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AMERICAN ADOPTION OF FRENCH ARTILLERY 1917-1918

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AMONG the military improvisations forced upon the United States by the demands of war in 1917, none had greater or more unexpected consequences than the adoption of foreign equipment as the principal artillery weapons of the A. E. F. Though some nations have relied out of necessity for their entire artillery equipment on foreign purchases, the spectacle of a great state famed for its industrial development and mechanical aptitudes abandoning all its own artillery matériel for combat purchases after war was declared and adopting the models of another state is unique. The record of this departure from tradition contains many interesting lessons for the United States.

Past experience seemed to demonstrate the futility and hazard of relying on foreign purchase for the hasty increase of American military equipment. Although this was hardly true in the case of the American Revolution, it was clearly revealed in the Civil War and in the Spanish-American conflict. In 1861, for example, certain European states were in a position to sell the Federal Government large numbers of muskets. Since the Civil War was primarily a struggle of infantry, this fact seemed promising on the surface. Up to 1862 the North purchased 726,705 muskets in Europe at the cost of $10,000,000.[1] Of this number only 116,740 were serviceable Enflelds, and 48,108 were of the French official type.[2] The rest were of small military value, and their employment added to the confusion of calibers and to the ammunition supply problem.[3]

Small arms are more easily manufactured than artillery units, so the latter provides the soundest basis on which to judge the wisdom and success of a policy of relying upon foreign ordnance types. When the war with Spain broke out in 1898, the artillery equipment of the American Army amounted to one hundred and twenty-three 3.2-inch field guns, twenty-two 3.6-inch field guns, twenty-two 3.6-inch howitzers, and a few siege batteries.[4] Though there was little balance to be observed in this stock of equipment, it was deemed sufficient in 1898 to equip ten regular and sixteen volunteer batteries. The artillery ammunition supply, however, was extremely limited. Only 28,100 rounds of

[1] *Official Records,* Series III, Vol. I, p. 418; Vol. II, p. 855.

[2] Shannon, *Organization and Administration of the Union Armies* (Cleveland, 1928) Vol. I, p. 123.

[3] Iowa troops for example were equipped with Austrian muskets, Prussian muskets, Belgian rifles, Harpers Ferry Muskets, Spencer carbines, Sharp carbines, Whitworth rifles, Minie rifles, and other less well-known types. *Ibid.*, I, 118, 125.

[4] *Report of the Chief of Ordnance 1898,* (Washington, 1898) p. 21.

ammunition were available for all the field batteries.[5] Under these circumstances the Chief of Ordnance attempted to relieve the artillery situation by foreign purchase. He was able to secure thirty-four 4.7-inch Armstrong guns in England with 300 rounds of ammunition per gun—all that was available for immediate delivery.[6] In addition he purchased for later delivery eight 6-inch guns in England. Since we had no weapons of similar caliber, these purchases complicated our ammunition problem without adding greatly to the strength of the artillery arm. Fortunately for the United States the short duration of the war did not expose the weakness of the army in the matter of artillery.

Some of the criticisms of War Department administration in the Spanish War are of value as a background to the difficulties which arose in 1917.[7] There was a notable lack of balance in the American ordnance program prior to the war with Spain, for on its outbreak the War Department had more guns on hand than carriages, more guns and carriages in proportion than artillery projectiles, and more projectiles than powder.[8] Since the military effectiveness of artillery is limited to the component on hand in the smallest quantity, this was a serious maladjustment. Though the army adopted a standard caliber for Army, Navy, and Marine Corps shoulder arms after the war no similar simplification seemed to be possible for the artillery.[9] The result was that although at the outbreak of war in 1917, the United States possessed what many soldiers believed was the best military rifle in the world, the artillery situation could only be described as chaotic.

The American artillery program was in a formative state in 1917. The Greble Board appointed in 1911 to survey the artillery needs of the army had recommended 3.16 guns per thousand men as a basis for organization and advocated no caliber heavier than 6-inch.[10] Under the impulse of the war in Europe the Treat Board was appointed on April 17, 1915 to consider the same field covered by the Greble Board and to make recommendations.[11] When this board was authorized the artillery equipment of the American Army was as follows:[12]

[5] *Ibid.,* p. 22.

[6] *Ibid.,* p. 21.

[7] *Cf. Report of the Commission Appointed by the President to Investigate the Conduct of the War Department in the War with Spain.* Senate Doc, No. 221, 59th Congress, 1st Session. 8 Vols. (Washington, 1910).

[8] *Report of the Chief of Ordnance 1898,* p. 9. The Ordnance Department normally ordered more guns than gun carriages on the assumption that the former required more frequent replacement than the latter.

[9] The decision to adopt a standard caliber for small arms paved the way for the adoption of the U. S. Rifle Caliber .30, Model 1903. *Cf. Report of the Chief of Ordnance 1899,* p. 11.

[10] *Hearings Before the Senate Committee on Military Affairs,* 64th Congress, 1st Session. (Washington, 1916) p. 513.

[11] Special Order No. 89, War Department, April 17, 1915.

[12] *Proceedings of a Board of Officers, Appointed by Special Order No. 89, War Department, April 17, 1915,* p. 2-3. Hereinafter cited as *Proceedings.* Except where otherwise stated documents referred to in this paper or authentic copies are to be found in the Mail and Record File of the Ordnance Department, U. S. A.

Unit	*With Troops*	*In Reserve*	*In Manufacture*	*Ammunition*
2.95-inch mt. gun ...	56	24	0	56,000
3-inch mobile howitzer	0	4	0	3,500
3-inch field gun	412	120	80	829,000
3.8-inch howitzer	0	28		32,000
3.8-inch field gun	0	8	0	2,000
4.7-inch howitzer	16	40	42	48,500
4.7-inch field gun ...	16	22	22	33,000
6-inch howitzer	8	24	24	21,000

The want of balance and the multiplicity of light artillery types in this interesting collection of weapons need scarcely be pointed out.

The Treat Board evidently thought there was a great deal of dead wood in the artillery establishment, for it applied the axe vigorously. It advocated an organization on the basis of 4.9 guns per thousand men. It called for a new 3-inch field gun with greater elevation, traverse, and range. It recommended a new carriage for the 4.7-inch field gun to permit an elevation of 40 degrees and a range of 13,000 yards. It advised the addition of very heavy artillery in the form of 7.6-inch, 11-inch, and 16-inch howitzers. The demand for super-heavy artillery for the American Army in 1915 can only be described as revolutionary, since guns of this caliber were obviously designed for use against heavily fortified works. No such works existed on the American continent, nor were there many roads capable of sustaining their transit. This seemed to foreshadow a campaign outside the American theatre of war.

The Treat Board concluded its remarkable report with a recommendation that sufficient mobile artillery be constructed to equip a force of one million men. This program included the following:[13]

Unit	*Number of guns*	*Rounds per gun*
3-inch field gun	1968	5022
3.8-inch howitzer	936	4506
4.7-inch field gun	312	3491
4-inch howitzer	312	2604
7.6-inch howitzer	104	2300
11-inch howitzer	72	923
16-inch howitzer	No recommendation.	

The completion of this program would have required the expenditure of $480,000,000, over a period of eight years.[14]

The officers of the Treat Board stressed the slow process of artillery manufacture, anticipated a delay of at least eighteen months in any large scale production schedule, and feared that a much longer delay would result from the shortage of skilled workers.[15] General Crozier, the Chief of Ordnance in 1915, frequently warned Congressional committees about the time required for artillery construction. He estimated that to produce artillery ammunition on the scale

[13] *Ibid.*, Appendix I, p. 22.
[14] *Annual Report of the War Department 1919,* Vol. I, Part IV, pp. 3868-3869.
[15] *Proceedings*, Appendix I, p. 9.

of expenditure in Europe would require up to 100 times the capacity of Frankford Arsenal, the principal agency for such production in the United States.[16] The Acting Chief of Ordnance in January 1917 estimated that two and a half years would be required for the construction of artillery units contemplated in the report of the Treat Board.

One result of the report described above was the development of a new carriage for the 3-inch field gun. This gun known as the "3-inch field gun model 1916" had a split trail, 53 degrees elevation, and 45 degrees traverse. These were features possessed by no other field gun in the world.[17] The only feature lacking was a dependable recoil mechanism. The pilot model, equipped with a hydro-spring recuperator, was under manufacture on April 6, 1917. Certain steps were also taken to modernize the carriage of the 4.7-inch field gun. Such in general was the status of changes in American artillery matériel at the outbreak of war.

It has frequently been pointed out in criticism of the War Department in 1917-1918, that, although the General Staff received information regarding artillery experience abroad, it failed to make adequate use of this information to bring our methods in line with World War experience. The following criticism is typical:

> Almost from the outbreak of war in August 1914, we succeeded in placing observers with the various armies in the field. Reports of these observers were filled with data showing the deficiencies of our own military organization for war on a modern scale and the obsolescence of most of our matériel. On these reports might have been based a complete rejuvenation of our designs and methods . . . but the reports were filed away in the archives of the War College to gather dust of official neglect.[18]

It seems impossible that the writer of this quotation took the trouble, while he was Assistant Secretary of War, to disturb the dust on these records. For if he had done so he would never have been able to frame such an eloquent condemnation of the General Staff and Ordnance Department.[19] There was very little useful information in the reports of our observers and military attaches in Europe. General Crozier frequently complained of the lack of detailed

[16] Brigadier General William Crozier had been Chief of Ordnance since 1901 when he was appointed to that office as a mere captain over the heads of many senior officers. He was widely known for his work on the Buffington-Crozier gun carriage and had intimate knowledge of the whole field of ordnance. See his testimony in *Hearings Before the House Committee on Military Affairs on House Res. No. 12766,* 64th Congress, 1st Session. (Washington, 1916) Vol. I, pp. 486-512.

[17] Report Col. J. B. Rose to Chief of Ordnance, January 10, 1919. MS in Ordnance Technical Library. The French 75mm field gun Puteaux Model 1897 had 15-20 degrees elevation and only 8 degrees traverse. *History of the 75mm Field Gun M1897.* Army Ordnance Confidential Publication No. 1862. p. 35.

[18] B. Crowell and R. F. Wilson, *The Giant Hand* (New Haven, 1921), pp. xiv-xv.

[19] Officers at the War College who examined these papers for me declared that they contained very little definite information. On December 9, 1915, Col. Spencer Colby, Military Attaché at Paris, said it was "almost impossible to get any reliable and definite data concerning many of the practices and results of actual experience in the French Army."

technical information.[20] There were plenty of wordy general observations but accurate scientific information was almost entirely lacking. It was not until the Ordnance Department sent Major L. T. Hillman on a special mission to Europe in 1916 that the United States Government was able to obtain the kind of accurate technical information desired on the ordnance experience of the Allied armies.[21] Major Hillman, it should be stated, was prepared to purchase information and designs.

Major Hillman visited England late in 1916 where the Ministry of Munitions showed him all types of ordnance equipment and provided him with photostatic copies of drawings.[22] They gave him all the information he asked for except figures on production. He found Armstrong-Vickers willing to sell designs for heavy howitzers, and the War Office agreeable, but the Foreign Office refused to sanction their transfer until after the United States entered the war.[23] He purchased designs for the 9.2-inch and the 12-inch Vickers howitzer. The French government at first refused to receive Major Hillman, but on learning that he was going to England anyway and might purchase designs for heavy artillery, they allowed him to see the 155mm matériel at St. Chamond and Le Creusot.[24] As a result of his visit to France he was able to acquire the rights to manufacture the St. Chamond recuperator for the U. S. 3-inch field gun model 1916 as well as designs for Schneider and St. Chamond heavy and railway mounts.[25] With the acquisition of these designs and the vast mass of detailed information Major Hillman was able to collect, the War Department for the first time had the kind of information needed in order to take advantage of European experience in the World War.[26] But by this time the United States had been drawn into the war.

In fact, the day on which war was declared Major Hillman was conferring in Paris with officers of the Bureau of Exterior Operations of the French General Staff. In reporting this conference he tactfully pointed out that while the French General Staff did not necessarily assume that an American expeditionary force would be sent to France, they advised great increases in machine guns and artillery in the existing American tables of organization should one be sent.[27] This recommendation swept aside the estimates on which the War

[20] Memorandum Chief of Ordnance to Chief of Staff, April 25, 1916.
[21] Letter Chief of Ordnance to A. G. O., August 21, 1916.
[22] The Chief of Ordnance had assured the British Ambassador to the United States that while preserving a correct official attitude Major Hillman's personal sympathies were with the Entente Allies. Letter Chief of Ordnance to Sir Cecil Spring Rice, July 29, 1916.
[23] Letter Hillman to Chief of Ordnance, April 11, 1917.
[24] Cable Hillman to Chief of Ordnance, May 18, 1917.
[25] Letter Nillman to Chief of Ordnance, May 10, 1917.
[26] Of importance to the later adoption of French artillery models was the information obtained in England regarding the weaknesses of the British hydro-spring recoil system revealed by the prolonged fire periods of trench warfare.
[27] Hillman to Chief of Ordnance, April 6, 1917.

Department had been operating up to that time. In March 1917 the Ordnance Department drew up tentative schedules for arming and equipping a force of one million men. The only artillery weapon which it seemed possible to provide in anything like) the required numbers was the 3-inch field gun.[28] Unfortunately the 1902 model was not thought to possess sufficient range for combat use in Europe, and the St. Chamond recuperator just purchased in France had not yet been tried on the model 1916 carriage.[29] Thus a combination of circumstances seemed to render the prospect of producing even light artillery doubtful. It is worth noting that in the estimates of March 1917 the Ordnance Department was preparing to produce more shrapnel than high explosive shell in spite of the fact that England and France were using 70% of the latter to 30% of the former.[30]

The scope of projected American military operations in France was not clearly defined until General Pershing sent his "General Organization Project" to the War Department on July 10, 1917.[31] It envisaged the shipment of 30 American divisions to France in 1917 and 1918. This remained the basis of the American program until July 18, 1918, when General March, Chief of Staff, submitted a program to the Secretary of War calling for the shipment of 80 divisions to France by June 1, 1919. With a total of 15 divisions in the United States, the total strength of the American Army in June 1919 would be 4,850,000 men.[32]

These rather staggering figures made the task of procuring artillery for the projected armies seem impossible. Two decisions of policy by the government soon removed all doubt on the matter. It was decided to allow no interference by the Ordnance Department with facilities occupied with military orders for the Allied governments and to allow the Navy priority on needs which could be completed within a year.[33] Depressing information about the speed of American manufacture of artillery was offered by the British Ministry of Munitions. The Bethlehem Steel Company which had agreed to deliver fifteen 9.2-inch howitzers in seven months required sixteen months to complete one.[34] The record of the Midvale Steel Company was not much better. This did not promise well for the new manufacturing facilities on which the Ordnance Department would be forced to rely for the bulk of its artillery program. The Bethlehem Steel Company and the Midvale Steel Company were among the few American firms with prior experience in ordnance manufacture.

[28] Memorandum Col. J. H. Rice to Col. C. C. Williams, March 20, 1917.
[29] Report Col. J. B. Rose to Chief of Ordnance, January 10, 1919.
[30] Statement of Mobile Artillery Ammunition Required to Complete the Allowance for a Million Men and to Meet the Needs of the First Year of War, March 27, 1917. MS in Ordnance, Department Files.
[31] Pershing, *My Experiences in the World War* (New York, 1931), I, p. 102.
[32] *Report of the Chief of Staff, 1919,* pp. 9-10.
[33] *Minutes of the Council of National Defense,* Vol. I, p. 163.
[34] Memorandum Col. R. L. Kenyon to Chairman General Munitions Board, May 17, 1917.

General Crozier was fully aware of these facts when he prepared a very candid memorandum on the artillery situation for the Secretary of War on April 30, 1917. He admitted that there! would be no increase in the available artillery for six months except in the 3-inch class, and these guns were described as not suitable for combat purposes. He appeared to be weighing the question of adopting foreign models, but argued against it at this time on the ground that such an adoption would throw back the artillery program in point of time and would confuse the ammunition supply problem.[35]

The prospect of using foreign models of artillery for combat purposes while retaining American models for training at home seemed to be raised in a conference on May 25, 1917, between General Crozier and M. J. M. Ganne, Directeur des Services de Fabrications de Guerre du Haut Commissariat and Colonel Remond of the French Military Mission to the United States. The results of this conference were confirmed by a letter on the following day which stated:

> The French Government should appreciate particularly if the United States Army, the day it comes to fight with the French front, is supplied, at least partially, with types of ordnance identical to those in service with the French Army . . . The French Government is of the opinion that standardization of ordnance, or at least of ammunition should facilitate military operations, particularly the replenishment of stores . . . The French Government has decided from now on to place at the disposal of the American Government all the drawings, specifications, etc., of our types of ordnance and ammunition.
>
> Beginning with August 1, 1917, the French Government can supply five 75mm field guns per day with an initial supply of 1,000,000 rounds of ammunition. From October 1, 1917, it can supply two 155mm howitzers daily with an initial supply of 100,000 rounds of ammunition and a daily supply of 6,000 rounds . . . .[36]

This definite offer of assistance in the matter of artillery came shortly after the British Military Mission had advised that no aid could be expected from England in the matter of artillery until late in 1918.[37]

After considerable discussion a decision was made on June 5, 1917, to adopt the French 75mm caliber in place of the 3-inch and the French 155mm in place of the 6-inch and to modify existing artillery matériel to use French ammunition. This decision was communicated to the army on June 9, 1917, by the A. G. O. which explained that "there was no prospect otherwise of obtaining the number of cannon required for the successful prosecution of the war."[38] On July 9 formal orders were placed for 155 batteries of 75mm field guns and 65 batteries of 155mm howitzers with the French Military Mission. The adoption of French calibers seemed to be in harmony with the traditional American respect for French military institutions and thought and was reported to the French Press in a triumphant statement written by M. Andre Tardieu on

[35] Memorandum Chief of Ordnance to Secretary of War, April 30, 1917.
[36] Letter M. J. N. Ganne to Chief of Ordnance, May 26, 1917.
[97] Letter W. T. Layton to the General Munitions Board, May 14, 1917.
[38] Letter A. G. O. to Chief of Ordnance, June 9, 1917.

Bastille Day.[39]

The artillery ordered was to be supplied to the American troops as needed for training and combat in France. Its acquisitions seemed at first sight to solve many problems and the decision to employ French matériel was widely applauded. The unfortunate aspects of the decision and the complications which followed did not become apparent until later.

Thirty-five 3-inch field guns had been completed in the United States since April 6th. They had to be re-lined and then re-bored to 75mm. caliber. Changes in the orders for 870 guns of similar caliber under contract had to be made. Just five days before the decision to adopt the French calibers orders for 9,000,000 rounds of 3-inch ammunition had been placed.[40]

Complete interchangeability of ordnance components had long been the dream of soldiers charged with the maintenance of weapons in the field. Steps in this direction were taken in the United States in the production of the U. S. Rifle Model 1903 and were later greatly advanced in the rapidly growing automobile industry. American practice in 1917 was considerably in advance of European. A decision to produce 75mm ammunition on an interchangeable basis in the United States caused work on these orders to be halted pending the arrival and translation of French drawings. When these papers arrived it was seen that the French shrapnel shell was so distinctly inferior to the American type that the Ordnance Department decided against interchangeability with the French matériel in this praticular. The French 75mm high explosive shell fuze did not provide a bore safety device which up to our entrance into the war was regarded by the Ordnance Department as a primary requisite of a satisfactory detonating fuze.[41]

To add to the confusion there were several different drawings of each component of the 75mm high explosive shell sent to the United States, and no member of the French Military Mission had definite information on which one was in current use in the French service. Officers had to be sent from France to advise on these matters.[42] When 75mm high explosive shells arrived from France as working models they did not conform to any of the drawings. The work of correcting and translating the French specifications of the 75mm shells was not completed until December 1917.[43]

Similar difficulties were experienced in the attempt to prepare for the manufacture of the 155mm howitzer and the 155mm G. P. F. (Grande Puissance Filloux) gun in the United States. Numerous errors were discovered in the

[39]The original longhand copy written in English by M. Tardieu for General Crozier bears testimony of his rugged but imprecise command of the English language. MS in Ordnance Department Files.

[40] Memorandum Control Bureau Ordnance Department to Chief of Ordnance, April 24, 1918.

[41] *Ibid.*

[42] *Ibid.*

[43] Major F. C. Cheston, "Early History of the Projectile Section of the Ordnance Department," p. 4. MS in Ordnance Technical Library.

drawings of the 155mm howitzer and the 155mm G. P. F. gun; 20,000 man hours were required for the correction and translation of the drawings of the latter weapon.[44] Tools sent from France for assembling the 155mm howitzer did not correspond to either the French or the American drawings. These difficulties revealed the fact that while the American Government was attempting to produce these weapons on an interchangeable basis, the French had achieved interchangeability of only a few large parts.

Up to February 1918 the United States did not commit itself to the adoption of the 75mm field gun Puteaux model 1897, for manufacture in the United States. On January 1, 1918, only five 75mm field guns were completed in the United States.[45] These were adaptions of the British 18-pounder field gun constructed ;by the Bethlehem Steel Company and described as "the poorest mount in the service."[46] The hopes placed in the model 1916 carriage seemed to be doomed. The pilot model of this type produced by the Bethlehem Steel Company ruptured its piston liners in trials at Sandy Hook Proving Ground on December 10, 1917.[47] The pilot model of the Rock Island Arsenal broke a pintle bearing while being driven across a railway track.[48] Meantime General Pershing poured cold water on the plan to employ the St. Chamond recuperator on this model. He cabled on November 28, 1917, that the French government had several times tried the St. Chamond brakes and had never found them successful and had no confidence in the design.[49] This was hardly true since the St. Chamond Company (Cie des Forges et Acieres de la Marine et d'Homecourt) had designed all the turrets in recent French battleships and their hydro-pneumatic brake had given successful service in the French Navy for seven years.[50] General Pershing, it will be seen, later reversed his recommendation, and after the Puteaux model 75mm field gun had been adopted, he added to the confusion by advocating the St. Chamond brake.[51] On February 8, 1918, after a number of ordnance officers had expressed belief that the Puteaux model would be easier to manufacture than the model 1916 gun, it was decided to adopt it for manufacture in the United States.

Meantime the 75mm field gun Puteaux model 1897 was being tried out side-by-side with the American 3-inch field gun model 1905 at the School of Fire at Fort Sill, Oklahoma.[52] The report of the test follows:[53]

[44] *History of the 155-mm Artillery Project,* Army Ordnance Confidential Publication No. 1863, p. 41, 42.

[45] Council of National Defense, *Statistical Report No. 20,* p. 1.

[48] Report Col. J. B. Rose to Chief of Ordnance, January 10, 1919.

[47] Letter C. O. Sandy Hook Proving Grounds to Ordnance Office, December 13, 1917.

[48] Report C. O. Rock Island Arsenal, March 1, 1918.

[49] Cable Pershing to Bliss, No. 9, November 28, 1917.

[50] Letter Hillman to Chief of Ordnance, April 6, 1917.

[51] Pershing to A. G. O. Cable No. 1472, July 19, 1918.

[52] The model 1905 3-inch field gun was slightly superior to the model 1902 but belonged to the same general class. It was distinctly inferior to the model 1916 gun.

[53] Report of Col. A. A. Fleming, School of Fire, Fort Sill, Okla., to A. G. O., March 15, 1918.

> We can do anything with the 3-inch gun on our latest carriage that French officers can do with the 75mm . . . .
>
> We were at first informed that the 3-inch gun was inferior in accuracy . . . but it has dawned upon us that this is not true. Our experience indicates that the dispersion of the two guns is about the same at short and mid-ranges; that from 4000 yards up that of the 3-inch is less.
>
> On the mechanical side we have had the same experience . . . The French gun is more complicated in design and less sturdy in construction. Specialized experts are needed to make even small repairs . . . The French carriage is not likely to stand up as well as ours in heavy cross country work . . . certainly not to such demands as we are in the habit of making upon our matériel.
>
> Our sighting system, shields, and draft arrangements are distinctly superior to the French (except perhaps the French independent line of sight) . . . Firing problems that are simplicity itself for the American gun are very difficult for the French.
>
> Unless arrangements have gone so far that very serious delay would result the school recommends most decidedly that the American gun and not the French be adopted as standard.

By the time this rather astonishing report reached Washington, the decision to manufacture the Puteaux model gun had already been made.

With the decision to produce the 75mm field gun Puteaux model 1897 in the United States on an interchangeable basis with the French further difficulties in this process were revealed. The screw threads on the gun carriage were not described on the French drawings and when examined on a French model were found to be of six different types and unknown to American ordnance officials. Information requested from France reached the wrong agency in the Ordnance Department and was "lost" in the files until April 5, 1918. When thread gauges arrived from France they did not correspond with the information in the French reply.[54] American threads were finally adopted after the principal tap and die manufacturers in the United States estimated that six months would be required to duplicate the French threads.

Until August 1918 it appeared that the problem of screw threads would be the limiting factor in the production of the model 1897 field gun, but the difficulties encountered in the manufacture of the Puteaux recuperator dwarfed these. The mechanism of the French hydro-pneumatic recoil system was often erroneously described as "an important military secret." Actually there was nothing secret about it. The Germans had captured hundreds of 75mm field guns, and had not only examined them carefully, but by a relatively simple change had greatly increased the range of the captured guns by raising the elevation.[55] They were thus able to outrange the French with their own weapons.

The, only secret about the French recoil system was the difficulty of its construction. It had never been manufactured outside of France. The viscosity of the oil to be used in the mechanism had to be tested by an instrument known

[54] Memorandum Captain W. C. Hedgcock to Col. Rice, "75mm. Gun Carriage Screw Threads," August 8, 1918.

[55] *History of the 75mm. Field Gun M. 1897.* Army Ordnance Confidential Publication No. 1862, p. 35.

as the "Barbey Ixometer" unknown in the United States. When the first recuperator produced in the United States was filled with oil taken from the French model, the packings and gaskets showed immediate deterioration.[50] The proper oil and grease was discovered just after the armistice, but even then the recuperators failed to function properly. They all returned to battery with a pronounced shock after the gun was fired. This was found to be due to the oil gauge rod which was longer in the actual French model than it was in the drawings.[57] When this final error was corrected the American-made brakes functioned perfectly.

It must be regarded as somewhat ironical that as the war went on, the model 1916 field gun carnage which was abandoned as our principal light artillery mount, should meet with increasing favor while the model 1897 mount was being described as obsolete. At a conference on ordnance problems in Paris on July 7, 1918, Colonel Remaillo, one of the greatest ordnance designers in France, described it as a "very good carriage". French officers at this conference agreed that the model 1897 carriage was out of date and did not meet the requirements of the battlefield.[58] General Pershing then re-entered the lists with a recommendation of French officials that the United States cease making the Puteaux brake and undertake the manufacture of the St. Chamond recuperator which he had previously condemned.[59] This was too much for the harried ordnance officials in the United States. They properly replied that there had been changes enough. For better or for worse the War Department was forced to carry on with its major light artillery program. It succeeded in producing at the end of November 1918, one successful model of a field gun which French officers already regarded as obsolete.

It will be observed that the principal attention has been given in this paper to the American experience with the French 75mm matériel. It was by far the largest part of the artillery program. The difficulties encountered in this part of the program were substantially the same as those met with in the other calibers.

The rather depressing results of the attempt to reproduce French 75mm high explosive shells in the United States were due to two primary causes. One was the vastly exaggerated estimate of the number of shells required. The other was the lack of balance maintained in the manufacturing problem.

The theoretical requirements of the American Army to September 1, 1918, for the 75mm high explosive shell were set at 20,000,000 rounds. In retrospect this contrasts somewhat oddly with the 4,225,501 rounds actually expended and wasted by the A.E.F. to November 11, 1918.[60] It is the part of wisdom to

[56] Captain W. C. Hedgcock, "The Manufacture of the Recoil Mechanism for the 75mm. Field Gun Carriage Model 1897," p. 8. MS in Ordnance Technical Library.
[57] *Ibid.*, p. 7.
[58] Digest of a conference between M. Loucher, Minister of Armaments and his assistants and Brig.-General C. B. Wheeler and his assistants, Paris, July 7, 1918.
[59] Pershing to A. G. O. Cable No. 1472, July 19, 1918.

err on the side of liberality in the estimates of requirements, but an error of such proportions is another matter. These huge requirements made a smaller successful program of shell production impossible, because a great deal of time was spent in preparing for a program which never was actually required. The estimation of the probable duration of a conflict is one of the functions of a general staff.

The failure of the Ordnance Department to balance the production of booster assemblies with other components of the 75mm high explosive shell limited the production of completed rounds on November 11, 1918, to 4,112,000.[61] It will be observed that the production of completed rounds in the United States almost equalled the number of rounds expended in France. Thirty-eight per cent of these shells reached France and one-tenth of one per cent were expended.[62]

With reoccurring irony it must be pointed out that while high explosive shell was relatively easy to manufacture and simple in design, and in great demand for trench warfare, it was produced more slowly in the United States than shrapnel which was complicated in design and for which less demand existed. The American Army, it will be remembered, retained its own shrapnel design. Working with our own equipment on designs with which we were familiar, production became embarrassingly great. Estimated production was exceeded—a most unusual case in the ordnance program. Over 7,000,000 rounds of 75 mm shrapnel were completed by November 14, 1918, nearly 4,000,000 rounds arrived in France before the armistice, but not a single round was expended in combat.[62] In spite.of the adoption of French calibers the United States produced a total of 18,294,000 rounds of artillery ammunition of all types up to the time of the armistice.[63] This was more than twice the total expenditure of all types in France.

The real check upon ordnance production imposed by the adoption of French types appears in the gun and howitzer program. A comparison of the completed units of both the American and French models on November 15, 1918, follows:

[60] "Report on Ammunition Expended and Wasted by the A. E. F. to November 11, 1918." General Staff, Statistical Branch Files. The term wasted applies to ammunition not expended in combat. General Pershing had set the requirements of the American army in France at 50 rounda of 75mm. H. E. shells per day. Pershing to A. G. O. Cable No. 507. Actual expenditure was 18 H. E.; 5.6 shrapnel per gun per day.

[61] Statistical Summary Series Report No. 5, U. S. General Staff. "The Production of 75mm. H. E. shell." This very long and extremely able survey of the American experience in attempting to manufacture 75mm. ammunition in the United States was prepared by Col. Leonard P. Ayres while he was chief of the statistics branch of the staff.

[62] Cf. "Testimony of Col. A. J. Stuart before the House Committee, July 17, 1919," *Hearings Before Sub-Committee No.* 5 *(Ordnance) of the Select Committee to Investigate Expenditures in the War Department,* 66th Congress, 2d Session, Serial 6, Vol. I, pp. 31, 439; General Staff Statistical Report No. 66, p. 3; "Report on Ammunition Expended . . .," p. 17.

[63] General Staff Special Statistical Report No. 208, p. 4.

American models[64]		*French models*	
75-mm field gun Model 1916	206	75-mm field gun Model 1897	0
75-mm field gun Model 1917	724	155-mm howitzer	144
4.7-inch field gun	163	155-mm G. P. F. gun	1
8-inch howitzer	173	240-mm howitzer	1

In round numbers the production of the principal American or British artillery types to mid-November 1918 amounted to 1,200 units, while the equivalent production of French types amounted to 146.

Against the apparent overwhelming disappointments from the artillery production point of view which resulted from the adoption of French types, must be set the very real advantages which resulted from the equipment of American combat forces with artillery in France. For a considerable period of training and a briefer period of combat, the A.E.F. was adequately equipped with materiel uniform to that of the French. These advantages would have been progressively apparent had the war continued for a longer period on the scale of intensity of the last three months. Whether these immediate advantages from the combat point of view outweighed the disadvantages of relegating our own materiel to the classification of training weapons is controversial. The ideal arrangement, of course, would have been to train all our artillery troops with the weapons they were to serve in combat.

Regardless of the conclusions one may arrive at concerning the questions raised above, it seems clear that the adoption of French models in 1917 was destined to exert a permanent effect on American artillery practices. We are still using metric delineations for our light artillery types, and efforts to modernize war-time equipment will probably cause a lengthy survival of these types in our service. The obvious lesson to be drawn from this experience is that the United States should never allow itself to be forced into another major war without having determined in advance by tests and experimentation just what its standard artillery types shall be.

[64] *Ibid.*, p. 3. The 75mm. field gun Model 1917 and the 8-inch howitzer were of British design but were familiar to American manufacturers.