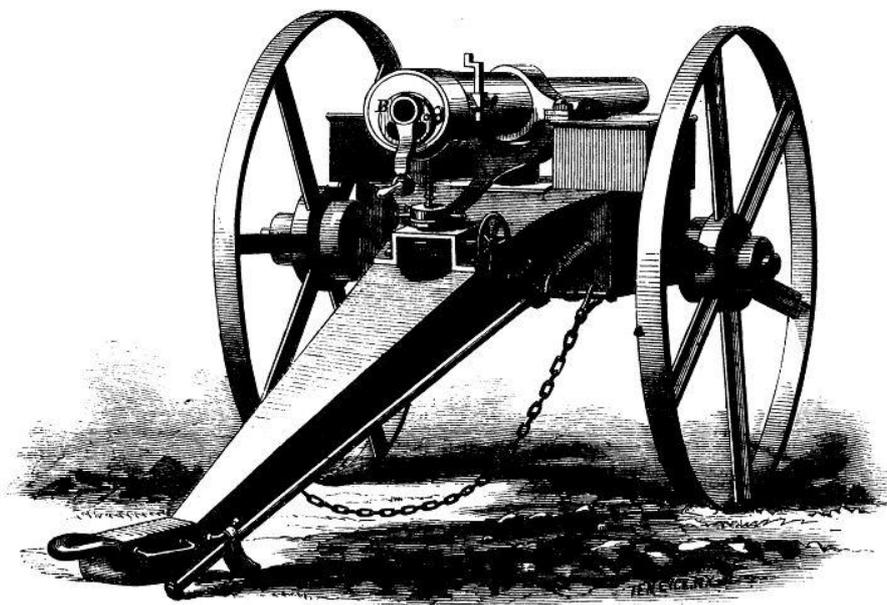


“Clay’s” Breech Loader 1862

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Overview

The so-called “Clay” breech-loading field gun was demonstrated to the British public during 1860. At least three were made by the Mersey Steel & Iron Company of Liverpool, whose managing director was William Clay, who took the title of “Major” and then “Lieutenant-Colonel” in the newly-formed Volunteer Artillery.

The barrel of these guns was made from rolled steel, a patent process of the Mersey works, and the breech mechanism was to Hugo Forbes’ patent of 1855. The barrel was made in three pieces, the rolled steel tube, the cast-steel breech and the cast-steel trunnion ring. The 3 inch bored tube was rifled with fifteen shallow grooves. Forbes’ eccentric screw breech anticipated that used in the 75mm Schneider field gun of 1896. The ammunition provided was Preston & Kennedy’s patent shot with a lead skirt, weighing 12 pounds.

Two “Clay” 3 inch rifled field guns were supplied to the Confederate States, one survived the Civil War, and existed as relic until around 1914, being displayed in Chicago in 1896.

3 inch Clay rifles - Olmstead

Breech-loading 3 inch rifles based upon Lt Col Clay’s British patent are noteworthy for the scarcity of references to them and for the absence of survivors. They featured a screw plug of large diameter loosely threaded into an oversize eccentric breech, with the axis of the plug below and parallel to the axis of the bore. Tightening jammed the blank seating area of the plug face against the rear of the bore, hopefully to seal against gas leakage. Loosening the plug by unscrewing permitted its eccentric hole to be aligned with the gun bore for loading. Without comment about the enormous breech to contain such a plug, Holley noted: “The breech is thus opened with one movement, and the parts, though large, are simple; but the obvious defect is the difficulty of applying a suitable gas check.”

Confederate General E P Alexander wrote: “The Clay gun was a breechloader and was called an improvement upon the English model which could not be obtained. Its grooving and projectiles were very similar to the breech-loading Armstrong. Its breech-loading arrangement appeared simpler and of greater strength. On trial, it failed in every particular. Every projectile fire ‘tumbled’ and fell nearer the gun than the target and at the seventh round the solid breech-piece was cracked through and the gun disabled.”

Alexander's original sentence appears to state that no breech-loading Armstrong rifle could have been exported so long as it was the regulation British field piece. The remainder identifies but one Clay rifle on trial, which may have been the extent of his experience within Longstreet's corps. At least one more Clay rifle must have been in Confederate hands. Trophy number 189 at West Point was listed in the 1914 catalogue as:

"3 inch [3.1 inch] Clay wrought-iron breech-loading rifle field gun, captured at Danville, Virginia, April 27, 1865. Patented by Lt Col Clay of the Mersey Steel & Iron Company, Liverpool, England."

The Clay Breech Loader 1862 – Industrial Exhibition

The 18-pounder breech-loading gun, exhibited by this company, is again of different construction.

The barrel of the gun instead of being forged, is rolled and tapered by a double action of the rollers, and the breech and trunnion shrunk on. At the breech end, the gun is formed with a projection, or extra depth, on its lower side, to allow for the boring out of a circular screw-threaded bore or recess of much larger diameter than the bore of the gun, and with its centre considerably below the centre of the bore. Into this recess is screwed a cylindrical screw-threaded block or breech piece, which closes the bore of the piece when screwed home. This has formed through it a cylindrical passage, so placed that when the breech-piece is turned back through a portion of a revolution, this passage comes exactly opposite to the bore of the piece, and allows of the charge being passed through into the barrel.

A pin is inserted at the upper right-hand portion of the end of the gun; this forms a stop for the handle to come against, and may be removed on loosening a thumbscrew that nips it, when it is desired to take the breech-piece entirely out of place for cleaning the parts.

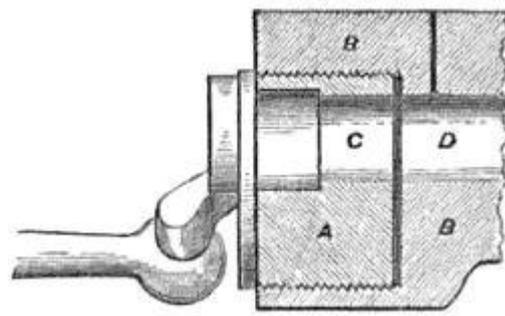
This mode of making guns is patented by Mr W Clay of the Mersey Steel and Iron Company. The qualities which he has attained are - reduced cost, as compared with other guns; rapidity of fire, *nineteen* rounds having been fired in one minute from the gun here exhibited; non-liability of the screw to foul, it being completely covered; and strength of gun.

As an example of the latter quality, we may quote an experiment that was made with a 2-pounder gun of this construction. An iron cylinder, 5 feet 7 inches in length, weighing 88 pounds and projecting 18 inches out of the muzzle, was fired from this gun.

After this it was loaded with eighteen shots and a 6-foot cylinder, which projected 5 feet out of the muzzle, and the projecting end of the cylinder placed against the solid rock. By these means the *gun was fired from the shot*, instead of the shot from the gun. This experiment was twice repeated without bursting the gun. The first charge was 1 pound and the second 2 pounds of powder.

These experiments were equal to firing a shot of 465 pounds, which is the weight of the gun.

The projectiles fired from these guns are coated with lead, like the Armstrong projectiles.



Clay – Holley 1866

The figure shows the apparatus patented by Lieutenant-Colonel Clay, of the Mersey Steel & Iron Co., Liverpool. One side of the breech is enlarged to receive a screw-plug, A., a little over twice the diameter of the bore. A hole, C, in the plug, forms, when the latter is unscrewed half a turn, a continuation of the bore, D, through which the charge is loaded. By

screwing up the plug half a turn, the solid part of it covers the end of the bore and sets closely against it. The breech is thus opened by one movement, and the parts, though large, are simple; but the obvious defect is the difficulty of applying a suitable gas-check.

Forbes' Patent Eccentric Breech-loading Screw 1856

A.D. 1856, April 15. - N° 895

FORBES, Hugo Frederick "Improvements in breech loading fire-arms and ordnance, and in projectiles used there with."

The breech end of the piece terminates in a cylinder, which is eccentric to the bore; a screw is inserted in the cylinder which has a diameter about twice that of the bore.

The screw is bored through eccentrically, and when screwed home by means of a projecting handle, the solid part of it closes the bore, when it is turned in a contrary direction the hole made in it coincides with the bore. Projectiles are made with their fore parts much heavier than the rear parts.

Hugo Frederick Forbes, Captain, of Park Place, Regent's Park, London, later of Florence, Tuscany

Suit, December 19, 20, 22, 1865, Forbes v. Francis Preston and the Mersey Steel & Iron Company, regarding provision of accounts relating to the working of the above patent, in England, France and Belgium. Forbes had engaged Preston to work the patent on his behalf and Preston in turn had granted a (sole) licence for manufacture to the Mersey company.

FRANCIS PRESTON, Engineer, Maker of Fire Arms, & Army Contractor, Owner of Forbes' Patent Eccentric Breech Loading Screw, and Patentee of the Intermediate Eccentric Disc for breech loading firearms, Maker of the Mersey Eccentric Breech-loading Cannon and Victoria Gun, Preston & Kennedy's patent projectiles, also bayonets, rifled barrels, rammers, &c., by patent machinery. Contractor to Her Majesty's War Department, Ancoats Bridge Works, Limekiln Lane, Ardwick, Manchester (Advertisement 1862)

Comment: Preston, of the Ardwick Spindle Works, was a well-established spindle and fly maker for the Manchester cotton industry in partnership with William Seed. In 1854, at the time of Crimean war, he adapted his machinery for the production of bayonets, and subsequently acquired patents for this apparatus and for improvements in firearms, ordnance, cartridges and projectiles. In 1858 he began making files and rasps, as well as spindles and army goods. Preston was contracting to make army goods and Enfield rifles in 1861 and 1862 for the British and United States governments. The contract for 25,000 rifles for America was voided as his was unable to deliver on schedule. He overreached himself in becoming director and manager of the Lancashire Steel Company, a Bessemer licensee, in January 1866, and became bankrupt in his original role as a spindle maker in September 1866, a process which ended his long partnership with Seed. He was bankrupt again in 1867 and 1871.

Breech-loading Steel Cannon – *Scientific American*, January 19, 1861

The accompanying engraving is a perspective view of a rifled steel cannon – breech loader – lately manufactured for the Russian government by Mr [William] Clay, of the Mersey Steel & Iron Works, Liverpool, England, and the London *Mechanics' Magazine*, which contains the illustration, states that he is about to make one for the United States government; it is therefore of no small interest to us.

The breech-loading arrangement is effected as follows: At the breech end, the gun is formed with a projection, or extra depth, on its lower side, to allow for the boring out of a circular screw-threaded bore or recess of much larger diameter than the bore of the gun, and with its centre considerably below the centre of the bore. Into this recess is screwed a cylindrical screw-threaded block or breech-piece, B, which closes the bore of the piece when screwed home, but which had formed through it a cylindrical passage so placed that when the breech-piece is turned back through a portion of a revolution, the passage is comes directly opposite to the bore of the piece, and allows of the charge being passed into the barrel. In the engraving, the breech-piece is shown in such a position that the charge may pass freely into the barrel; when this has been done, by turning the handle (shown on the breech-piece) partly round,

the hole in the breech-piece will be moved away from the bore of the gun, and the latter thus effectually closed. On a close inspection of the engraving, it will be seen that a pin is inserted at the upper right hand end of the gun; this forms a stop for the handle to come against, and may be removed by loosening a thumb-screw that nips it, when it is so desired to screw the breech-piece entirely out of place for cleaning the parts.

The carriage on which the gun is mounted is also made from Mersey steel, and has excited a good deal of admiration. The gun is supported by its trunnions (which are formed in one with a hoop shrunk upon the gun) upon a strong bracket, which is pivoted upon the top of the carriage, and has a tail-piece that extends backwards, and is supported upon a box bracket fixed on the carriage near the top. In the extremity of the tail piece is formed a slot through which rises the point of a nut or bolt, the head of which (which is within the box-bracket) receives a transverse screw worked by a hand wheel. As this wheel is turned, the gun is traversed with the greatest nicety. The elevating screw is placed above the tail-piece, passing into a hand nut below, and carrying a bracket above in which the breech of the gun rests.

The range and accuracy of fire of a gun depend in no degree upon any given form of breech-loading device, but a good breech-loading arrangement may prove very beneficial, viz., by increasing the rapidity of fire obtainable. This gun has been discharged no less than nineteen times per minute, and in this high rate of discharge it is incomparably superior to both the Armstrong and Whitworth breech-loading arrangements.

Lancashire Rifle Contest at Hightown – November 10, 1860

These were, however, very interesting, including as they did, for the first time, a prize for artillery. It was expected that Mr Whitworth would have sent a gun to compete for the prize, that gentleman who was on the ground on Friday, having offered to send one of his guns, but no satisfactory arrangement could be made as to the ammunition, &c., which would have involved a cost of £200. The competition was therefore confined to the three guns sent by Major Clay, of the Mersey Steel and Iron Works Company, Liverpool, and one by Captain Blakely. Each gun was attended by a detachment of ten men.

The first gun, one of Major Clay's, was commanded by Captain Inman, of the 8th Brigade. It was a breech-loader, 7 feet in length, one inch bore, and in the five rounds, which were allotted to each gun, was fired at the following elevations:

1st round, 4.75; 2nd 4.375; 3rd 4.5; 5th round, 5

The second gun, also one of Major Clay's, was commanded by Major Jackson, of Blackburn, and attended by a detachment from the Blackburn Artillery Corps. It was a breech-loader, three inches bore, and of a similar length to No 1. The elevations at which it was fired were as follows:

1st round, 5.75; 2nd 5.875; and the remaining three, 5.5

The third gun was under the command of Lieutenant Dean, of the 8th Brigade, and was similar in dimensions and calibre to the second, the elevation at which it was worked being uniformly 4.875, with the exception of the fourth round, when a variation was made to 5.5

The fourth gun was a patent of Captain Blakely's, and was commanded by Captain Campbell of the 4th Brigade. It was a combination of wrought and cast iron manufactured by Messrs Fawcett and Preston, Liverpool, and loaded from the muzzle. The elevations at which this gun were fired were: First round 3.90; second 4.125; third 4.5; fourth 4.75; fifth 4.125

The charges of powder in the first three guns were from 1½ pounds to 1¾ pounds, and of the fourth, 2½ pounds. The distance of the target was a mile. The rifling of Major Clay's guns is similar to the Armstrong; but there is a screw at the breech which is supposed to load with greater rapidity.

The whole of this contest excited a great deal of interest in many quarters, many foreigners and English authorities on artillery practice being present. The umpire was Colonel Wodehouse, CB, Assistant-Adjutant-General of Artillery, and Aide-de-Camp to the Queen.

Preston & Kennedy's Patent Projectiles 1855



Patented January 12, 1855 by Francis Preston of Ardwick, Manchester and Thomas Kennedy of Kilmarnock, Ayrshire, as "Improved Projectiles for Ordnance". The body of the projectile is of cast-iron, and cylindrical, the front portion being rounded off, or near hemispherical; the other end of the projectile is recessed, and is furnished with a groove, into which a ring of melted lead, or other suitable metal is cast; this ring is caused to expand by the action of the exploding powder, in the same manner as the Minié bullet thereby preventing windage. Along the cylindrical, and partly on the rounded portion of the improved projectiles, three or other suitable number of diagonal or slanting grooves are cast; these grooves being deepest near the front, and gradually diminishing in depth until they entirely cease. The object and effect of these grooves is to impart a rotary motion around its axis to the projectile without making grooves into the barrel of the cannon, the said motion being derived from the resistance of the air reacting in the sides of the inclined grooves.



New York Times - June 11, 1861

For instance, Clay's gun has a large eccentric, hollow breech, into which an immense plug is screwed from the rear. In this screw-plug is a continuation of the bore of the gun, through which the charge is put into the chamber from the rear. The plug is then screwed in a half turn further, so that the hole in it, through which the charge was put in, is moved away from the bore of the gun, and the solid flat end of the plug jammed tightly over the end of the bore. This goes very smoothly for a time; but since the parts of the plug and of the breech where the explosion occurs get quite hot, while the rest is cool, only the top section of the chamber is covered by the plug, and the screw works hard after firing a few rounds. The same thing would occur with a Colt's revolver of cannon dimensions, as any one may imagine. It is evident that no mechanical adjustment can remedy the grand defect. Some new principle must be struck out.

House of Commons – April 7, 1864

Some Volunteer Artillery corps were so disgusted with the guns which had been supplied to them that they had armed themselves. Messrs Horsfall and Clay, of Liverpool, had for some time been making 12-pounder breech-loading guns on the pattern of Captain Forbes, a very

distinguished artillerist. Four of these guns had been either purchased by or presented to the 8th Lancashire Artillery Volunteers, of which Mr. Clay, a member of the firm, was commander, and with these they were able to hit the bull's-eye at a mile range twice out of three times. It might be asked why such guns were not noticed by the Government, and the only reason that he could imagine was that they were too cheap. It seemed as though in the eye of the Government quality signified nothing. These guns without appurtenances cost only £95 a piece, while the price of similar weapons of the Armstrong pattern was £125. They might, however, at least be admitted to a trial; but it seemed that anything which came into competition with Sir William Armstrong's productions was regarded with the greatest disfavour by the Government.

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