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SOJ 5(10)
Gribeauval Cannon 1765-1789

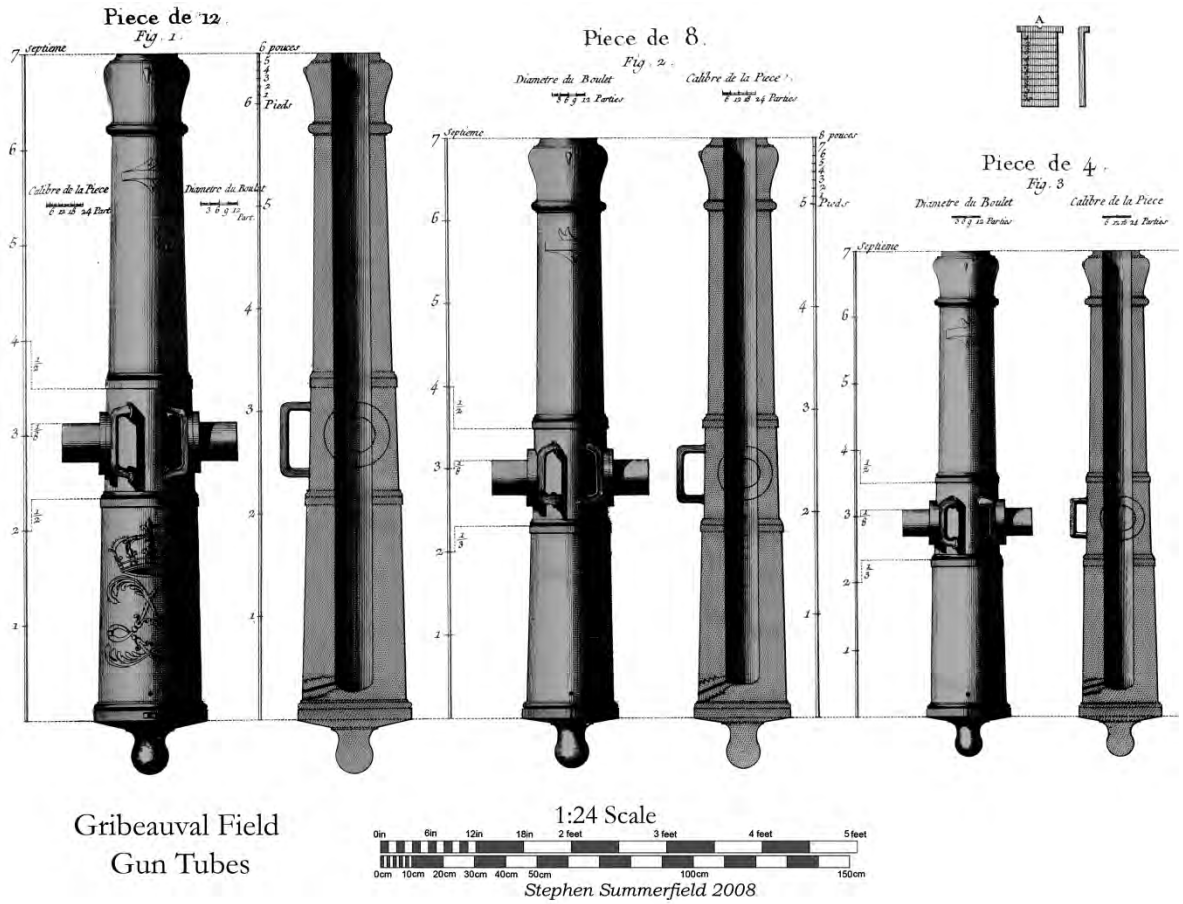
Stephen Summerfield of Loughborough University

May 1763, *Gribeauval* writes a report upon his return to France in response to the *Duc de Choiseul,* Secretary of State for War's request for suggestions for the improvement of French Artillery.

1 July 1763, Choiseul recommends Gribeauval be employed as *Inspecteur General du Corps Royale Artillerie* and *le Commandant en Chef des Mineurs.*

April 1764, Gribeauval is appointed as *Inspecteur de l'Artillerie.*[130] He undertakes tests upon the 18 Calibre guns produced by Maritz II.[131]

12 December 1764, the Gribeauval 4-, 8- and 12-pdr plus 6-*pouce* howitzer were adopted and everything else was unchanged from the M1732 Vallière system. This was a pragmatic choice due to the very poor state of the French economy.[132]



[130] Summerfield (2011) *SOJ-2,* 14
[131] Picard (1906) 72-73; Summerfield (2011) *SOJ-2*, 14
[132] Decker (1994) p151

1765-71 Gribeauval Field Guns

12 January 1765, Choiseul directed that 50 8-pdrs (1250lb each) and 75 4-pdrs (630lb each) would be cast at Strasbourg upon the return of Maritz II from Spain. Dartein (his deputy) would finish those that had already been proofed.[133]

13 August 1765, the Royal Ordonance outlined the reorganisation of the French Artillery into seven regiments as recommended by Gribeauval.[134]

17 August 1765, Gribeauval divided the artillery into Field, Garrison, Siege and Coast.[135]

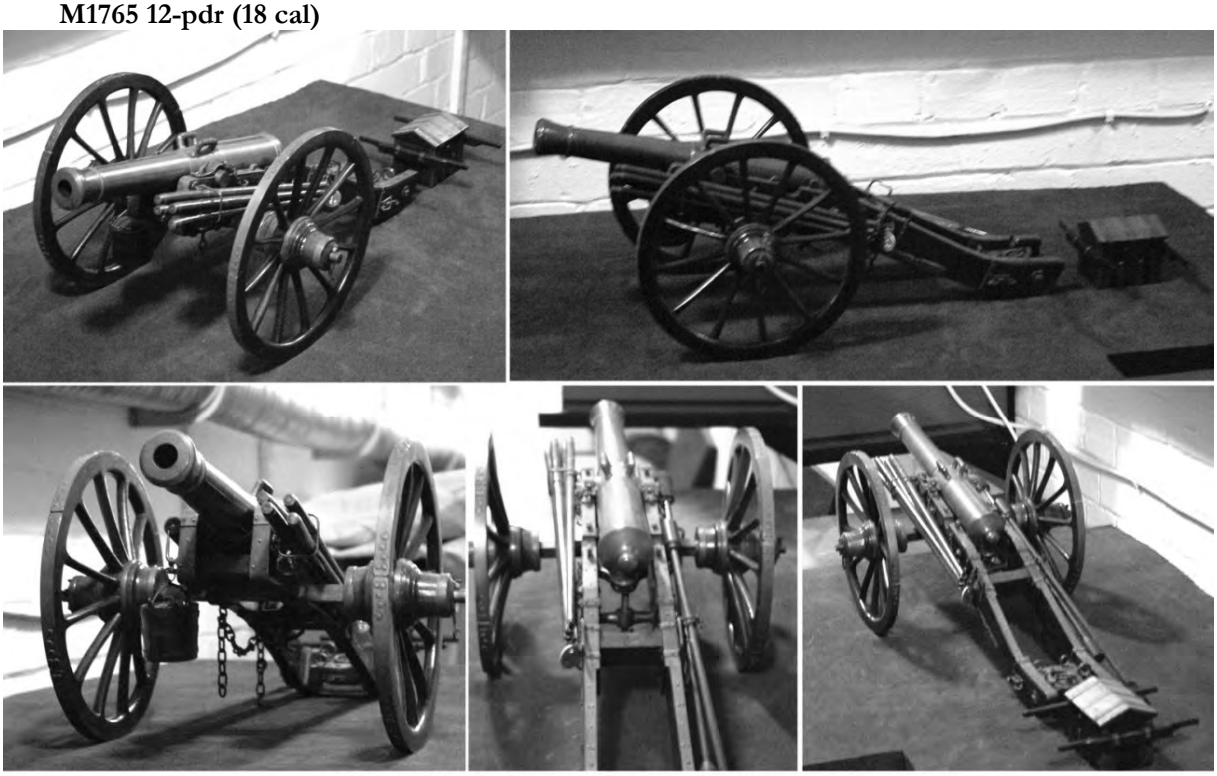
19 August 1766, Muy and Gribeauval published their report on the Strasburg tests.

16 March 1766, Garrison and siege guns to remain the same as the M1732 Vallière designs with the simpler M1764 Maritz II guns tubes.[136] The carriage designs for the other guns were finalised with the iron axle.

Table 3: Dimensions of French M1765 Gribeauval field guns.[137]

	12-pdr	8-pdr	4-pdr
Calibre	121.2mm	106mm	84mm
Shot diameter	118mm	104mm	82mm
Windage	3.2mm	2mm	2mm
Weight of shot	6.0kg	4.0kg	1.8kg
Tube length	211cm (18 cal)	184cm (18 cal)	146cm (18 cal)
Weight	985kg	580kg	290kg
Weight ratio	161:1	145:1	145:1

M1765 12-pdr (18 cal)



Model of the Gribeauval 12-pdr at Fort Nelson, UK
[Courtesy of the Trustees of the Royal Armouries]

[133] Grave (1800 r/p1984) p10-2.
[134] Summerfield (2011) *SOJ-2,* 14
[135] Decree of 17 August 1765 by Choiseul, Secretary State for War, introduced a new artillery system as championed by Muy, Gribeauval and du Coudray.
[136] Decree of 16 March 1769
[137] Gassendi (1809) *Aide-Memoire*, Paris, Volume II, pp520-521

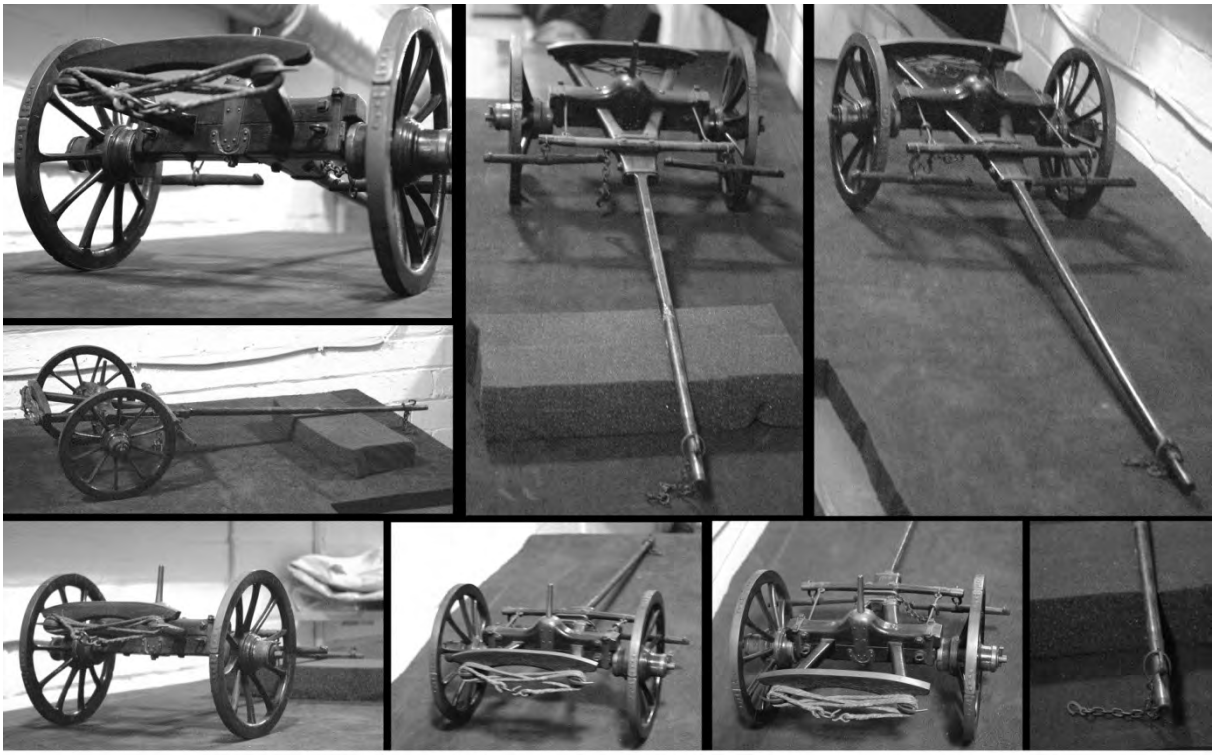
- Cast in 1780 mounted on a Gribeauval carriage that was built in 1821 is on display in the Musée de l'Armée, Paris.[138]
- Cast in Paris at the Chaillot Foundry by the Perier Brother in 1793-4 has a calibre of 121mm, 211cm long and weighs 926.6kg.[139]
- *LE MINOS* cast on 8 May 1794 at Douai with a calibre of 121mm, 210.8cm long and weighs 874kg. This is thought to have been captured at Waterloo.[140]
- *VOLTAIRE* cast on 19 November 1794 at Douai. Captured at Waterloo. Calibre of 122mm, 210.8cm long and weighs 884.9kg.[141]

M1765 8-pdr (18 cal)

- *LA RIGIDE* cast by J. Bérenger in 1789 was 201cm long.
- Cast by the Perier Freres in March 1794 has a calibre of 108mm and 185cm long.[142]
- M1765 4-pdr (18 cal)

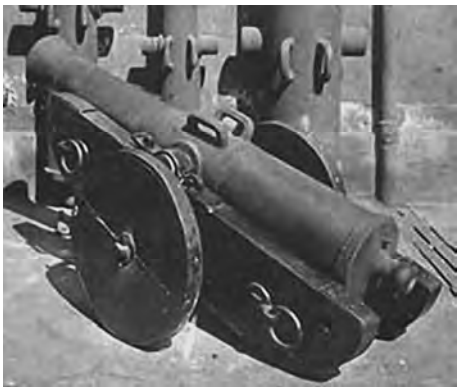
M1765 4-pdr

- Cast in 1792 with AN cipher – *Liberte* – *Egalite* had 86mm calibre and 152cm long
- Cast in 1796 at Lille Army Museum on an original M1792 carriage.



French M1792 8-pdr Limber at 1/6 scale in the Fort Nelson reserve collection.
[Courtesy of the Trustees of the Rayal Armouries.]

[138] See the pictures in Dawson et al (2007) 66.
[139] Royal Armouries XIX-57
[140] Royal Armouries XIX-76
[141] Royal Armouries XIX-54 [Blackmore (1976) pp123-4]
[142] Rotunda II-108



1771 Puget Mountain Gun Carriages

Puget developed mountain guns carriages that were later adopted by the Gribeauval System.

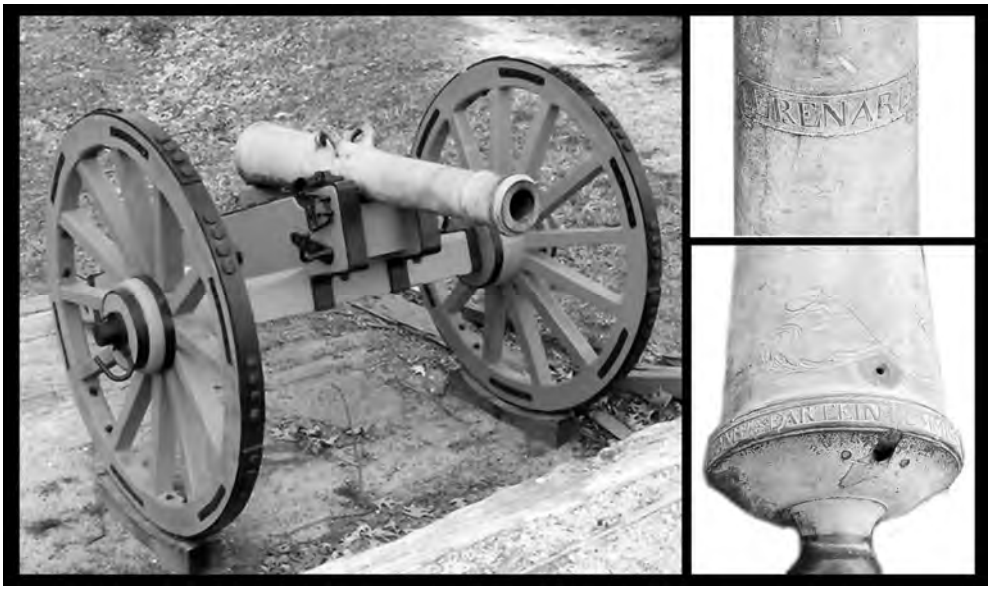
Left: 8-pdr on gun sledge [Musee de l'Armee]

1772-75 Gribeauval System Abolished

In **23 August 1772:** Gribeauval System reformed was abolished by Vallière Junior.[143]

In **1772**, a regulation assigned two M1757 1-pdr *Rostaing* guns to the regiments in Iles de France [today Mauritius Island] and Ile Bourbon [today Ile de la Réunion]. In **1773**, the regulations specified that the 1-pdr Rostaing gun would be served by 8 fusiliers receiving higher pay.[144]

In **1773,** The 4-pdrs *a la Suédois* were returned to the infantry. The M1773 4-pdr *a la Suédois* reduced to 165:1 weight ration by removing the decoration removed. These and earlier 4-pdrs *a la Suédois* served in America with Rochambeau's Expeditionary Force in 1780-83 and were not withdrawn from them until the 1790s when they were re-bored to 6-pdr calibre. D'Urtubie (1787: 275) refers to 4-pdrs with three horses in single draft so this must refer to this gun rather than the Gribeauval 4-pdr with four horses in double draft.



M1773 4-pdr "*a la Suédois*" on reproduction "British Muller" carriage at Yorktown, USA.

[143] Decree of 23 August 1772.

[144] Jean-Louis Vial (2012) "French Artillery à la Rostaing", *Seven Years' War Project*, www.*kronoskaf.com* [Accessed 12/6/2012].

M1773 4-pdr *a la Suédois* gun and M1732 single draft limber

- Calibre 84mm, 146cm (16.5 calibres) long, 325kg, and weight ratio of 165:1 Interesting the total weight including carriage and limber was 730kg compared to 1040kg for the Gribeauval 4-pdr.[145]
- Three example of the M1773 4-pdr cast between 1773 and 1775 exist at Musée de l'Armée in Paris N164, N165 and N166.[146]

M1773 Long Guns

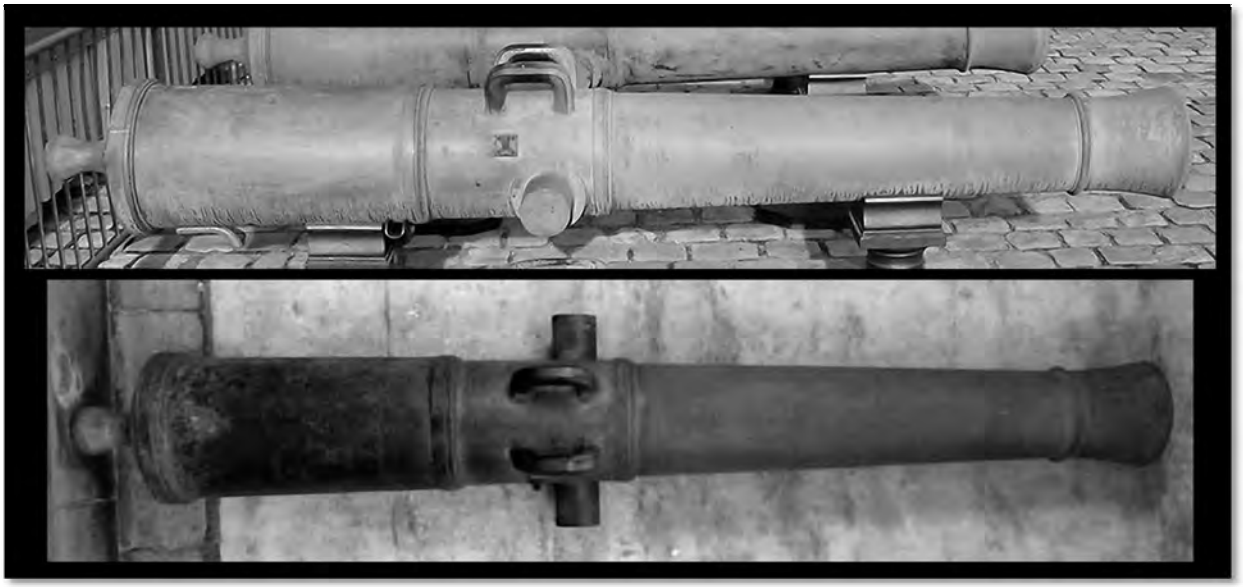
Vallière junior introduces new **M1773 Long Guns** that have the same dimensions as his father's M1732 guns but are plain and have plain dolphins. These are the same as the M1760 Maritz II guns but with plane square dolphins that Jean Maritz II had already introduced into Spain.

Table 4: Dimensions of French M1773 siege guns.[147]

	24-pdr	16-pdr
Calibre	153mm	134mm
Shot diameter	148.5mm	130mm
Windage	4.5mm	4mm
Weight of shot	12kg	8.0kg
Tube length	323cm (20 cal)	311cm (22 cal)
Weight	2740kg	1990kg
Weight ratio	228:1	249:1

M1773 Long 24-pdr (20 cal)[148]

- Cast 1801 at Douai, weighs 2,784kg and 355cm long
- M1773 24-pdr cast in 1801 at Douai with Musée de l'Armée N171 is identical to the M1764 but has plane dolphins. Cast 1801 at Douai, It weighs 2784kg and 355cm long.



M1773 24-pdr Heavy Gun.

[145] Decker (1994) p56
[146] Decker (1994) p56
[147] Gassendi (1809) *Aide-Memoire*, Paris, Volume II, pp520-521
[148] Musée de l'Armée N171.

M1773 Long 16-pdr (22 cal)[149]

- Cast on 3 July 1778 in Strasbourg has plain dolphins, calibre of 132mm, weighs 1990.7kg and 312.4cm long.. Weight ratio of 246:1.
- M1773 16-pdr on reproduction carriage at Yorktown, USA
- M1773 Long 12-pdr cast on 17 February 1787 by J. Bérenger at Douai is 293cm.[150]
- M1773 16-pdr made in the Paris Arsenal in 1800 was captured by the British at Waterloo.[151]

Left:
M1773 16-pdrs heavy guns cast in 1794
[Musee de L'Armee]

M1773 Long 12-pdr (23 cal)

- M1773 Long 12-pdr was cast in 1796.[152]
- Le Sarasin was cast in 1789.[153]

M1773 Long 8-pdr (24 cal)

M1773 Long 4-pdr (28 cal)

M1773 Gribeauval Garrison Guns

The M1773 Gribeauval Garrison Carriage was based upon the Austrian modifications made during the Seven Years War including smaller truck wheel and the *Richtsmachine* elevating system.[154] In service 1775-1828 with modifications by Manson in 1786.[155]

M1773 24-pdr Garrison Gun

- The ¼ scale model at the Musee de l'Armee. Calibre of 152.6mm, 323cm (20.4 calibres), 2760kg and weight ratio of 230:1. Total weight of 4060kg.[156]

M1773 16-pdr Garrison Gun

- The ¼ scale model at the Musee de l'Armee. Calibre of 133.7mm, 311cm (22.3 calibres), 2035kg and weight ratio of 250:1. Carriage cheek length of 211cm. Total weight of 2885kg.[157]

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[149] Royal Armouries XIX-56.
[150] Dutch War Museum, Delft
[151] Old College, Sandhurst, National Army Museum, Camberley. [Jobe (1971) 209]
[152] N.215 (1796) [Decker (1994) 63]
[153] N.183 (1789) [Decker (1994) 64]
[154] Summerfield (2011) SOJ-2, 29
[155] See Summerfield (2011) *SOJ-2,* 39 for illustrations.
[156] O.77 and O.90 [Decker (1994) 65].
[157] O.89 [Decker (1994) 65].

M1773 Long 12-pdr Garrison Gun

- The ¼ scale model at the Musee de l'Armee. Calibre of 121.3mm, 293cm (23.2 calibres), 1560kg and weight ratio of 260:1. Carriage cheek length of 195cm. Total weight of 1560kg.[158]

M1773 Long 8-pdr Garrison Gun

- *LE VICTORIEUX* was cast by Bérenger at Douai (1/4 scale model): Calibre of 106mm, 265cm (24 calibres), 1070kg and weight ratio of 270:1. Carriage length of 184cm.[159]

M1773 Long 4-pdr Garrison Gun

M1773 Coast Artillery

M1773 bronze Long 24-pdr (20.4 cal) on Gribeauval garrison carriage and M1732 single draft limber

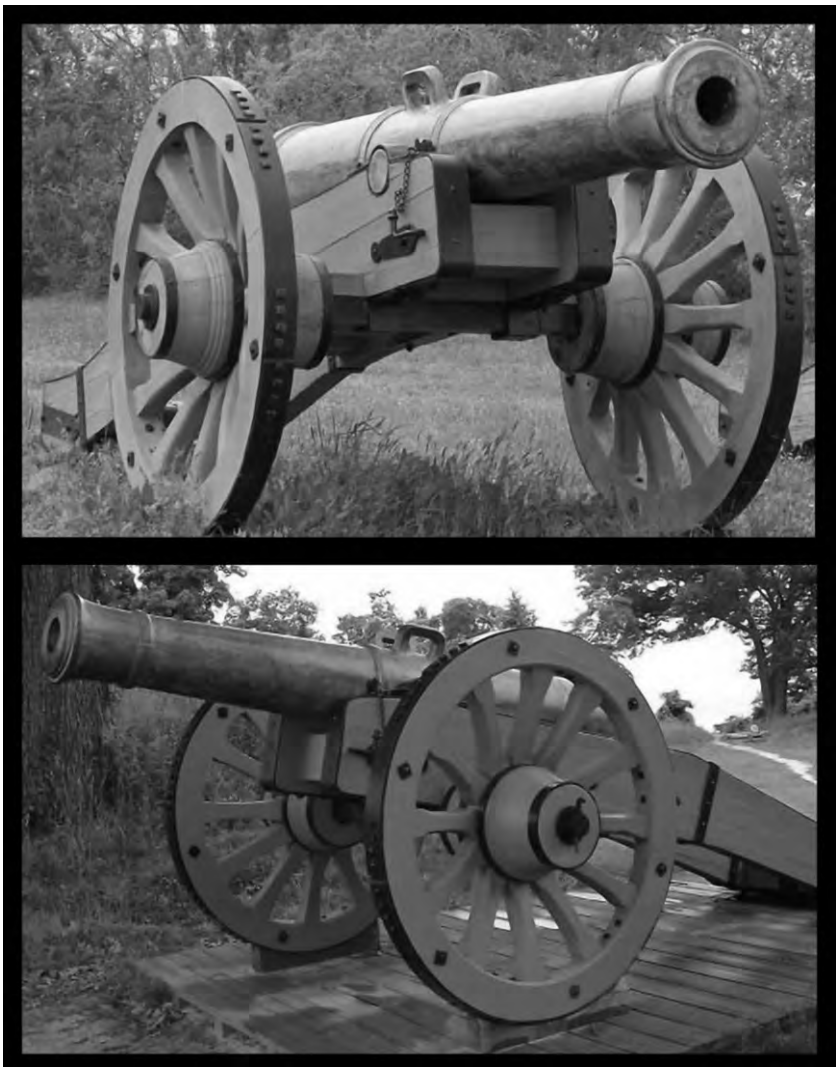
- A 1:4 scale model in the Musee de l'Armee collection: M1773 bronze 24-pdr coast artillery gun of 152.6mm, 323cm (20.4 calibres), 2760kg and weight ratio of 230:1. Carriage cheek length of 211cm and chassis of 422cm. Height of barrel was 177cm. Total weight of 3500kg.[160]

M1773 Siege Guns

M1773 24-pdr and 16-pdr Siege Guns were on carriages that had changed little from the M1732 Vallière carriage and were still elevated with quoins (wedges).

M1773 Long 24-pdr (20 cal) on siege carriage and M1732 single draft limber

M1773 Long 16-pdr (22 cal) on siege carriage and M1732 single draft limber



Left: M1773 24-pdrs on reproduction siege gun carriage at Yorktown, USA.

[158] O.79 [Decker (1994) 64].
[159] O.80 and O.92 [Decker (1994) 59].
[160] O.87 and O.309 [Decker (1994) 60].

10 May 1774: Louis XV died and was succeeded by his grandson Louis XIV so the balance of power changes in favour of Gribeauval.

3 October 1774: The Committee of the Four Marshals of France recommended the reintroduction of the Gribeauval System. The Royal Ordinance of instructed that the 4-pdrs *a la Suédois* to once again be returned to the Artillery. A Battery would consist of two sections of two guns manned by the same officers and gun crews.[161]

1776 Re-introduction of the Gribeauval System

In **January 1776:** Gribeauval appointed as Inspector General of Artillery. On **6 June 1776**, Vallière Junior dies and Gribeauval succeeds him as Lieutenant General of Artillery.

On **26 June 1776**, the 4-pdr *a la Suédois* (146cm long) was re-issued to the infantry at 2 per battalion and the M1773 Long 4-pdr (235cm) was allocated to the artillery reserve according to the Règlement de l'Infanterie du 1776.[162]

On **3 November 1776**, Gribeauval ordered that artillery officers and specific gun crews were to be permanently assigned to specific guns.[163]

On **16 November 1776**, Gribeauval System reinstated for the field artillery only Decree of 16 November 1776. The Siege and garrison artillery remained as the M1773 modified Vallière system.[164]

1778-83, French intervention in the American War of Independence that had started in 1775

1778-79, War of Bavarian Succession

On **24 October 1784,** the *Corps Royal of Colonial Artillery* was established under Jakob Manson.

M1786 Garrison Carriages modified by Manson and Rostaing

M1786 "Gribeauval" Garrison Carriage had the truck wheel at the back removed and changing the elevating system to an elevating screw. Manson also replaced the *Richtmaschine* (introduced in 1780) for the siege guns with the elevating screw.

M1773 Long 24-pdr (20 cal) on M1786 garrison carriage and M1732 single draft limber

M1773 Long 16-pdr (22 cal) on M1786 garrison carriage and M1732 single draft limber

M1773 Long 12-pdr (23 cal) on M1786 garrison carriage and M1732 single draft limber

M1773 Long 8-pdr (24 cal) on M1786 garrison carriage and M1732 single draft limber

- M1773 8-pdr garrison gun 1:6 scale model named "*LA VICTORIEUX*" by Bérenger of Douai.[165]

M1773 Long 4-pdr (28 cal) on M1786 garrison carriage and M1732 single draft limber

[161] Royal Ordinance of 3 October 1774
[162] D'Urtubie (1787) pp89-90, p275 and p427 referring to *Règlement de l'Infanterie du 1776*.
[163] Royal Ordinance of 3 November 1776
[164] Decree of 3 November 1776
[165] O.80 and O.92 [Decker (1994) p60]

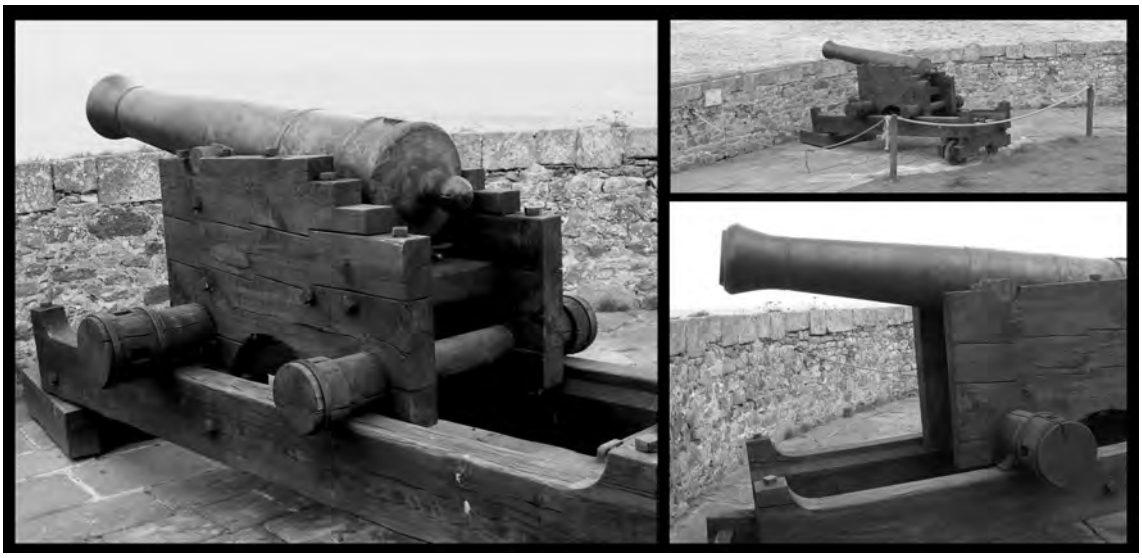
M1786 Manson Iron Naval and Coast Artillery

These were introduced in 1786 according to Caruana (1997)[166] and Decker (1994) Interestingly Percy (1832) gives 1790 as the date of introduction.

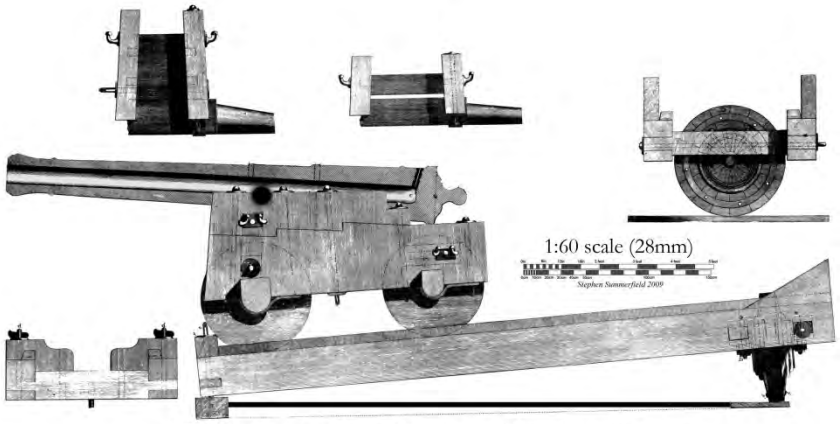
M1786 Manson Iron 36-pdr[167] on Meunier carriage.

- Two examples of the M1786 Manson Iron 36-pdrs [Royal Armouries XIX-60 and XIX-61] captured/Ushant at the Glorious First of June (1 June 1794)

M1786 Manson Iron 24-pdr on Meunier[168] carriage.



Manson Iron 24-pdr on Meunier Carriage at Fort La Latte



M1786 Manson Iron 24-pdr on Meunier coast gun
[After Manson, 1792]

M1786 Manson Iron 18-pdr on Meunier carriage.

- Calibre 138.7mm, 260cm (17.6 calibres), 2060kg and weight ratio of 235:1. The carriage cheeks were 203cm long and the chassis was 422cm. The barrel was 276cm high. Total weight of 2720kg.[169]
- M1786 Manson Iron 18-pdr was cast in 1818 is in the Musee de l'Armee collection in Paris.

M1786 Manson Iron 12-pdr on Meunier carriage.

- Calibre 121.2mm, 260cm (20.3 calibres), 1600kg and weight ratio of 260:1 [170]
- M1786 Manson Iron 12-pdr cast in 1812 Dutch War Museum, Delft.

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[166] Caruana (1997) Vol II, p258)
[167] Blackmore (1976) p122.
[168] Plan Manson (1792) in Dawson et al (2007) p191
[169] O.471 ¼ scale model [Decker (1994) p61].
[170] Decker (1994) p61

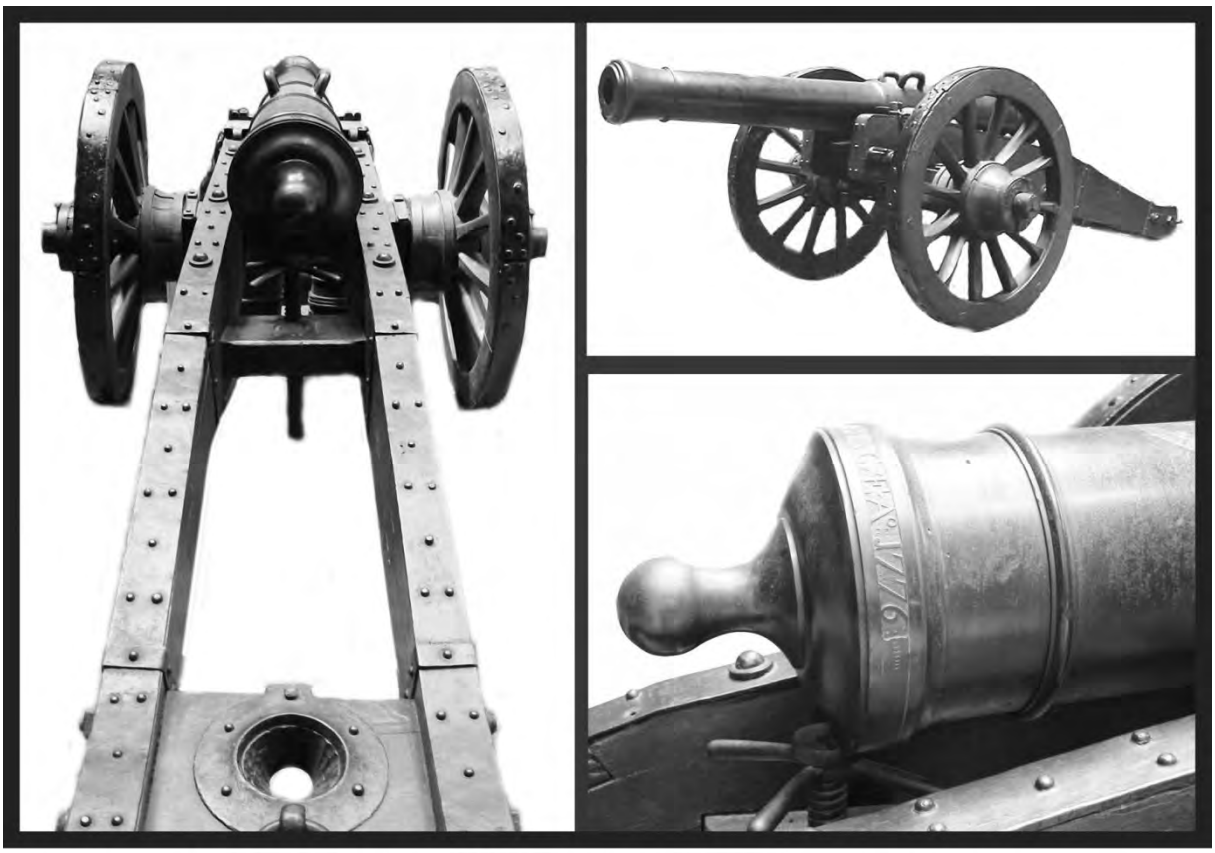
M1786 Manson Siege Guns

Manson also replaced the *Richtmaschine* for the siege guns with the elevating screw.

M1773 Long 24-pdr (20 cal) on M1786 siege carriage and M1732 single draft limber

M1773 Long 16-pdr (22 cal) on M1786 siege carriage and M1732 single draft limber

- 1:4 scale model of the M1786 Siege gun named "*LA FULMINANTE*" cast by Bérenger of Douai.[171]



M1775 24-pdr cast in 1776 on a M1786 Manson siege gun carriage with vertical elevating screw.
[Brussels Army Museum]

[171] Decker (1994) p71

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SOJ-4(11)
Discussions on the Gribeauval System

Translated by Tim Mahon
Extracted from Napoleon III and Favé , *Histoire de l'artillerie,* pp. 131-162

Trials were ordered on the changes proposed by Gribeauval: they began in Strasbourg in 1764 and lasted four months. Officers of all branches in the region were invited to observe and give their opinions. Only those who were supportive were allowed to sign the transcripts. In 1765 the new equipment was adopted by Minister Choiseul.

After a long and vigorous polemic directed against the new ideas by Vallière's son and successor, the new equipment was rejected by Minister Monteynard in 1772. A committee, consisting of Marshals de Broglie, Contades, Soubise and Richelieu decided to restore the new equipment in 1774. After Vallière's death on 6th June 1776 the appointment of Gribeauval as premier inspecteur général de l'artillerie ensured its final adoption. All Gribeauval's innovations had been attacked and many of the objections made to the new equipment were not without foundation. We will rapidly examine below the main criticisms that were made at the time, following the same order we have established for examining the improvements.

Guns: the new guns were criticized for having;

1. Less range
2. Less accuracy of fire
3. Less accuracy of aiming
4. Lower muzzle velocity
5. A lower number of ricochets
6. Higher recoil
7. Less durability and endurance

The objections made on the first five points lacked precision, stemming above all from a lack of knowledge of ballistics, and the debate on these issues became mired in imprecision. It seems that further trials would have enabled wider agreement.

The objection made regarding recoil was more important, since it was a more serious issue:

> "*The antagonists observed that the recoil for an older 12-pounder cannon was 4½ feet, while that of a new 12-pounder, in the same gun position, with the same charge and elevation, was 15 feet 8 inches. They concluded there would be a considerable loss of time to return the gun to its firing position after each discharge and that the new cannon could not therefore be placed in battery in constrained positions without overturning their carriages, should the be allowed to recoil, or damaging them if the recoil was impeded.*"

Gribeauval expressed himself thus on the subject:

> "*We shall now respond once and for all to the objection of higher recoil, which has been blown out of proportion. The officers appointed to the trials have not found it excessive. The same situation applies in the artillery schools, where rounds have been fired from these guns for the last five years with much more energy than was ever achieved with the former pieces; the only difference the recoil makes is that the gunners should withdraw two paces when firing the piece, rather than one. The short cannon of the Austrian and Prussian artillery, which recoil even further due to their low weight, are served with no less energy than ours.*"

Protagonists of the new system asserted that the recoil was only significant in the confined space of a firing range, not on the battlefield, and that it while was thus too high for emplacements, field pieces should not be so emplaced. Anything that contributes to increased mobility will certainly increase the recoil, but do not the advantages outweigh the disadvantages?

The endurance trials carried out on the new pieces had not been conclusive. The 8- and 4-pounders had fired more than 1,000 rounds without deterioration, but the 12-pounders had fired only 780 and 442. Gribeauval responded:

> *"Vallière cites the two 12-pounders without recognizing that, for the first, which had fired 780 rounds, a screw had been removed from the muzzle and as for the second, which had fired but 442 rounds, a total of five such screws, each 4-5 lignes in length, had been removed, which prevented the piece achieving its full potential.[172] Having broken the handles[173] of this piece, we recognized there was a casting fault in the gunmetal and that the argument should therefore be directed at a faulty casting process rather than the endurance of the gun."*

In any case, the aspirations of Gribeauval's supporters themselves were surpassed in the wars that followed. To his adversaries, who protested strongly that short cannon were inappropriate for the defence of entrenchments due to the rapid deterioration of the embrasures, Gribeauval responded laconically:

> "*Field artillery should never be firing through embrasures.*"

> "*Supporters of the opposing view sought to conceal this inconvenient truth and claimed that in field service such guns would only be fired from covered positions, but that it was inevitable that the rapid deterioration of the embrasures and the recoil of the new pieces, too high when so emplaced, would establish the inferiority of the new cannon when compared with the old in the particular application of the defence of field fortifications. Gribeauval's supporters were wrong to deny this failing; they should have admitted such, and affirmed that such a weakness, in the particular circumstance in which the artillery was static, could not outweigh the advantages it demonstrated when mobile.*"

It seems that no objections were raised with respect to the howitzers, although their calibre was said to be too small for the objective they were intended for – the destruction of inhabited areas.

Gribeauval's supporters responded:

> "*It has been well established that howitzers should not serve in the field except to cause concern to the enemy behind fortifications or heights that field guns cannot reach, and to destroy buildings they can reach. Both these objectives can also be achieved with cannon by means of ricochet or heated shot, if sufficient time and preparation is possible; if not, a howitzer is to be preferred – a howitzer of such a calibre as to be mobile, since the targets do not demand precision of impact nor large shells, which in any case rarely explode at the point of aim – requirements very different from those of a siege. It is therefore quite right to consign 8 inch howitzers to the siege train and only to use 6 inch howitzers for the field artillery, where they are unlikely to be used for any purpose other than those we have just identified, at least not if there is no lack of cannon, which will always be preferred since their fire is longer ranged, more accurate, more rapid and less costly than that of howitzers.*"

Manufacture: discussions on the positioning of the kingpins and their supports were riddled with errors as a result of a lack of theoretical knowledge of the materials. The trials later reported in favour of the new system.

> "*Maritz, a foundryman from Geneva, had introduced a new manufacturing method to France since 1740, comprising casting [barrels] whole and then boring them after cooling with the aid of advanced machinery. Only Gribeauval had adopted this manufacturing process and put it to general use; it had been fiercely criticized for providing less resistance and solidity for the gun tube's inner surfaces than the previous technique. Adversaries asserted that the pouring of a core, a method is use for centuries, gave the bronze close to the core a temper that assured the durability and life of the gun tube. They forgot all the disadvantages of cores, and claimed the trials already conducted on the new pieces supported their opinion. It is worth remembering that Gribeauval had had to return to pouring cores for mortars; however, as these had to be bored out in order to attain a precise diameter, the adversaries again criticized this method for removing a layer of the most resistant metal from the tubes, thus reducing the mortar's durability and life.*"

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[172] An extremely difficult sentence to translate accurately in the absence of specialist knowledge – "vis" certainly means screw and is used thus in several artillery terms such as 'elevating screw.' I am unaware of any screws at the muzzle of a period piece; if they exist all well and good – if they do not, this *might* translate as 'fillet' or 'sliver.' I have no evidence one way or another at the moment.

[173] I had wanted to translate this originally as 'dolphins,' but the word "dauphins" is used later in a later passage – I suspect they may mean the same but have chosen handles here as more literal.

"*External machining of the piece meant that the graceful ornamentation of Vallière's guns was lacking and the new style of handles, replacing the dolphins, gave rise to criticisms of the same nature. However, the new position for the kingpins, whose axis was coincident with the axis of the cannon, demanded a greater precision for the external machining of the piece than had been the custom hitherto. Machining had thus become a necessity and the new handles were created in a form appropriate to their purpose.*"

Cartridges: the principal criticisms levelled at their use were that they accelerated fire too much and could be easily deformed, thus rendering them unusable. Their inherent advantages, though, far outweighed these minor complaints.

Projectiles: Roundshot cartridges were criticized for encouraging a waste of ammunition. Only inadequate trials were conducted with ball cartridges. These projectiles carried with them the serious disadvantage of being significantly more costly. Against the advantages of reducing windage for field artillery, the serious disadvantage of not being able to use these pieces for firing heated shot was brought up. However, the introduction of howitzers again gave the field artillery the capacity for incendiary fire, without the attendant need for all the preparations and inconvenience necessary for heating and loading heated shot into the cannon.

Gun carriages: the carriages for the new pieces were as heavily criticized as the cannon themselves. For the 8- and 12-pounders, they were attacked for being too heavy by comparison with the former pieces of the same calibre. The growth in the number of metal fittings, bolts, nuts, supporting bands and locking mechanisms required a considerable increase in expenditure, which was useless and even harmful from a certain perspective, since repairs could no longer be carried out, as had been the case hitherto, by blacksmiths in the areas close to camp.

Even though there is some foundation to this latter criticism, defence of the new carriages was easy, since the increased weight came principally from the ammunition chests,[174] whose usefulness nobody could deny, and the iron axles which reduced friction. The metal fittings, certainly greater in number, contributed to the strength of the carriage and the uniformity of dimensions that existed between one carriage and another allowed for the provision of replacement parts that helped repair work immensely.

Iron axles were rejected by Vallière in 1772 for the following reasons:

"Particularly for the gun carriages, for they cost far more than wooden ones, especially with copper fittings, without which they quickly destroy the wheel hubs. They also require frequent replacement as a result of their construction, causing extreme difficulty in repairing them in camp. By comparison, wooden axles can be replaced by means of a tree found en route or by an axle from another carriage if circumstances are pressing. With iron axles it is impossible to use 'false axles,' whereas one always retains this possibility with wooden ones. Finally, because they are significantly hampered[175] *by the increased recoil when the cannon has to be fired. To all these objections should also be added the fact that the friction of the stub axles is reduced, and that while this does facilitate manoeuvring on horizontal ground, there is a risk that the piece may be carried away by its heavy weight when descending, or even that the proposed method of controlling it may dislocate the wheels."*

The shafts were criticized for breaking too frequently and for making the work of the horses when on the road far harder. In addition, the train drivers needed to be more experienced in order to drive the train horses, which was a serious disadvantage, given the process by which the drivers were recruited.

Bricoles: the objections to the new system made with regard to the method of manoeuvring the cannon by hand on the battlefield were justified by experience; in addition, the method was little employed.

Prolonges: the *prolonge* was greeted with a degree of scepticism, even though no serious objection was raised against it. Nevertheless, it was the cause of the artillery being able to play such a great part in mobile operations.

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[174] Difficult to know whether this is the correct translation for "coffrets," though it makes sense in the absence of being able to find any other specialist meaning of the word.

[175] From the context, this may mean 'stressed' rather than 'hampered.'

Caissons: the ammunition wagons were criticized for introducing to the artillery park too great a variety of differently configured vehicles. Their use, however, which provided for better conservation of ammunition and greater rapidity in operation, compensated in full for this minor disadvantage.

Sights: the following, according to General Favé, is the discussion that took place with regard to the use of sights:

> "*Let us first examine how Dupuget, perhaps the strongest of Gribeauval's innumerable critics, understood the issue. He expressed himself thus:*
>
> *'In our times, having done away with the ridiculous front sight placed on the greatest diameter of the barrel, we do not rely solely on the gunner's rear sight (at least in France), but content ourselves with observing the fall of shot, unless firing at point blank range. Once the correct angle of fire has been determined, it is marked on the elevating wedge for reference.*
>
> *Even supposing that the new mobile rear sight is sturdy enough to overcome the normal accidents and the inevitable knocks that even an attentive soldier will give it during the heat of an action; is well enough made so that the gunner may raise and lower it with ease when he needs to change the degree of elevation; is at the same time sufficiently stable to keep to the assigned position; long experience suggests it will be necessary to note the horizontal ranges corresponding to its divisions, create range tables, have the officers and gunners learn these tables and then train them all to be able to judge the enemy's distance at a single glance, in order to adopt the appropriate division on the sight.*
>
> *The divisions of the mobile rear sight correspond to horizontal distances that are not always identical, but inclined above or below the level of the battery in certain circumstances. It thus becomes necessary to create range tables for each division of the rear sight for oblique inclinations and to have these learned, as for the principal tables, training gunners to estimate not only distance but also the angle relative to the ground on which the battery sits. These tables will be required for roundshot, but yet others will be needed for canister.'*

Vallière did away with front sights in order to avoid aiming errors caused by the irregular nature of the height from the supporting wheels, and Dupuget thought that artillery should never be fired in battle at anything more than point blank range, which for the Vallière cannon was around 200 *toises*.[176] He thus concluded his dissertation as follows:

'1. The rear sight is a poor instrument;
2. It serves only to facilitate fire when one should not be firing;
3. Its operation is always trial and error and frequently impossible;
4. It serves only to throw the gunner into error.'

When Vallière had the Gribeauval system rejected in 1772, he did away with the rear sight, which he believed could be advantageously replaced with notches in the elevating wedge. These notches were unable to replicate the effect of the sight, especially on campaign, when the centre of support for the wheels and the trail change after each discharge. By using the same sight for several rounds, the same relationship is maintained between the elevation with regard to the target and the axis of the gun relative to the trajectory, whilst an elevation governed by using the same notch [in the elevating wedge] merely maintains the same relationship - that is, the same angle – between the trail of the carriage and the gun's axis.

Gribeauval and his supporters had all the advantages in this debate, since they offered up the sight as a means of improving aiming when shot fell short of the desired distance and of maintaining it once the first fall of shot had been observed. In this argument, they demonstrated that the difference in height between wheel support would not produce sufficiently large aiming errors to cancel out the advantages of the sight and that the inclination of the line of elevation on the horizon would have little influence on the range as dictated by the sight.

When one reflects on the fact that at the time Gribeauval introduced this method of aiming the former gunner's setsquare had been abandoned, that there was no method of ensuring aiming at any distance

[176] The *toise* is a measure of length approximating to 2 metres or six and a half feet.

above point blank range and that the gunner was reduced to making the vaguest estimates in order to aim the piece, it is astonishing that the methodology could be so short-sighted as to have given birth to such mistaken understanding, developed over a long period and so furiously supported.

In order to appreciate the influence that the rear sight had on the range of cannon on the battlefield, it should be sufficient to recall that the author of the *Essai sur l'usage de l'artillerie dans la guerre de campagne et dans celle de siege*,[177] Dupuget – who, as we have seen, was one of the opponents of the sight – gave the following as the ranges at which Vallière's cannon should be employed:

> '*At 400 toises, cannon shot is inaccurate; at 200, it begins to become more certain; it becomes deadly at 100. Thus, when the enemy is at the first distance, a slow fire should be maintained to disrupt their manoeuvring, giving oneself time to aim; at the second distance, the rate of fire should increase to slow down their advance; at the third it should be as rapid as possible to break them.*'

This extended and very erudite discussion, in which numerous officers took part, allowed all questions pertinent to the artillery to be raised. Mistakes were made by both parties to the discussion, but the experience of the wars that followed showed the full value of Gribeauval's work. Thanks to him, France was able to undertake a struggle against the European coalition with an artillery that was light, sturdy and uniform, whose qualities certainly overcame its few disadvantages.

[177] *Essay on the employment of artillery in field and siege operations*

SOJ-4(12)
Gribeauval Ordnance 1765-1827

By Stephen Summerfield of Loughborough University

The poor performance of the French army during the Seven Years War (1756-63) set off a program of military reform in France guided by the Duc de Choiseul, French Secretary State for War (1761-70). The M1732 Vallière Ordnance was considered too heavy and cumbersome so creating the M1765 Gribeauval System.

15 September 1715
Jean Baptiste Vacquette de Gribeauval (1715-89) was born in Amiens on to a middle class lawyer family.[178]

Vallière Ordnance 1732-1764

In 1732, Vallière Senior rationalised the calibres of French ordnance whose design dated back to the reign of Louis XIV. Jean Maritz introduced his Horizontal Boring Machine to France. Gribeauval joined the artillery as a volunteer.

1749
Jean Baptiste Vacquette de Gribeauval (1715-89) designed the M1749 Garrison Carriage based on his experience of siege war during the Austrian War of Succession (1740-8).[179]

1752
Gribeauval was a captain in the Miners.

1755
In 1755, Gribeauval visited Prussia to observe the Prussian M1754 Light 12-pdr with conical bore.

1757
Gribeauval fell into disfavour for stating that the humiliating defeat of Rossbach (1757) was in part due to the introduction to battalion guns championed by Marshal de Saxe.[180] Unlikely to receive a field command or promotion, his request to transfer to Austrian Service was accepted.[181]

1759
Vallière senior died. Marshal de Broglie (1718-1804) on his own initiative ordered the reboring of his M1732 4-, 8- and 12-pdrs to the 6-, 12- and 16-pdr respectively at Strasbourg Arsenal.[182]

1760
Jean Maritz II (1711-90) produced Vallière guns without decoration with his new combined horizontal boring machine and lathe.[183]

1761
Duc de Choiseil who was French Ambassidor in Vienna returned to France to take up the role of Secretary State for War.

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[178] Passac (1816) 3
[179] Fave (1871) IV: 144-5
[180] Hennebert (1896) 30
[181] Rouquerol (1898) 15
[182] Percy (1832) 14
[183] See Plate XII in Graves (1984)]

21 December 1761
Louis XV instructed Jean Maritz II to design lightened gun barrels of 18 calibres and these were cast at Strasbourg.[184]

March 1762
Dubois of the War Office instructed Gribeauval to write a report upon Austrian Artillery.

20 July-9 October 1762
Gribeauval conducted the active defence of Schweidnitz against the Prussian Army of General Tauenzein so compelling Frederick the Great to take personal command. Hence, Gribeauval was one of the few in the French artillery officers that emerged with an enhanced reputation from the Seven Years War.

Gribeauval Ordnance 1765-1772

The poor performance of the French army during the Seven Years War (1756-63) set off a program of military reform in France guided by the Duc de Choiseul, French Secretary State for War (1761-70). The M1732 Vallière Ordnance was considered too heavy and cumbersome.

April 1764
Duc de Choiseul chose Gribeauval as Lieutenant-General of Artillery who was only a Captain of Artillery in French service before entering Austrian service to oversee the implementation of the reforms of the Artillery. They had first met when Choiseul was the French Ambassador in Vienna. The appointment of Gribeauval was an affront to the senior artillery due to his lack of seniority, humble origins, opposition to de Saxe's battalion guns, foreign service with Austria and his low opinion of the Vallière system was taken as an affront by the senior artillery establishment, the nobility and especially Jean Florent de Vallière junior, the son of Vallière senior.[185]

Summer 1764 Gun trials
Gribeauval undertook the gun trails at Strasbourg of the M1762 Maritz II and M1732 Vallière guns on his return in front of Marshal Contades (the local artillery garrison commander) and general staff officers including Rochambeau and Bensenval.[186] The final report concluded that the range of the M1762 Maritz II guns were inferior to the M1732 Vallière guns and both were inaccurate at extreme range. The report emphasised the manoeuvrability of the Gribeauval guns.

17 August 1765
The introduction of the Gribeauval System in 1765, there followed years of arguments between the supporters of Vallière *(les rouges* [the reds]) and Gribeauval (*les bleu* [the blues] so named after their breeches and waistcoats they wore. This focused around the mobility of the Gribeauval guns and the range advantages of the Vallière guns. The new field artillery system introduced.

- The 18 calibre M1765 8- and 12-pdr guns being about 30% shorter and 40% lighter than the M1732 guns.[187]
- The elevation screw was applied to all calibre of guns other than the Swedish 4-pdr to improve accuracy, and new carriages were designed to maximize tactical and operational mobility.[188]
- Iron axle was introduced but the design was not finalised until 1768.
- The M1765 6.4In Howitzer carriage had wooden rather than an iron axle.

[184] D&S (2008) 23
[185] Fave (1871) IV: 96
[186] Alder (1997) 101
[187] D&S (2008)] 24
[188] Picard (1906)

16 March 1769
The Decree confirmed that the M1732 guns and carriages were retained with minor alterations for siege and garrison operation.

1770 End of the Choiseul Ministry
The Choiseul Ministry ended and Gribeauval lost his major political patron. Monteynard (1720-1782), who replaced Choiseul, was a weak and vacillating man who swayed by the power of the "rouges" and in the name of economy directed that a return be made to the Vallière system and the old organization. The vitriolic arguments between the supporters of Vallière and Gribeauval over the artillery material were reminiscent of the 1740s debate over lighter guns were publicly debated in the salons and in print.

1771 Muy and Gribeauval Plans
These permitted, the six arsenals of construction [Auxonne, Douai, Le Fère, Metz, Nantes, Strasbourg] to produce carriages with the same dimensions so their parts were interchangeable.[189]

1771
Commissionaire de Fontes Bérenger at Douai after quarrelling with his father in law of Jean Maritz cast M1732 Vallière guns without decoration that in tests were more durable and superior range over the M1765 Gribeauval guns.[190] In other tests, the M1765 carriages lasted only ten rounds when they were fired with half the weight of shot rather than their designed charge weight.

1772
Assistant Professor M.N. Dupuy at the Artillery School of Grenoble translated Robins' (1742) *New Principles of Gunnery*.

The Interregnum 1772-75
On 23 August 1772, Joseph-Florent de Vallière [the Younger] (1717-76) replaced Gribeauval as Lieutenant General of Artillery and re-introduced the M1732 system.

1773
Du Coudray who was one of the strongest supporters of the Gribeauval published *L'Artillerie Nouvelle* anomalous in defence of the Gribeauval System in Amsterdam. This was later republished by Otto De Scheele in 1777 after Du Coudray's death in America as the first volume of his compilation work, the second volume being a compendium of the Vallière and Gribeauval debate 1765-1774. This nature of debate was only possible given the wide spread print culture of France, especially Paris and its salons.

Euler's theories of interior ballistics were used to defend the M1732 Vallière system against Gribeauval's new designs, as the Vallière guns fired larger powder charges. However, the supporters of Vallière failed to appreciate that muzzle velocity was only one aspect of ballistics.

1774
Louis XV (r1715-74) died on 10 May and succeeded by Louis XVI (1774-92). On 3 October 1774, Marshals Richelieu (1696-1788), Soubise (1715-87), Contades (1704-95) and de Broglie (1718-1804) recommended the Gribeauval System.

Production was finally centralised at Strasbourg by Colonel Claude-Marie Valennubet Le Duc and he also added a special pattern room to the Regimental Artillery School where artisans could prepare the patterns that were sent to the other arsenals.[191].

[189] Alder (1997) 156-7
[190] Alder (1997) 100-1
[191] Alder (1997) 158

Gribeauval Ordnance 1775-89

In 1775, Comte de St Germain (Secretary State for War) appointed Gribeauval as First Inspector of Artillery. On 6 June 1776, Vallière junior died and Gribeauval replaced him as Lieutenant General of Artillery so at last consolidating his control over the artillery. On 3 November 1776, Gribeauval instructed that officers and gunners would be henceforth assigned permanently to a specific piece for the first time. On 16 November 1776, the Gribeauval system for field artillery only was reintroduced.[192]

1784

The artillery totalled 11,085 men, 784 field guns, and 224 howitzers/mortars.

1788

Gribeauval was a key member of the military commission on the French Army.[193]

May 1789

Gribeauval died and Jean-Pierre du Teil (1722-1794) became First Inspector of Artillery.

Gribeauval Ordnance 1791-1803

The post of First Inspector of Artillery was abolished. The French had 7,746 fortress pieces including 2,000 mortars and howitzers; 1,800 pieces of coastal artillery; 1,300 field pieces.

1792 Louis XVI deposed

Louis XVI was deposed in September. The National Assembly sanctioned the use of captured guns (mainly Austrian M1753 ordnance) and rebored the "Swedish" 4-pdrs to 6-pdr to use captured ammunition.[194] The addition of captured and foreign equipment so increasing the logistic nightmare of the French Army. Out of necessity batteries were deployed with mixed calibre guns often with howitzers attached.

1792 Manson's *Tables of Construction*

These codified the changes to the Gribeauval system made by Phillip Comte de Rostaing and Jakob (Jacques) Manson (1724-1809).

- Codification of the simplification of the M1773 siege and garrison guns.
- These included the M1765 6.4in howitzer receiving a vertical elevating screw instead of the Richtmaschine.
- Number of different wheels reduced from 26 to 13.

1792 Manson leaves French service

Jakob Manson joined the *Armée de Condé* to fight against the Revolutionaries.

21 Jan 1793.

Louis XVI and Marie Antoinette were executed.

1795 Longue Portée Howitzer

This replaced the M1768 Prussian 10-pdr and Gribeauval 6.4in howitzer and was mounted on a carriage designed by Jean Philippe Raymond Dorsener. These still served with the Corps batteries equipped with Gribeauval 12-pdrs as late as 1820s.[195]

1797 Manson joins the Russian Army

Jakob Manson joined the Russian Army with the rank of General.

1799 Manson enters Bavarian service

Jakob Manson entered Bavarian service in 1799 on the invitation of Elector Maximilian Joseph who had commanded the Strasbourg garrison in the 1780s where Manson had been Director of the Strasbourg Arsenal (1774-91).

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[192] D&S (2008) 28
[193] Fave (1871) IV: 160
[194] DDS (2007) 68
[195] D&S (2008) 30

Table 5: Dimensions of the Gribeauval Field Ordnance.

	M1765 4-pdr	M1765 8-pdr	M1765 12-pdr	M1792 6.4in Howitzer	M1795 Long Porte Howitzer
GUN[196]					
Calibre	84.2mm	106mm	121.2mm	165.8mm	165.8mm
Windage	2mm	2mm	2mm	4mm	4mm
Tube Length	146cm (18 cal)	184cm (18 cal)	211cm (18 cal)	77cm (4.6 cal)	108cm (7 cal)
Bore Length	16.5 cal	16.5 cal	16.5 cal	3.0 cal	4.3 cal
Total Tube Length	158cm	200cm	229cm	91cm	122-124cm
Tube Weight	290kg	580kg	965kg	320kg	680kg
Weight Ratio	150:1	145:1	160:1	26:1	47:1
CARRIAGE[197]					
Cheek length	236cm	286cm	303cm	270cm	341cm
Cheek width	8.1cm	9.5cm	10.8cm	9.5cm	10.8cm
Wheel Diameter	135cm	146cm	146cm	146cm	146cm
Axle	197cm	209cm	209cm	215cm[198]	209cm
Total Weight	-	-	1570kg	-	-
LIMBERED[199]					
Limber	4-pdr Limber	8-pdr Limber	8-pdr Limber	8-pdr Limber	8-pdr Limber
Limber wheels	103cm	114cm	114cm	114cm	114cm
Weight plus limber	1050kg	1620kg	2080kg	-	1780kg
Horses (Foot)	4 horses	4 horses	6 horses	4 horses	6 horse
Horses (Horse)	4 horses	6 horses	-	6 horses	-
AMMUNITION					
Ball diameter	82mm	104mm	119mm	156mm	156mm
Shot/shell weight	2.0kg	4.0kg	6.1kg	12.4kg	12.4kg
Charge weight	0.8 kg	1.3kg	2.0kg	0.8kg	2.2k
Shot & cartridge	2.8kg	5.3kg	8.1kg	13.2kg	14.6kg
Charge Ratio	1:2½	1:3	1:3	1:15½	1:5.6
***COFFRET* (AMMUNITION BOX)**[200]					
Rounds	18 rounds	15 rounds	9 rounds	4 rounds[201]	None
Length	59.5cm	60.9cm	43.2cm	?	-
Width	27.1cm	33.8cm	39.7cm	?	-
Height to peak	27.1cm	29.8cm	36.5cm	?	-
Height of roof	10.1cm	10.8cm	10.8cm	?	-
Height of box	18.0cm	19.8cm	25.7cm	?	-
Length of Arms	83.9cm	90.7cm	97.4cm	?	-
RANGE[202]					
Point Blank	475 paces	540 paces	575 paces	200 paces	250 paces
Effective	1100 paces	1270 paces	1350 paces	1500 paces	1700 paces
Extreme	1600 paces	1925 paces	2450 paces	1850 paces	2200 paces

196 Decker (1994)
197 Decker (1994)
198 Wooden axle so wheels of different construction to the 8-pdr/12-pdr wheel.
199 Decker (1994)
200 Graves (1800 rp1984) 29
201 No *coffret* in the original 1765 design as the *Richtmaschine* was used as the elevating system. Introduced in 1792 with the introduction of the elevating plate. Probably the same size as the 8-pdr box. Shown by Decker (1994) 68.
202 Adye (1813 rp2010) 300