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FACTS
About the Way
the United States
Made War

War pamphlet

GOVERNMENT LOAN ORGANIZATION
Second Federal Reserve District
Liberty Loan Committee
120 Broadway New York

FACTS ABOUT THE WAY THE UNITED STATES MADE WAR

INTRODUCTION.

The information in this pamphlet has been issued by the United States Treasury Department in Washington.

It is for the use of Speakers in the Victory Liberty Loan Campaign.

With these facts any speaker will be able to answer objections that may be raised at meetings where he speaks. A great deal of valuable material is contained herein and the constant use of it will simplify the speaker's task.



EXCERPTS FROM "AMERICA'S MUNITIONS"

At the outbreak of the war there were only 97 officers in the Ordnance Department. Eleven thousand officers were required for the first 5,000,000 men.

In the Ordnance Department alone there were 100,000 separate and distinct articles.

At the time of the signing of the Armistice nearly 8,000 plants were engaged in Ordnance work in the United States.

In view of the ability of England and France to provide artillery for our 1918 American Expeditionary Force, a small *early* production was sacrificed in order to build facilities for larger ultimate production. We could not make exact French "75s" on account of the use of metric measurements by the French and the English system used by us. No taps, dies, drills, etc., could be used, so we modified or translated their designs to our system of measurement.

Ordnance requirements were made secondary to those of the Allies, our Navy, our Merchant Marine and at times even our railroads.

The estimated cost of the ordnance required to equip our first five million men was between \$12,000,000,000 and \$13,000,000,000. From 1775 to April 6, 1917, the total appropriations of Congress amounted to but \$26,000,000,000, including the cost of five wars and the pensions resulting from these wars. The total cost of the ordnance effort to equip our first five million men amounted to \$12.00 for every hour since the birth of Christ.

SUCCESES

There was never a shortage of smokeless powder.

Over 2,500,000 shoulder rifles were produced in the 19 months of our participation in the War—more than either England or France produced during that period—England produced 1,970,000 and France 1,400,000, ours from a standing start. The average monthly production during July, August and September, 1918, was as follows:

France	40,500
England	112,821
United States	233,562

Over three billion rounds of small arms ammunition were produced and our speed before the Armistice was twice that of France and 10 per cent. greater than England's.

Our production of machine guns during the period from April 6, 1917 to Nov. 11, 1918, was slightly more than England's and

slightly less than France's. At the end of the war our rate was twice that of France and nearly three times as great as England's.

In connection with 75-millimeter shells, 4,250,000 high explosive shells, 500,000 gas shells and 7,250,000 shrapnel had been produced by November 11, 1918. A total of 6,250,000 rounds of 75-millimeter ammunition were fired by American *Artillerymen*. Eight million five hundred thousand rounds had been shipped.

"We were building to make Victory absolutely certain."

It takes 10 months to manufacture one 14-inch .50-caliber rifle at a cost of about \$200,000. Its life is 150 shots—then a new liner is inserted before it is used again.

The life of a 75-millimeter gun is up to 12,000 rounds.

Guns of 3-inch to 9.5-inch caliber supplied to Allies from April, 1917, to Nov. 11, 1918, were 1,305.

MONTHLY PRODUCTION OF FINISHED CANNON

Ranging in size from 75 millimeters to 240 millimeters, at the various machining and assembling plants.

Caliber	1917-1918						
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
75-millimeter	5	45	48	52	74	127	169
3-in. anti-aircraft	3	16	24	16	2	..	11
4.7-in. gun .....	..	..	..	..	..	..	6
155-mil. howitzer .....	..	..	3	10	16	28	75
155-mil. gun .....	..	..	..	..	..	..	..
8-in. howitzer .....	..	..	..	34	38	8	..
240-mil. howitzer .....	..	..	..	..	..	..	..
Totals	8	61	75	112	130	163	261

Caliber	1918						
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
75-millimeter	142	204	199	214	320	214	1,813
3-in. anti-aircraft	10	11	22	50	34	31	230
4.7-in. gun	8	15	29	71	50	39	218
155-mil. howitzer	110	248	206	350	231	179	1,456
155-mil. gun	2	..	14	51	22	40	129
8-in. howitzer .....	..	28	22	33	14	14	191
240-mil. howitzer .....	..	1	..	..	1	..	2
Totals	272	507	492	769	672	517	4,039

TOTAL PRODUCTION OF PROPELLANTS

April 6, 1917 to November 11, 1918

United States	632,504,000 lbs.
France	343,950,000 "
England	294,290,000 "

AVERAGE MONTHLY RATE OF HIGH EXPLOSIVE PRODUCTION

November 1918

United States	39,121,000 lbs.
England	29,122,000 "
France	23,154,000 "

At the beginning of the war the cost of smokeless powder was 80c per pound for small arms and at November 11, 1918 it was 62c per pound.

The following figures show the number of loaded GRENADES, either rifle or hand, shipped overseas, or on the dock awaiting shipment up to November 23, 1918:

	<i>Shipped to Date</i>	<i>Awaiting Shipment</i>
Rifle grenades (V. B. Mark 1).....	655,000	3,078,000
Offensive hand grenades (Mark 111)	173,000	3,306,800
Defensive hand grenades (Mark 11).	517,000	8,128,000

Cost of 75-millimeter shell.....\$11.00 each

Cost of 155-millimeter shell.....\$30.00 "

Fifty per cent of employees in explosive plants were women.

Following table shows amount of shrapnel, high explosives and fuse loaded in this country and accepted by the Government from April 6, 1917 to November 30, 1918, also the quantity shipped overseas:

<i>Kind of Ammunition</i>	<i>Loaded and Accepted</i>	<i>Shipped Overseas</i>
Shrapnel		
2.95-in. mountain gun.....	91,820	.....
75-millimeter	7,865,358	5,308,000
75-millimeter anti-aircraft	507,643	80,000
3-in. gun	40,000	.....
3-in. anti-aircraft	30,164	.....
3-in. field gun.....	2,048,697	.....
3.8-in. howitzer	11,757	.....
4.7-in. howitzer	60,787	.....
4.7-in. gun	257,356	195,000
155-millimeter gun and howitzer.....	159,193	.....
6-in. howitzer	3,826	.....

Total..... 11,076,601

<i>High Explosive Shell</i>	<i>Loaded and Accepted</i>	<i>Shipped Overseas</i>
37-millimeter L. E.....	4,060,411	1,686,000
75-millimeter	6,556,491	2,866,000
3-inch field gun	1,070,902	.....
3-inch 15-pounder	879	.....
3.8-inch howitzer	11,750	.....
4.7-inch gun	124,653	72,000
4.7-inch howitzer	39,198	.....
5-inch seacoast gun.....	14,124	7,000
155-millimeter howitzer	1,101,611	231,000
155-millimeter gun	47,927	.....
6-inch gun	61,869	11,800
6-inch howitzer	107,327	.....
8-inch howitzer	193,200	.....
8-inch gun	137,625	.....
9.2-inch howitzer	170,608	14,000
10-inch seacoast gun.....	74,537	.....
Total.....	13,773,112	.....

ORDNANCE MOTOR PRODUCTION

<i>Size</i>	TRACTORS			
	<i>Quantity Ordered</i>	<i>Quantity Accepted Nov. 11, '18</i>	<i>Quantity Accepted Jan. 31, '19</i>	<i>Floated to Nov. 11, 1918</i>
2½-ton	5,586	6	25	2
5-ton	11,150	1,543	3,480	558
10-ton	6,623	1,421	2,014	675
15-ton	267	267	.....	232
20-ton	1,165	126	154	81

TRAILERS				
1½-ton anti-aircraft machine gun	2,289	150	562	126
3-in. field gun.....	830	235	472	15
4-ton shop bodies.....	576	101	384	12
4-ton shop chassis.....	576	260	555	.....
10-ton	540	104	245	1
3-in. anti-aircraft.....	612	543	611	.....
2½-ton ammunition .....	.....	.....	.....	.....
2-ton 11-in. trench mortar.....	.....	.....	.....	.....
4.7-in. anti-aircraft .....	.....	.....	.....	.....

TRUCKS				
F. W. D. Chassis.....	13,907	5,361	10,615	3,561
Nash chassis	16,165	7,137	12,884	5,859
Ammunition bodies	24,729	18,212	21,709	.....
Ammunition mountings	24,729	9,615	11,024	6,955
Artillery repair	1,332	1,605	1,332	350
Artillery supply	5,474	813	1,838	444

TRUCKS—Continued

	Quantity Ordered	Quantity Accepted Nov. 11, '18	Quantity Accepted Jan. 31, '19	Floated to Nov. 11, 1918
Light repair	1,012	1,012	1,012	362
Dodge chassis	1,012	1,012	1,012	436
Commerce chassis	1,500	1,500	1,500	24
Machine gun bodies, mounted on Commerce or White 1-ton chassis	1,500	486	1,306	241
1-ton supply	60	60	60	55
White chassis	2,695	1,929	2,695	575
Reconnaissance	1,081	712	1,003	320
Staff observation	1,175	1,164	1,175	189
Equipment repair	310	310	310	121
H. M. R. S. trucks.....	624	287	416	12

An outlay of about \$175,000,000 was contemplated in the tank program. Over 23,000 had been ordered; work had been started and some deliveries made.

MACHINE GUNS

On November 11, 1918, we had orders for 288,174 Brownings and more were to be placed.

48,082 Browning rifles were sent overseas.

30,582 heavy Brownings were shipped to the A. E. F. and we had placed orders for 110,000.

Total Production, Machine Guns and Rifles,
from April 6, 1917 to November 11, 1918

United States	181,662
France	229,238
England	181,404

Monthly Average Production, July, Aug. and Sept., 1918

United States	27,270
France	12,126
England	10,947

Following table shows the kinds of machine guns ordered during the war, the date of the orders, quantity ordered, and number completed up to the signing of the armistice:

Type	Date of Order	Quantity Ordered	Quantity Delivered Nov. 11, '18
Browning machine gun (heavy)	July 16, 1917	10,000	592
	Sept. 24, 1917	10,000	10,000
	Mar. 2, 1918	10,000	1,548
	Feb. 27, 1918	50,000	29,664
	Mar. 2, 1918	10,000	....
	Sept. 23, 1918	20,000	....
		110,000	41,804

MACHINE GUNS (Continued)

Type	Date of Order	Quantity Ordered	Quantity Delivered Nov. 11, '18
Browning tank guns.....	Sept. 23, 1918	40,000	4
Browning aircraft machine guns.	Dec. 19, 1917	10,000	....
	Sept. 26, 1917	5,000	531
	May 16, 1918	15,000	....
	July 26, 1918	10,000	33
	Oct. 5, 1918	15,000	....
		<hr/> 55,000	<hr/> 564
Marlin aircraft guns	Sept. 25, 1917	23,000	23,000
	Feb. 21, 1918	15,000	15,000
		<hr/> 38,000	<hr/> 38,000
Vickers machine guns (field)...	Nov. 19, 1915	125	125
	Dec. 16, 1916	4,000	4,000
	Sept. 8, 1917	3,000	3,000
	Dec. 12, 1917	5,000	5,000
		<hr/> 12,125	<hr/> 12,125
Vickers aircraft machine guns and 11-millimeter (caliber .30)	June 13, 1918	6,000	882
	Sept. —, 1918	7,500	....
		<hr/> 13,500	<hr/> 882
Vickers machine guns (Rus- sian type)	May 24, 1918	948	829
	April 4, 1918	1	1
	May 5, 1918	9	9
		<hr/> 958	<hr/> 839
Lewis aircraft machine guns...	Dec. 18, 1916	800	800
	June 12, 1917	4,400	4,400
	July 26, 1917	12,000	12,000
	Sept. 25, 1917	22,000	15,031
	Nov. 15, 1918	45,000	....
		<hr/> 84,200	<hr/> 32,231
Browning automatic rifle.....	Jan. 15, 1918	20,000	2,364
	July 16, 1917	12,000	8,749
	Oct. 8, 1917	25,000	25,000
	Mar. 11, 1918	20,000	15,685
	June 26, 1918	10,000	....
	June 27, 1918	36,174	....
	July 1, 1918	15,000	....
	Oct. 9, 1918	75,000	....
	Oct. 24, 1918	50,000	....
	Sept. —, 1918	25,000	....
		<hr/> 288,174	<hr/> 51,798

Machine guns on hand in the United States at the beginning of the war:

Benet-Mercie	670
Maxim, model of 1904.....	282
Colt	148
Lewis, caliber .303.....	353

RIFLE RECORD

Ten months after we declared war we were producing in a week four times as many rifles as Great Britain had turned out in a similar period after 10 months of war. Our production was then twice as large in volume as Great Britain had attained up to that time.

Rifle Production to November 9, 1918

<i>Months</i>	<i>Eddy- stone</i>	<i>Win- chester</i>	<i>Ilion</i>	<i>Spring- field Armory</i>	<i>Rock Island Arsenal</i>	<i>Total</i>
Before Aug. 1917	....	....	....	14,986	1,680	16,666
Aug. 1 to Dec. 31, '17	174,160	102,363	26,364	89,479	22,330	414,696
1918						
January ...	81,846	39,200	32,453	23,890	7,680	185,009
February ..	98,345	32,660	39,852	6,910	2,460	180,227
March	68,404	42,200	49,538	120	420	160,682
April	87,508	43,600	36,377	2,631	....	170,116
May	84,929	41,628	54,477	3,420	550	185,004
June	104,110	34,249	52,995	6,140	619	198,113
July	135,080	35,700	60,413	14,841	2,038	248,072
August	106,595	20,030	65,144	27,020	1,597	220,386
September .	110,058	31,550	58,027	29,770	3,813	233,218
October ...	100,214	33,700	53,563	35,920	3,256	226,653
Nov. 1-9	30,659	9,100	16,338	10,500	808	67,405
<hr/> Totals	<hr/> 1,181,908	<hr/> 465,980	<hr/> 545,541	<hr/> 265,627	<hr/> 47,251	<hr/> 2,506,307

PISTOLS AND REVOLVERS

At the outset of the War comparatively few enlisted men carried pistols, but this weapon proved to be so efficient that it was decided to manufacture it in greatly increased quantities. This decision was made in the summer of 1917. The following table shows the production up to the end of the year 1918:

PISTOLS

	<i>Colt</i>	<i>Remington U.M.C.</i>	<i>Total Pistols</i>
1917			
April 6 to Dec. 29.....	58,500	.....	58,500
1918			
January	11,000	.....	11,000
February	14,500	.....	14,500
March	21,300	.....	21,300
April	22,400	.....	22,400
May	35,000	.....	35,000
June	37,800	.....	37,800
July	39,800	.....	39,800
August	40,400	.....	40,400
September	32,100	640	32,740
October	42,300	3,881	46,181
November	45,800	4,102	49,902
December	24,600	4,529	29,129
Total	425,500	13,152	438,652

REVOLVERS

	<i>Colt</i>	<i>Smith & Wesson</i>	<i>Total re- volvers.</i>	<i>Total pistols & rev.</i>
1917				
April 6 to Dec. 29.....	20,900	9,513	30,413	88,913
1918				
January	8,700	7,500	16,200	27,200
February	8,800	8,550	17,350	31,850
March	11,800	12,400	24,200	45,500
April	10,400	10,650	21,050	43,450
May	11,100	12,150	23,250	58,250
June	11,100	14,250	25,350	63,150
July	11,600	11,555	23,155	62,955
August	11,300	13,358	24,658	65,058
September	11,100	12,650	23,750	56,490
October	13,500	16,675	30,175	76,356
November	11,900	12,660	24,560	74,462
December	9,500	11,400	20,900	50,029
Totals	151,700	153,311	305,011	743,663

SMALL ARMS AMMUNITION

The progress in this Department is indicated by the fact that our average production for July, August and September, 1918, was 277,894,000 rounds as against a monthly average for Great Britain of 259,769,000 rounds and for France of 139,845,000 rounds.

Following table shows accepted quantity of ammunition for all small arms, from November 30, 1917 to January 31, 1919:

1917	
November 30	156,102,792
December 31	351,117,928
1918	
January 31	573,981,712
February 28	760,485,688
March 31	1,021,610,956
April 30	1,318,298,492
May 31	1,616,142,052
June 30	1,958,686,784
July 31	2,306,999,284
August 31	2,623,847,546
September 30	2,942,875,786
October 31	3,236,396,100
November 30	3,507,023,300
December 31	3,741,652,200
1919	
January 31	3,940,682,744

HAND GRENADES

An incident which illustrates one of the reasons for waste and delay, occurred in the manufacture of hand grenades. A grenade had been designed after the general model of those in use at the front, with certain improvements to make it safer in the hands of the soldier. After the shipment of considerable amount of these grenades to the front, a cablegram was received to the effect that the safety devices designed to protect the American soldiers had resulted in a grenade that was too safe. The mechanism was too complicated, and the American soldier in the excitement of action would not, in many cases, go through the operations required to fire the fuse. As a result of this information, all production was stopped with the result that some 15,000,000 rough castings of grenade bodies, 3,500,000 assembled but empty grenades and 1,000,000 loaded grenades were made unavailable for use. Even some of the machinery used in the production had to be remodeled. But in a few months' time manufacture of the new design was again under way. Total orders for the new design of grenades called for delivery of 44,000,000, and when the armistice was signed the daily rate of production was between 250,000 and 300,000.

The orders and production of grenades is shown in the following table:

<i>Article</i>	<i>Ordered</i>	<i>Completed to Nov. 8, 1918</i>	<i>Completed to Feb. 1, 1919</i>	<i>Sent Overseas</i>
Dummy hand grenades	415,870	415,870	415,870	.....
Practice hand grenades	2,280,000	3,605,864	3,605,864	.....
Defensive hand grenades	58,000,000	17,477,245	25,312,794	516,533
Offensive hand grenades	7,000,000	5,359,321	7,000,000	173,136
Gas hand grenades....	2,400,000	635,551	1,501,176	249,239
Phosphorus hand grenades	2,000,000	505,192	521,948	150,600
Thermit hand grenades	655,450	.....	.....	.....

(NOTE) In above figures all grenades are unloaded with the exception of those sent overseas, which were loaded.

The following table shows the production of rifle grenades during the War:

<i>Article</i>	<i>Ordered</i>	<i>Completed to Nov. 8, 1918</i>	<i>Completed to Feb. 1, 1919</i>	<i>Sent Overseas</i>
Rifle grenades..	33,615,409	a-18,098,930	a-25,660,686	b-685,200
Toxic gas sets..	50,000	c- 24,688	d- 39,989	.....
Livens projector barrels	62,912	63,051	63,151	8,906
Gas shells	316,598	d- 73,723	d- 73,723	7,400

a—Not loaded.

b—Loaded.

c—Without firing mechanism.

d—Not filled.

SUMMARY OF ALL FORCES IN THE ARMY AT TIME OF
ITS GREATEST STRENGTH

November 11, 1918

	<i>Officers</i>	<i>Men</i>	<i>Total</i>
Army personnel in Europe.....	80,842	1,868,474	1,949,316
At sea, en route to Europe.....	1,162	21,072	22,234
Total	82,004	1,889,546	1,971,550
Marines (on duty with Army in Europe)	1,002	31,383	32,385
Total including marines.....	83,006	1,920,929	2,003,935
Siberian expedition	298	8,806	9,104
Total A. E. F. in Europe and Siberia	83,304	1,929,735	2,013,039
In United States	104,155	1,530,344	1,634,499
In insular possessions, Alaska, etc.	1,977	53,758	55,735
Grand total in Army excluding marines	188,434	3,482,454	3,670,888
Grand total in Army including marines	189,436	3,513,837	3,703,273

CLOTHING AND EQUIPAGE STOCKS

November 1, 1918

Stocks on hand in France, and days' supply based on General Pershing's new automatic allowances effective November 1, 1918:

	<i>Stock in U. S.</i>	<i>Stock overseas</i>	<i>Number of days 2,000,000 men could be supplied with stock overseas</i>
Blankets	4,294,000	1,119,000	425
Drawers, winter	15,746,000	5,304,000	202
Jerkins	1,405,000	1,044,000	159
Coats, denim	3,991,000	1,419,000	154
Puttees, wool	5,231,000	3,356,000	149
Trousers, denim	3,374,000	1,842,000	140
Boots, rubber, hip	1,199,000	551,000	140
Shirts, flannel	6,710,000	3,033,000	136
Stockings, wool, heavy.....	16,290,000	8,753,000	134
Coats, wool	4,142,000	2,141,000	126
Shoes, field	8,850,000	2,033,000	103
Gloves, wool	3,734,000	2,682,000	82
Paulins	38,000	21,000	80
Breeches and trousers, wool.	6,791,000	1,789,000	75
Overcoats	3,691,000	477,000	73
Raincoats	1,620,000	550,000	59
Undershirts, winter	13,806,000	1,231,000	55
Mittens, leather	3,070,000	664,000	51
Caps, overseas	2,931,000	189,000	14

CLOTHING AND EQUIPAGE PRODUCED AND SHIPPED
TO THE A. E. F.

April 6, 1917 to November 11, 1918

	<i>Produced</i>	<i>Shipped Overseas</i>
Blankets	19,419,000	3,127,000
Coats, denim	10,238,000	3,423,000
Coats, wool	12,365,000	3,871,000
Drawers, summer	38,118,000	3,889,000
Drawers, winter	33,766,000	10,812,000
Overcoats	7,748,000	1,780,000
Shirts, flannel	22,198,000	6,401,000
Shoes, marching and field.....	26,423,000	9,136,000
Stockings, wool, light and heavy.....	89,871,000	29,733,000
Trousers and breeches, wool.....	17,342,000	6,191,000
Undershirts, summer	40,895,000	4,567,000
Undershirts, winter	28,869,000	11,126,000

SUBSISTENCE SHIPPED TO A. E. F.

April 1, 1917 to December 1, 1918

Not Including Y. M. C. A. and Civilian Relief Supplies

	<i>Quantity lbs. except as noted</i>	<i>Unit price</i>	<i>Total cost</i>
Bacon	147,956,223	\$.44	\$65,722,154
Beef, frozen	250,584,692	.23	58,536,584
Beef, tinned	140,843,476	.32	45,717,792
Flour	542,874,797	.05	28,500,927
Tobacco	27,449,645	.67	18,407,732
Cigarettes, each	2,439,260,097	.006	15,123,412
Reserve rations, each....	15,623,150	.76	11,873,594
Sugar	106,169,345	.07	7,888,382
Cigars, each	160,180,225	.05	7,768,741
Butter and substitutes....	16,200,799	.40	6,433,337
Tomatoes	100,081,789	.06	6,024,924
Beans, baked	54,731,786	.10	5,226,886
Jam	26,029,028	.19	4,877,840
Coffee	39,185,167	.12	4,729,650
Milk, evaporated	42,922,743	.11	4,498,303
Fish, salmon	30,961,801	.14	4,408,960
Beans, dry	39,646,677	.11	4,297,700
Vegetables, dehydr.	12,971,935	.30	3,924,010
Lard and substitutes....	15,781,228	.25	3,861,666
Syrup, gals.	6,171,808	.59	3,654,945
Hard bread	27,978,830	.13	3,614,865
Candy	7,895,053	.28	2,191,667
Rice	25,466,547	.08	2,029,684
Prunes	15,748,931	.10	1,630,014
Fruit, evaporated	8,976,848	.13	1,191,228

	<i>Quantity lbs. except as noted</i>	<i>Unit price</i>	<i>Total cost</i>
Cornmeal	16,074,687	.05	736,221
Pickles, gals.	1,333,210	.47	625,809
Ham	1,772,917	.34	610,238
Corn, sweet	7,639,786	.06	431,648
Emergency rations, each.	765,400	.53	401,835
Vinegar, gals	1,319,877	.28	367,586
Oatmeal	4,661,732	.06	296,020
Peas, green	4,689,425	.06	262,608
Peaches, canned	2,415,182	.11	255,043
Hominy	1,826,269	.09	155,963
Beans, stringless	2,148,759	.06	127,207
Salt	13,707,276	.009	120,624
Pears, canned	1,150,120	.10	117,542
Apples, canned	1,831,096	.06	117,007
Cheese	314,203	.28	87,191
Pineapples, canned	899,258	.09	82,012
Apricots, canned	863,415	.09	78,743
Cherries, canned	423,444	.12	51,703
Total .....		...	\$327,059,997

CARGO TRANSPORTED TO THE A. E. F.

April, 1917, to November 1, 1918

Short Tons by Supply Service

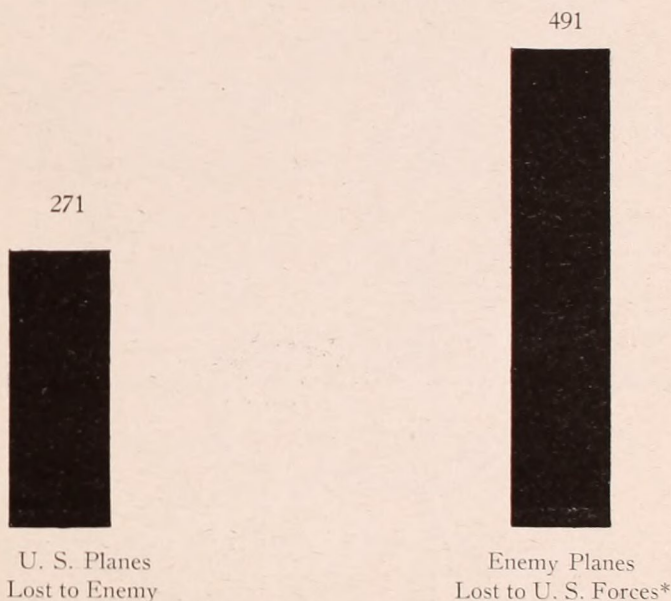
1917	Total
June	15,800
July	11,800
August	19,400
September	53,000
October	114,900
November	77,900
December	179,500
1918	
January	122,000
February	227,500
March	289,200
April	373,200
May	450,000
June	425,200
July	535,700
August	571,700
September	681,300
October	749,500
Total	4,897,600

U. S. SQUADRONS AT THE FRONT

A squadron is equipped with from 15 to 25 planes

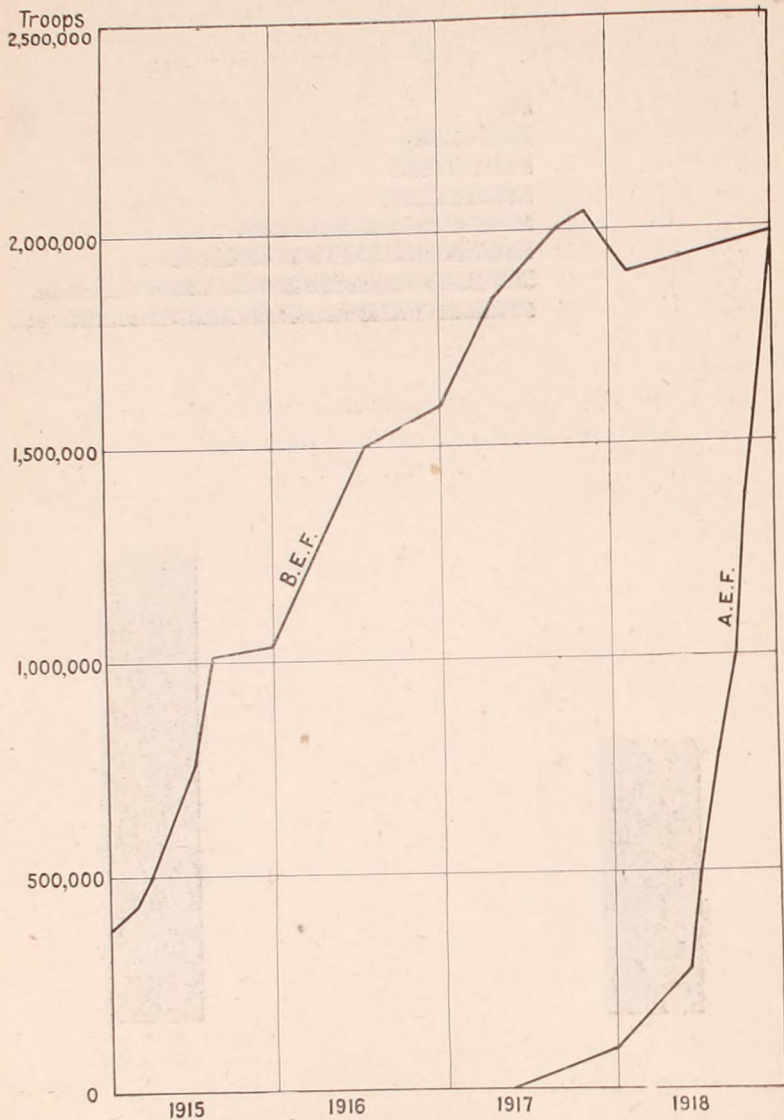


COMPARISON ENEMY PLANES BROUGHT DOWN BY U. S. FORCES AND U. S. PLANES BROUGHT DOWN BY THE ENEMY



* Confirmed losses; in addition there are 354 unconfirmed.

BRITISH AND AMERICAN EXPEDITIONARY FORCES ON WESTERN FRONT



AERIAL PHOTOGRAPHY

The advance in Aviation called for an advance in Photography.

When the War ended, cameras were in common use taking photographs at an altitude of two miles with such microscopic fidelity as to show even where a single soldier had recently walked across a field.

The Signal Corps made 100,000 pictures of battle lines in four days of the final drive of the Yanks in Argonne.

American manufacturers produced an aerial film camera weighing only 35 pounds.

In October, 1918, we shipped overseas 1,500,000 sheets of photographic print paper, 300,000 dry plates, 20,000 rolls of films, 20 tons of photographic chemicals, and 75 motorized, mobile, photographic laboratories.

AVIATORS' CLOTHING

To equip aviators with proper clothing, such as sweaters, leather coats, fur-lined coats, helmets, there was provided or in the course of manufacture on November 11, 1918, in excess of \$5,000,000 worth of material, consisting of 50,000 fur-lined flying suits, 100,000 leather helmets, 100,000 leather coats, and over 80,000 goggles.

RADIO TELEPHONE

There were provided about 5,000 sets of radio or wireless telephone receivers and transmitters for Army use alone. The Navy adopted modified form for use on 110-ft. submarine chasers, enabling boats to be in constant touch with each other.

BALLOONS

The balloon program called for thousands of new looms to turn out millions of yards of cloth needed for building balloons. In April, 1917, the production of all cotton mills together was sufficient to build two balloons a week. In November, 1918, it had increased to 10 balloons a day, an expansion of over 3,000 per cent in 19 months. Had the War continued another year we would have been able to produce 15 complete kite balloons a day.

Balloon cable consists of 114 separate special steel wires besides the telephone center of three copper wires properly insulated and armored. Production reached 50,000 feet per week November 11, 1918.

Hydrogen gas, lightest and cheapest of gases, is universally used in balloons. When mixed with air it is highly inflammable and can be touched off by a spark of fire or electricity.

All observers using balloons filled with hydrogen equipped with complete parachute apparatus.

On the day the Armistice was signed, the United States, with combined efforts of Signal Corps, Navy, and Bureau of Mines, was enabled to develop in a commercial way helium gas, having all the assets of hydrogen less inflammability. Up to two years ago the total world production of helium gas since its discovery had not been more than 100 cubic feet. This gas was valued at about \$1,700 per cubic foot. Astonishing success in producing helium gas resulted in our having 147,000 cubic feet of helium gas ready for loading on board ships the day Armistice was signed. At its pre-war value this would have been worth \$250,000,000.

Commercial production of helium gas was undoubtedly the greatest step ever taken in development of ballooning accomplished by the United States.

German General Staff so strongly appreciated work in this line that in rating aviators they ranked a balloon brought down as equal to 1½ airplanes.

SUPPLIES FOR THE ARMY

November 11, 1918, Division of Military Engineering and Engineering Supplies alone had received during 19 months of warfare 1,500,000 tons of supplies, valued at approximately \$200,000,000; 875,000 tons shipped from United States; 750,000 tons still in stock at great storage depots covering 20 acres of covered storage and 400 acres of uncovered storage. Engineers built to December 1, 1918, 18 new ships and lighter berths, 225 miles of standard barracks for living quarters, 127 miles of hospital wards, 80 miles of standard warehouses, 937 miles of standard-gauge railway, and equipment to care for 26,000 animals, including veterinary hospitals. This construction called for the use of 189,000,000 board feet of lumber, 3,623,000 ties, 38,000 piles.

When the Armistice was signed, construction projects in France of course were stopped, but there had up to that time been completed:

Cold storage plants capable of taking care of 513,000 tons of meats and other foodstuffs.

Oil storage for 215,000 barrels.

Base hospitals with a bed capacity of 182,196 patients.

Camp hospitals with best capacity for 26,254 patients.

80 ship berths as part of port terminal development.

13,256,351 square feet of covered storage space at various depots.

4,801,686 square feet of covered storage space for the Air Service.

3,107,086 square feet of covered storage space at various docks.

3,639,497 square feet of miscellaneous covered storage space.

1,692,108 square feet of space at remount depots.

1,061,932 square feet of space at veterinary hospitals.

936 miles of standard-gauge railway construction.

MAPS

French map producing plant unable to take care of our needs. Five large rotary lithographic presses and a number of linotype machines and other printing equipment shipped.

During heavy fighting in July and August, 1918, our printing plants supplied Seventh and Eighth French Armies the base maps of their front. From July 25, until September 15, 1918, plant worked 24 hours a day.

Invention of three-lens camera enabled photographing a strip of territory $3\frac{1}{2}$ miles wide at 4,000 feet elevation.

MILITARY BRIDGES

Posts and poles cut into 6-foot lengths, can support wire fence, with posts one rod apart, one-third of the distance around the earth. Piling, if stood end to end, would make a flagpole 435 miles high.

Produced monthly 50,000 barrels of cement from five cement mills leased from the French Government.

Foreign purchases made by Purchasing Board, headquarters Paris, saved fully 140 complete shiploads at a time when every available ton of shipping was greatly needed for the transportation of troops and such material as could only be procured in United States. This Board bought in excess of 2,500,000 tons of material and supplies valued at \$371,573,543.

CAMOUFLAGE

Camouflage requirements called for 3,000,000 square yards of burlap per month. At close of war we were using \$1,500,000 worth of camouflage materials monthly.

LOCOMOTIVES

July 10, 1917, Pershing cabled the French Government asking for 300 locomotives and 2,000 kilometers of track, including accessories that go with an order of this size.

Locomotive price reduced from \$46,000 apiece to \$37,000 apiece, saving on total order for 3,340 locomotives approximately \$22,989,000.

Actual shipment to A. E. F. of 1,303 locomotives, which played big part in ultimate victory.

In August, 1918, call came for locomotives at rate of 300 a month and 8,200 freight cars monthly.

Locomotives shipped completely set up, packed in hay. First shipment made in this manner enabled saving of 15 days in unloading, and an additional 14 days saving for assembly on arrival in France.

Seven hundred cranes, mostly locomotive type, and 886 hoisting cranes, engines alone costing \$4,996,000. Two-thirds of this shipped and installed in France.

Part of Requirements Needed by Engineers for Their Work.
Small Tools and Construction Material.

Screw posts, 18-inch.....	number.....	866,609
Screw posts, 4 feet 6 inches.....	do	1,172,616
Angle posts	do	2,577,126
Nails, roofing, finishing, spikes, etc.....	tons.....	10,612
Galvanized and painted steel sheets....	do	68,823
Roofing paper	rolls.....	701,504
Concrete mixers	number.....	217
Shovels, various kinds.....	do	3,223,936
Picks, mattocks, and pick-mattocks.....	do	1,701,950
Hatchets	do	155,279
Hammers	do	286,516
Dogs, iron, pinching and logging.....	do	191,845
Wall board	square feet....	17,380,752
I beams	tons.....	70,563
Sand bags	number.....	22,392,830
Steel shelters, large and small.....	do	85,120
Barbed wire	tons.....	131,802
Plain wire	do	1,556
	miles.....	200
Plain wire, Signal Corps.....	do	631
Copper wire	do	10,824
	tons.....	145
Wire, weaving (150-ft. roll).....	rolls.....	451,700
Burlap	yards.....	380,697
Paint	pounds.....	1,921,062
	gallons.....	851,637
Staples	tons.....	1,030
Shops, portable, sawmill.....	number.....	35
Portable buildings	do	2,082
Portable pile drivers.....	do	51
Sawmill equipment	do	620
Spades	do	4,137
Saws, all kinds, cross-cut, circular, etc..	do	399,877
Wagons, various	do	18,392
Sheets, steel.....	\$	179,333.03
Wagons		259,546.25
Power pumps		248,000.00
Road rollers		583,918.72
Cranes		1,600,000.00

Sheets, steel	1,015,218.75
Barbed wire	2,040,000.00
Nails	238,889.00
Metallic parts	10,704,450.00
Cranes	345,100.00
Sheets, steel	706,652.83
Turnouts	208,900.00
Sheets, steel	255,000.00
Wire, weaving	368,640.00
Steel bridges	194,458.56
Marching compasses	2,450,500.00
Chassis	12,120,000.00

BENEFITS OF WAR INDUSTRY

Better understanding of Army requirements for paints and varnishes reduced the number of shades from 29 to 16 and brought the total number of commodities down from 315 to 99. This will be of great use to paint and varnish manufacturers in the future.

Mechanical rubber industry has standardized production as result of Army's needs. More good accomplished in short time than trade was able to accomplish for itself in previous three or four years of effort.

Standard test for enamel was, unknown prior to War, result of Engineers' work.

Bureau of Mines, in co-operation with Engineering Department, developed an explosive which is cheaper than T. N. T., and promises to replace it for engineering operations.

PURCHASES

Some of the larger items purchased through the General Engineering Depot at Washington were as follows:

General machinery	\$ 47,663,719.78
Iron and steel products.....	49,143,465.50
Hardware and hand tools.....	14,406,428.79
Track material and fastenings.....	90,880,096.20
Automotive transportation	26,590,091.50
Horse-drawn transportation	9,016,201.16
Building material and supplies.....	11,347,176.55
Liquids	2,548,028.79
Engineer supplies	43,238,152.68
Miscellaneous	4,640,020.97
Railway rolling stock.....	140,374,349.74
Railway motive power.....	154,508,913.59
Lumber	1,667,485.87
Explosives and accessories	757,620.46
Construction machinery	105,386.01
Military surveys and maps.....	16,162.94

GEOPHONE

Perfection of sound-ranging apparatus known as geophone, enabled detection of enemy subterranean operations, location of batteries, and detection of night-raiding airplanes and zeppelins. The most important was the location of the position of enemy batteries.

Germans never able to produce successfully for themselves, and never succeeded in capturing equipment that had not been so mutilated as not to serve as a model for reproduction.

During the final months of war more enemy guns were located by listening instruments than by any other means. American Army spotted 117 German gun positions in a single day.

At the close of the war we had in operation on the American Front 12 complete outfits, sufficient to locate the guns of the enemy on a 60-mile front.

Geophone enables detection of enemy planes at a distance of one to three miles from instrument. November 11, 1918, machine perfected, gun fired at 4.1 miles distance, would enable warning to be given out 19 seconds before shell arrived, thus enabling troops to cover in dugouts.

SEARCHLIGHTS

Development of metal mirror for use in searchlight production enabled cut of $\frac{2}{3}$ in cost and $\frac{4}{5}$ in time—carrying 95 per cent. of the reflectivity of glass mirror.