WIARD'S SYSTEM OF MARINE ARTILLERY

The importance of a well-considered and thoroughly-organized and perfected system of Marine Artillery as an arm for special service in the harbors and on other inland waters, and the shallow waters along our exposed and extended coast, cannot be overestimated. The want of a comprehensive, easily-managed, and trustworthy system of transportation for men, stores, and artillery, from our ships of war and transports on our great extent of seaboard, and on our mighty lakes and rivers, to the adjacent shores, whether on a great maritime expedition, such as that of Burnside or Banks, or for crossing in the face of the enemy, as at Fredericksburg, has resulted in every way to our disadvantage. Not only has this want been felt at the moment of action, but previously in the hour of preparation, when, from want of suitable combination, vexatious delays occurred which were, to a certain extent, fatal to the interests and to the purposes of nearly every expedition that has been organized during the present war.

My attention was first attracted to this department of our war service while I was engaged in fitting out the Burnside expedition. Great promptitude was demanded; delay was impossible, and from the want I have already stated, I had to use almost superhuman exertions to find even stores that could be *made* to serve the purpose required, many of them having to be *created or improvised* from such materials as could be gathered at the shortest notice, and be made to serve as best they might.

From that time I determined to prepare a remedy for this obvious defect in our military system, so that when the Government had sudden necessity for the utmost energies of such an organization, it could be put into successful operation at once, and accomplish as much in two weeks satisfactorily as could be effected under the present no-system manner in as many months.

The results of my labors will be found herinafter set forth. My extensive experience has suggested to me every essential detail required to perfect my system of Marine Artillery, so as to adapt it to, and make it an efficient and indispensable part of all our armies in the field, especially of all mixed armed expeditions for service on land or water; and I have reason to know that my system is warmly indorsed by the most eminent officers in active service in the South, where the first fruits of my labors, produced under every disadvantage, have been for many months in practical operation.

In preparing the expedition of Gen. Burnside for service in North Carolina, it was decided to organize a new branch of the service, to be called Marine Artillery. As Superintendent of Ordnance stores I was directed to consult with Col. Wm. A. Howard, and supply the necessary guns, carriages, and implements for the purpose, and, accordingly, twelve steel 12-pounder rifled boat howitzers were provided, of my fabrication, each with a sliding and field-carriage, implements, and ammunition, and four 6-pounder "Wiard" field-guns, equipped so as to adapt them to be used in the same manner. Col. Howard enlisted the men for a regiment, caused the launches to be made, and secured two light-draft steamboats, as well designed for the purpose as possible. On one of these steamboats four guns were placed, and each of the steamboats of the fleet was prepared to receive one or more of these guns, if exigencies should make it proper to use them in that manner. Notwithstanding the preparation was in a measure imperfectly made, from the fact that proper steamboats could not be procured in the limited time allowed for fitting out the expedition, the Marine Artillery has borne an important part in every battle in that State, and has been spoken of by Gen. Foster as forming "an essential part of all coastwise expeditions." It has frequently been reported to me by officers in the division of North Carolina, that light-draft steamboats were necessary to the complete success of Marine Artillery, and Gen Foster reported to the Ordnance Department that, "with the addition of a light-limber, the use of these guns need not be confined to the sea-coast." Having been successful in constructing light-draft and fast steamboats for Western rivers, I conceived the idea of designing a boat for the Marine Artillery, and when the Picket, the best boat for the purpose (that, however, drew five feet of water) in the Burnside expedition, was blown up by the explosion of her magazine, I exhibited the drawings of the boat I had prepared to Col. Howard, and he expressed himself delighted with it. I had previously, at his request, designed a light-limber and harness, with which he was also so much pleased that he procured a requisition from Gen. Foster for twelve of them. I exhibited the plans for Marine Artillery equipment to the Hon. P. H. Watson, the able Assistant Secretary of War, and to Gen. Banks, and he so far approved of it that he directed me to provide for his expedition twelve guns, with carriages, launches, and all the equipment, except the steamers, which there was not time to prepare before his expedition sailed, and he hoped to make up this deficiency from some of the light-draft steamboats he might be able to procure at his place of destination.

The organization of the Marine Artillery, for continuous active duty with light-draft steamboats, instead of the heavier ships of the Navy, for coast, river, and land service, has created the necessity for a manual, in which a full and detailed description of the equipment of the guns, steamboats, and launches should be incorporated with instructions for the service of the guns on the steamboats, in launches, and on shore, which, however, has not yet been provided. I have such a manual in preparation, and hold myself ready to complete it at any time the War Department may request it, without charge for my services.

By adopting so much of the equipment and service of the piece as is available from the Naval Boat-Gun service, we have a Light Artillery that much excels any other Light Artillery yet adopted by the military departments of the United States or foreign nations. For instance, five regiments of Marine Artillery would be supplied with 60 guns, 60 launches, and 10 light-draft steamboats. Let us suppose such an armament attached to the Army of the Potomac, for operation on Chesapeake Bay and the rivers and creeks of Virginia; the men can be enlisted more readily than for any other branch of the service, from sailors in the lake and sea-coast ports who are not fit for soldiers, and who will not enlist in the regular Navy. From this source large additions to the forces would be received that would not otherwise be had. To insure its utmost efficiency, however, this branch of the service should receive complete official indorsement and recognition, then much dash and esprit-du-corps may be expected from it. The steamboats would be superior transports, when required for that purpose, and when they are not engaged in active duty could run up rivers and creeks that other steam-craft could not enter, for they draw but 30 inches of water when loaded, and sail either end first with equal facility. No wharves or docks would be required; such transports could run up to the river bank or beach, to take on or put off their load. When the corps is not on active duty the men may go into camp on shore. Each boat can, upon an emergency, take 500 men, and the launches easily 50 more each, to be towed; thus 800 men by this means could be transported along or across a river at each trip. The launches could be used for expeditions up rivers with oars; for an army crossing a river, with oars; or as pontoon bridges; and the guns can be fired on the steamboats, and in one minute fired from a launch, manned and ready to dash ashore; the gun can be fired from the launch as the beach is reached and in one minute changed to its field carriage, run ashore and fired from the beach—this feat has been repeatedly performed. When on shore, the guns on their light iron carriages are drawn by the crew, and if the roads are impassable for other guns, can be taken to pieces and carried in parts by the crew, by the use of the spars and straps provided as part of the equipment. If a raid is to be made far inland, limbers are provided, by which the gun and ammunition is drawn by horses. No arm of the service could be so effective as Marine Artillery in their launches manned with 50 sailors, armed with cutlass, pistol, and breech-loading carbine; each launch having a 12-pounder rifled cannon, to protect the crossing of troops, or in laying a pontoon bridge, as at Fredericksburg, where such service had to be performed by infantry, with pontoon boats. The cost of preparation for five regiments with 60 guns would not be greater than the cost of ten batteries of field artillery with the same number of guns, and the "*state of the roads*," would not render their arrival at an *appointed place at an appointed time* uncertain.

Much of the efficiency of the Marine Artillery would be lost, if the Commander of an expedition, the Chief of Artillery and staff officers, in which it formed a part, were not familiar with the variety of service for which the organization is well adapted; and the want of familiarity with the proper supplies necessary for such service would also detract from its efficiency. It is important that ample supplies be always on hand, ready for any emergency.

By supplying the form of chambers necessary for cutting cartridge cloth, and the calibers for the size of projectiles, as given in the following columns, ordnance officers will be enabled to more promptly fill requisitions for ammunition. It will be prudent to secure a full supply of extra articles, according to the appended lists, found by experience to be required for an expedition going a distance from depots of supplies or manufactories, and perhaps be the means of avoiding an irksome delay at a critical time. Heretofore, boat howitzers have not gone far or remained long away from their ship, their base of operations and depot of supplies.

It has been objected, by Gen. Ripley, senior Colonel of Ordnance, that these guns have a different caliber from any others in service with the army. I am of opinion that the rifled guns should have a caliber of 3 inches to conform to the field gun of the model of 1861, and it will be found of advantage to rifle them in the same manner as the 3-inch field gun or the Wiard 6-pounder, which is better. The twist in the Dahlgren naval howitzer is too quick, being one turn in five feet, and often results in stripping off the lead from the shot. This would not be a serious evil for a gun to be used on board ship, but is objectionable for field service. Marine Artillery should be adopted as a distinct branch of the naval service. It is an almost indispensable auxiliary in keeping the blockade along the *peculiar* coast, from Chesapeake Bay to Texas. The Treasury Department should employ it for the collection of the revenue, and the War Department should attach a corps to each coast division of the army.

The following letters from Maj.-Gen. Burnside and Maj.-Gen. Banks I offer as the evidence that the services, "of which preparing and equipping Marine Artillery was a part of the duties I was charged with," in their respective expeditions, were faithfully performed and appreciated.

ANNAPOLIS, Jan. 6, 1862.

Major P. V. HAGNER, Ordnance Department.

DEAR MAJOR: It affords me great pleasure to state to you that the duties assigned to Mr. Norman Wiard, as Superintendent and Inspector of Ammunition and Ordnance Stores, have been performed to my entire satisfaction. His judgment and discretion in the distribution of stores has been highly commendable, and his lists have been full and complete, and the entire work done by him on board the vessels composing the fleet under my command reflects great credit upon him as a prompt and efficient officer. Very truly yours,

A. E. BURNSIDE, Brig.-General.

NEW-YORK, Dec. 4, 1862.

MY DEAR SIR: I desire, at the moment of my departure, to make to you my unqualified acknowledgments for the valuable assistance you have rendered me in fitting out my expedition. Your suggestions have been most important, and your services valuable. When I can, you may rely upon my fully reciprocating your favors. As soon as time will permit me, I will make known to the Secretary of War my opinion of your efforts. I remain, most truly and sincerely, your friend, &c.,

N. P. BANKS.

NORMAN WIARD, esq.

Referring to Marine Artillery, Gen. Foster stated to the Ordnance Department:

"This species of Light Artillery has proved very valuable, and with the addition of a light limber would be made more so in a march into the country."

Extracts from letters from Col. W. A. Howard, Commanding Marine Artillery:

. . . "So much is thought of Wiard's Steel Guns, as we have been fighting them, that they have ordered horses taken from the field batteries for us."

"NEWBERN, N. C., June 23, 1862. . . . They are much wanted, and strongly urged by the Generals."

"NEWBERN, N. C., July 4, 1862. . . . Your guns have a better reputation than any other."

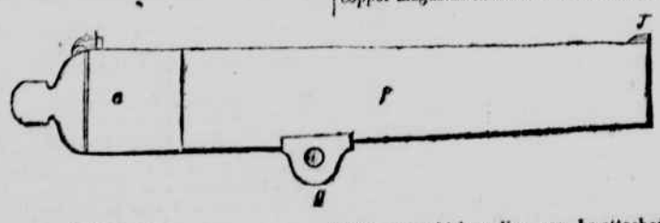
"NEWBERN, N. C., July 11, 1862. . . . See Wiard at once for me, and ask him about the guns. He must do all he can to get me more of them."

"Tell Wiard his guns are perfect little pets." . . . "I always surprise the enemy by getting into action and winning the battle before they are ready with their heavier guns."

EQUIPMENT FOR A REGIMENT.

The proper equipment of Marine Artillery for a regiment with twelve guns is:

2 Light Draft Steamboats, with supplies; 12 Launches, 8 feet wide, 30 feet long; 12 Boat Howitzers; 12 Sliding Carriages; 12 Field Carriages; 12 Limbers; 30 Horses and Harness; 120 Ammunition Boxes, with partitions for 10 rounds for the smooth-bore howitzer, and 12 rounds for the rifle; 72 Spars, 5 feet long, 3 inches in diameter, for carrying guns; 200 Straps for do.; 12 Awnings for Launches; 12 Lines, 200 fathoms in length, with Spring Hook at one end; 12 sets of Oars, Boat-Hooks, and Poles, for Launches; 12 boxes Spare Articles; 12 sets of Gun Implements; 24 Pivot Bolts for Sliding Carriages; 24 Grapnels, with 30 fathoms of line to each; 12 pairs of Skids for landing Guns; 24 Tow Lines for Copper Tanks, when overboard the Launches; 12 balls of Strong Twine; 4 Canvas Slings to put Horses overboard; 24 Corn Sacks; 12 Wooden Buoys; 12 Paulins; 600 Boarding-Pikes, staves 8 feet long.



THE GUNS

are 12-pounders, rifled and smooth bore, and may be alloyed as my field-batteries are, with two smooth bore, and four rifle guns, if desired. The weight of each gun is 750 pounds if of bronze, and 783 if of steel.

The rifled howitzer is 3 4-10-inch caliber, and the smooth bore 4 62-100-inches caliber, both of the same exterior form, and they will interchange on the sliding or field carriage.

NOMENCLATURE OF THE GUN.

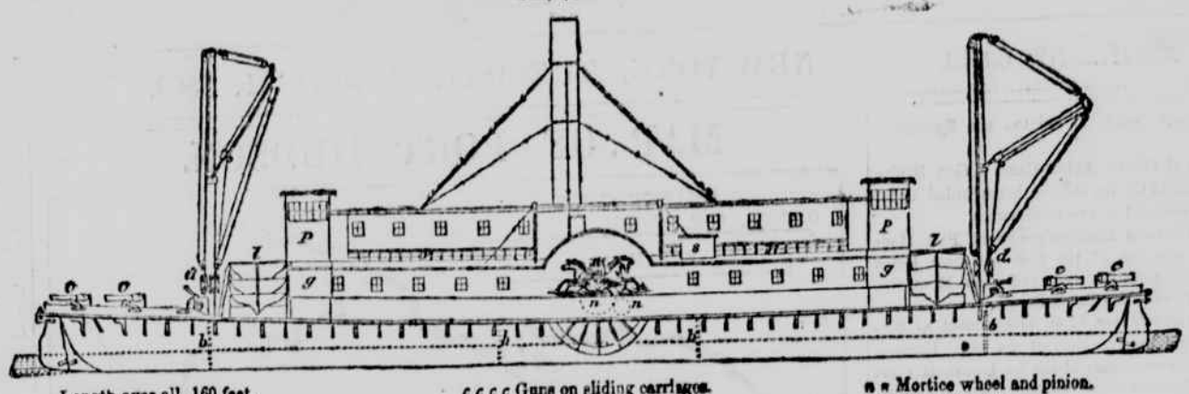
(a), the breech plate; *(b)*, the knob; *(c)*, the neck; *(d)*, the base ring, all that part in the rear of the base ring is the cascabel; *(e)* the cylinder (parallel); *(f)*, chase; *(g)*, loop, with hole for bolt; *(h)*, lock lugs; *(i)*, lip for elevator, or knob of the cascabel; *(j)*, muzzle-sight; *(k)*, base for breech-sight.

The bore includes all the part bored out, viz: Cylinder of bore; chamber.

The twist of the Dahlgren Navy rifled howitzer is one full turn in a length of five feet, the shortest of any gun in the United States service. If these guns are used and the lead flies off the projectile, reduce the charge until the evil is remedied, or use coarser powder. The steel howitzers of my *design* and fabrication will be rifled to one turn in a length of 10 feet, from which a proper projectile will always be delivered most effectively without danger from stripping of lead. The graduation of the sights is to seconds, and agrees with the time of fuses; so when you are using a three-second fuse, the gun is elevated three seconds by the breech sight. With the rifle gun at 1,300 yards, use three-and-a-half-second fuse; it will be better to have the shot ricochet than to go over.

With the smooth-bore howitzer elevation of two seconds, the shell will burst 500 yards from the piece, and do execution 100 yards further. If you aim low, and the shell bursts after the ricochet, the area of "dangerous ground" is increased.

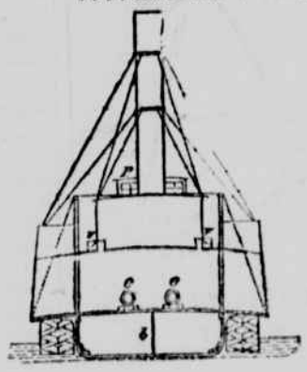
THE STEAMBOATS.



Length over all, 160 feet.
Breadth of beam, 21 feet 4 inches.
Breadth over all, 34 feet.
Wheels are 16 feet diameter, 6 feet
b b b b Athwart ships.

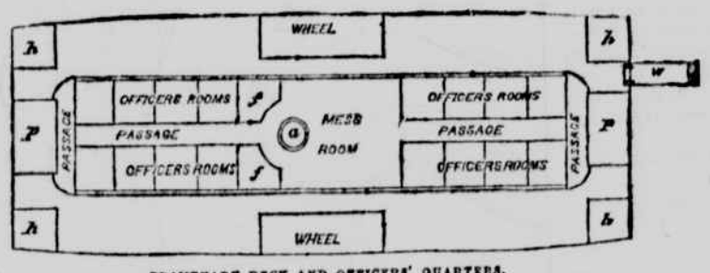
c c c c Guns on sliding carriages.
d d Winches for hoisting.
p p Pilot-house.
g g Gangways.
l l Launches.

n n Mortice wheel and pinion.
e Companion way.
v v Ventilation.
Draft when loaded, 30 inches.
Draft when light.



CROSS SECTION.

b Bulk head.
e e Engines. *P* Pilot-house.
v v Ventilation whole length of the officers' quarters.

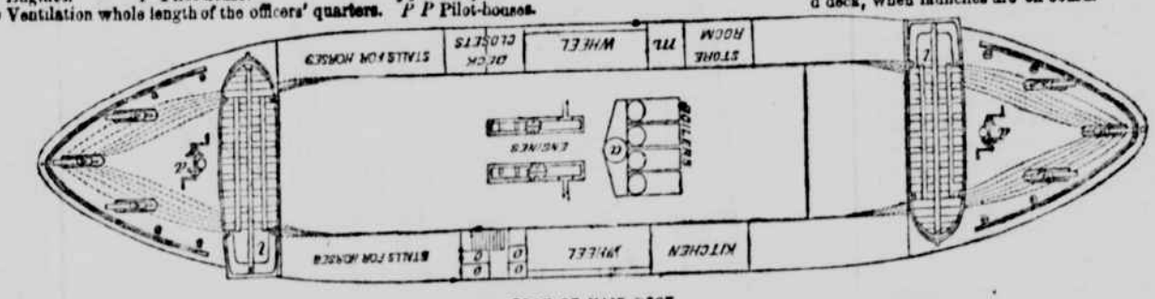


PROMENADE DECK AND OFFICERS' QUARTERS.

h h h h Hatches over gangways.
f f Pantrys.
P P Pilot-houses.

MODEL LINES.

a Chimney.
W Portable way, and step-ladder to pass to forward deck, when launches are on board.



PLAN OF MAIN DECK.

a Chimney. *l l* Launches. *d d* Winches. *m* Machine-shop.

DESCRIPTION OF THE STEAMBOATS.

Each steamer has two engines, with cylinders of 14 inches diameter and 24 inches length of stroke, working steam expansively, furnished with surface condensers and regenerators, by which the boilers are completely supplied with fresh water, and a sufficient additional quantity for all necessary uses and for the consumption of 400 men.

There are four boilers which have 1,260 feet of heating surface and but little radiating surface, which are set in pairs and so arranged that a strong draft through inclined tubes is attained without blowers; but comparatively little thickness of metal is interposed throughout the whole boiler, between the fire and the water.

The wheels are Irving's patent, 16 feet in diameter, and five feet face, entirely of iron. On the shaft of each wheel is a core-wheel five feet in diameter, with wooden cogs, 10 inches face, into which works a cut pinion, 24 inches diameter on the engine shafts. The engines make 100 double strokes while the wheels make forty revolutions. By the use of these wheels and these devices I attain lightness that is very essential, absence of noise, and jarring or trembling of the light frame-work of the boat.

There are five bulkheads, made of double thickness, of pieces 16 feet long, six inches wide, and one inch thick. These pieces are matched with a tongue and groove like common flooring, and put up for the fore and aft bulkheads inclined diagonally in opposite directions, and are clinker clinched with wrought nails at each intersection or crossing of the parts; four other bulkheads are inserted, as shown by dotted lines on the cut showing the elevation of the boat.

The quarters for the men are between decks and below well lighted, and ventilated by sashes under the seats on the promenade deck that reach the whole length of the officers' cabin on each side. Between decks is the kitchen, a store-room, a machine-shop, stalls for thirty horses, and capacious water-closets for men and officers; and on the promenade deck are the officers' quarters, a long mess-room, state-room, and the two pilot-houses with passages.

The spars for hoisting are so placed as to be convenient for putting off or on the launches, guns and carriages, and the horses. Each spar is furnished with geared winches, and the boom is so rigged as to have its peak raised or lowered to lay down or take up articles at any distance within its radius from the foot of the spar. Horses are put in and out by the use of canvas slings buckled about their bodies, the slings having loops on the backs to attach the hook of the tackle on the boom. The plank of the botton is all fastened with copper-covered rivets; this manner of fastening gives great strength with lightness, and the bottom is coppered.

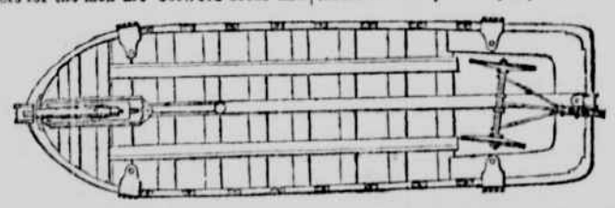
With the coast of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas to assault and defend, the whole of which is a network of shallow waters, of sounds, bays, inlets, rivers, and creeks, with only a few places where it can be approached with heavier ships, it would seem to be indispensable that the Government should have a great number of the fast and light-draft steamboats above described, which, from their peculiar adaptation and equipment, would seem to be especially calculated for that duty, and designed to meet all the conditions required.

Their speed will enable them to retreat to shallow water from any enemy afloat, and a retreat to the launches or boat, from an assault on land, would insure the safety of the party; while, for secret expeditions up creeks or rivers, or into a more easily-approached harbor in the night, their assault would be very formidable. The enemy, too, could be watched from seven points with the steamboat and six launches, and an assault by boarding from the crews of six launches, each with a rifled 12-pounder gun and with small arms, including pikes, could scarcely be resisted by any ship, if it was conducted in the night and with proper viger.

These boats would not alone be useful for the purposes above described, they are powerful tugs and good transports for men and stores, shipping and transhipping; where there are no wharves or docks running up to the beach or river bank to take on or put off their load, whether stores, men, horses, or cattle, and could not be excelled, under many circumstances that could be described, for use as lighters for transhipping from heavier transports, and I have offered them *completely equipped*, except the guns and field carriages, to be made exactly according to the design and specification herein, for the price of $12,500 each, ready for service; and I will supply the entire armament and outfit *more promptly than it can be attained in any other manner, if required.*

EQUIPMENT FOR ONE STEAMBOAT.

6 Launches; 2 Anchors, 600 lb each, 50 fathoms chain; 1 large Kitchen Range, and the usual cooking utensils for 400 men; 1 set of Cabin Furniture for Officers' Cabin; 16 sets Stateroom Furniture, and Bedding for 3 berths in each; 2 Ships' Compasses for Pilot Houses; 1 Glass; 6 Copper Magazine Tanks for Small-Arm Ammunition; 1 Portable Forge for Machine Shop; 1 Anvil for Machine Shop; 1 Bench Vise for Machine Shop; 1 Chipping Hammer; 2 Screw Wrenches; 6 Files with Handles; 4 Cold Chisels; 2 Oil Cans; 1 Oil Tank; 6 Casks for Water; 2 Bilge Pumps, connected to engines and with hand gear.

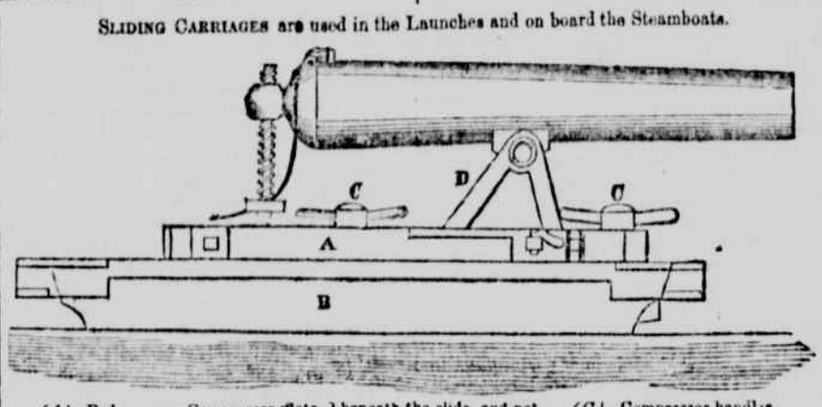


THE LAUNCHES

are eight feet wide, thirty feet long, and three feet deep; have three pivot sockets at bow and stern, at the points of a triangle, that the sliding carriage may be fixed in any two of the points with the pivot bolts; two tracks placed fore and aft, the proper width apart for the wheels of the field carriage; two skids, with hooks at the ends to fix in eyes at bow and stern, continue the track to the beach, for the support of the field carriage on landing. Sixteen oars are locketed to thole pins for use. The pins have a piece of India-rubber tube slipped over them, and the oar rests on a piece of rubber let into the gunwale to muffle their sound.

Each launch has four water-breakers, and a band is placed near the ends with an eye, by which the breaker with water can be suspended under the limber when the gun's crew make a raid into the country away from the boats. Each launch has twelve passing-boxes, in which each of the gun's crew can carry one round of ammunition on landing; and two copper magazine tanks are furnished, made water tight, to which a line can be attached. When a launch is under fire the magazines should be overboard, and towed five or ten fathoms behind. Each magazine will float with one hundred pounds of powder. Two grapnels with thirty fathoms of line are to be thrown overboard, outside the surf, in landing, to haul off the boat as soon as the gun and gun's crew are landed. This would be indispensable in landing on a beach in a heavy sea, and often in a marsh at the side of a river. If a grapnel line has to be cast away, a buoy should be found on board and attached to the inboard end of the line that it may be recovered afterward.

SLIDING CARRIAGES are used in the Launches and on board the Steamboats.



(A)—Bed. *(B)*—Slide. ——Compressor plate, ——Compressor bolts, } beneath the slide, and not shown on the plate. *(C)*—Compressor handles. *(D)*—Lugs for loop.

The recoil is controlled by compressing the slide between the bed and the lower plate, for which purpose the bolts connecting the upper and lower pieces have a thread above, and a corresponding nut with handles. These are set as firmly as the strength of an ordinary man allows, and will then always suffice to keep the recoil within the limits of the slot in the slide. After discharging the howitzer, the compression is relieved, and the piece run out.

In order that this arrangement may invariably perform its function, it is necessary that the surfaces of the carriage to be in contact should be plane, which will be known to be otherwise when the compression is not found to be sufficient to control the recoil. In this case, dismount the gun, take the carriage apart, and examine the surfaces of the three parts. Wherever the coincidence does occur, the wood will be worn smooth. Let this be removed in the slightest manner, and the surfaces corrected generally, which will be found to reduce the recoil; but remember that, in making a plane surface, it is by no means necessary to make it smooth; it should be as little so as possible for the present purpose.

If the carriage moves out on the the slide with difficulty when the compressors are free, it is owing to the guide in the slot having swelled or warped, and will be easily remedied by removing a very slight shaving from its sides.

With all the care that can possibly be taken in selecting seasoned stuff, it is well known that the continued exposure alternately to sun and rain, incidental to sea service, will after a while warp material of the best quality, and, therefore, it will be necessary, with a new carriage, to examine it occasionally, and correct the evil.

With very little attention, the compressors will be found to perform their part in controlling the recoil even of the most active of these pieces.

The force of recoil thus resisted may be appreciated by the fact that this piece, being mounted in the bow of a frigate's third cutter, 27½ feet in length, with at least twelve persons in, beside the gun, ammunition, oars, etc., would, when fired, send the boat many yards astern, in smooth water. And yet the application of this force produced no effect on the frame of the boat—not even the paint over the plank-ends having been disturbed by a hundred rounds, fired chiefly when the boat was under full way.

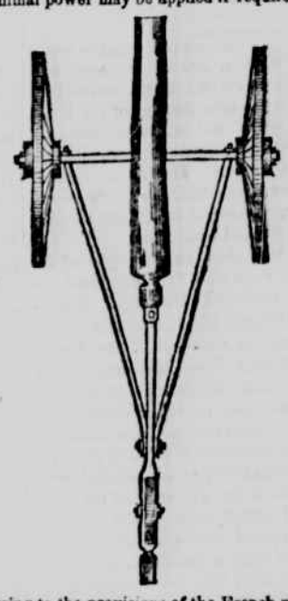
FIELD CARRIAGES

For the 12-pounder, rifled and smooth, are designed to accompany parties when disembarked. It is of wrought iron, and considerable difficulty was experienced for some time in so arranging it as to endure the recoil. The trail has a small wheel or runner to ease it over any obstacle, and it is found preferable in draft to attach the drag-rope to the trail. The carriage weighs rather less than 500 pounds, and with its piece is drawn readily by a dozen men, making this undoubtedly the best light artillery in the world, getting into action, changing position, and maneuvering with wonderful rapidity.

The parts of the carriage are fastened together by screw-nuts; hence no difficulty ought to arise in taking it apart, if desirable. The two braces which branch from the trail to the axle have nuts on their ends just outside of the axle; these should have particular attention in course of firing. A pin is driven over them to prevent their being started; but this, too, might be forced out by the severe shock. It has never been known to occur, but, as their security is essential, an eye should be given to them occasionally, to prevent even a possibility of accident.

The axle or pin of the trail-wheel may be drawn out, and the wheel itself turned up on the trail, to moderate the recoil by friction on the ground.

For service in the field, this carriage, it is believed, will offer greater facilities for moving easily than the unlimbered field-carriage of the army, which is in no wise calculated to be so used; and when limbered up, is indeed a proper draft for horses, while the navy carriage will seldom be found burdensome to a boat's crew, and at the same time animal power may be applied if required.



Referring to the provisions of the French navy for similar cases, it will be seen that the Mountain howitzer (12-pdr. of 220 lbs.) alone is designed for landing, and that its two "caissons," packed over the gun, carry but twelve fixed shells and two canister. A force, in metal and supply of ammunition, certainly very inferior to this.

LIMBERS

are provided, that the service of boat howitzers need not be confined to the sea-coast.

The limber carries three boxes of ammunition; one spare article box, mess-chest, and a box for pea-jackets of the men. Eyes are affixed on each side of the shafts for straps, to secure the boarding-pikes, and two hooks under the shafts will carry a water-breaker; the drag-rope is passed around the boxes on the limber for use in any emergency.

WEIGHT OF THE PARTS OF LIMBERS.

Two wheels	188 lb
One pea jacket box	55 lb
One mess chest	56 lb
Gun body	313 lb
Total	612 lb

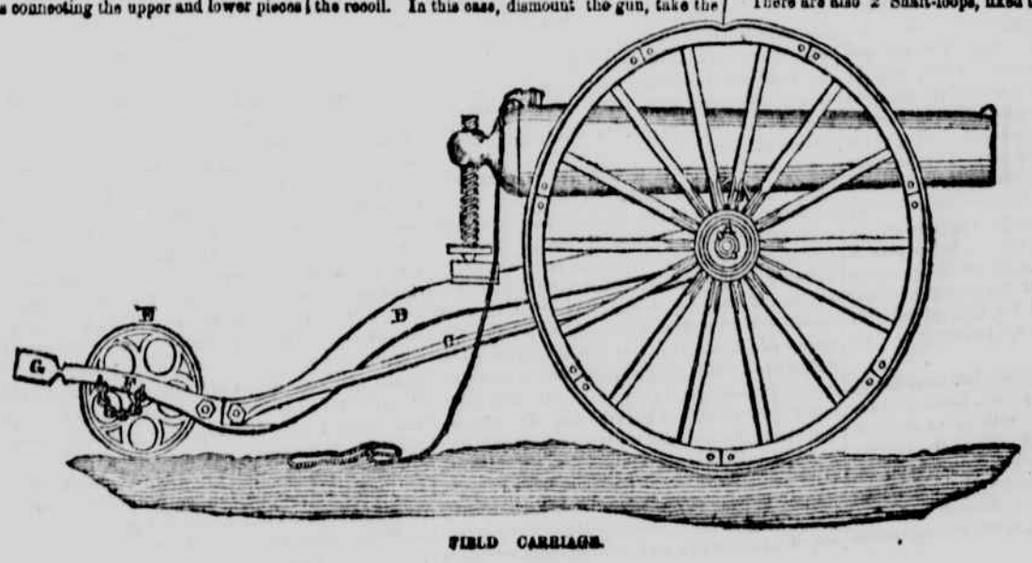
If a wheel is disabled on the gun carriage, it should be taken from the limber; if the gun carriage is altogether disabled, the gun can be triced up under the limber, using the drag rope to lash it fast; lashing cord should always be found in the till of the pea-jacket box. The harness is made up of artillery and mountain howitzer harness parts; the bridle, halter, saddles, and cruppers being from field artillery harness, the balance from mountain howitzer harness.

HARNESS

Is made up from the field artillery harness: 2 Driver's Saddles and Girths, 2 Halters, 2 Bridles, 2 Loop Straps and Cruppers, 1 Trace Loop.

And from the mountain howitzer harness: 2 Breast Straps, 2 Breechings.

There are also 2 Shaft-loops, fixed to saddle-tree



FIELD CARRIAGE.