

RESTRICTED

Serial No. 31

# GENERAL INFORMATION

INCLUDING DESCRIPTIONS AND  
TESTS OF ELECTRIC AUXILIARIES

## U. S. S. TORPEDO BOAT DESTROYERS

Nos. 342 to 344

INFORMATION RELATIVE TO ITEMS UNDER COGNIZANCE  
OF THE BUREAU OF CONSTRUCTION AND REPAIR  
NAVY DEPARTMENT



**RESTRICTED**

**CONFIDENTIAL**

Serial No. 31

## **GENERAL INFORMATION**

**INCLUDING DESCRIPTION AND TESTS  
OF ELECTRIC AUXILIARIES**

**TORPEDO BOAT DESTROYERS Nos. 342 TO 344**

**U. S. S. HULBERT**

**U. S. S. NOA**

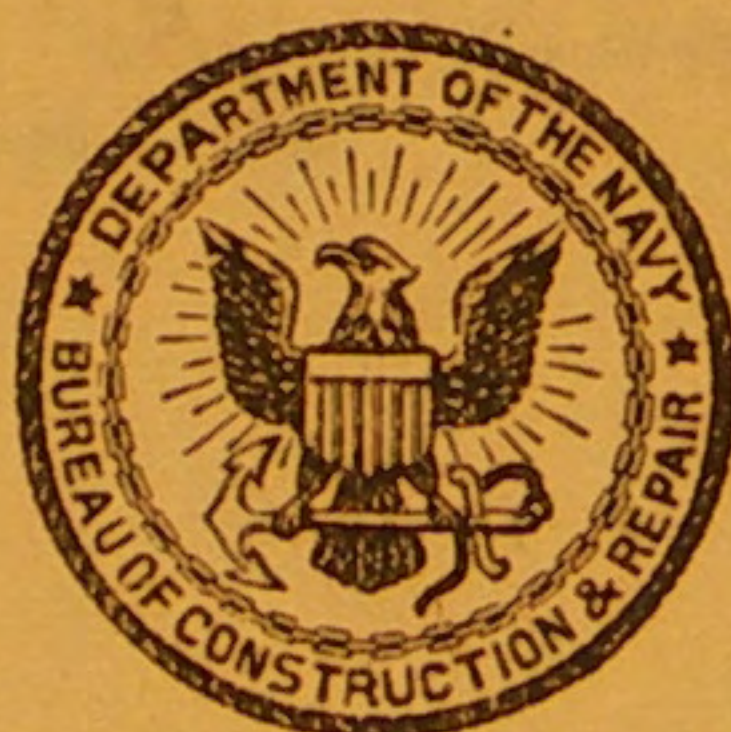
**U. S. S. WILLIAM B. PRESTON**

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**Information relative to items under cognizance of  
Bureau of Construction and Repair  
Navy Department, Washington, D. C.**

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**1922**



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## INTRODUCTION.

### HISTORICAL DATA.

Authorized by act of Congress, October 6, 1917.

Vessel built by Norfolk Navy Yard, Portsmouth, Va.

Orders to begin construction of vessels received by yard, January 25, 1918.

Contract date of completion.

Keels were laid November 18, 1918.

*Hulbert* and *Noa* launched June 28, 1919; *William B. Preston* launched August 7, 1919.

U. S. S. *Hulbert* christened by Mrs. Victoria C. Hulbert, of Rivervale, Md.

U. S. S. *Noa* christened by Mrs. Albert Morehead, of Chapel Hill, N. C.

U. S. S. *William B. Preston* christened by Mrs. Lucy Preston Beale, Buchanan, Va.

Date of commissioning, *Hulbert*, October 27, 1920; *William B. Preston*, August 23, 1920; *Noa*, February 15, 1921.

### DIMENSIONS AND DISTANCES.

Length over all, 314 feet 4½ inches.

Length between perpendiculars, on 9 feet 0 inches W. L., 310 feet 0 inches.

Breadth, molded, extreme, 30 feet 11½ inches.

Breadth, extreme, over fenders, 31 feet 8½ inches.

Depth, molded at side (frame No. 88½), 20 feet 7½ inches.

Depth, molded at center (frame No. 88½), 21 feet 10 inches.

Tons per inch (9 feet 4 inches W. L.), 15.48 tons.

Mean trial displacement, actual (*Wm. B. Preston*, October 2, 1920), 1, 204.80 tons.

Wetted surface (9 feet 4 inches W. L.), 9,910.0 square feet.

Coefficient block (designed 9 feet 4 inches W. L.), 0.472.

Coefficient prismatic (designed 9 feet 4 inches W. L.), 0.623.

Coefficient midship (designed 9 feet 4 inches W. L.), 0.758.

Coefficient water line (designed 9 feet 4 inches W. L.), 0.676.

Area of rudder, 77.65 square feet.

Center of buoyancy (9 feet 4 inches W. L.), above bottom of keel, 5.708 feet.

Center of buoyancy (9 feet 4 inches W. L.), forward of middle perpendicular, 1.06 feet.

Transverse metacenter above C. B. (9 feet 4 inches W. L.), 4.875 feet.

Longitudinal metacenter above C. B. (9 feet 4 inches W. L.), 742.0 feet.

Center of gravity of water line abaft middle perpendicular (9 feet 4 inches W. L.), 4.90 feet.

Center of gravity of full load water line abaft middle perpendicular (9 feet 9¾ inches W. L.), 5.60 feet.

Frame spacing, throughout, 21 inches.

### LONGITUDINAL DISTANCES.

Projection of stern abaft A. P., 16½ inches.

Axis of rudder, forward of A. P., 6 feet 4½ inches.

Forward end of straight keel from F. P., 12 feet 0 inches.

After end of straight keel from A. P., 41 feet 5½ inches.

Length of straight keel, 256 feet 6½ inches.



## GENERAL INFORMATION.

Forward end of bilge keel from F. P., 92 feet 6 inches.  
 After end of bilge keel from A. P., 78 feet 9 inches.  
 F. P. to center of foremast, at main deck, 90 feet  $1\frac{7}{16}$  inches.  
 F. P. to center of stack No. 1, at main deck, 107 feet  $4\frac{11}{16}$  inches.  
 F. P. to center of stack No. 2, at main deck, 123 feet  $4\frac{3}{8}$  inches.  
 F. P. to center of stack No. 3, at main deck, 145 feet  $10\frac{13}{16}$  inches.  
 F. P. to center of stack No. 4, at main deck, 161 feet  $10\frac{1}{2}$  inches.  
 Center of mainmast, at main deck, to A. P., 58 feet  $9\frac{3}{4}$  inches.  
 Center of shaft struts forward of A. P. ( $\frac{1}{2}$ -inch forward of frame No. 165), 21 feet  $3\frac{1}{2}$  inches.  
 Propellers, forward of A. P., 16 feet  $10\frac{1}{2}$  inches.

## HEIGHTS ABOVE DESIGNER'S WATER LINE.

Bridge at center (frame No. 40, top of plating), 22 feet  $5\frac{5}{8}$  inches.  
 Bridge at outboard ends (frame No. 47, top of beams), 22 feet  $1\frac{1}{4}$  inches.  
 Forward smokestack on C. L., 38 feet  $10\frac{3}{4}$  inches.  
 Lookout platform (crow's nest), 65 feet  $3\frac{1}{2}$  inches.  
 Signal yard, 88 feet  $10\frac{1}{2}$  inches.  
 Radio.  
 Upper wireless aerial, 93 feet at foremast, 50 feet at mainmast.  
 Lower wireless aerial, 54 feet 6 inches at foremast, 40 feet at mainmast.  
 Main deck, at side (frame No. 50 top of plating), 13 feet  $6\frac{5}{8}$  inches.  
 Main deck, at side (frame No. 140 top of plating), 9 feet 1 inch.  
 Top of after deck house (frame No. 150 top of plating at C. L.), 16 feet  $5\frac{1}{8}$  inches.  
 Freeboard at stem, 17 feet  $1\frac{3}{16}$  inches.  
 Freeboard at stern, 8 feet  $1\frac{3}{16}$  inches.

## CONDITIONS OF LOADING.

## SHIP AS DESIGNED.

Ship complete, ready for service in every respect, with full complement of officers and crew, with their effects, and consumable load, is tabulated below, for normal, full, and emergency conditions.

In the design of the vessel the mean draft corresponding to the "designer's water line," viz, 9 feet 4 inches, contemplates the condition of loading given under the heading "Normal."

Kind.	Normal.		Full.		Emergency.	
	Quantity.	Weight.	Quantity.	Weight.	Quantity.	Weight.
(a) Hull.....						
(b) Hull fittings.....		405.89		405.89		405.89
(c) Steam engineering.....		60.60		60.60		60.60
(d) Reserve feed water.....		430.80		430.80		430.80
(e) Battery.....	(2)	14.00	(3)	21.00	(4)	40.75
(f) Ammunition and ordnance stores.....		40.11		40.11		40.11
(g) Equipment and equipment stores.....		37.82		38.15		38.15
(h) Outfit and stores <sup>1</sup> .....		32.94		33.40		33.40
(i) Fuel oil.....	(2)	42.61	(3)	53.01	(4)	66.76
(j) Margin.....	(2)	150.00	(3)	225.00	(4)	375.00
Total.....		.23		.23		.23
		1,215.00		1,308.19		1,491.69

<sup>1</sup> Item (h) includes potable water.<sup>2</sup> Two-thirds supply.<sup>3</sup> Full supply.<sup>4</sup> Tanks filled to capacity (95%).



## DESIGNED COMPLEMENT.

(Section X-3.)

## Officers:

Commanding officer.....	1
Wardroom officers.....	5

## Seaman branch:

Chief boatswain's mate.....	1
Boatswain's mate, second class.....	1
Coxswain.....	1
Chief gunner's mates.....	2
Gunner's mates, first class.....	2
Gunner's mates, second class.....	2
Chief quartermaster, navigating.....	1
Quartermaster, first class.....	1
Quartermasters, second class.....	2
Seamen.....	16
Ordinary seamen.....	13
Total.....	42

## Artificer branch:

Electrician, first class.....	1
Electricians, first class, radio.....	2
Electrician, second class, radio.....	1
Carpenter's mate, second class.....	1
Total.....	5

## Artificer branch (engine-room force):

Chief machinist's mates.....	3
Machinist's mates, first class.....	3
Machinist's mates, second class.....	3
Chief water tender.....	1
Water tenders.....	5
Boiler maker.....	1
Blacksmith.....	1
Coppersmith.....	1
Oilers.....	4
Firemen, first class.....	10
Firemen, second class.....	7
Total.....	39

## Special branch:

Yeoman, first class, commanding officer.....	1
Yeoman, second class, engineer department.....	1
Hospital steward.....	1
Total.....	3

## Commissary branch:

Ship's cook, first class.....	1
Ship's cook, third class.....	1
Total.....	2

## Messmen branch:

Cabin steward.....	1
Cabin cook.....	1
Mess attendants.....	2
Total.....	4

3½ inches.

f officers and  
nd emergencys water line,"  
"Normal."

Emergency.

Quantity.	Weight.
.....	405.89
.....	60.00
.....	430.80
.....	40.75
.....	40.11
.....	38.15
.....	33.40
.....	66.76
.....	375.00
.....	.23
.....	1,491.69

acity (95%).



## RECAPITULATION.

Officers.....	6
Crew.....	95
Total.....	101

NOTE.—Berthing accommodations are provided for the following:

Commanding officer.....	1
Wardroom officers.....	7
Chief petty officers.....	10
Emergency cabin (one transom berth).....	2
Yeomen.....	2
Crew.....	116
Hammocks.....	12
Radio room.....	2
Total.....	152

## PLANS.

(Section B-1.)

Furnished under the cognizance of the Bureau of Construction and Repair for ship use.

All of the following plans are a part of the ship's regular allowance of articles under cognizance of the Bureau of Construction and Repair, Equipage, Title "B," Class 35.

Additional copies of any plan specified in this list may be issued to the commanding officer at his request for use on board ship. The booklet sets are issued to the commanding officer in sufficient number to provide one copy for each officer in charge of a department or division.

All plans issued to the vessel shall be receipted for, and shall be considered as a charge on the books of the executive officer, under the same regulation as governing articles of equipage.

All plans and booklets are to be considered as confidential documents.

The plans furnished the vessel are in portfolios 32 inches by 15 inches, bound on the 32-inch edge.

The prints are taken on 30-inch wide blue-print paper, folded "bellows fashion," 13 inches wide, arranged so that the top fold presents the title of the plan without unfolding.

The inside front cover of the portfolio carries a list of plan numbers and a list of portfolio numbers and titles of the plans.

An additional copy of the lists, inside the front cover of the portfolio, is made up into booklet form for use in finding plans, and is left loose in the front part of the portfolio.

Blue prints of electrical auxiliaries, steering engine, windlass, etc., obtained from outside sources, are of miscellaneous sizes. They are attached together and folded as one set, and the set assigned a single number in series of portfolio numbers.

There is one copy furnished of all the plans named in the list except Booklets of General Information and Booklets of General Plans, of which one copy is furnished for each officer.

Booklet of General Information and Final Inclining Experiment are not included with the plans made up in the portfolio; there is included, however, in the portfolio an uncut print of small scale booklet plans of the vessel.



## MACHINERY.

(A) Engines: The propelling machinery consists of Parson's turbines in combination with reduction gear and placed in two compartments.

The power is divided on two shafts, each driving a propeller and each being driven, through gearing, by one single-flow high-pressure turbine and one double-flow low-pressure and single-astern turbine. Each astern turbine is fitted in the casing with the corresponding low-pressure ahead turbine.

There are two main condensing plants, one for each power unit, with curved-tube surface condensers, main air and circulating pumps.

The main circulation of cooling water through the condensers is by means of scoops, and an auxiliary turbine-driven circulating pump providing circulation when maneuvering or backing.

Steam is provided by four Normand boilers fitted for fuel oil only. Two boilers are arranged in each of two water-tight compartments.

The forced-draft system consists of two sets of three turbine-driven blowers each, discharging air into each respective fireroom.

## (B) Propellers and shafts:

Diameter of propeller shafting .....	11½ inches
Diameter of line shafting .....	11½ inches
Diameter of axial hole in shafting .....	7½ inches
Number of propellers .....	
Number of blades, each propeller (cast solid) .....	
Diameter of propellers (designed) .....	110 inches
Pitch of propellers, fixed (designed) .....	122 inches
Ratio of diameter to pitch (designed) = $P = \frac{D}{P}$ .....	0.91
Area, projected (designed) $D^2$ .....	36.27 square feet
Area, helicoidal (designed) .....	43.45 square feet
Area, disk (designed) .....	66 square feet
Lower tip of blades below bottom of keel .....	18½ inches
Tips of blades below 9 feet 4 inches W. L. (above bottom of keel) .....	20½ inches
Material of propellers .....	Comp. "Mn."
Starboard propeller is right hand.	
Port propeller is left hand.	

## (C) Boilers:

Kind of boiler (oil burning) .....	Normand
Number (2 in each boiler room) .....	260 pounds
Designed working pressure .....	6,750.43 square feet
Heating surface, each boiler .....	715.65 cubic feet
Cubical contents of combustion chamber, each boiler .....	10½ inches inside diameter
Diameter of main steam pipes between engine and boiler rooms (two) .....	7½ inches inside diameter
Diameter of steam pipe from each boiler .....	
Number of oil burners, each boiler .....	
Number of furnaces, each boiler .....	
Smokepipes, height above base line. (1) 48 feet 2½ inches, (2) 47 feet 8½ inches, (3) 47 feet 1½ inches, (4) 46 feet 7½ inches .....	
Number of smokepipes .....	20.3 square feet
Area of section through one smokepipe .....	



## MACHINERY.

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## (B) Propellers and shafts:

Diameter of propeller shafting .....	11½ inches.
Diameter of line shafting .....	11½ inches.
Diameter of axial hole in shafting .....	7½ inches.
Number of propellers .....	2
Number of blades, each propeller (cast solid) .....	3
Diameter of propellers (designed) .....	110 inches.
Pitch of propellers, fixed (designed) .....	122 inches.
Ratio of diameter to pitch (designed) = P= .....	0.9175
Area, projected (designed) D .....	36.27 square feet.
Area, helicoidal (designed) .....	43.45 square feet.
Area, disk (designed) .....	66 square feet.
Lower tip of blades below bottom of keel .....	18.7½ inches.
Tips of blades below 9 feet 4 inches W. L. (above bottom of keel) .....	20½ inches.
Material of propellers .....	Comp. "Mnc."
Starboard propeller is right hand.	
Port propeller is left hand.	

## (C) Boilers:

Kind of boiler (oil burning) .....	Normand.
Number (2 in each boiler room) .....	4
Designed working pressure .....	260 pounds.
Heating surface, each boiler .....	6,750.43 square feet.
Cubical contents of combustion chamber, each boiler .....	715.65 cubic feet.
Diameter of main steam pipes between engine and boiler rooms (two) .....	10½ inches inside diameter.
Diameter of steam pipe from each boiler .....	7½ inches inside diameter.
Number of oil burners, each boiler .....	14
Number of furnaces, each boiler .....	1
Smokepipes, height above base line. (1) 48 feet 2½ inches, (2) 47 feet 8½ inches, (3) 47 feet 1½ inches, (4) 46 feet 7½ inches.	4
Number of smokepipes .....	20.3 square feet.
Area of section through one smokepipe .....	

Type.	Compart
4-inch .50 caliber cartridge...	A-111 M.
Do.....	D-108 M.
4-inch .50-caliber drill cartridges.	A-114 M.
3-inch .23-caliber antiaircraft cartridges.	D-107 M.
3-inch .23-caliber antiaircraft dummy cartridges.	D-107 M.
.30-caliber ball cartridge, model 1906, machine gun.	A-112 M.
.30-caliber ball cartridge, model 1906, rifle.	A-112 M.
.30-caliber ball cartridge, model 1898.	A-112 M.
.30-caliber blank cartridge, model 1909.	A-112 M.
.30-caliber blank cartridge, model 1898.	A-112 M.
.30-caliber dummy cartridge, model 1906.	A-112 M.
.45-caliber ball cartridge, model 1911.	A-112 M.
Impulse primers.....	A-112 M.
Superheater fuses.....	A-112 M.
Impulse powder.....	A-112 M.
War heads.....	D-109 M.
A. C. R. mechanism.....	D-109 M.
Torpedo detonators.....	Searchlight form and deck.
Net cutter bombs.....	do.....
War-head appliances.....	D-109 M.
Torpedoes.....	Main deck

<sup>1</sup> Pounds.<sup>2</sup> Not box

Caliber.

4-inch .50-cal. rapid-fire gun.....

Do.....

Do.....

Do.....



## LIST OF AMMUNITION STOWAGE.

(Section U-1.)

Type.	Compartment.	Total capacity.	Allowance.	Number in each box or tank.	Length.	Stowage sizes, width.	Depth or diameter.	Weight of each box or tank.
					<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Pounds.</i>
4-inch .50 caliber cartridge...	A-111 M.....	269 tanks...	400.....	{	1	51.92	6.64	84
Do.....	D-108 M.....	223 tanks...			1	51.92	6.64	84
4-inch .50-caliber drill cartridges.	A-114 M.....	6.....			1	51.92	6.64	84
3-inch .23-caliber antiaircraft cartridges.	D-107 M.....	53 boxes...	50 boxes...	6	20	13	9½	120
3-inch .23-caliber antiaircraft dummy cartridges.	D-107 M.....	1 box.....	1 box.....	6	20	13	9½	120
.30-caliber ball cartridge, model 1906, machine gun.	A-112 M.....	20 boxes...	24,000.....	1,200	16¼	14	8	91½
.30-caliber ball cartridge, model 1906, rifle.	A-112 M.....	12 boxes...	11 boxes (13,200).	1,200	18¾	9½	14½	95
.30-caliber ball cartridge, model 1898.	A-112 M.....	4 boxes...	4,800.....	1,200	34½	9	7½	99¾
.30-caliber blank cartridge, model 1909.	A-112 M.....	1 box.....	2,000.....	2,000	17½	11¾	12.45	84
.30-caliber blank cartridge, model 1898.	A-112 M.....	4 boxes...	4,000.....	1,000	19¾	13½	8	44½
.30-caliber dummy cartridge, model 1906.	A-112 M.....	1 box.....	1,000.....	1,000	21½	12½	7	66
.45-caliber ball cartridge, model 1911.	A-112 M.....	3 boxes...	6,000.....	2,000	16¼	12¾	7½	110
Impulse primers.....	A-112 M.....	7 boxes...	6 boxes...	24	4.86	3.036	3.32	3
Superheater fuses.....	A-112 M.....	8 boxes...	7 boxes...	20	4.86	3.036	3.32	3
Impulse powder.....	A-112 M.....	1 can.....	50 pounds..	<sup>1</sup> 50	16.6	10½	10½	77
War heads.....	D-109 M.....	12.....	12.....	( <sup>2</sup> )	28½	.....	21	<sup>3</sup> 426
A. C. R. mechanism.....	D-109 M.....	12 boxes...	12.....	1	12¾	8¾	7½	57
Torpedo detonators.....	Searchlight platform and main deck.	8 lockers...	24.....	4	4¾	3¾	3¾	2
Net cutter bombs.....	do.....	3 boxes...	3 boxes...	4	.....	.....	.....	.....
War-head appliances.....	D-109 M.....	do.....	do.....	4	.....	.....	.....	.....
Torpedoes.....	Main deck.....	12.....	12.....	( <sup>4</sup> )	.....	.....	.....	.....

<sup>1</sup> Pounds.<sup>2</sup> Not boxed.<sup>3</sup> Head loaded.<sup>4</sup> One in each torpedo tube.

## BATTERY.

## GUNS.

(Section A-5.)

Caliber.	Location.		Gun No.
	Deck.	Frame.	
4-inch .50-cal. rapid-fire gun.....	Main.....	27-28 C. L.....	1
Do.....	Top of galley house.....	77-78 P.....	2
Do.....	do.....	77-78 S.....	3
Do.....	Top of after deck house.....	152 C. L.....	4



## GENERAL INFORMATION.

## ANTI-AIRCRAFT.

Caliber.	Location.		Gun No.
	Deck.	Frame.	
3-inch .23-cal. anti-aircraft gun.....	Main.....	162-163 C. L.....	

## TORPEDO TUBES.

6.8 m. by 21 inches, triple.....	Main.....	107-108 S.....	1
Do.....	do.....	99-100 P.....	2
Do.....	do.....	137-138 S.....	3
Do.....	do.....	127-128 P.....	4

## SMALL ARMS.

25 .45-cal. Colt's automatic pistols <sup>2</sup> .....	A-112M.....	41-45 P.....	
25 .30-cal. rifles, mod. 1903 <sup>2</sup> .....	do.....	41-45 P.....	
3 Lewis machine guns <sup>1</sup> .....	do.....	41-45 P.....	

<sup>1</sup> Two machine-gun stands located on main deck: No. 1 between frames 61-62 S. and No. 2 between frames 63-64 P.

<sup>2</sup> Provision made for stowing 30 pistols in 5 racks and 30 rifles in 5 transportable racks.

## BOATS.

(Section U-5.)

Name.	No.	Carrying capacity (each).
24-foot motor sailing launch.....	1	19
24-foot whaleboat.....	1	23
21-foot motor dory.....	1	10
10-foot punt.....	1	

## LIFE RAFTS.

(Section A-5.)

No.	Carrying capacity.
4 (28 persons each).....	112 persons.

Name of valve.

Fire and bilge pump discharge.

Fire and bilge pump suction.

Fire and bilge pump discharge.

Fire and bilge pump suction.

Torpedo air compressor suction.

Torpedo air compressor discharge.

Forward condenser inlet.....

Fire and bilge pump discharge.

Fire and bilge pump suction.

Augmentor condenser discharge.

Auxiliary air and oil cooler circulating pump suction.

Auxiliary condenser circulating water discharge.

Forward condenser outlet.....

After condenser inlet.....

Oil cooler circulating pump suction.

Evaporator blow.....

Fire and bilge and evaporator suction.

After condenser outlet.....

Fire and bilge pump discharge.

Forward internal draft gage....

Midship internal draft gage....

After internal draft gage.....

All sounding tubes extend into fuel oil tanks.

Sounding tubes in 6-inches apart the whole is curved the holes are on



## GENERAL INFORMATION.

## ANTI-AIRCRAFT.

Caliber.	Location.		Gun No.
	Deck.	Frame.	
3-inch .23-cal. anti-aircraft gun.....	Main.....	162-163 C. L.....	

## TORPEDO TUBES.

6.8 m. by 21 inches, triple.....	Main.....	107-108 S.....	
Do.....	do.....	99-100 P.....	
Do.....	do.....	137-138 S.....	
Do.....	do.....	127-128 P.....	

## SMALL ARMS.

25 .45-cal. Colt's automatic pistols <sup>2</sup> .....	A-112M.....	41-45 P.....	
25 .30-cal. rifles, mod. 1903 <sup>2</sup> .....	do.....	41-45 P.....	
3 Lewis machine guns <sup>1</sup> .....	do.....	41-45 P.....	

- <sup>1</sup> Two machine-gun stands located on main deck: No. 1 between frames 61-62 S. and No. 2 between frames 63-64 P.  
<sup>2</sup> Provision made for stowing 30 pistols in 5 racks and 30 rifles in 5 transportable racks.

## BOATS.

(Section U-5.)

Name.	No.	Carrying capacity (each).
24-foot motor sailing launch.....	1	19
24-foot whaleboat.....	1	23
21-foot motor dory.....	1	10
10-foot punt.....	1	

## LIFE RAFTS.

(Section A-5.)

No.	Carrying capacity.
4 (28 persons each).....	112 persons.

SUBMARINE DESTROYERS NOS. 342 TO 344.  
OPENINGS BELOW LOAD WATER LINE.

Location.	Location of center of opening.		Circle.	Size of opening in inches or in feet and inches.
	Above bottom of hull.	From center line of ship.		
10 inches forward frame 6, P.	0 4 1/2	2 4	28 6 1/2	3 1/2-inch diameter.
10 inches forward frame 6, P.	0 4 1/2	2 3 1/2	28 9 1/2	4 1/2-inch diameter.
10 inches forward frame 6, P.	0 2 1/2	2 3 1/2	28 10	3 1/2-inch diameter.
10 inches forward frame 6, P.	0 3 1/2	2 2 1/2	28 11	4 1/2-inch diameter.
10 inches at frame 65, P.	1 0 1/2	5 9 1/2	24 7 1/2	4 1/2-inch diameter.
10 inches at frame 97, P.	1 0 1/2	5 9 1/2	24 6	3 1/2-inch diameter.
Frames 8-100, S.....	4 11 1/2	13 4 1/2	15 8 1/2	6 feet 2 inches by 1 foot 10 inches elliptical.
10 inches forward frame 100, P.	6 3	14 2	14 0	3 1/2-inch diameter.
10 inches forward frame 100, P.	4 3	12 6	16 7	4 1/2-inch diameter.
10 inches at frame 110, S.	1 2 1/2	5 9 1/2	22 8 1/2	6 1/2 inches by 4 1/2 inches elliptical.
10 inches at frame 111, S.	3 0 1/2	10 1 1/2	18 3	10 1/2-inch diameter.
10 inches at frame 114, S.	8 8 1/2	14 4 1/2	10 9 1/2	4-inch diameter.
Frames 112-115, S.....	5 2	12 7 1/2	14 9 1/2	4 feet 2 inches by 1 foot 10 inches elliptical.
Frames 113-117, P.....	5 1 1/2	12 5 1/2	14 11	6 feet 2 inches by 1 foot 10 inches elliptical.
10 inches at frame 122, P.	0 5 1/2	2 1 1/2	25 1	4 1/2-inch diameter.
10 inches forward frame 125, P.	0 5 1/2	1 10 1/2	24 7 1/2	3 1/2-inch diameter.
10 inches forward frame 126, P.	4 0 1/2	8 11 1/2	16 4	4 1/2-inch diameter.
Frames 128-131, P.....	6 3 1/2	11 5 1/2	13 0	3 feet 7 1/2 inches by 1 foot 10 inches elliptical.
10 inches forward frame 130, P.	7 0 1/2	12 4	11 8	3 1/2-inch diameter.

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10 inches at frame 12, S.	1 0 1/2	1 3	25 4	3-inch diameter.
10 inches forward frame 18, P.	0 3 1/2	2 0 1/2	29 1 1/2	Do.
10 inches forward frame 104, P.	4 11 1/2	1 7	14 9 1/2	Do.

## SOUNDING TUBES.

Standard 1 1/2-inch steel pipe, galvanized, except in cases where black pipe is used.  
 Sounding tubes are perforated with 1/2-inch diameter holes spaced at 12-inch intervals along the length of the pipe within the tank which is sounded, and where the holes are on the inside of the curve.