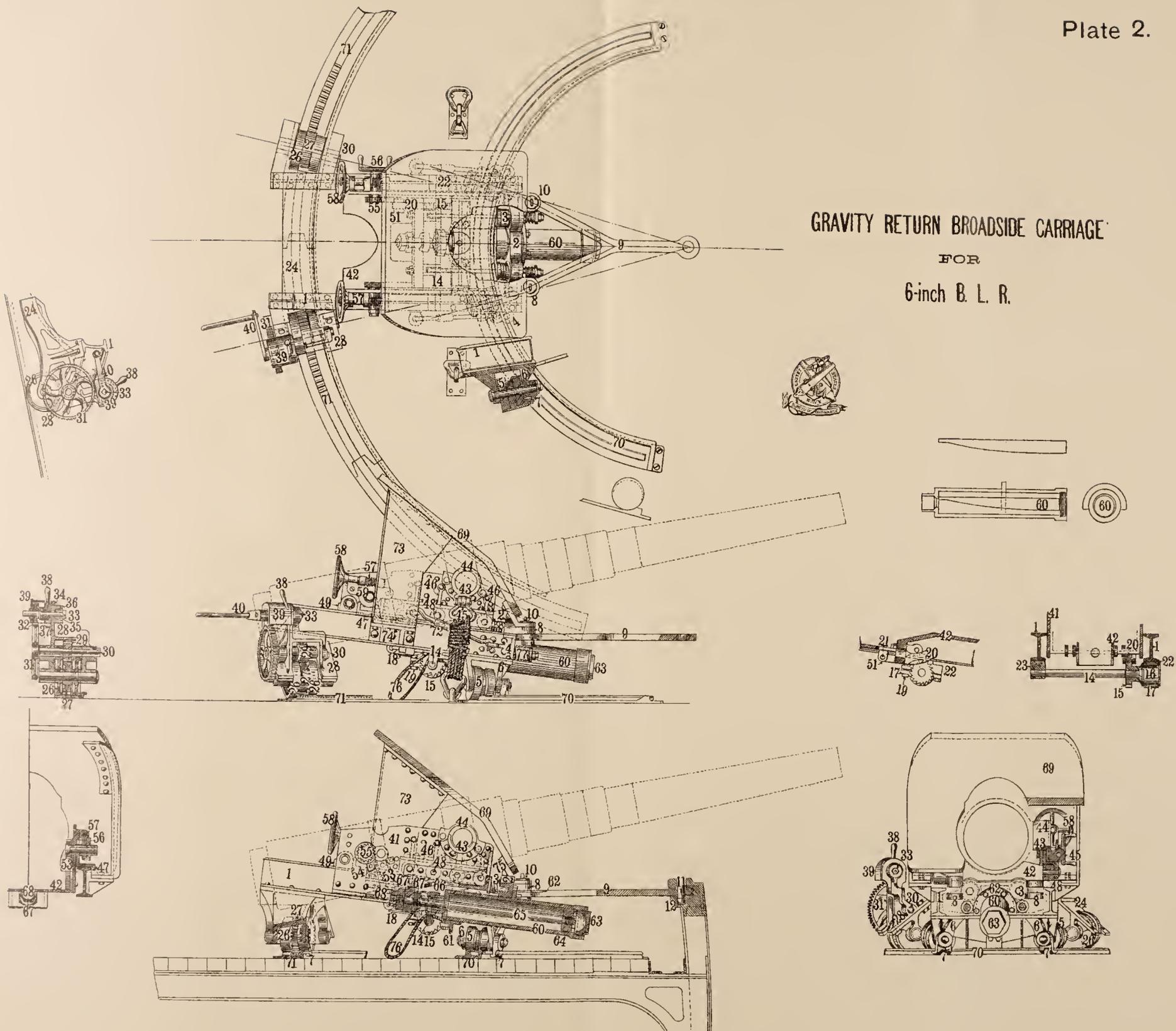


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# GRAVITY RETURN BROADSIDE CARRIAGE

FOR

6-inch B. L. R.

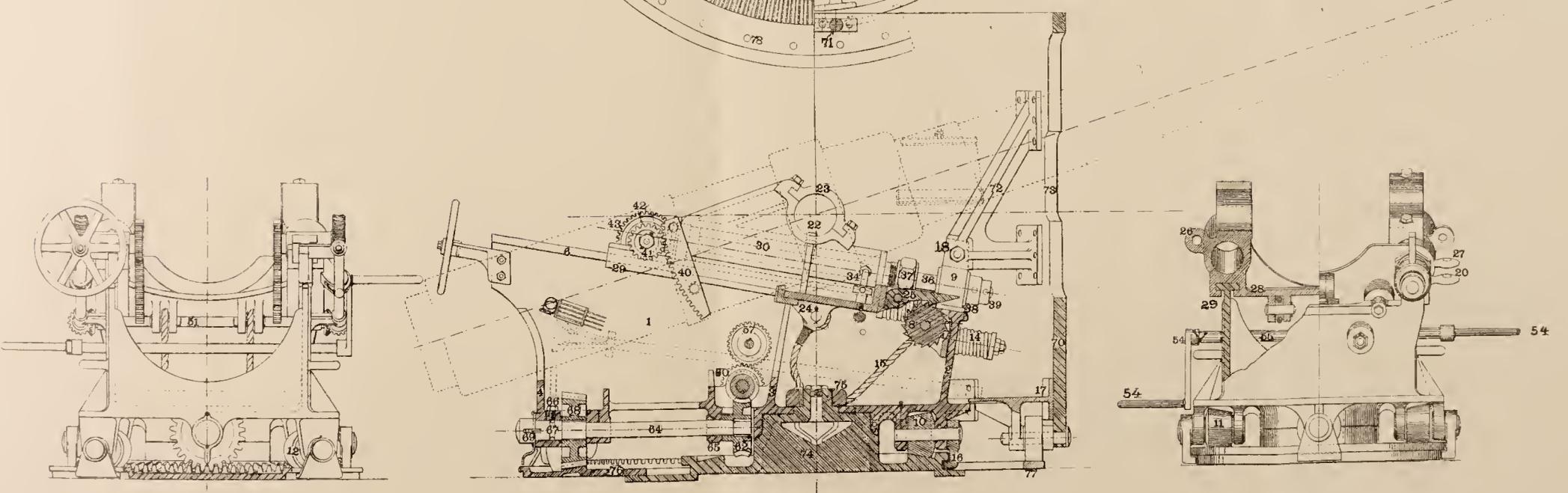
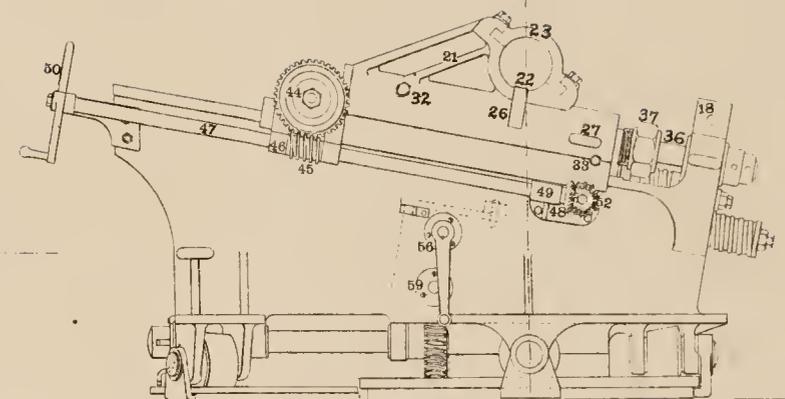
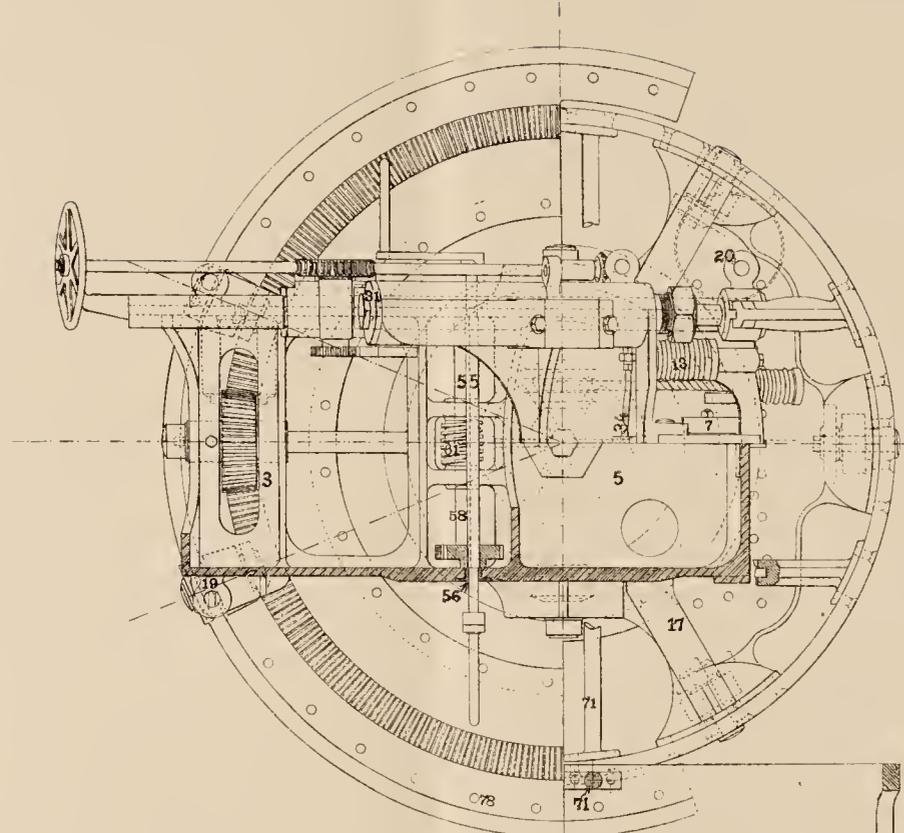




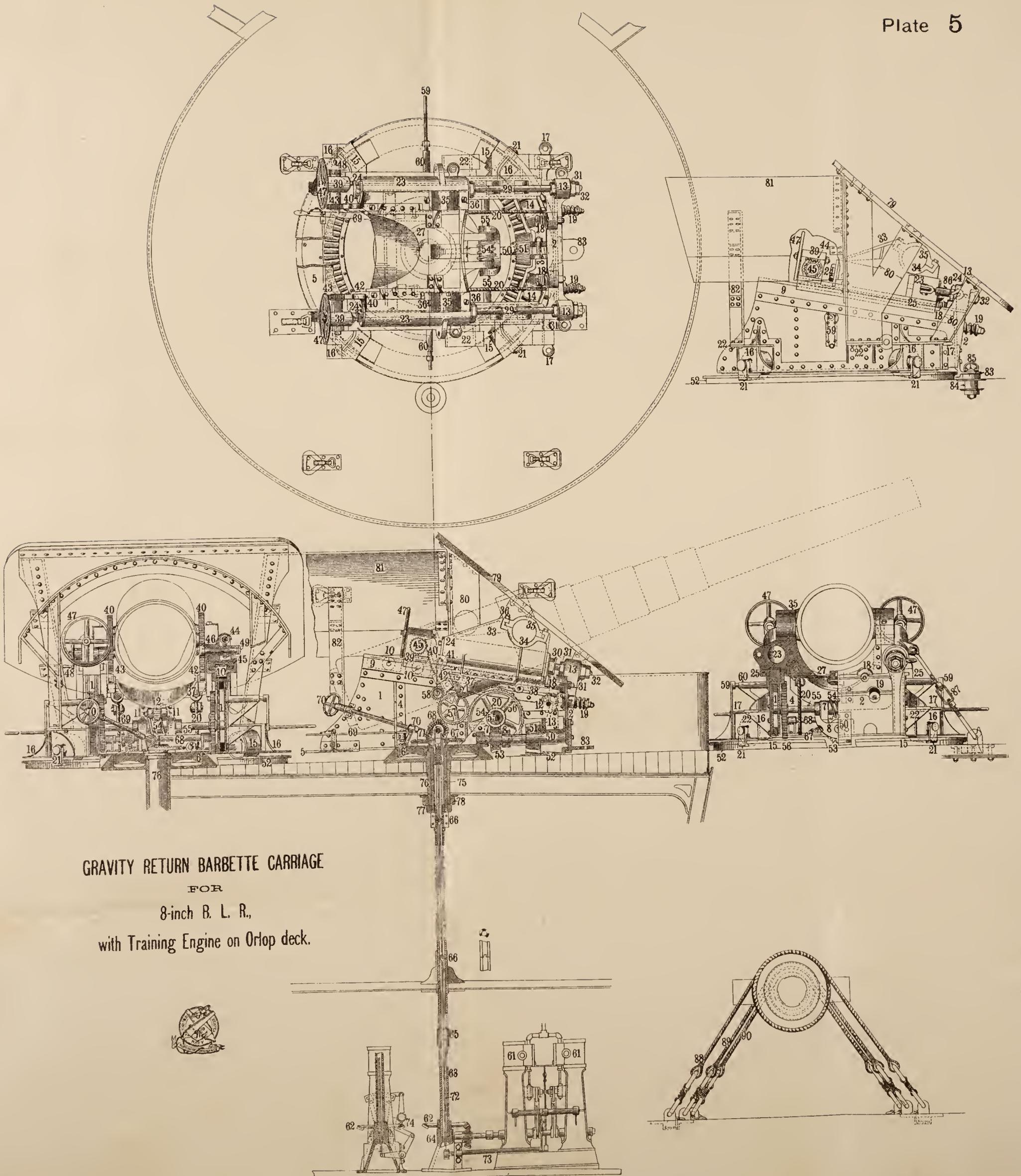




Center Pivot Carriage  
for  
6" B.L.R.  
Mark IV.



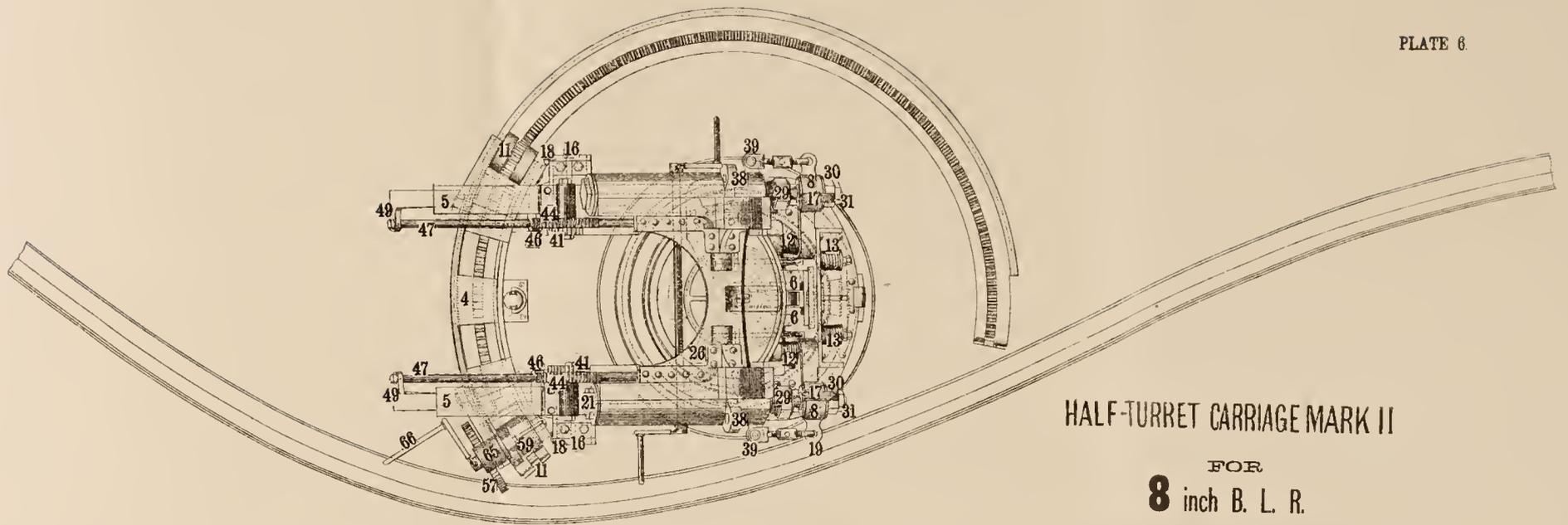




GRAVITY RETURN BARBETTE CARRIAGE  
FOR  
8-inch B. L. R.,  
with Training Engine on Orlop deck.



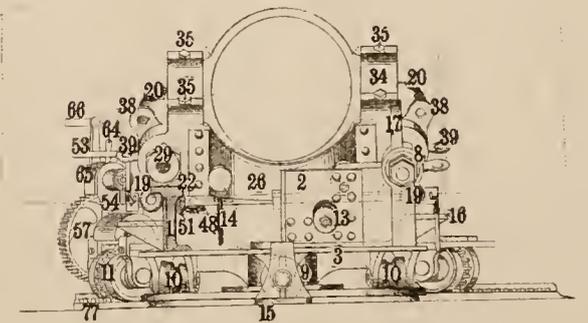
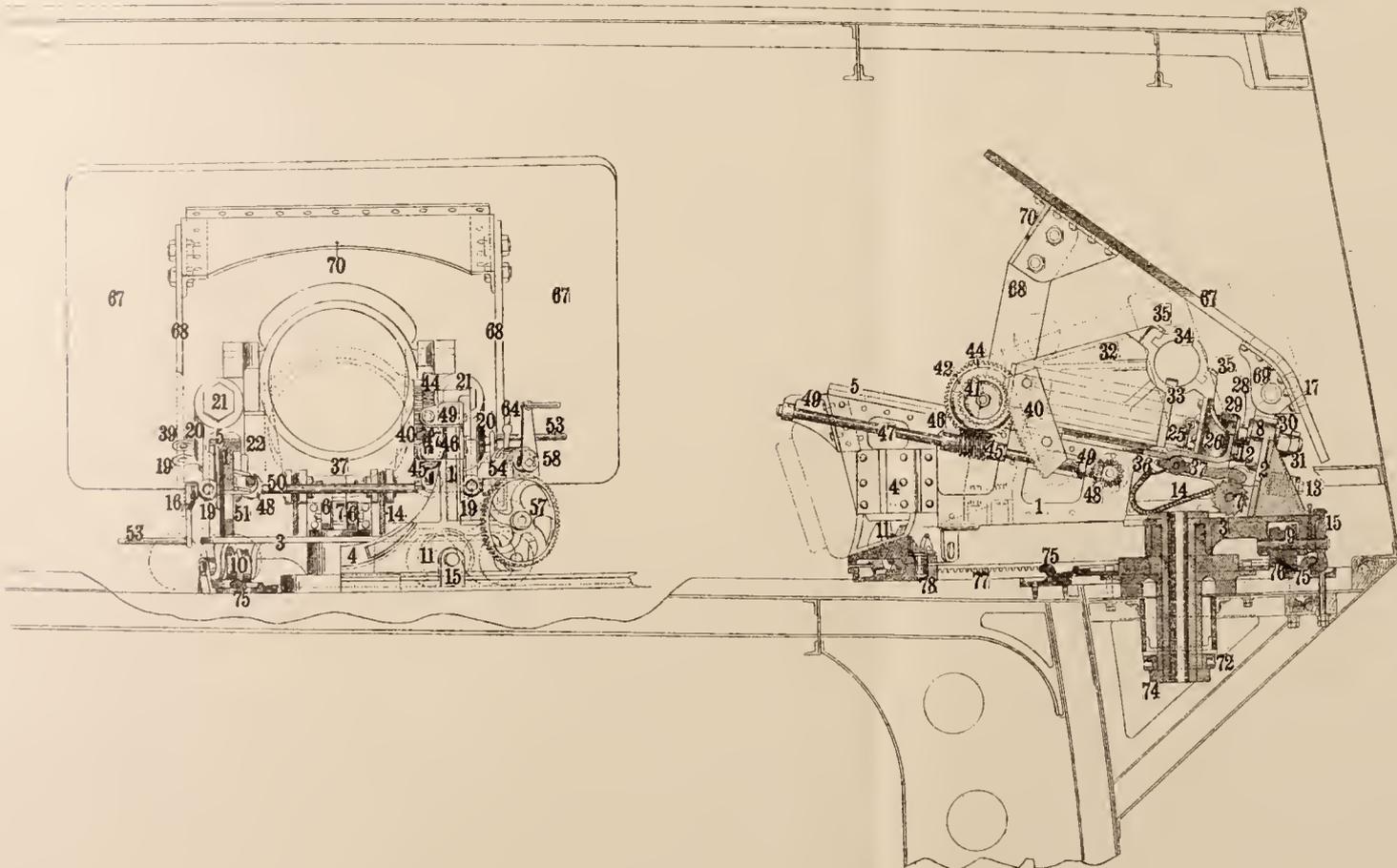




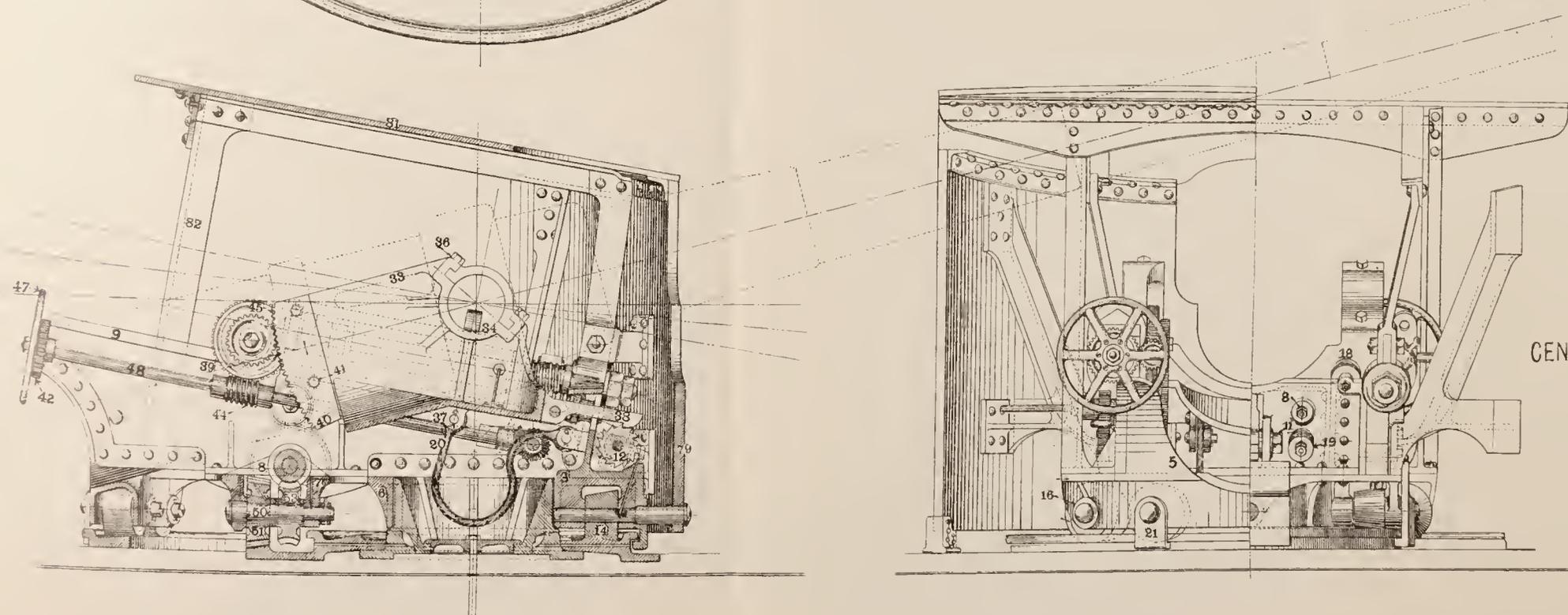
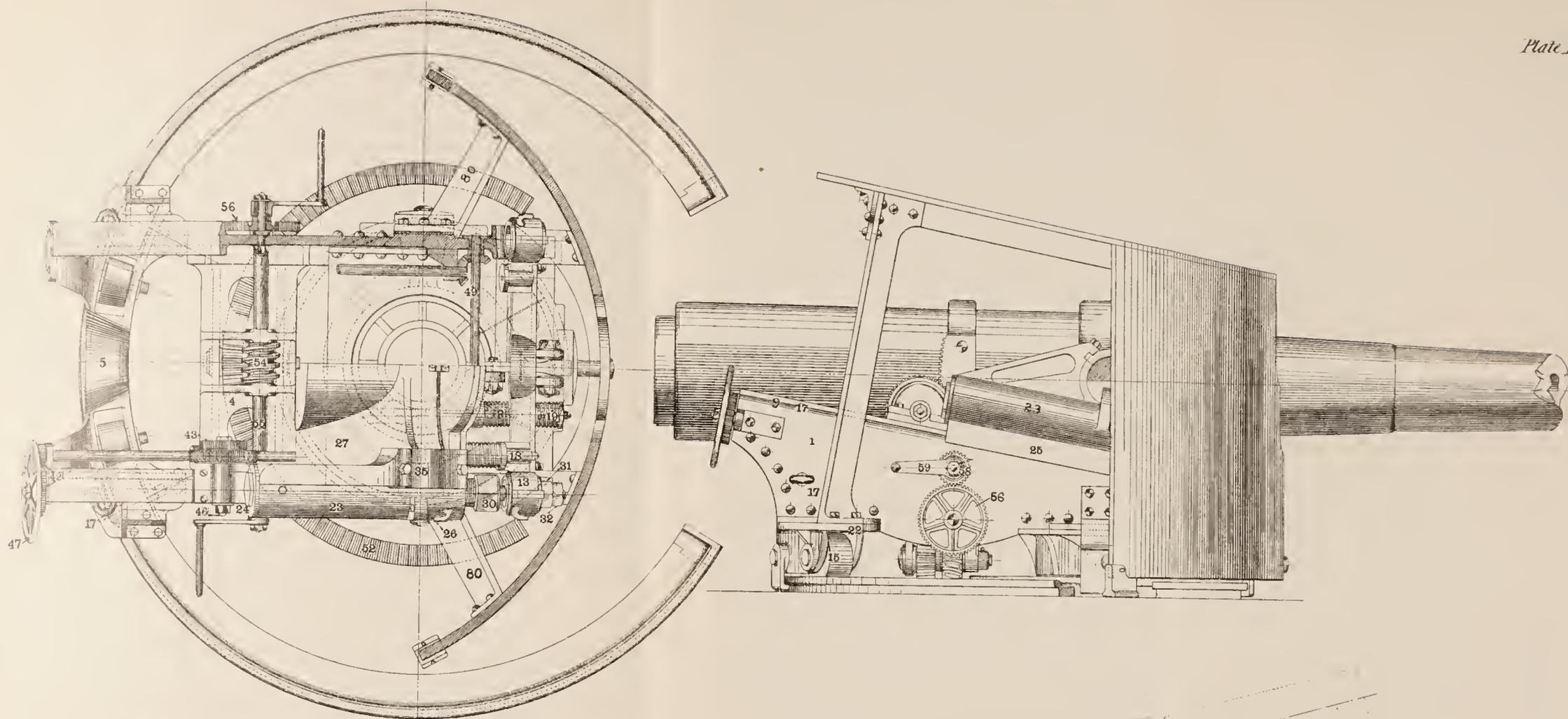
HALF-TURRET CARRIAGE MARK II

FOR  
8 inch B. L. R.

OF  
U. S. S. CHICAGO.







CENTER PIVOT CARRIAGE  
FOR  
8-INCH B. L. R.,  
MARKS III AND IV.



# TURRET MOUNTS.

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## 8-INCH TURRET MOUNT, MARK V.

This type of carriage has been adopted for the 8-inch guns of the *New York* and the *Olympia*. They are similar to the service broadside 8-inch carriages, with the exception that but one recoil cylinder is used instead of two, and this cylinder is placed under the gun.

The mount consists of the following principal parts:

The top carriage, fig. 1, Plate I.

The recoil cylinder, fig. 9, Plate II.

The box slide, fig. 18, Plate III.

The ammunition hoist, Plate IV.

General plans of turret and mounts, Plates V, VI, and VII.

### THE TOP CARRIAGE, PLATE I.

The top carriage, fig. 1, is a bronze casting carrying the gun in the trunnion seats (fig. 6) and sliding on the box slide (fig. 18, Plate III), to which it is held against vertical movement by holding-down clamps (fig. 3). A lug (fig. 2) is cast in one with the top carriage, to which is secured the end of the recoil piston rod. Lugs (fig. 4) for the elevating shaft form part of this casting. In the forward part of the top carriage are placed four friction rollers, two on each side, which travel on the inclined rails of the box slide. A buffer (fig. 7) coming against a corresponding buffer on the box slide brings the carriage to rest when the gun is returned to battery.

### THE RECOIL CYLINDER, PLATE II.

This is a steel casting (fig. 9) securely bolted to the box slide by the flanges (fig. 17) on each side. In this cylinder works the recoil piston (fig. 14) and the piston rod (fig. 15). The ends of the cylinder are closed by heads or bonnets (figs. 10 and 11) screwed in, and a stuffing box (fig. 12) about the piston rod. Nuts (fig. 16) secure the piston rod to a lug (fig. 2, Plate I) on the top carriage. Three grooves are cut on the inner surface of the cylinder, which permit the slow passage of the liquid with which the cylinder is filled from one side of the recoil piston, thus gradually checking the recoil of the gun and top carriage. In the position shown in the drawing the piston is at the forward end of the cylinder and the gun is assumed to be ready for firing.

### THE BOX SLIDE, PLATE III.

The box slide, or lower carriage, is a heavy steel casting bolted to the floor of the turret and to the turret girders. The top carriage

travels on the upper inclined rails of the box slide. The recoil cylinder is bolted to flanges (fig. 19) cast in one with the box slide.

Counter-recoil bumpers are secured to the forward end of the slide (fig. 20).

#### AMMUNITION HOIST, PLATE IV.

The turret ammunition hoist consists of the ammunition car (fig. 21), ammunition guides (figs. 26 and 27), swinging crane (fig. 29), the hand-hoisting mechanism (fig. 31), and the electro-hoisting motor and mechanism (fig. 34).

The guides (figs. 26 and 27) are bronze castings secured to the turret floor by braces (fig. 28) and to the lower end of the ammunition tube (not shown in the drawing), and turn with the tube and turret. The rollers of the ammunition car travel in these guides.

The ammunition car (fig. 21) consists of three bronze cylinders revolving about a central axis, suspended by a yoke (fig. 22). The powder charge is in two sections, and is carried in the two larger cylinders (fig. 24). The projectile is carried in the small cylinder (fig. 23).

The ammunition car travels in the guides, in the central part of the tube, and is hoisted in the turret between the guns. When the car reaches the upper ends of the guides it is swung clear by the crane (fig. 29) and is carried by this crane to the rear of either gun. As but one car can be used for the ammunition the guns must be loaded alternately.

Provision is made for hoisting ammunition by either hand or electrical power. The electric motor operates by means of a worm and gearing, a drum around which is wound a wire rope, running over the rollers in the crane and secured to the ammunition car.

The electric motor is used for both hoisting and lowering the ammunition car. When the hand mechanism is used for hoisting, the car can be lowered by means of a friction brake (fig. 32) or by slowly turning back the hand crank.

#### THE SIGHTING MECHANISM.

The sight-connecting rod is pivoted at 73 to a sight band on the gun. The stationary sight bracket is bolted to the turret and has a vertical slot cut in it to allow the sliding sight bracket to move up and down as the gun is elevated and depressed.

The sight bar and head are of the ordinary type and are adjusted for range in the customary way. When the gun is fired the sight-connecting rod swings to the rear about its upper pivot as a center; the sliding bracket moves down and up again to its former position as the gun runs out to battery.

#### GENERAL VIEWS OF TURRET, GUNS, AND CARRIAGES, PLATES V, VI, AND VII.

Plate V gives a section of turret and carriages parallel to the axes of the guns. The section of the turret proper is taken through the center, that is, on a diameter. The section of the carriage is taken through the axis of the gun, and consequently on a chord of the turret.

The two lower carriages, or box slides, are bolted to four girders, which form the chief support of the whole turret structure. These girders are supported at their ends on a circular cast steel ring, traveling on a system of live rollers, which in turn move on a lower fixed

steel ring. The rollers are of hard steel and are spaced about 18 inches apart. They are kept in their proper relative positions by means of two rings, in which work the roller axles. The turret is revolved by a steam engine in the handling room below the protective deck. This engine revolves a worm shaft, working in a worm wheel around the lower end of the turning tube. The worm wheel is secured to the tube by friction clamps, set up with just sufficient force to turn the turret. When a very heavy turning force is brought on the turret, as is the case when a single gun is fired, the tube slips in the worm wheel, and thus prevents the breaking of the threads on the worm shaft or the bringing of a too great twisting strain on the tube.

The upper end of the turning tube is securely bolted to the turret floor and girders. This tube also affords a passage for the ammunition.

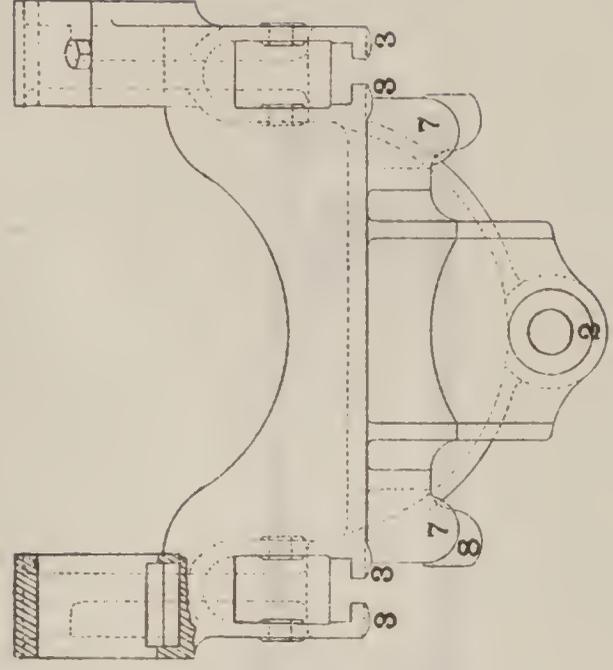
Plate VI shows a section through center line of turret and perpendicular to the ones of the guns. Plate VII shows the plan view of turret and guns. Sighting towers (fig. 42) are placed on the center line of the turret and just outside of each gun. From these towers the guns are sighted by means of a fixed front sight on the forward edge of the turret and a sliding rear sight moving up or down with the breech of the gun.

Elevation is obtained by the handwheel (fig. 50), the shaft (fig. 49), the worm (fig. 48), and the elevating wheel (fig. 52). The lateral train is controlled by the gun captain on the seat (fig. 66) in the sighting tower by means of a vertical rod running down the turning tube and gearing into a rack operating the valve on the turning steam engine.

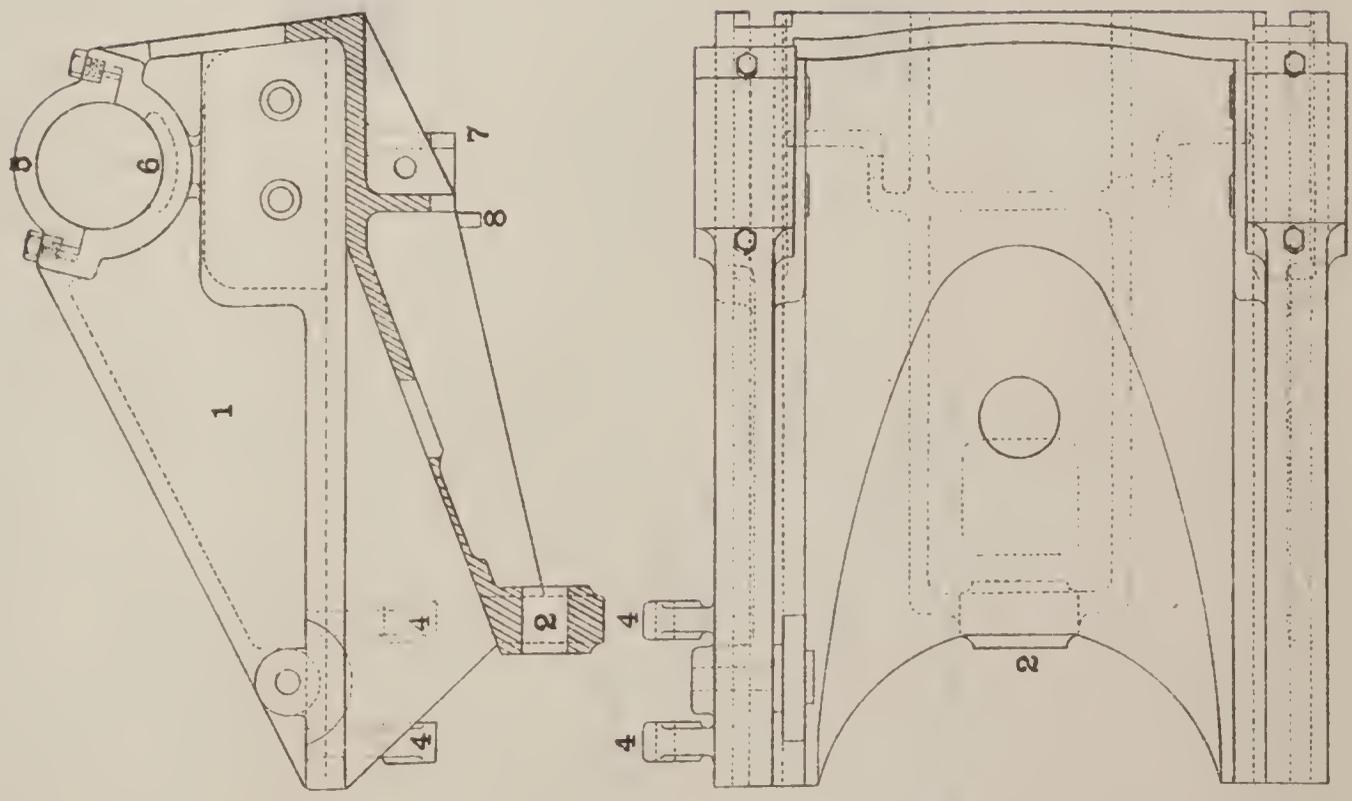
The turret can be turned at the rate of one complete revolution in fifty seconds.

Holes are cut in the turret armor in rear of each gun to afford means of entering and leaving the turret and to permit the easy handling of the loading rammer.





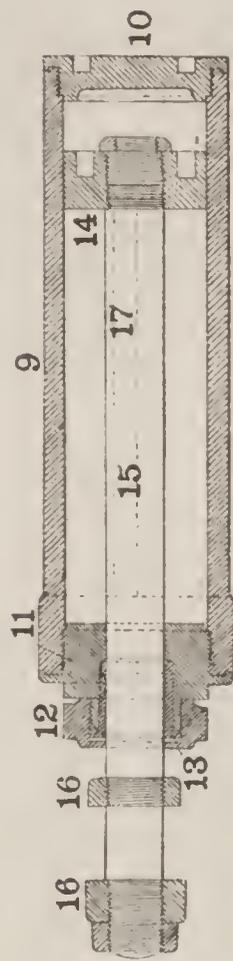
- 1. Top Carriage
- 2. Recoil lug
- 3. Holding-down clips
- 4. Lugs for inclined elevating shaft
- 5 Trunion cap
- 6 " " seat.
- 7. Lugs for counter-recoil bumpers.
- 8 " " recoil bumpers.



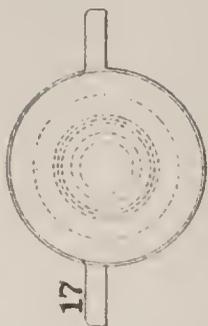
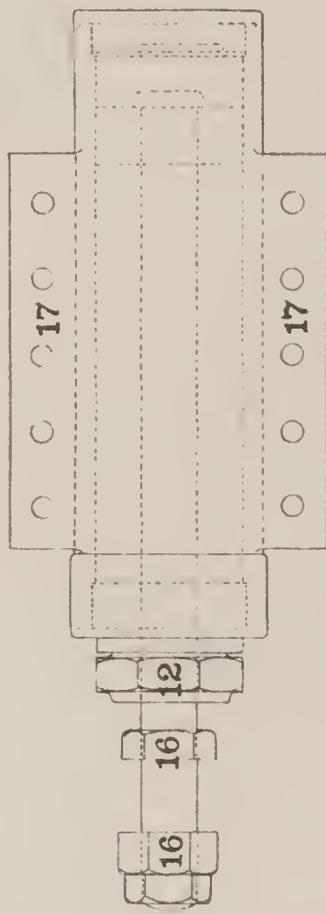
# 8-IN. TURRET MOUNT



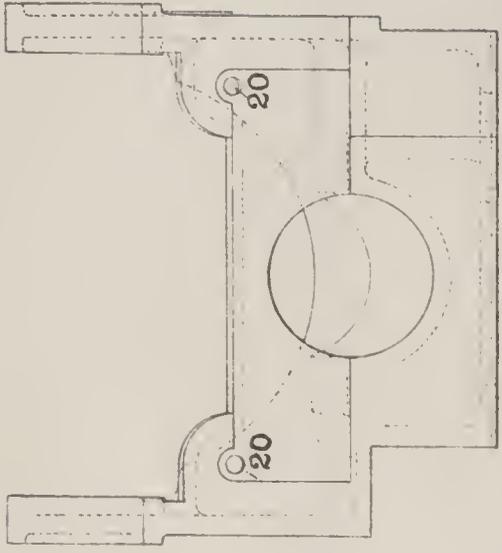
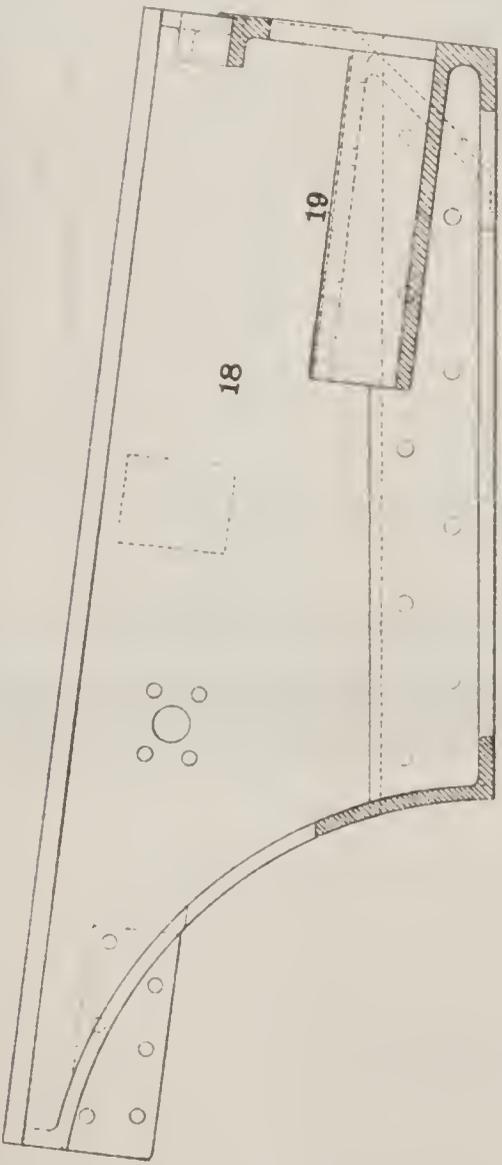
# PLATE 2.



- 9. *Recoil Cylinder*
- 10. " " *Bonnet*
- 11. " " *Stuffing Box*
- 12. " " " *Nut*
- 13. " " " *Gland*
- 14. " " *Piston*
- 15. " " *Rod*
- 16. " " " *Nuts*
- 17. *Flanges for securing to box slide.*







18 Box Slide.  
19, Flanges for securing recoil cylinder.  
20, Holes for securing counter-recoil bumpers.

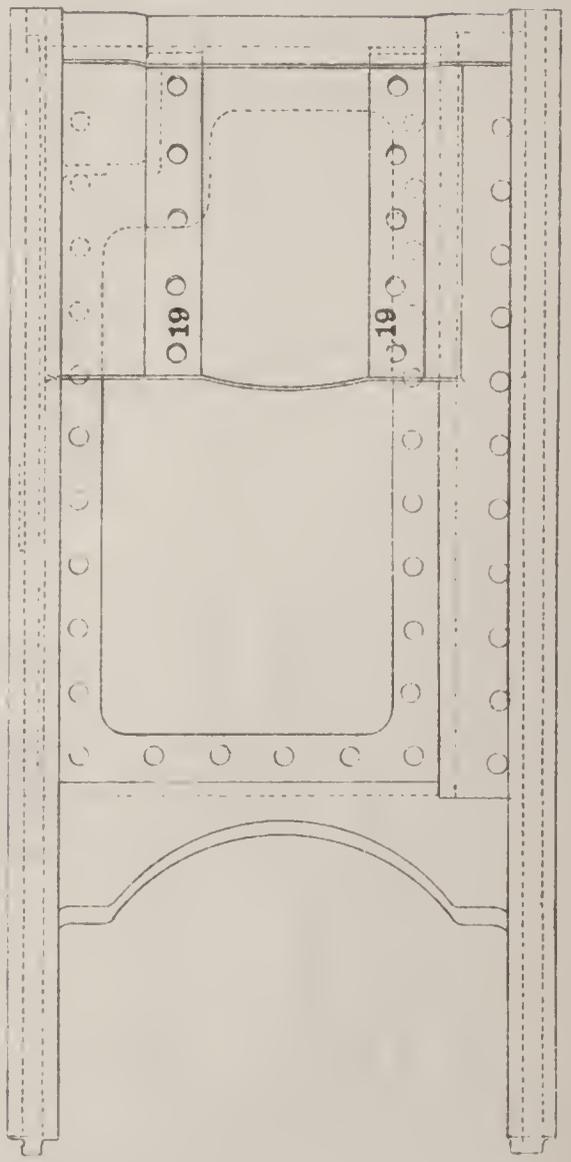
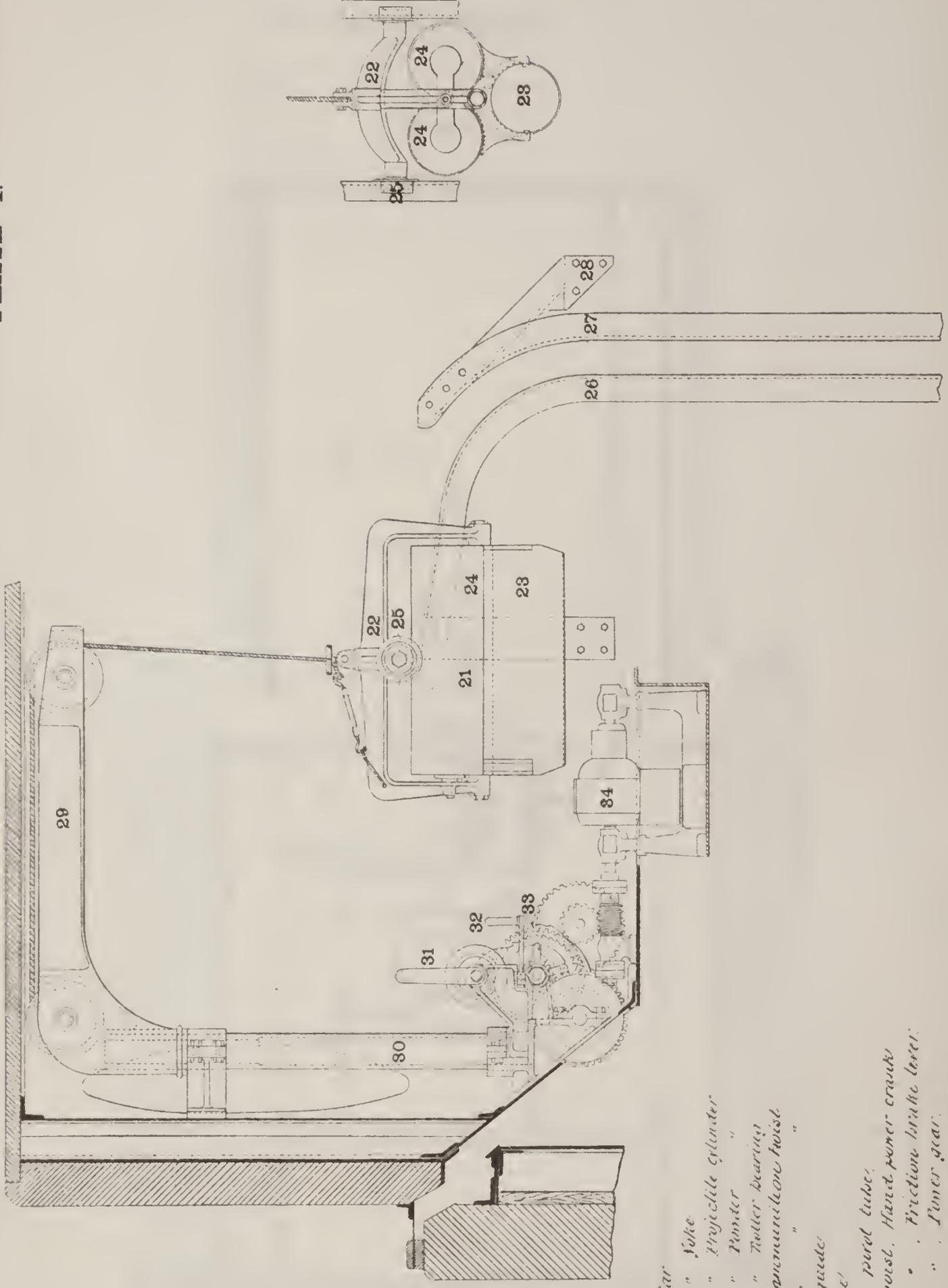




PLATE 4.

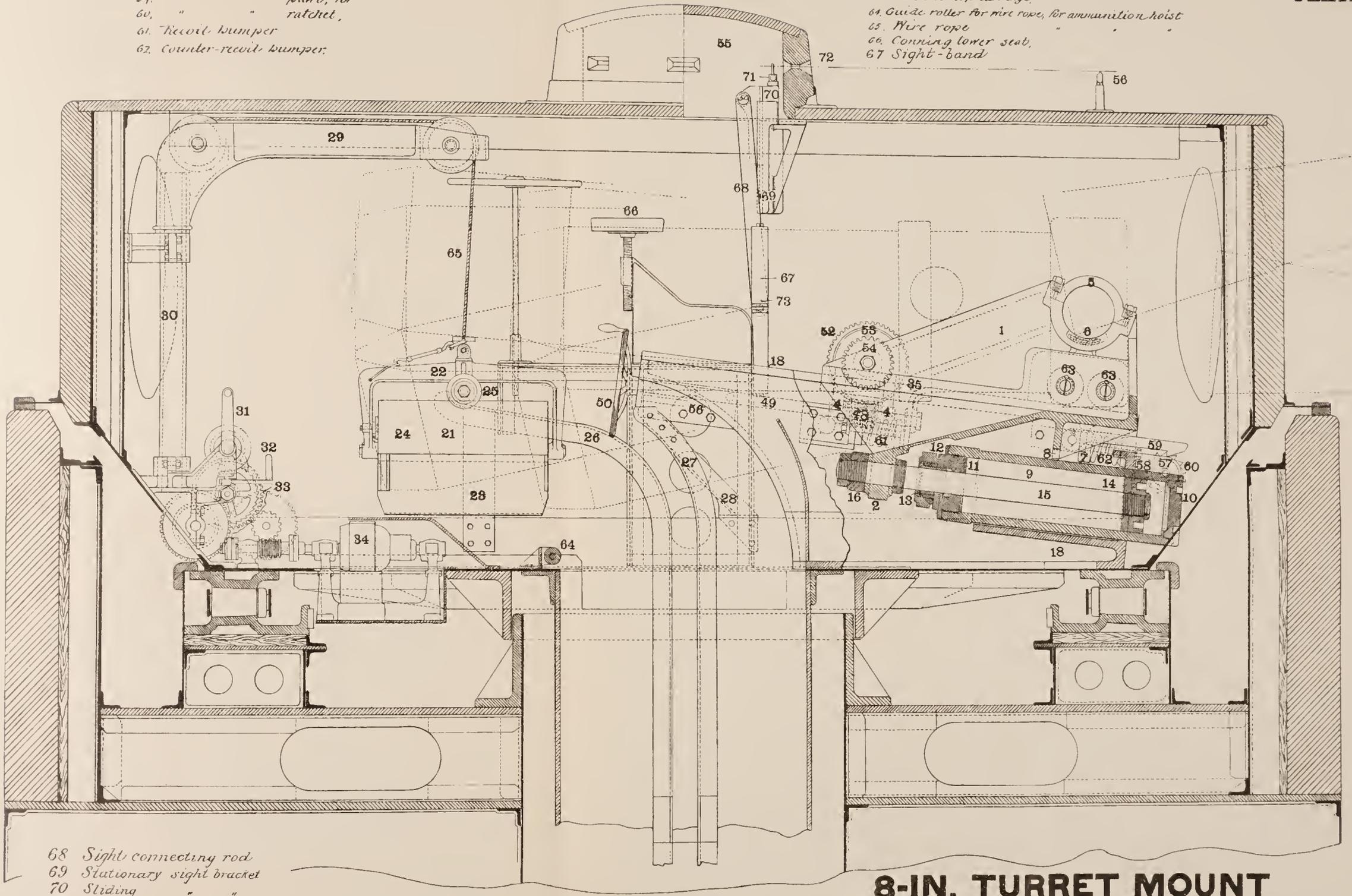


- 21. Transmission Car
- 22. " " Soke
- 23. " " Projectile cylinder
- 24. " " " Powder "
- 25. " " Roller bearing
- 26. Rear guide to ammunition hoist
- 27. Front " " "
- 28. Brace to front guide
- 29. Smoothing crank
- 30. " " " port tube.
- 31. Ammunition hoist. Hand power crank
- 32. " " " Friction brake lever.
- 33. " " " Lower gear.
- 34. " " " Electric motor.



- 57. Cone Compressor
- 58. " " bearing for
- 59. " " part, for
- 60. " " ratchet,
- 61. Recoil bumper
- 62. Counter-recoil bumper.

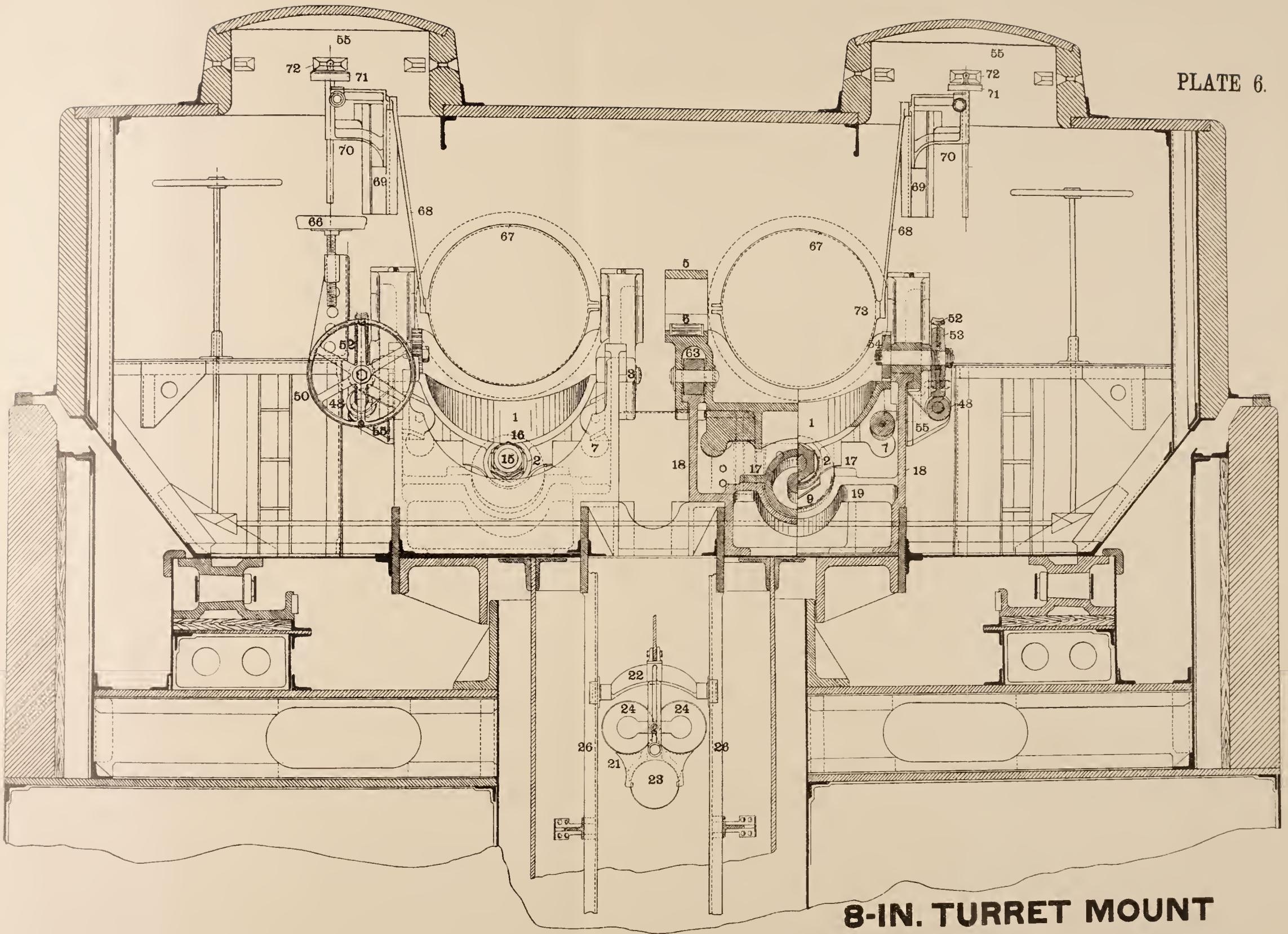
- 63. Rollers for top carriage.
- 64. Guide roller for wire rope, for ammunition hoist
- 65. Wire rope
- 66. Conning lower seat,
- 67. Sight-band



- 68. Sight connecting rod
- 69. Stationary sight bracket
- 70. Sliding " "
- 71. Sight head
- 72. " hole
- 73. Lower connecting-rod pin

**8-IN. TURRET MOUNT**  
**NEW YORK and OLYMPIA**

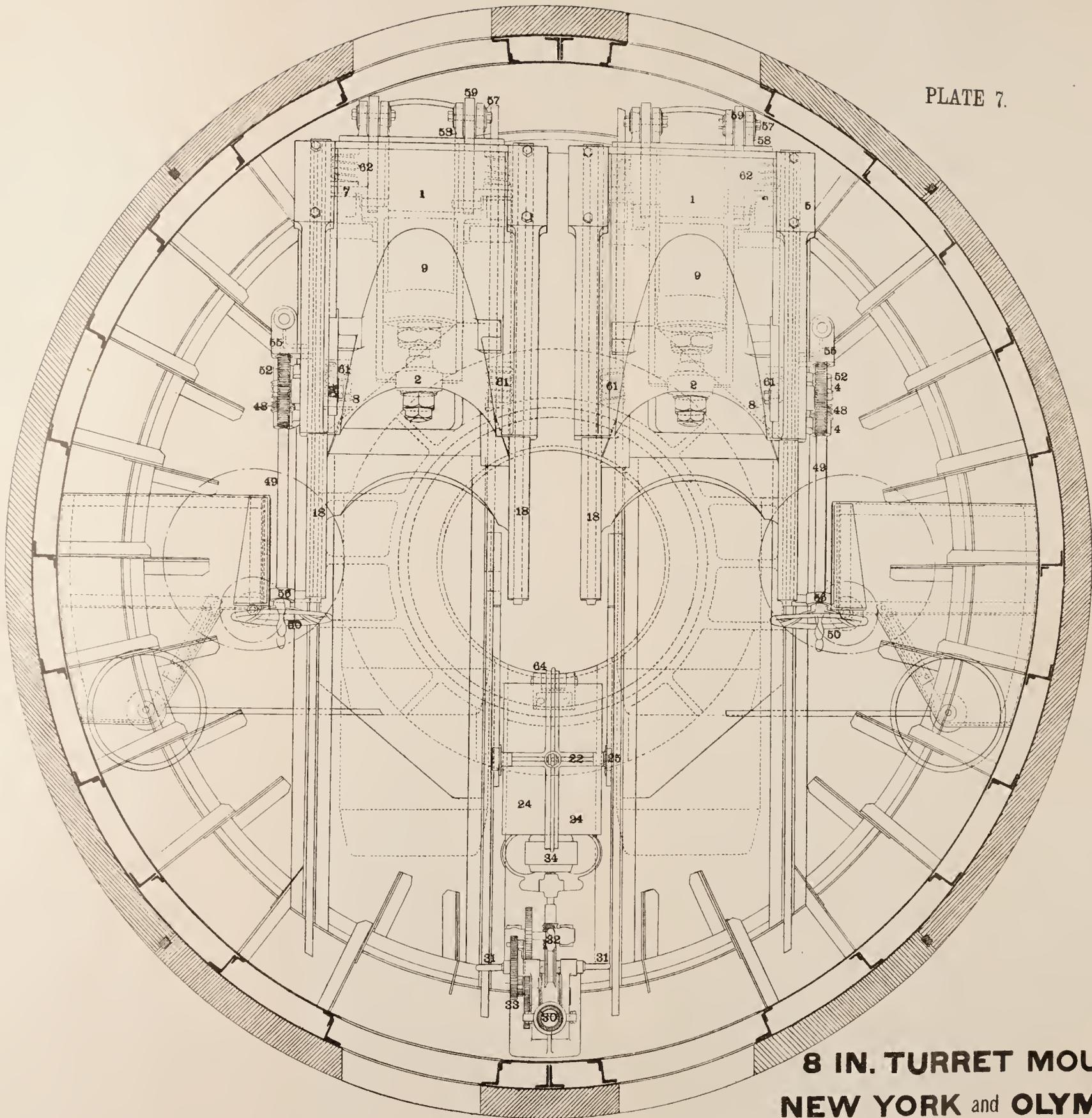




**8-IN. TURRET MOUNT**  
**NEW YORK and OLYMPIA**



PLATE 7.



**8 IN. TURRET MOUNT**  
**NEW YORK and OLYMPIA**



## 10-INCH TURRET MOUNT, MARK II.

This type of hydraulic mount has been constructed for the 10-inch and 12-inch guns of the *Monterey*, *Amphitrite*, *Monadnock*, and *Puritan*, and 13 inch guns of the *Indiana*, *Massachusetts*, and *Oregon*. The principal parts of Mark II 10-inch mount (which corresponds to the Mark I 12-inch mount) are as follows:

Gun and saddle, Plate I.	Elevator, Plate v.
Recoil cylinder, Plate II.	Rammer, Plate VI.
Slide, Plate III.	Ammunition hoist, Plate VII.
Deck lugs, Plate IV.	General views, Plates VIII, IX, X.

The saddle, Plate I (fig. 2), is a bronze casting to which the gun is secured by front and rear straps (figs. 6 and 7), and which is fitted to the rails of the slide by clips (figs. 4 and 5, Plate I).

This saddle is connected by a heavy lug (fig. 3) to the recoil piston and recoils with the gun. The gun is kept from turning in its saddle by a key on its under side, which is also let into a recess in the saddle. Steel clips (fig. 4) on the outer edge of the front end of the saddle and bronze gibs (fig. 5) on the inner side engage the flanges of the slide rails and hold the gun and saddle down.

The recoil cylinder, Plate II (fig. 11), is a steel casting bolted to the rear end of the slide, midway between its rails. It has three rifled grooves, widest at the front end, for the passage of the fluid. These grooves gradually decrease in width until they close at a point near the rear end of the cylinder. (The 12-inch mount has five grooves.)

The piston rod is packed by a stuffing box of the ordinary type. On the under side of the front end of the cylinder are three openings for the escape into the overflow chamber of the fluid during recoil. These openings are closed by spring valves (fig. 17). There is also an opening in the rear end, on the under side (fig. 14), connecting with the pressure pipe of the hydraulic pump. A check valve is placed in this opening, which closes when the gun is fired.

The piston rod (fig. 20) and head are of cast or forged steel, the rod being partly bored out for lightness. The piston head is not packed, but fits the cylinder neatly with a small clearance. On the front end of the rod is a heavy nut for attaching it to the saddle.

The slide, Plate III (fig. 24), is a large steel casting, pivoted on its front end (fig. 25) to the deck lugs (fig. 28, Plate IV). Its upper rails are planed to fit the saddle, which, with the gun, rests upon them.

The deck lugs, Plate IV (fig. 28), are heavy steel castings bolted to the floor and girders (fig. 27) of the turret, to which the slide is pivoted by the pivot bolts (fig. 32). It supports a collar or water section (fig. 29), which connects the main pressure pipe with the rear end of the recoil cylinder to supply water to run the gun out.

The elevator, Plate V (fig. 33), is a steel casting suspended from the turret girders beneath the rear end of the slide. It has a piston (fig. 34) packed with leather, and a connecting rod (fig. 35), by means of which the rear end of the slide is raised or lowered. Water is admitted to or released from the cylinder by means of a valve (fig. 36). The levers for working this valve (fig. 37) are in the sighting tower.

The hydraulic rammer, Plate VI (fig. 40), is a bronze telescopic water motor, placed on brackets (fig. 42) and supported by a transom (fig. 43) in rear of the gun. The axis of the rammer is in the prolongation of the axis of the gun when at the loading angle ( $10^{\circ}$  elevation). The rammer is supported on trunnions (fig. 44), through which it receives and discharges its fluid, and upon which it is turned to a vertical position when the gun is fired. Water is admitted to and released from the rammer by means of an ordinary piston valve (fig. 45), worked by a hand lever (fig. 46).

The ammunition hoist, Plate VII (fig. 48), consists of a bronze casting forming three cylinders, which carry the charge, the lower one being for the projectile and the upper ones each carrying one-half the powder charge.

The loading tray is carried on top of the upper cylinder. The car runs on guides (fig. 54) from the handling room to the breech of the gun. The ammunition-hoist motor (fig. 49) is of bronze, and consists of a hydraulic piston, with three sheaves at its end, working in a cylinder, also fitted at its closed end with three sheaves. A wire rope is rove around the sheaves through an overhead block (fig. 56) at the turret roof and to the car; the other end is made fast to the cylinder. The running out of the piston causes a quick movement to the ammunition car. In the handling room is a small car and turntable (fig. 57), upon which the projectile is landed from a shell carrier and overhead trolleys. From this turntable the shell is pushed into the cylinder of the ammunition car.

Referring to Plates II and VIII it will be seen that when the gun is run out and in position to be fired the piston rod is drawn out of the recoil cylinder to its full length, and the latter would consequently be full of water, as the pump must be in operation and the cylinder and system filled before the gun can be fired. The pumps are to be kept in operation during the firing. The walls of the recoil cylinder being cut with rifled grooves, the pump pressure is exerted on both sides of the piston, and the fluid would escape through the three spring valves (fig. 17) at the front end of the cylinder were the springs not set up sufficiently to resist the pump pressure, which is expected to be maintained at 600 pounds per square inch.

Water is admitted to the recoil cylinder only at the rear end, through the aperture (fig. 14), and can escape only at the front end, as there is a check valve in the supply pipe (fig. 14), which closes when recoil takes place; otherwise the pipes or pump would be burst by the violent and sudden pressure due to recoil. When the gun is fired the piston rod is driven into the recoil cylinder, and consequently must displace a quantity of water equal to the volume of the entering piston rod. The fluid thus displaced escapes by the spring valves (fig. 17) into the overflow chamber (fig. 21), and thence by a flexible hose attached to the opening (fig. 22) to the exhaust or waste pipe, and back to the tank.

Recoil is taken up by the restriction of the fluid in passing from the pressure to the reverse side of the piston by means of the grooves in the cylinder, and while the spring valves are on the reverse side the tension on the springs does, in a manner, affect the recoil, and if they are set up too tightly the length of recoil will be reduced. These springs should be set up so that the valves will be tight under the normal pressure of 600 pounds per square inch and no more. Care should be taken to see that the valves have a lift of not less than three-fourths inch, as this is necessary to give a proper valve opening for the escape of the water when the gun is fired.

When recoil takes place the check valve in the pressure pipe closes, but as soon as the gun is at rest pressure is admitted to the cylinder and its action on the rear face of the piston returns the gun to battery. The effective area for doing this work is the area of the piston rod.

If it be desired to run the gun in for any purpose, it is necessary to close the valve (fig. 66) in the pressure pipe, thus cutting off the pump; bring the gun to the loading position and raise the central spring valve (fig. 18), when the gun will run in by gravity. To run the gun out again set up the relief valve (fig. 18) and open the valve in the pressure pipe (fig. 66). If it be desired to raise the breech of the gun the valve admitting pressure to the elevator (the one toward the muzzle of the gun) must be raised, when the elevator piston will at once rise. To lower the breech, close the valve which admits pressure and raise the other, when the gun and slide will fall by gravity. The upward movement of the elevator piston is finally checked by a ring screwed into the upper part of the elevator cylinder. In raising the breech above the level water should be admitted to the elevator cylinder very slowly in order that the elevator piston will not strike the ring in the cylinder with a blow.

The motors for the ammunition hoists, elevators, and the hydraulic rammers have leather cup packing and balanced piston valves, and should have the water let on daily in order to keep the packing from becoming dry. Should the spring valves at the front end of the recoil cylinder leak very considerably, no ill effect would result, provided the cylinder were kept full, as the leakage would simply run into the exhaust pipe and back to the tank. The spring valves should be tight under the ordinary pressure of 600 pounds per square inch. By uncoupling the flexible hose when the pump is in operation it can be readily ascertained whether the valves are leaking.

In loading, the gun is brought to an angle of  $10^\circ$ . To facilitate this, under the ordinary conditions of firing, a bronze casting is attached to the top of the elevator upon which the slide will rest when at that angle. If a greater elevation than  $10^\circ$  is necessary the casting can be removed and the slide held in place by the locking bolts (fig. 30) at the loading position. The gun being in the loading position, that is, at an angle of  $10^\circ$  elevation, and run out on the slide, the breech is opened, the rammer turned down from the natural to the loading position, and clamped to its transom.

The charge and projectile having been placed in the hoist in the handling room below, it is run up by the hoisting motor until the plug tray is in line with the screw box of the gun, when it is placed in position for loading. The car is then raised till the cylinder carrying the projectile is fair with the bore. In so doing the car should be permitted to raise a few inches above and then should be lowered, when it will land on stops on the guides and will not go lower. The rammer may then be operated and the projectile driven home. It is necessary that the car should rest on the stops referred to, as the rammer, having great power, would probably do some injury were it to strike the car.

After the projectile is rammed home the rammer is withdrawn, the car slightly raised to free the pawls and then lowered to the proper position for loading, first one-half and then the other of the powder charge, there being stops at proper intervals on the guides to support it. The car, having received the loading tray, is lowered to the handling room, the rammer is turned up to a vertical position, breech plug closed, and the gun is ready to be laid at any angle and fired.

Each motor has its pressure and exhaust pipes connecting with the main pressure and exhaust pipes, and each is supplied with a valve, by means of which any one may be shut off if necessary. There is also a valve on each side of the main pressure pipe, by means of which the whole of either mount may be cut off if desirable.

A small bristle sponge with a staff of convenient length is most suitable for cleaning out the chamber, a scraper being sometimes required to clean the compression slope. For cleaning the bore a sponge head with a lanyard at each end is found more convenient than one with a long staff. The bore does not require cleaning until after firing is over. Should the projectile fail to stick in its seat, a rope yarn tied around it in front of the band will probably overcome the difficulty; but the power of the rammer is sufficient ordinarily to drive it in with such force as to make it remain in its seat.





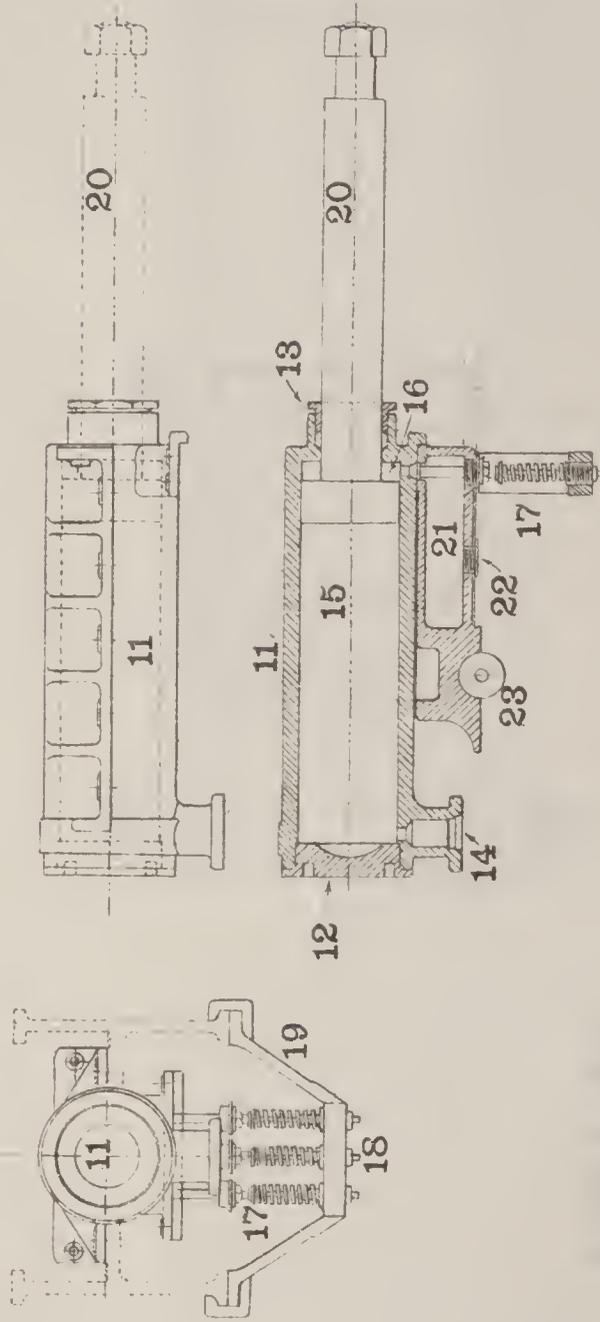
# PLATE 2

## RECOIL CYLINDER

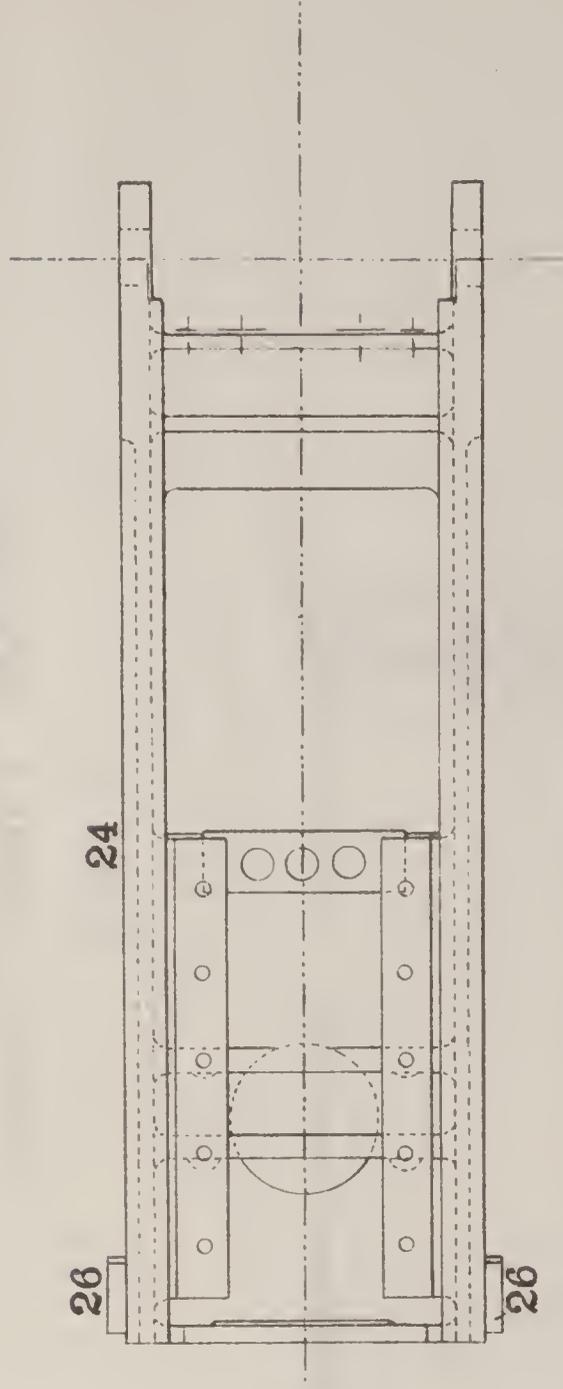
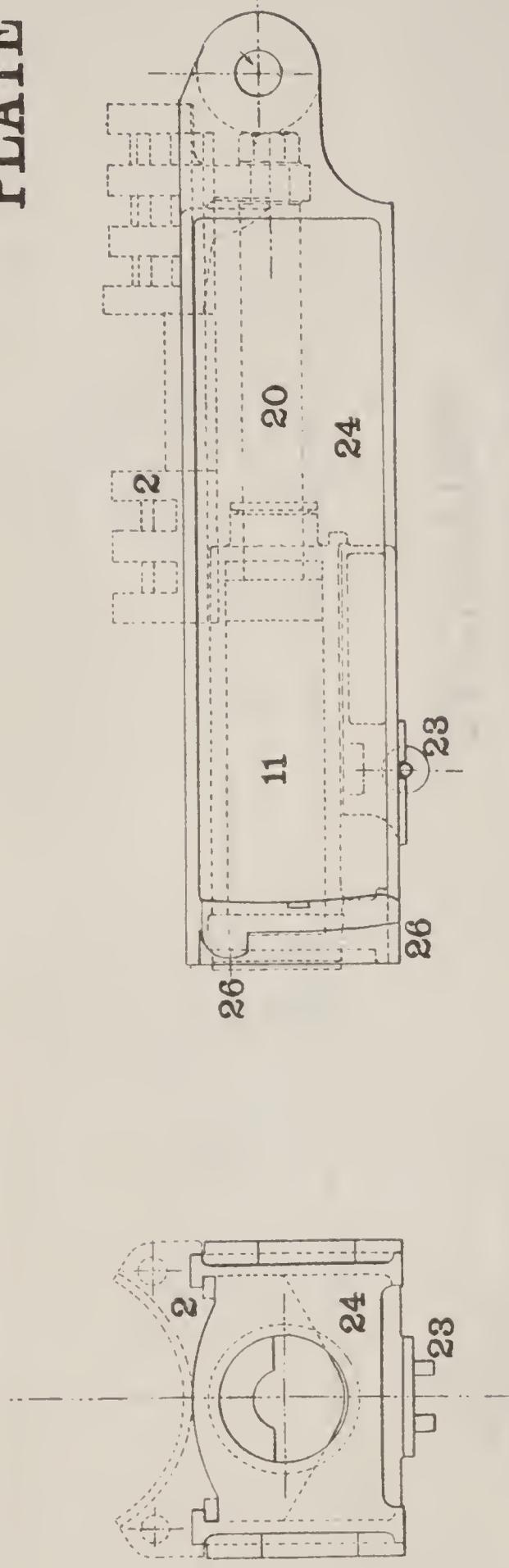
### 10-inch TURRET MOUNT

Mark II.

- 11. Recoil Cylinder
- 12. Rear Bonnet
- 13. Stuffing Box and gland
- 14. Opening for pump pressure and check valve
- 15. Pressure side
- 16. Reverse side
- 17. Spring valve.
- 18. Relief valve (centre one)
- 19. Yoke
- 20. Piston rod, head and nut.
- 21. Over-Flow chamber
- 22. Connection for waste pipe
- 23. Lug for elevator connecting rod





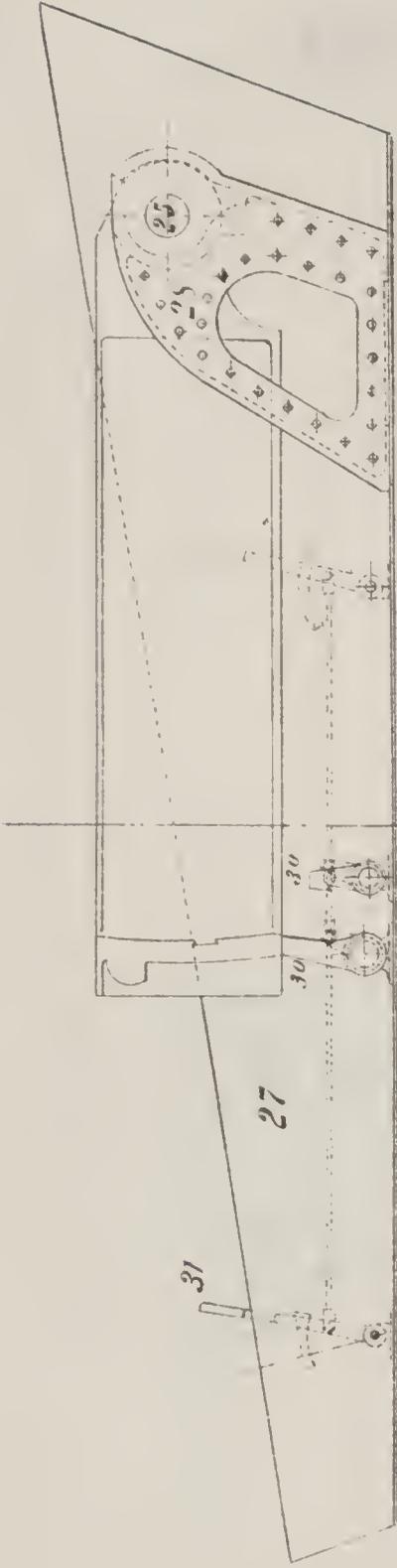


- 24. Slide.
- 25. Holes for pivot bolts.
- 26. Stop piece.

SLIDE,  
10-inch TURRET MOUNT

Mark II.



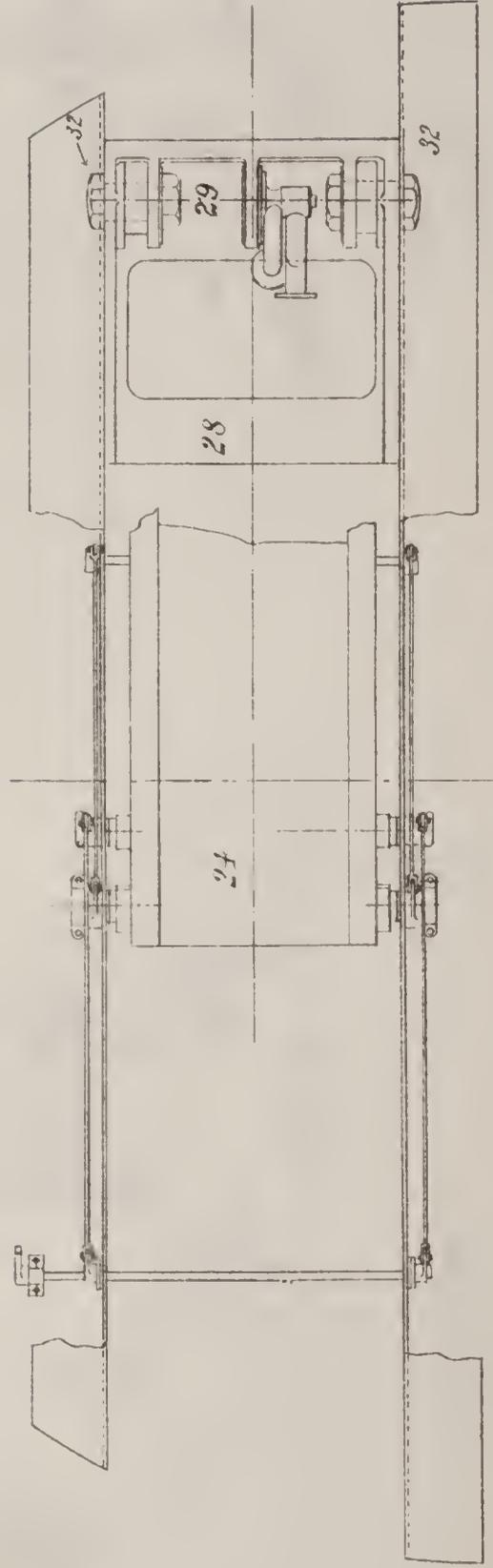


- 27 Turret girders
- 28 Deck lugs
- 29 Collar for pressure-pipe.
- 30 Locking lugs
- 31 ..... levers
- 32 Pivot bolts

## DECK LUGS

### 10-inch TURRET MOUNT

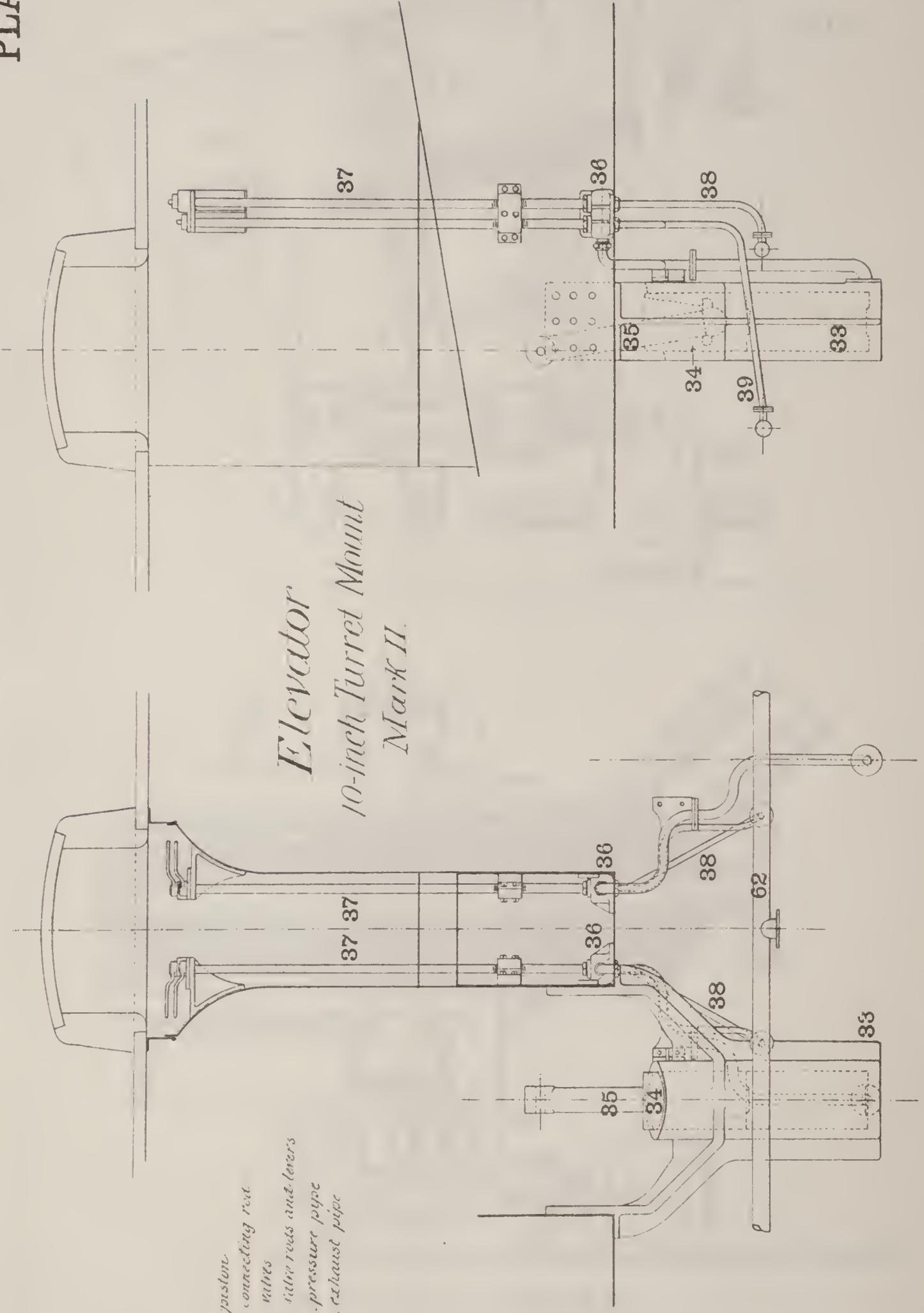
Mark II.



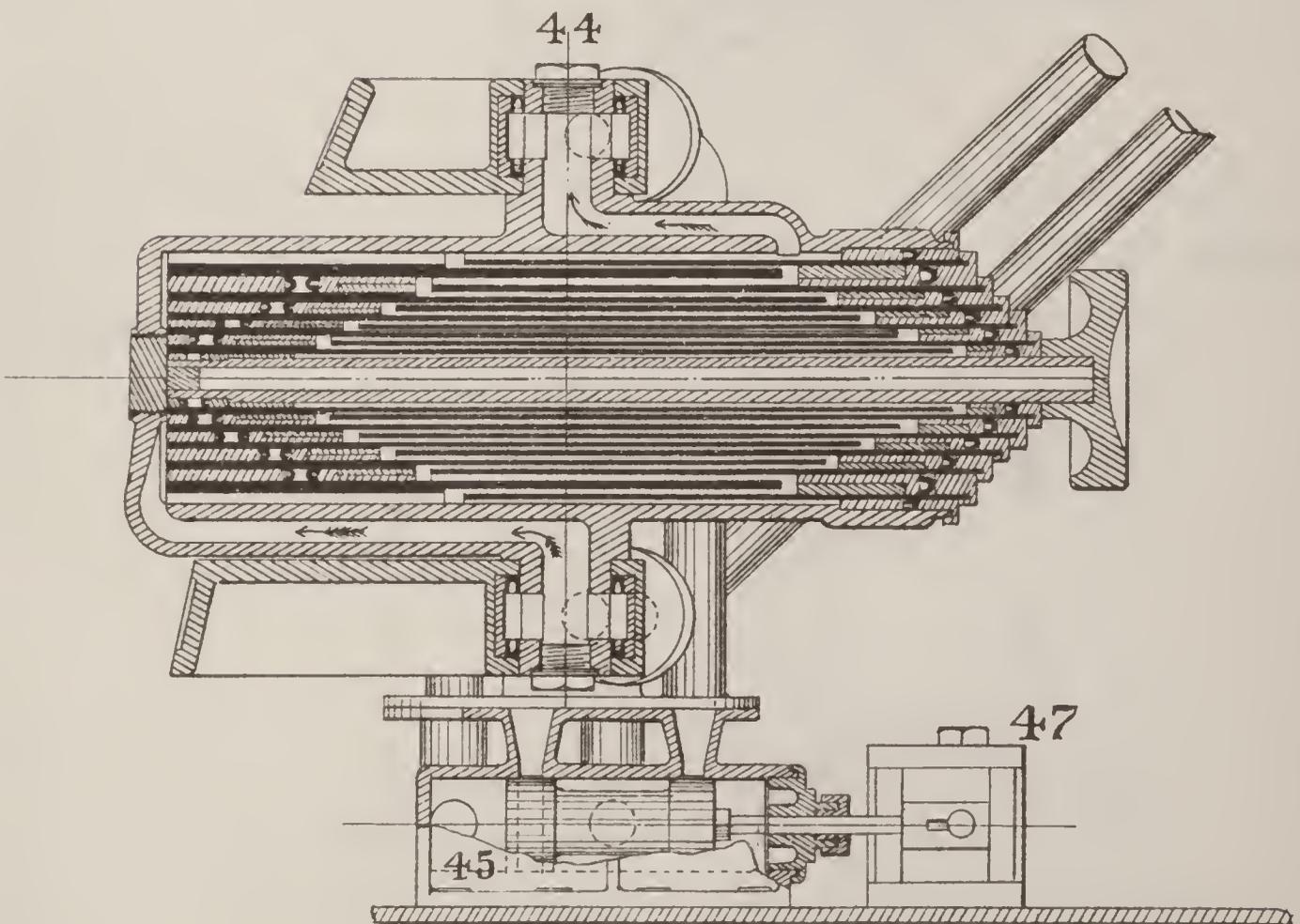
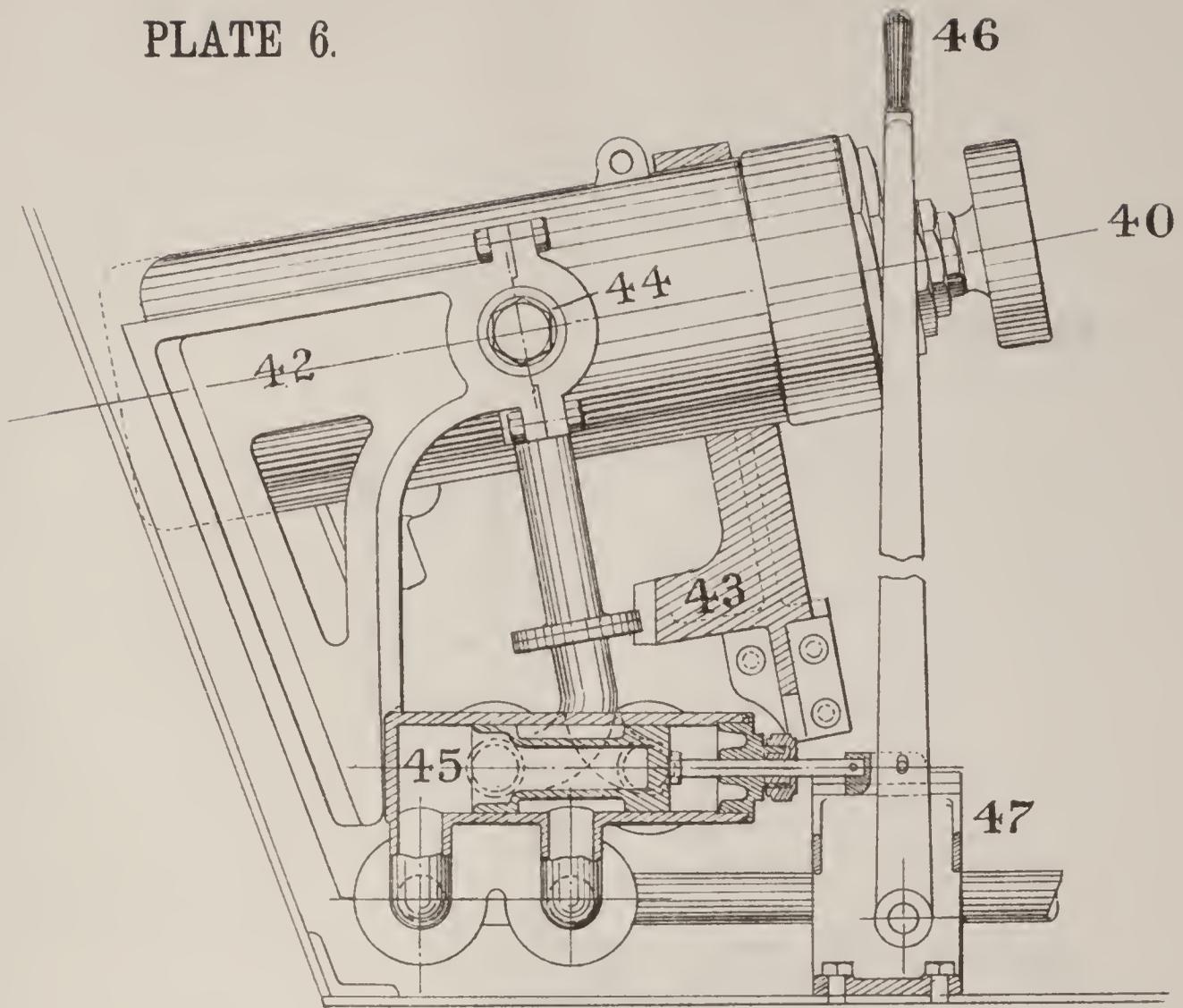


*Elevator  
10-inch Turret Mount  
Mark II.*

- 33. . . . Elevator
- 34. . . . piston
- 35. . . . connecting rod
- 36. . . . nuts
- 37. . . . drive rods and levers
- 38. . . . pressure pipe
- 39. . . . exhaust pipe



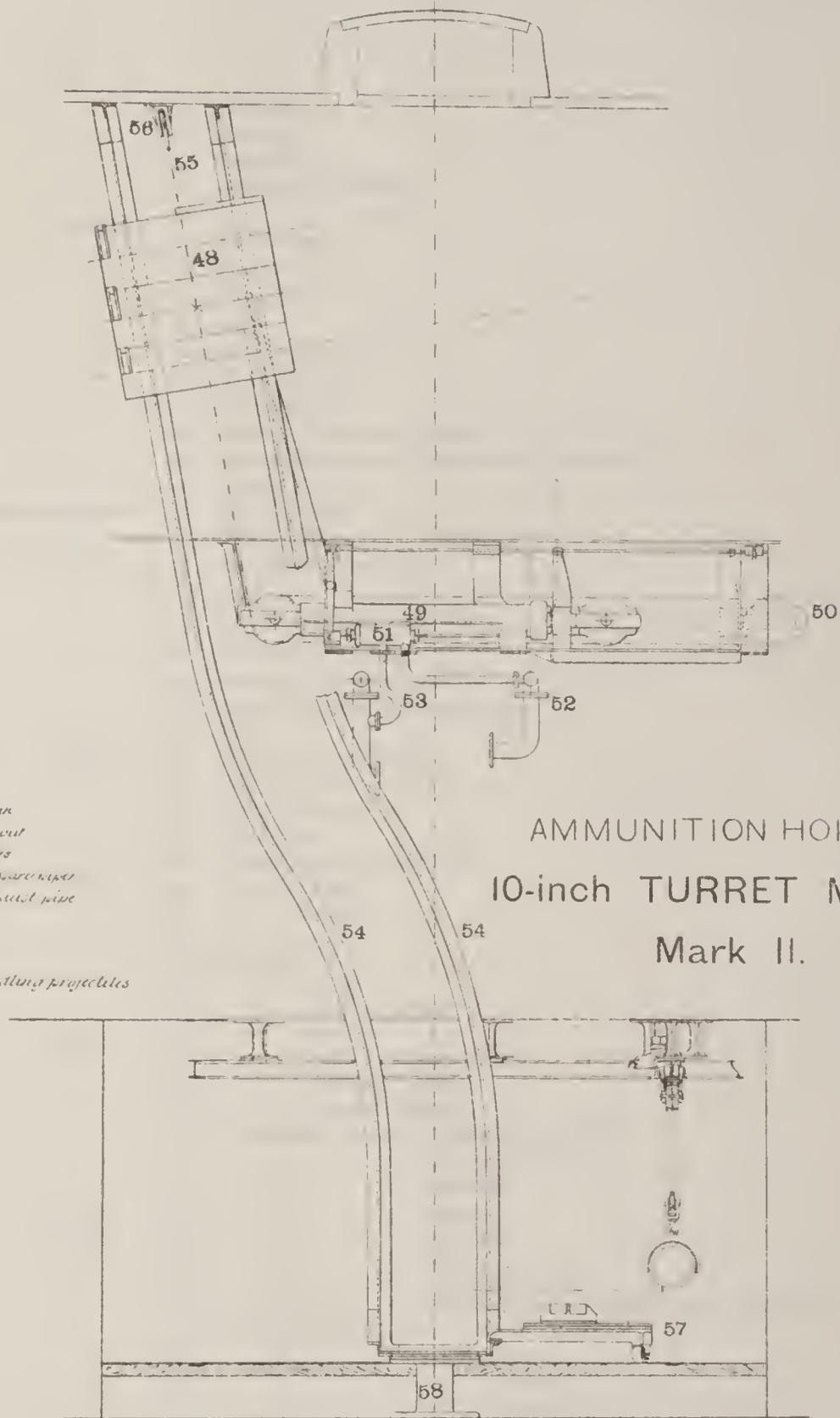




HYDRAULIC RAMMER  
10-inch TURRET MOUNT  
Mark II.



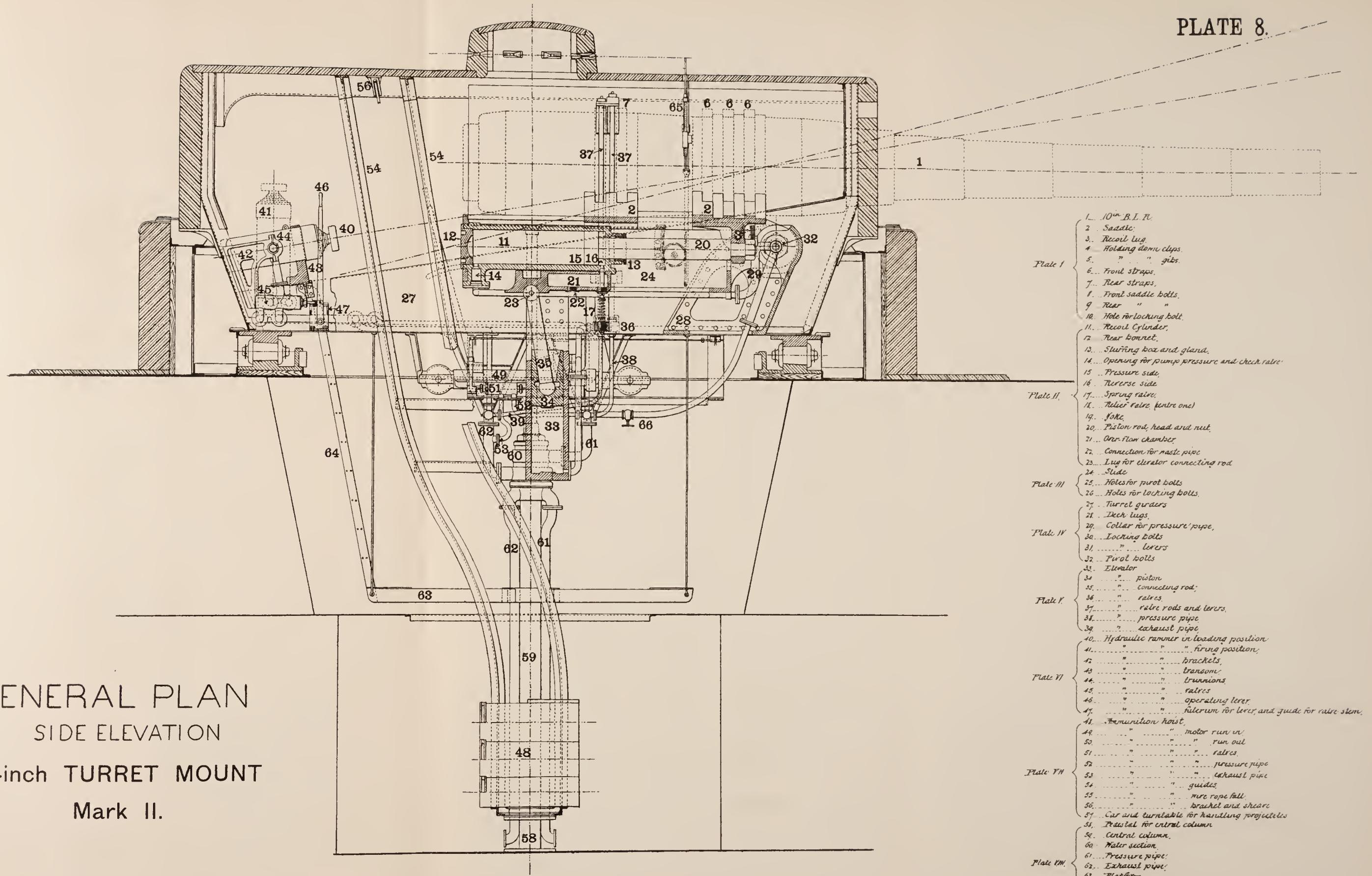
PLATE 7.



- 48. Ammunition hoist
- 49. " " motor, run in
- 50. " " " run out
- 51. " " " valves
- 52. " " " pressure pipe
- 53. " " " exhaust pipe
- 54. " " " guides
- 55. " " " wire fall
- 56. Bracket and sheave
- 57. Car and turntable for handling projectiles

AMMUNITION HOIST  
 10-inch TURRET MOUNT  
 Mark II.



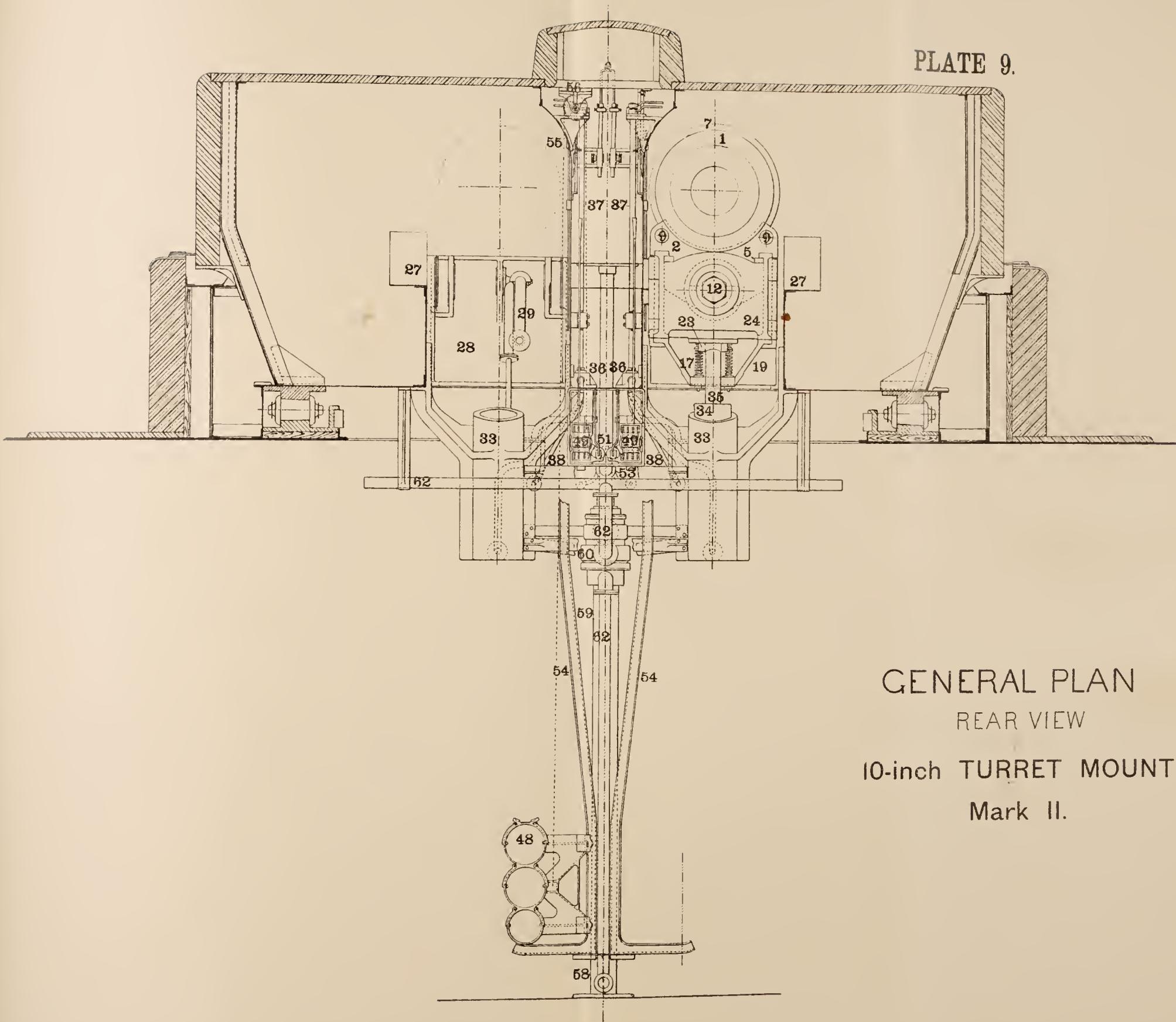


GENERAL PLAN  
SIDE ELEVATION  
10-inch TURRET MOUNT  
Mark II.

- 1. 10" B.L.V.
- 2. Saddle.
- 3. Recoil lug.
- 4. Holding down clips.
- 5. " " gibs.
- 6. Front straps.
- 7. Rear straps.
- 8. Front saddle bolts.
- 9. Rear " "
- 10. Hole for locking bolt.
- 11. Recoil Cylinder.
- 12. Rear bonnet.
- 13. Sluicing box and gland.
- 14. Opening for pump pressure and check valve.
- 15. Pressure side.
- 16. Reverse side.
- 17. Spring valve.
- 18. Relief valve, (first one)
- 19. Yoke.
- 20. Piston rod, head and nut.
- 21. One-flan chamber.
- 22. Connection for waste pipe.
- 23. Lug for elevator connecting rod.
- 24. Slide.
- 25. Holes for pivot bolts.
- 26. Holes for locking bolts.
- 27. Turret guides.
- 28. Deck lugs.
- 29. Collar for pressure pipe.
- 30. Locking Bolts.
- 31. " " levers.
- 32. Pivot bolts.
- 33. Elevator.
- 34. " piston.
- 35. " connecting rod.
- 36. " valves.
- 37. " valve rods and levers.
- 38. " pressure pipe.
- 39. " exhaust pipe.
- 40. Hydraulic rammer in loading position.
- 41. " firing position.
- 42. " brackets.
- 43. " transom.
- 44. " brunnions.
- 45. " valves.
- 46. " operating lever.
- 47. " fillerum for lever, and guide for valve stem.
- 48. Ammunition hoist.
- 49. " motor run in.
- 50. " run out.
- 51. " valves.
- 52. " pressure pipe.
- 53. " exhaust pipe.
- 54. " guides.
- 55. " wire rope fall.
- 56. " bracket and sheave.
- 57. Car and turntable for handling projectiles.
- 58. Pedestal for central column.
- 59. Central column.
- 60. Water section.
- 61. Pressure pipe.
- 62. Exhaust pipe.
- 63. Platform.
- 64. Ladder to turret.
- 65. Sights.



PLATE 9.

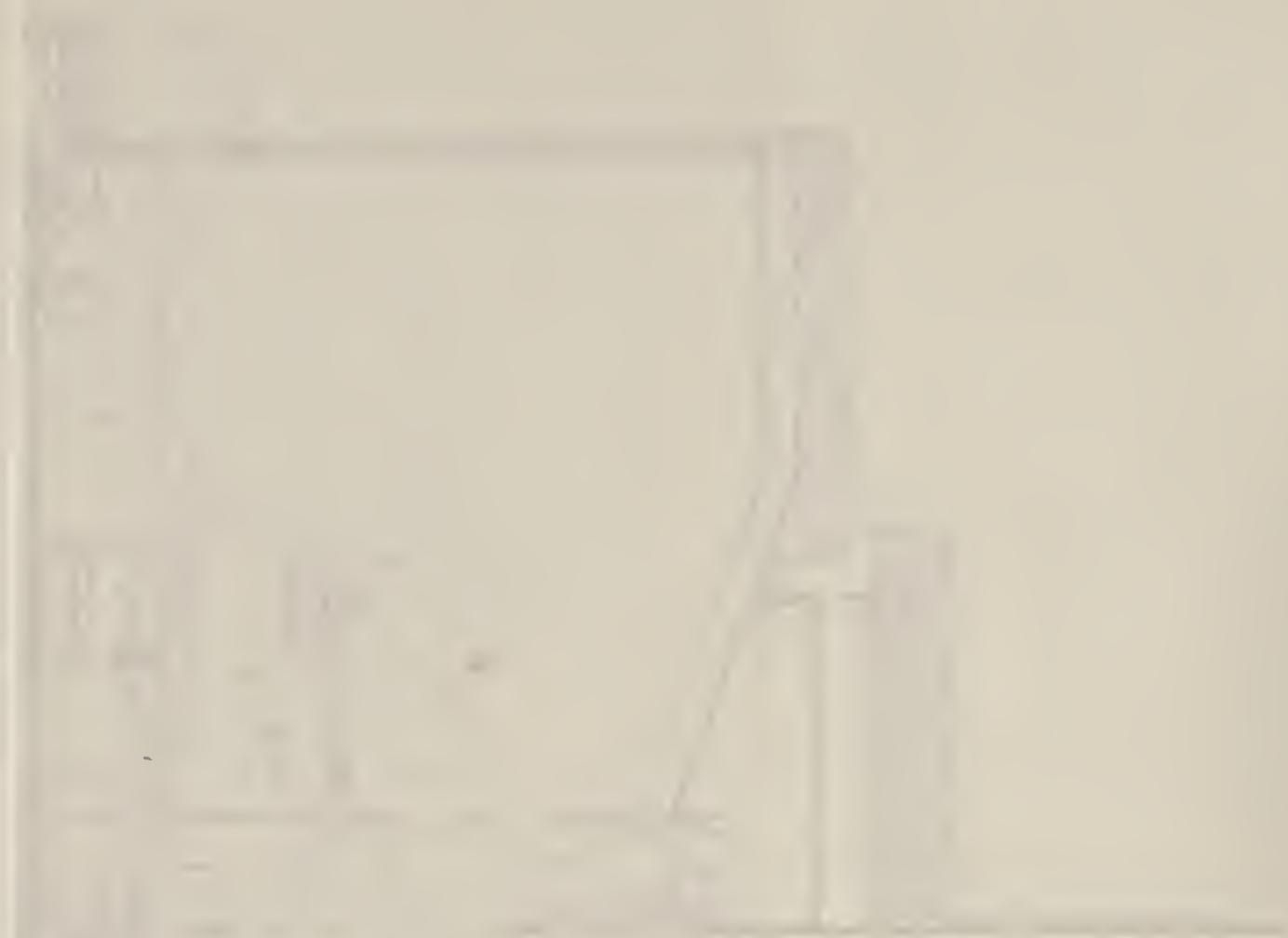


GENERAL PLAN

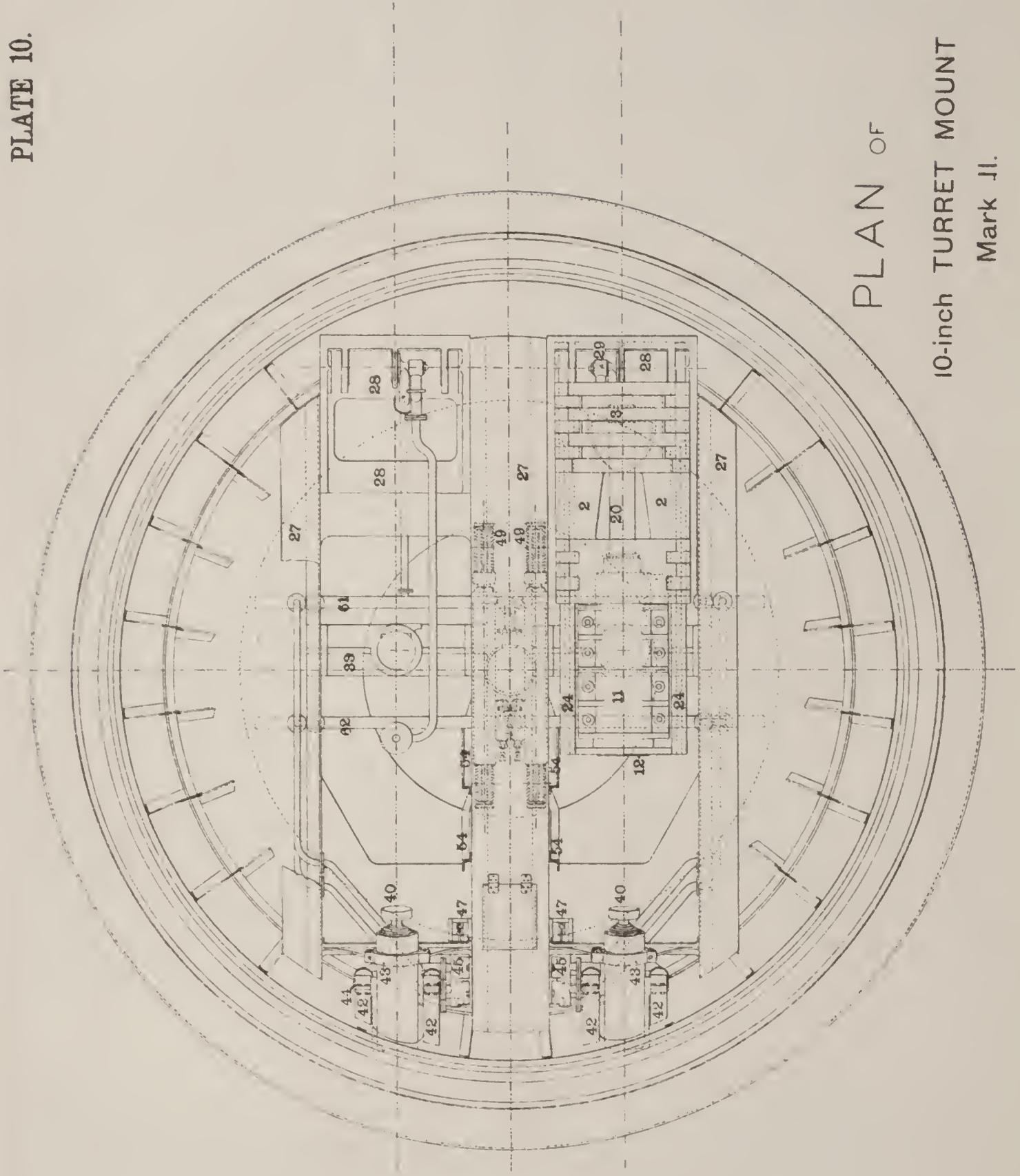
REAR VIEW

10-inch TURRET MOUNT

Mark II.



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PLAN OF

10-inch TURRET MOUNT

Mark II.



## 10-INCH TURRET MOUNT, MARK III.

This type of mount has been adopted for the 10-inch guns of the *Maine* and the 12-inch guns of the *Texas*. In the case of the *Texas* they are distinguished as 12-inch mounts, Mark II.

This type of mount differs from the 10-inch Mark II and 12-inch Mark I in the method of checking the recoil and returning the gun to battery. Here the recoil is controlled entirely by a piston working in a closed cylinder rifled with the ordinary form of groove. The gun is returned to battery by means of pistons working in auxiliary cylinders.

The principal parts of this mount are the following:

Gun and saddle, Plate I.	Gun-working motor, Plate VI.
Recoil cylinder, Plate II.	Rammer, Plate VII.
Slide, Plate III.	Ammunition hoists, Plate VIII.
Deck lugs and turret girders, Plate IV.	Arrangement of sights, Plate IX.
Elevator, Plate V.	General views, Plate X, XI, XII.

## THE SADDLE, PLATE I.

Fig. 2 is a bronze casting fitted to the slide rails, and to which the gun is secured by the front and rear straps (figs. 6 and 7). It has on its under side, at the rear end, a heavy lug (fig. 3), to which the recoil piston rod (fig. 18) is attached; also two smaller lugs at the front end (fig. 10), to which the piston rods of the gun-working motors (fig. 40) are secured. The saddle is held to the slide by steel clips (fig. 4) and bronze gibs (fig. 5) to prevent its rising when the gun is fired.

The gun is held out to battery by means of the spring holding out device (Plate XIII). The latch *d* hooks to the bolt *a* when the gun is out, the former having a certain amount of vertical motion about *e* that permits it to slide up and engage the hook at the end of the bolt. The spring *h* is set up by the piston *c* to a tension sufficient to hold the gun out when at maximum elevation. When the gun is fired, the bolt is drawn out against the pressure of the spring and the latch slides up on the inclined jaws *f* and is released. To prevent the bolt from recoiling too rapidly after releasing, the cylinder *b* is filled with oil, which is permitted to flow from one side to the other through small holes cut in the piston.

## THE RECOIL CYLINDER, PLATE II.

The recoil cylinder (fig. 12) is of cast steel and is bolted by its flanges (fig. 20) to corresponding flanges (fig. 26) on the slide. It is located at the front end of the slide, midway between the rails, and has no connection whatever with the hydraulic system, being a closed receptacle filled with glycerin mixed with 20 per cent of fresh water.

Its piston rod (fig. 18), which is drawn out when recoil takes place or the gun is run in, is connected by the piston nut (fig. 21) to the recoil lug (fig. 3) on the saddle. Its front end is closed by a steel bonnet (fig. 22) and its rear end has an ordinary stuffing box and gland (fig. 14). The cylinder is rifled with three grooves, by means of which the fluid passes from one side of the piston head to the other. The piston

rod (fig. 18) is of forged steel. The piston head (fig. 17) is of cast steel and fits the cylinder neatly with a small clearance. When the recoil cylinder is filled the gun must be run entirely out on the slide, in order that the full volume of the piston rod may be in the cylinder. Filling and draining holes are provided; counter-recoil bumpers are attached to the lugs (fig. 19) on top of the cylinder.

#### THE SLIDE, PLATE III.

The slide (fig. 23) is of cast steel and pivots at its front end to the deck lugs (fig. 28) by means of pivot bolts (fig. 28½). The recoil cylinder is bolted to flanges on the slide (fig. 26). In the rear end of the slide there are two gun-working motors (fig. 39), one on each side, whose function is to run the gun in or out. The valve stems (fig. 41½) of these motors are attached to the same shaft and the valves (fig. 41) are simultaneously operated by a hand lever (fig. 43½). When this lever is thrown to the rear to run the gun out, the lever is held back by means of a catch (fig. 65), attached to which is a weight (fig. 64) to throw the lever (fig. 43½) forward, when the catch is released by the movement of the saddle as it approaches its final position when the gun is run out. There is also a striker on the rear end of the saddle, which brings up against the lever (fig. 43½) and throws it forward when the gun is run out, thus cutting off the pressure from the gun-working motors (fig. 39) and allowing the water in them to run back to the exhaust system.

In their normal position the gun-working motors have no pressure on them, and when the gun is fired it will remain in until the lever (fig. 43½) is thrown to the rear. When the lever is brought to the rear pressure is admitted to the motors and the gun is returned to battery.

Should it be desired to run the gun in, the elevator can be lowered and it will come in by gravity, but if desired to run in with the slide rails level a stop on the slide must be turned down and the lever (fig. 43½) thrown forward, when the gun-working motors will receive pressure from their front ends, and will run the gun in. Reversing the levers will run the gun out again.

#### DECK LUGS AND TURRET GIRDERS, PLATE IV.

The deck lugs (fig. 28) are of cast steel and are bolted to the turret floor and the girders (fig. 29).

#### THE ELEVATOR, PLATE V.

The elevator is of cast steel. The cylinder (fig. 32) has arms by means of which it is bolted to the turret girders. Its piston (fig. 33) is of cast steel and has a leather packing at its lower end. There is a bronze ring in the top of the cylinder to arrest the upward movement of the piston when the gun has reached its maximum depression.

There is a connecting rod (fig. 34) attached to lugs on the slide (fig. 27) which rests on the elevator piston and imparts movement to the slide when pressure is admitted. When the valves are opened for the escape of water from the elevator the breech end of the gun and slide fall by gravity. The levers (fig. 36) for operating the elevator are in the sighting tower (fig. 62) and the valves (fig. 35) are between the turret girders (fig. 29).

## THE GUN-WORKING MOTORS, PLATE VI.

The gun-working motors are of bronze. They have bronze piston rods and pistons (fig. 40) and are controlled by piston valves (fig. 41).

## THE RAMMER, PLATE VII,

is of the oscillating type (fig. 44), and must be thrown up vertically when not in use for loading the gun. When in position for use it is clamped to its transom (fig. 45). It receives and discharges its fluid through its trunnion (fig. 48½). The operating lever (fig. 48) has a stop to hold it when not in use in such a position that the pressure is on, but in the direction which keeps the sections closed. The valves (fig. 47) are of the piston type. The packing is cup-shaped and is of leather. Unless kept wet this packing is liable to leak when first put in use.

## AMMUNITION HOIST, PLATE VIII.

This is of the same type as in the Mark II mount, and the handling of ammunition and process of loading is the same as in the Mark II mount.

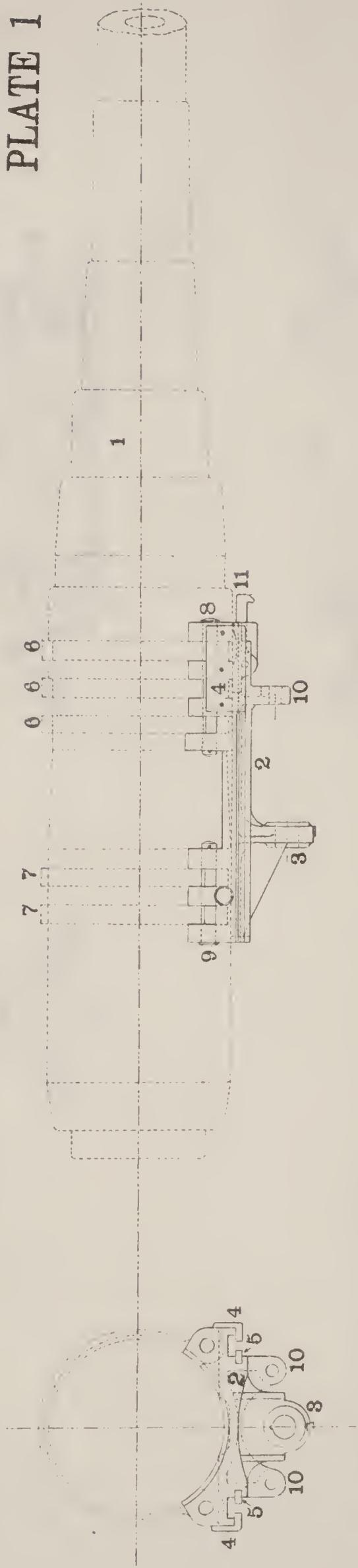
## LOADING SHOE.

To diminish the strain on the rammer and to facilitate loading by hand in case the rammer is disabled, a sliding tray is provided which keeps the shell centered as it slides along the chamber of the gun.

This tray or loading shoe, as it is called, is made of hard wood lined with sheet steel on its upper face, and is just thick enough to raise the axis of the shell up to the axis of the gun when in the chamber. On its rear end it carries the lug A, which has a vertical movement in a suitable guide and is kept up by the light spring B. The loading shoe is placed in the gun on the loading tray, and as the shell is rammed out of the carrier the nose forces the lug down and the body of the shell passes over it. On the rammer head is screwed a horseshoe-shaped piece of metal slightly thicker than the lug. This pushes against the base of the shell and allows the lug to spring up into place when the shell has passed over, and the rammer then presses against the shell and lug and forces shell and loading shoe along the bore. The chain C is made fast to the bell crank D, and is just long enough to allow the shoulder of the shell to enter the rifling, its rear end being fastened to the rear end of the gun-carriage slide. When the shell has reached this part of its travel the chain pulls down on the bell crank, allowing the rammer head to clear the lug and push the shell home. When the rammer is withdrawn the loading shoe is drawn out by means of the chain.



PLATE I



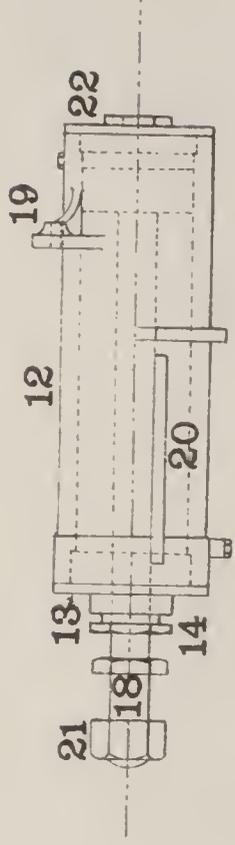
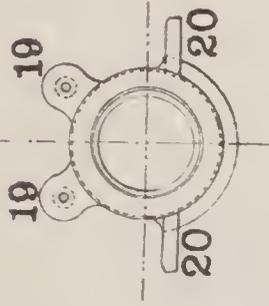
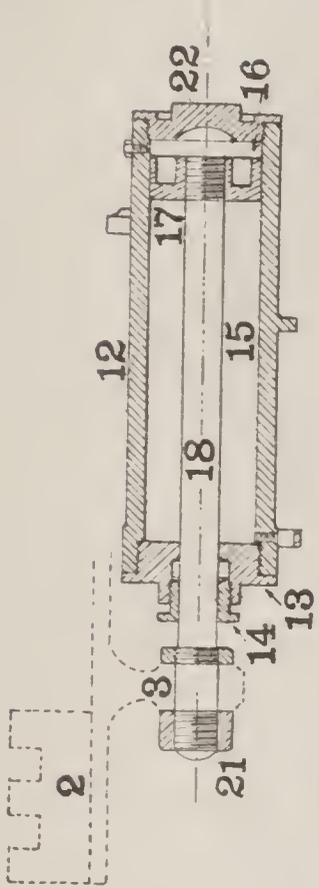
- 1. 10" B.L.R.
- 2. Saddle
- 3. Recoil Lug
- 4. Holding dome clips
- 5. " " gibs
- 6. Front Straps
- 7. Rear Straps
- 8. Front Saddle Bolts
- 9. Rear " "
- 10. Lugs for Gun Working Motors
- 11. Holding-out Latch

Saddle and Gun,

10-inch TURRET MOUNT

Mark III.





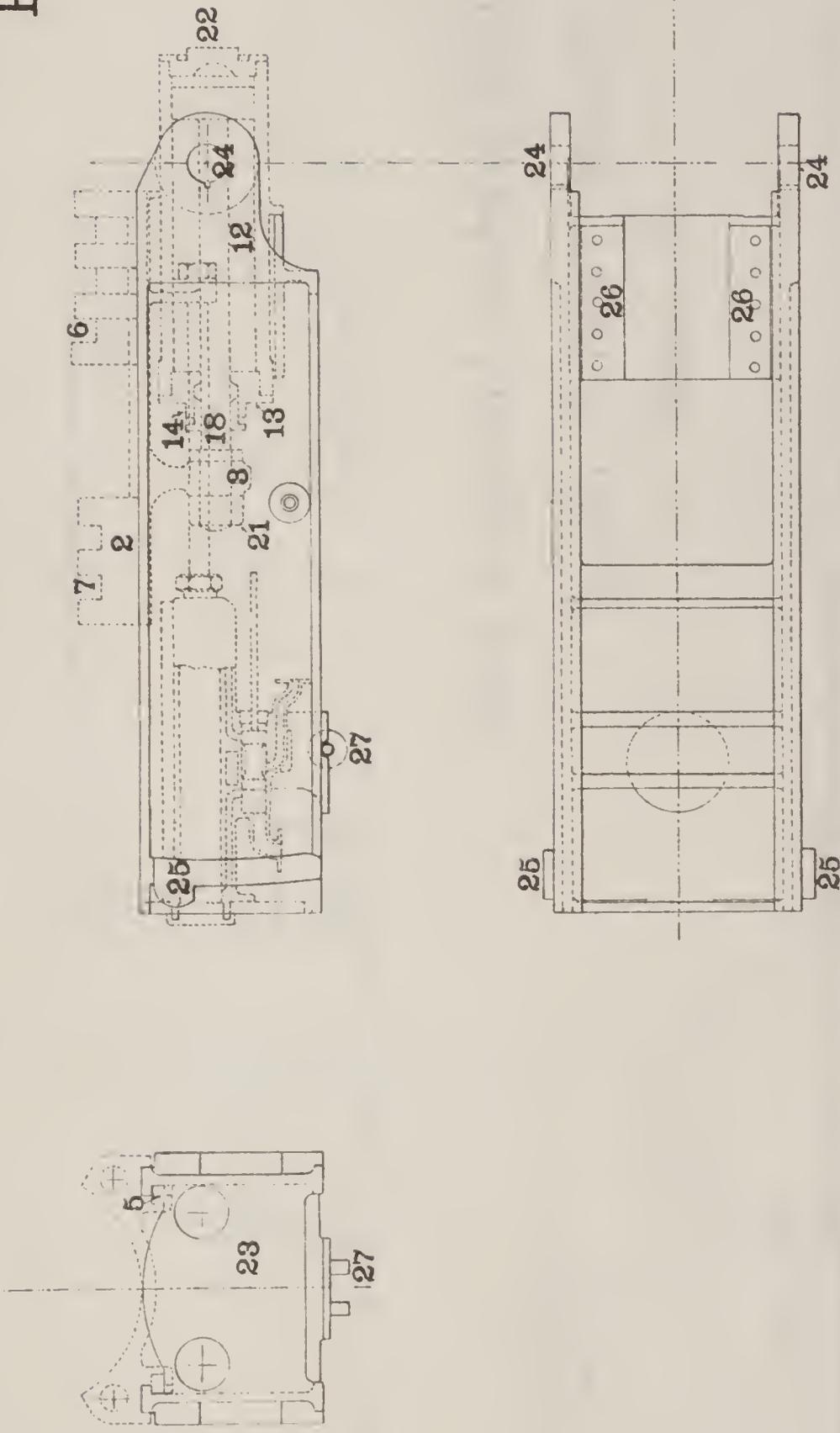
- 12. Recoil Cylinder
- 13. Rear Bonnet
- 14. Stuffing box and gland.
- 15. Pressure Side
- 16. Reverse "
- 17. Piston
- 18. Piston Rod.
- 19. Bumper plates
- 20. Flanges for securing to slide.
- 21. Piston Nut
- 22. Front Bonnet.

RECOIL CYLINDER  
10-inch TURRET MOUNT

Mark III.



# PLATE 3



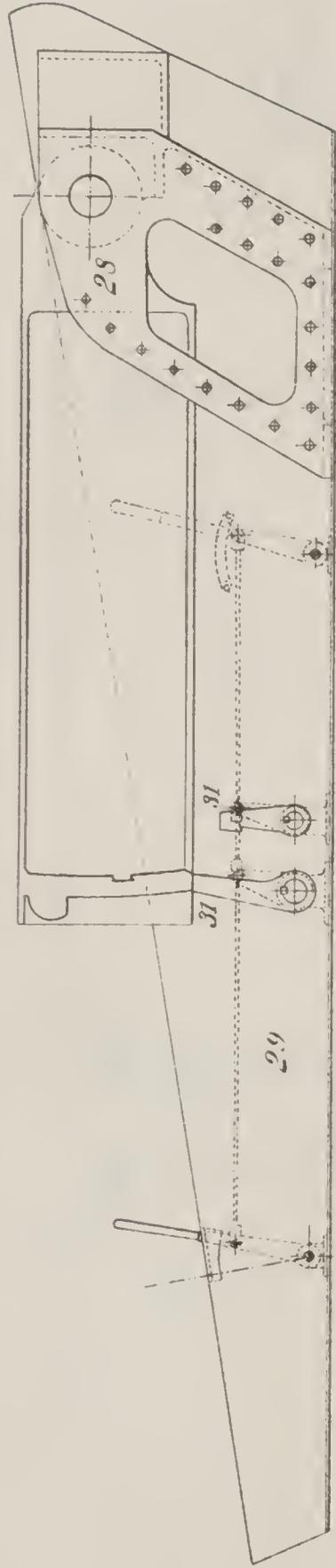
- 23. Slide
- 24. Holes for pivot bolts.
- 25. Stop piece
- 26. Flanges for securing recoil cylinder
- 27. Lugs for attaching elevator connecting rod.

## SLIDE

### 10-inch TURRET MOUNT

Mark III.

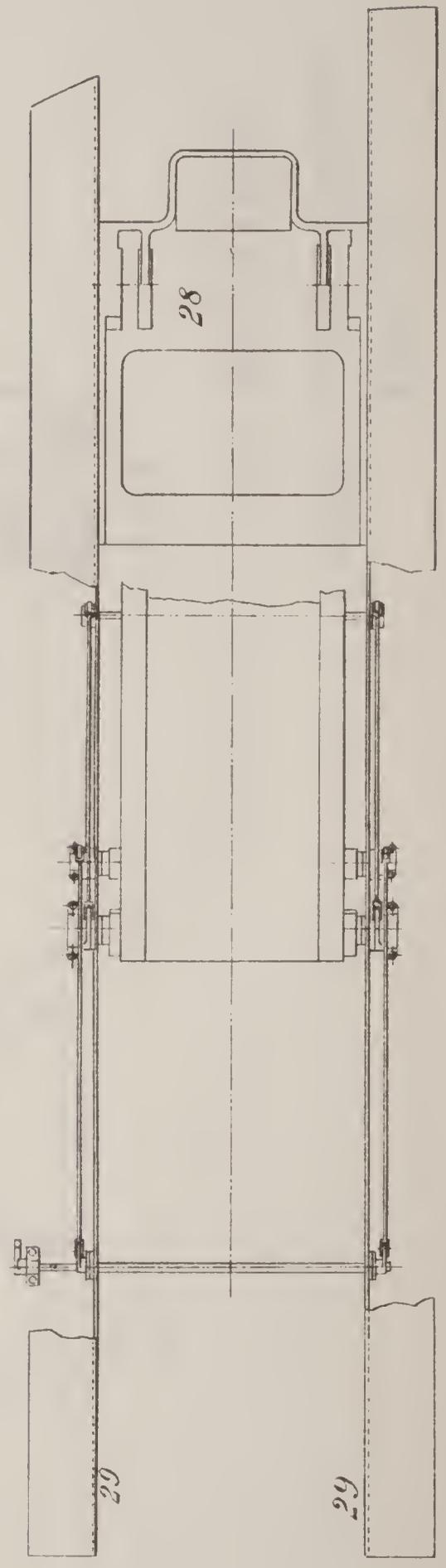




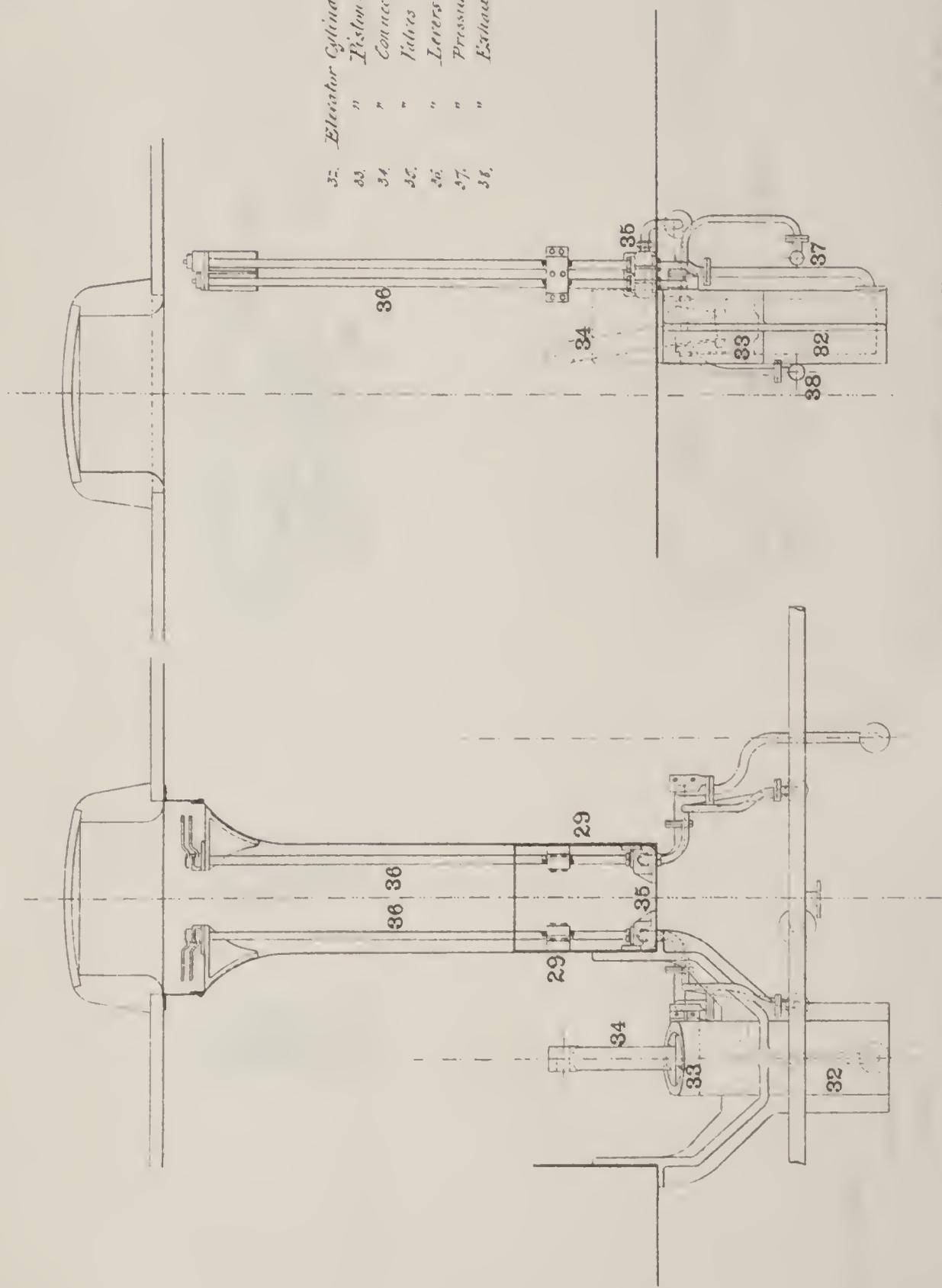
Deck Lugs and Locking-device,  
10-inch TURRET MOUNT

Mark III.

- 28 Deck Lugs
- 29 Turret Girders
- 31 Locking lugs







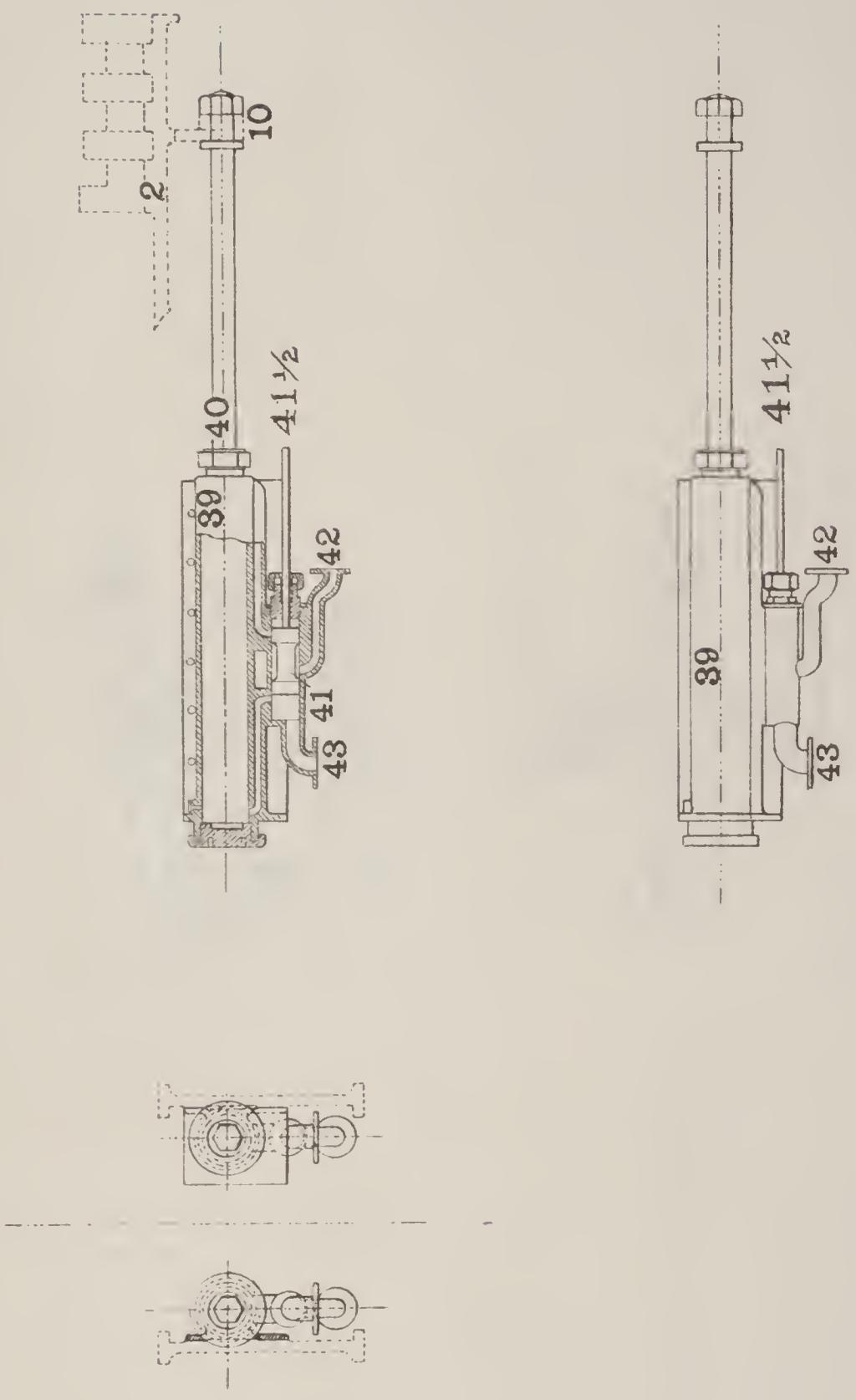
- 32. Elevator Cylinder
- 33. Piston
- 34. Connecting Rod
- 35. Levers
- 36. Shaft
- 37. Pressure Pipe
- 38. Exhaust Pipe

ELEVATOR

10-inch TURRET MOUNT

Mark III.



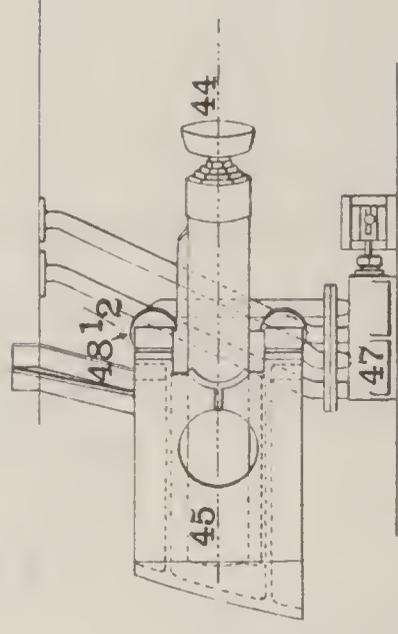
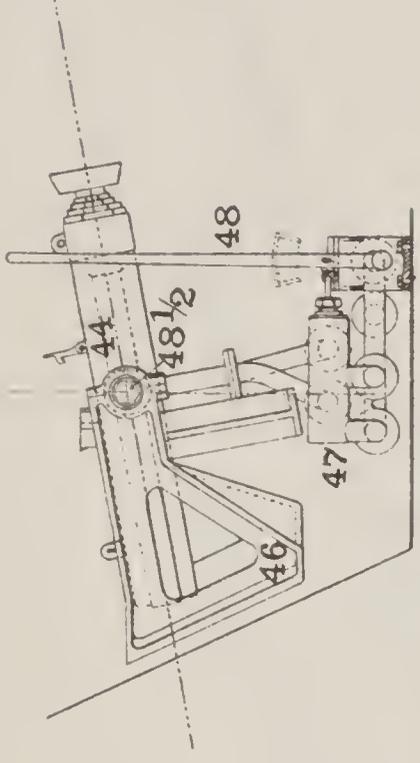


- 34. Gun Working Motor.
- 40. " " piston
- 41. " " valves.
- 42. " " pressure pipe.
- 43. " " exhaust pipe.
- 48 1/2. " " levers.

GUN-WORKING MOTOR  
10-inch TURRET MOUNT

Mark III.



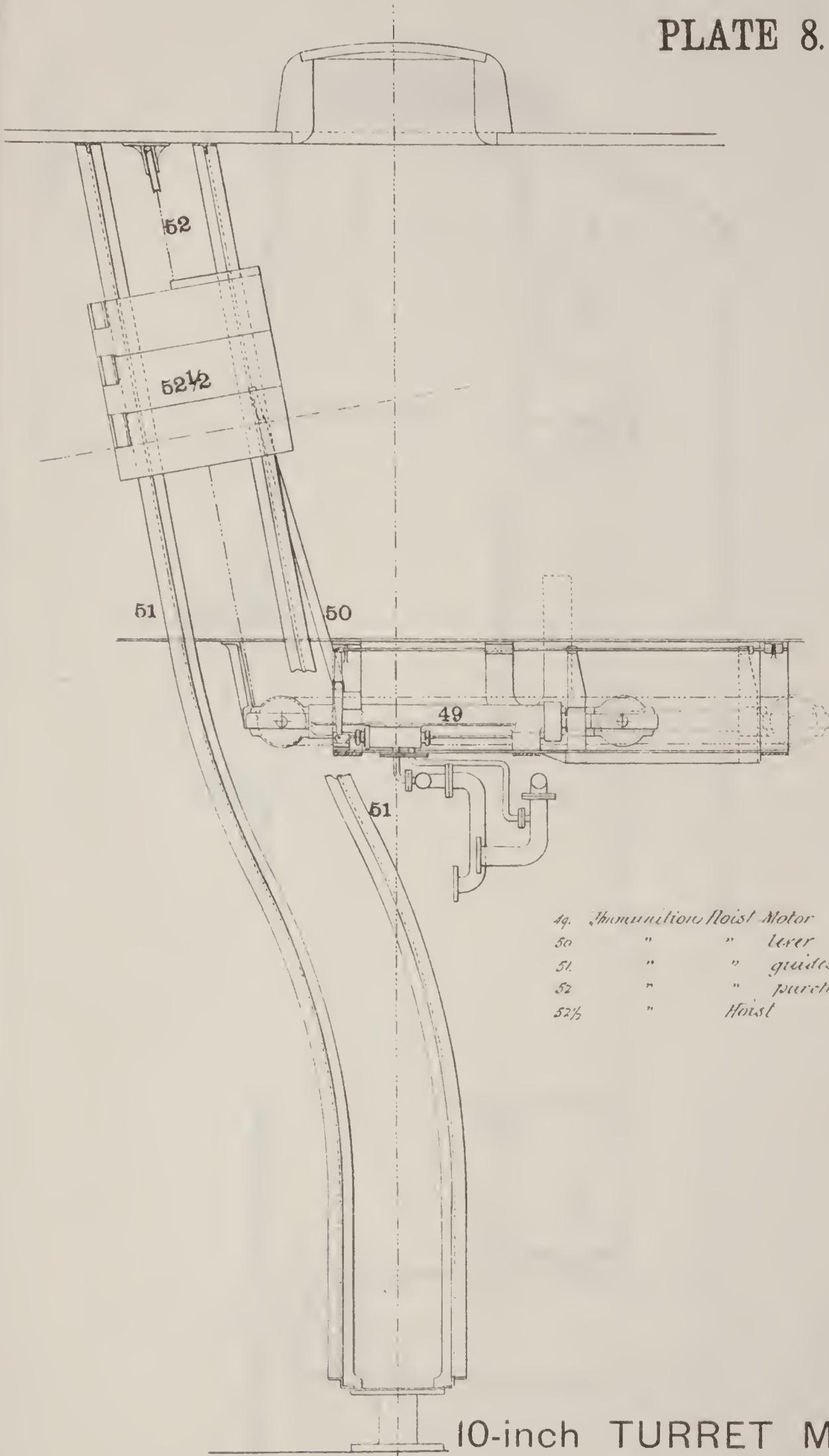


- 44 Rammer
- 45 " trusion
- 46 " brackets
- 47 " valves
- 48 " lever
- 48 1/2 " trunnions.

HYDRAULIC RAMMER  
 10-inch TURRET MOUNT  
 Mark III.



PLATE 8.



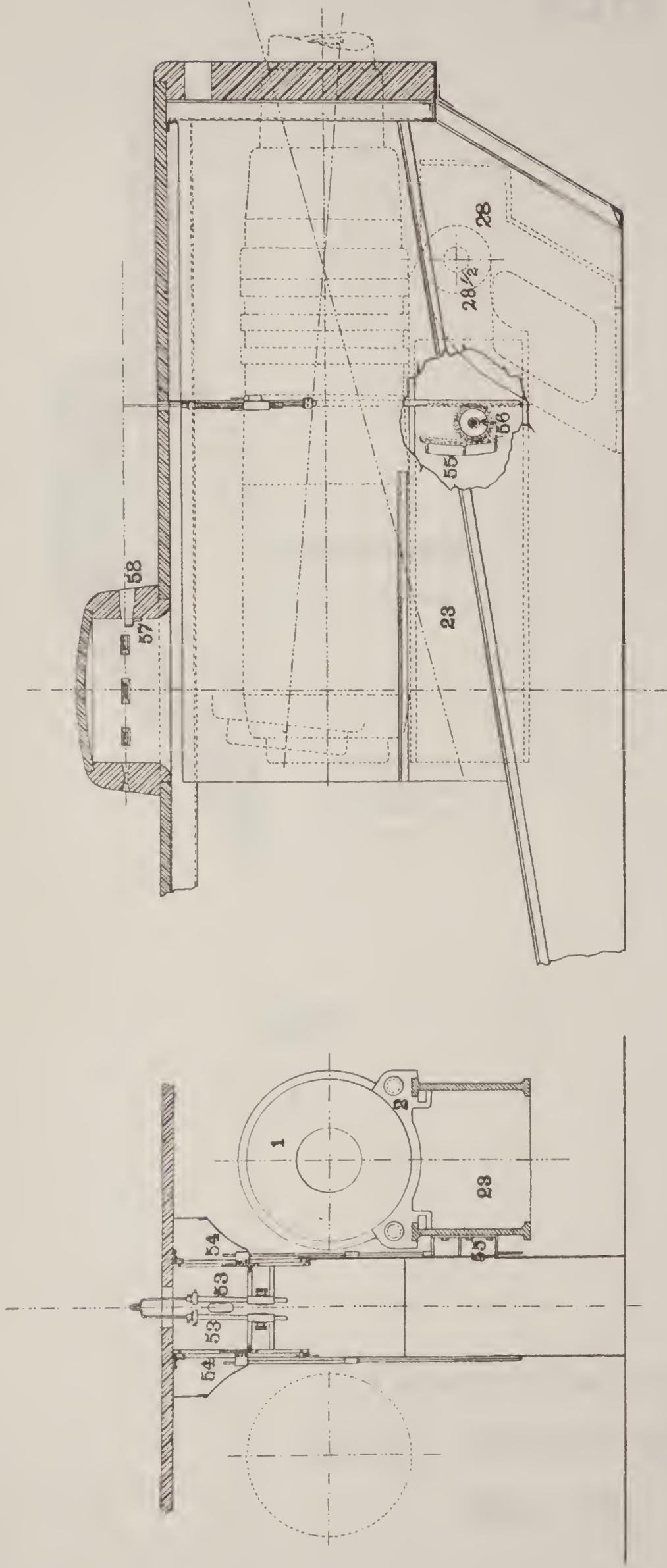
- 49. Ammunition Hoist Motor
- 50. " " lever
- 51. " " guides
- 52. " " purchase
- 52 1/2. " hoist

10-inch TURRET MOUNT

Mark III.

AMMUNITION HOIST.

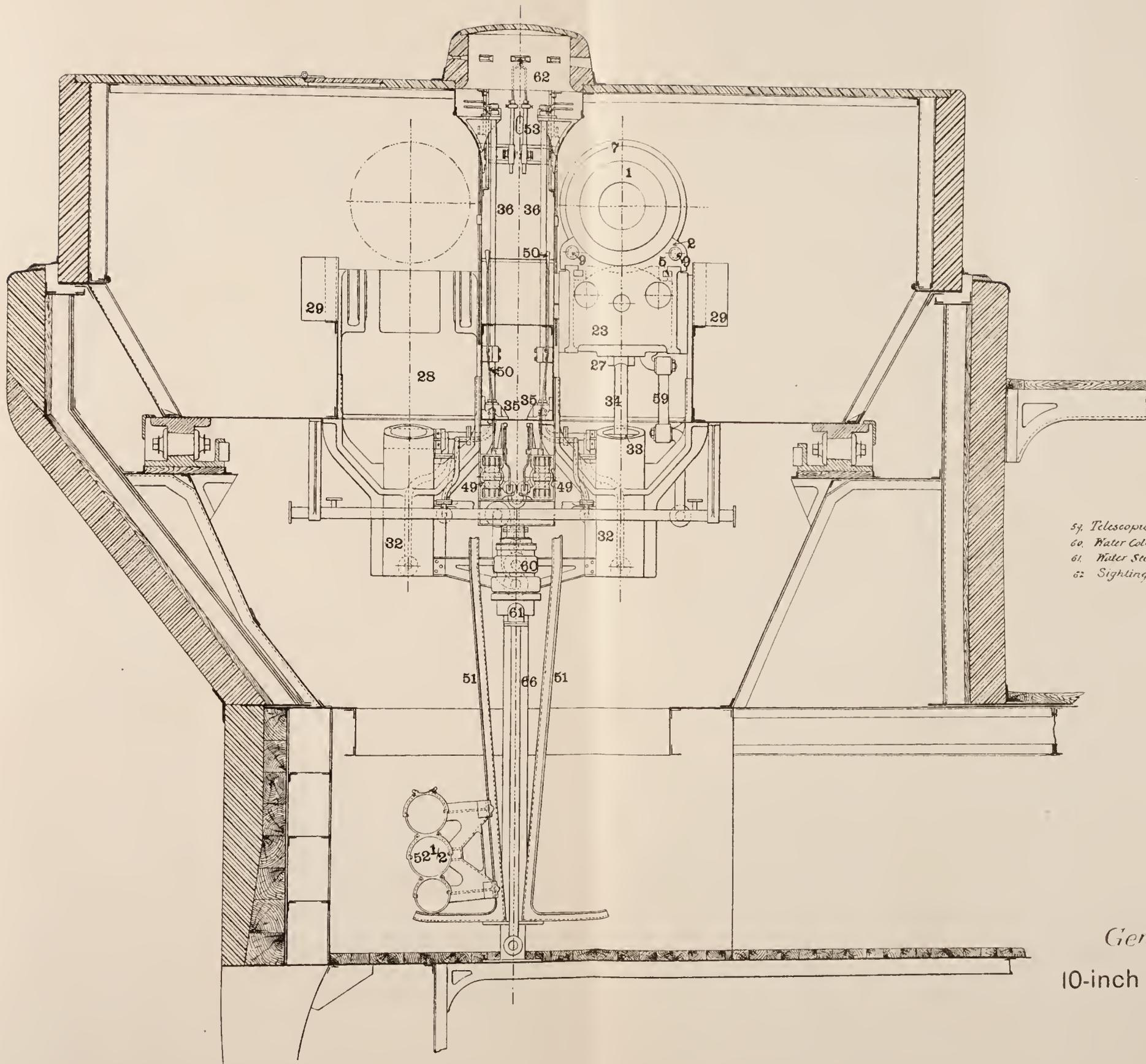




- 53 Sight bars
- 54 " " carrier
- 55 Track on slide for sights
- 56 Turret on bulkhead.
- 57 Sight in turret lomer
- 58 Sight hole in turret

SIGHTS  
 10-inch TURRET MOUNT  
 Mark III.



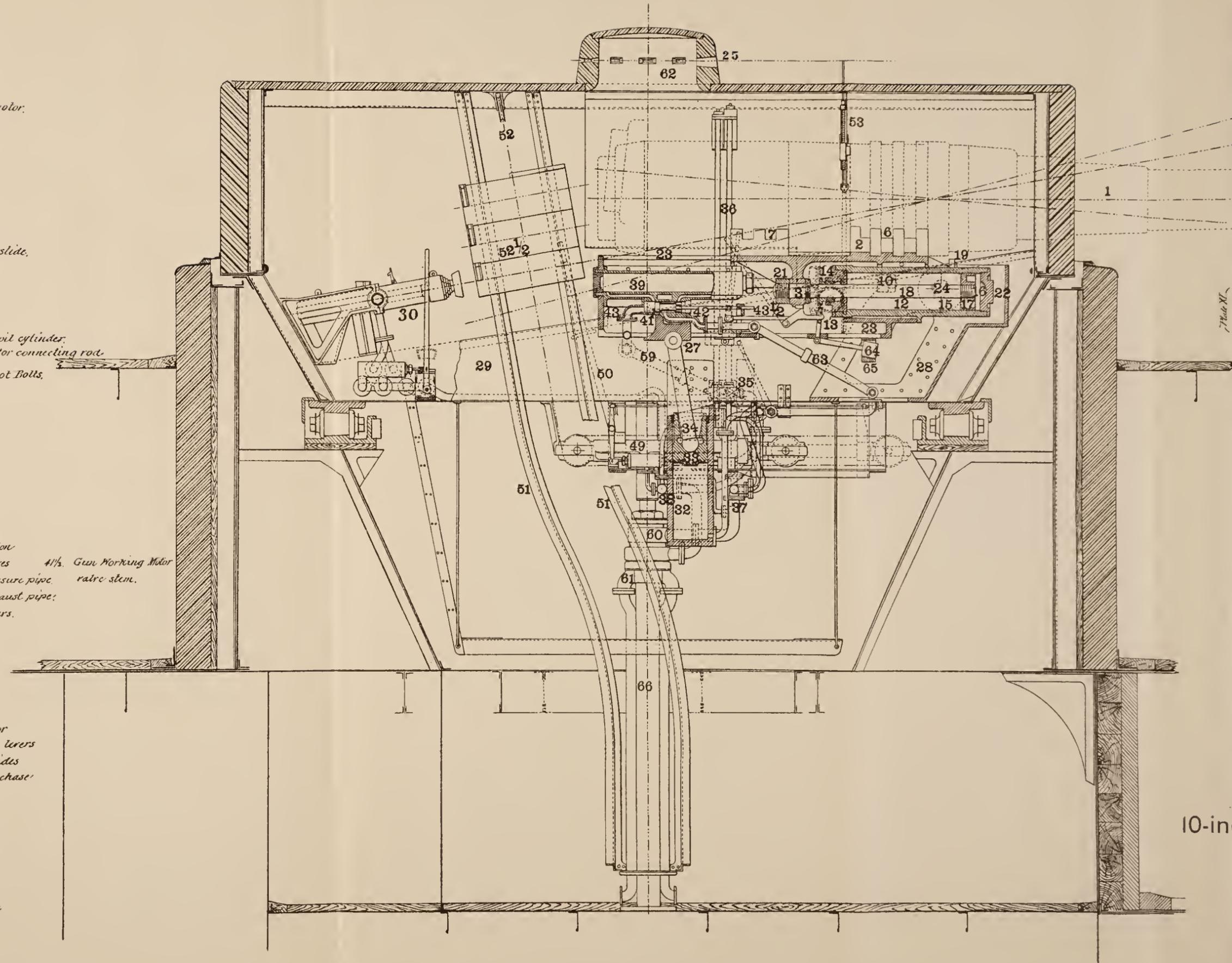


- 53. Telescopic exhaust pipe,
- 60. Water Collar
- 61. Water Section,
- 62. Sighting-hood

General Plan, rear view  
10-inch TURRET MOUNT  
Mark III.



- 1. 10" B.L.R.
- 2. Saddle.
- 3. Recoil Lug
- 4. Holding down clips
- 5. " " gibs
- 6. Front Straps
- 7. Rear "
- 8. Front Saddle bolts
- 9. Rear "
- 10. Lug for gun working motor.
- 11. Holding-out Latch
- 12. Recoil Cylinder
- 13. Rear Bonnet.
- 14. Starting box and gland
- 15. Pressure Side
- 16. Reverse "
- 17. Piston
- 18. Piston Rod
- 19. Bumper plates.
- 20. Flanges for securing to slide.
- 21. Piston Nut
- 22. Front Bonnet.
- 23. Slide.
- 24. Holes for pivot bolts
- 25. Sighting hole
- 26. Flanges for securing recoil cylinder.
- 27. Lug for attaching elevator connecting rod.
- 28. Deck Lugs
- 29. Turret Girders 2 1/2" Pivot Bolts.
- 30. Rammer
- 31. Locking Bolts
- 32. Elevator Cylinder
- 33. " piston
- 34. " connecting rod.
- 35. " valves
- 36. " levers
- 37. " pressure pipe
- 38. " exhaust "
- 39. Gun Working Motor
- 40. " " piston
- 41. " " valves 4 1/2" Gun Working Motor
- 42. " " pressure pipe. valve stem.
- 43. " " exhaust pipe.
- 43 1/2. " " levers.
- 44. Rammer
- 45. " Trunnion.
- 46. " Brackets
- 47. " Valves
- 48. " levers
- 48 1/2. " trunnions
- 49. Ammunition Hoist Motor
- 50. " " levers
- 51. " " Guides
- 52. " " purchase
- 52 1/2. " "
- 53. Sight Bars
- 54. " " carrier
- 55. Rack on slide for sights
- 56. Pinion on bulkhead
- 57. Sight in carring tower
- 58. Sight hole in tower.
- 59. Telescopic exhaust pipe
- 60. Water Collar
- 61. Water Section
- 62. Sighting-hood

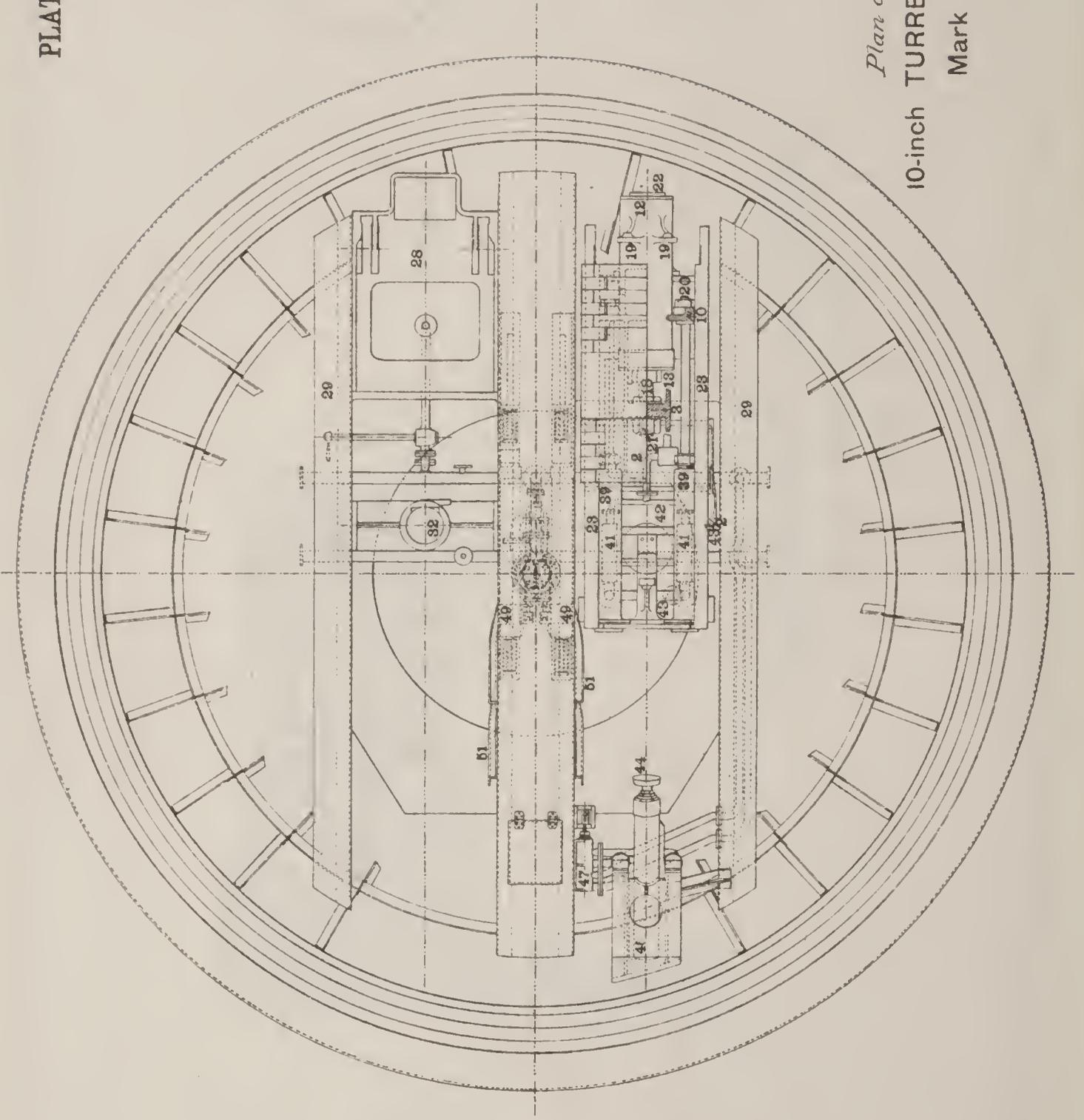


63. Telescopic pressure pipe  
 64. Weight to operate valves of gun working motor.  
 65. Catch to support weight 64.  
 66. Central Column.

General Plan  
 10-inch TURRET MOUNT  
 Mark III.



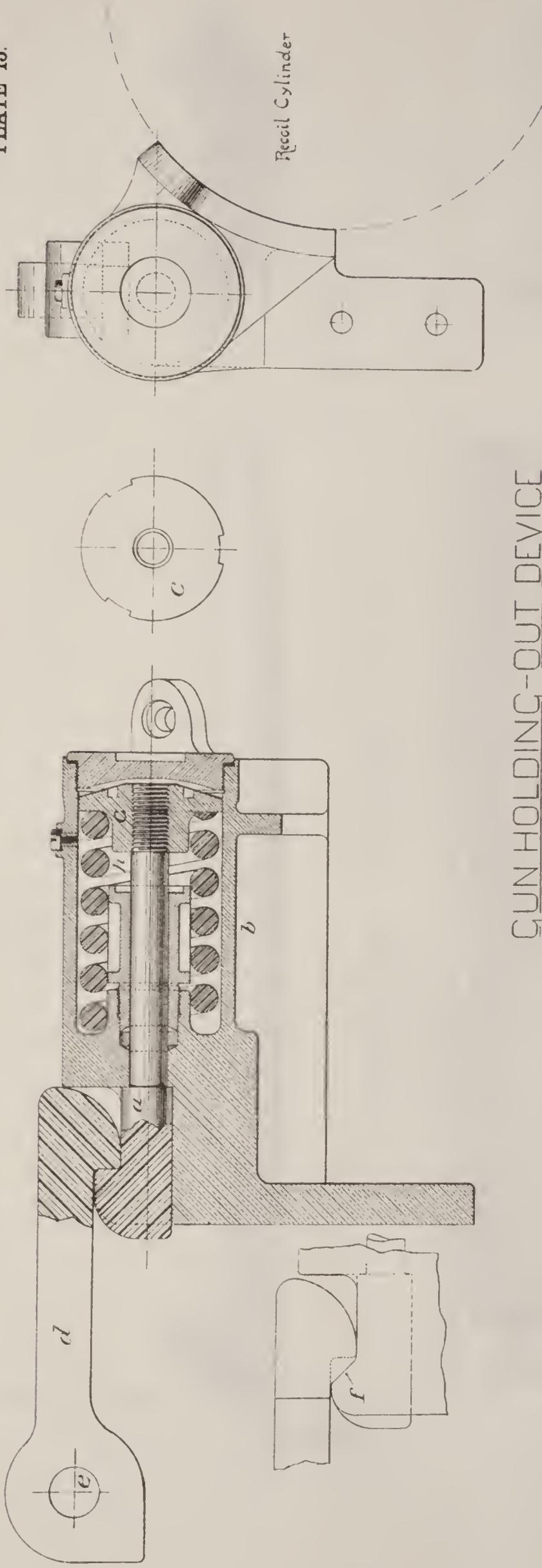
PLATE 12.



*Plan of*  
10-inch TURRET MOUNT  
Mark III.



PLATE 13.

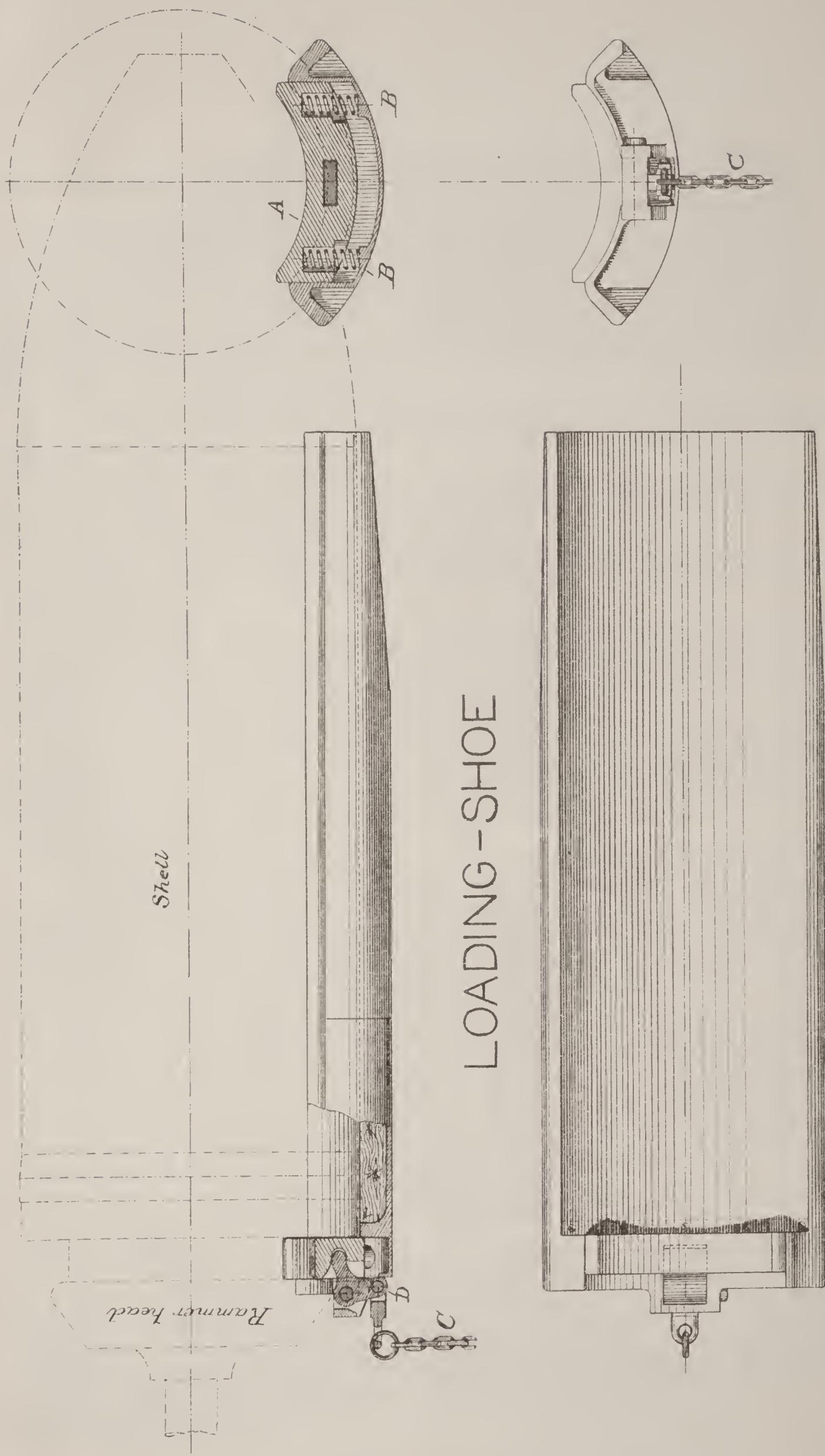


GUN HOLDING-OUT DEVICE

10-inch TURRET MOUNT

Mark III.





Shell

Rammer head

LOADING-SHOE



## THE CARE AND PRESERVATION OF HYDRAULIC TURRET MOUNTS.

Cup-leather packings should be occasionally well oiled to insure their pliability, and no great period should be allowed to elapse without circulating water throughout the entire system for the purpose of wetting these packings. This is particularly important with respect to the rammer. If the rammer packings are allowed to become dry, upon the admission of water under pressure it will spurt out at the front ends of the joints and some time will elapse before the packings will operate and allow the rammer to be used.

It is highly important that the water used shall be clean and absolutely free from grit. The supply tank should be thoroughly cleaned and filled with distilled water.

All cylinders, pipes, and valves should be kept drained and particular care should be exercised that this is accomplished when there is any liability of the pressure water freezing.

All sliding parts should be kept well oiled and free from rust. The turret roller path should be kept perfectly clean and covered with a slight coating of oil.

As the top of the elevating ram is open, small tools and light articles might be dropped in the ram through accident or carelessness. This should be carefully guarded against and an examination be made frequently with a view to ascertaining that it is clear.

In the Mark II 10-inch and Mark I 12-inch mounts, it is important that the small air valves on top of the relief chamber should be clean and in good working order, or else they will fail to open, the relief chamber will remain full of water, and at the first fire the rubber exhaust hose or relief chamber itself will burst.

The three spring-loaded relief valves in the forward end of the recoil cylinder in these mounts are provided with ample lift, and just sufficient pressure should be exerted by the springs to keep them from leaking when the pressure of 600 pounds to the square inch is on. From continued use the springs weaken slightly and require setting up. Great care should be exercised that sufficient play is left in the springs after setting them up to allow for a full lift of the valves.

The Mark III 10-inch and Mark II 12-inch mounts having independent recoil cylinders, the running-out motor rods are arranged so that they will push the gun out to battery, where it will be held, ready to fire, by the holding-out bolt. Just as the gun gets out the valve is automatically reversed and the rods run in out of the way of recoil. There should be one man in the gun's crew whose duty it is to see that these rods have run back before the gun is fired.

In case the running-out motors are disabled, the gun may be jacked out to battery.

The holding-out bolt cylinders are kept filled with mineral lubricating oil. In case the stuffing box in the after end should leak and require setting up, the gun may be run in, the holding-out device removed from the recoil cylinders of the mount, when, with the increased accessibility, the stuffing box can be set up with little difficulty. When well packed the necessity for setting up should not occur more than once a year.

The men should be taught to close valves slowly. The static pressure is greatly increased by the "water ram" caused by suddenly stopping the flow. In this connection it is well to call attention to the uselessness of attempting to force the shell home in the bore by more than one blow of the rammer. In case the shell sticks in the slope of the chamber, withdrawing the rammer and running it out again will not remedy the difficulty, and will only endanger the hydraulic fittings by causing a "water ram" when the rammer brings up against the base of the shell. If the shell sticks the rammer should be withdrawn and the shell backed out by means of a piece of scantling or boat's strong-back.

When the loading shoe is used a very small valve opening should be given the rammer, or it will move forward too rapidly.

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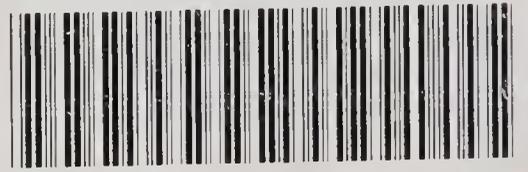








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