THE LATEST SUBMARINES OF THE UNITED STATES NAVY.

As in all mechanical development an improved type of any particular device is an evolution from its predecessors, so in general, the modern Holland torpedo boat, of which the government is now building a number, is a descendant of the original little craft of that name, which first made its appearance at the close of the Spanish war.

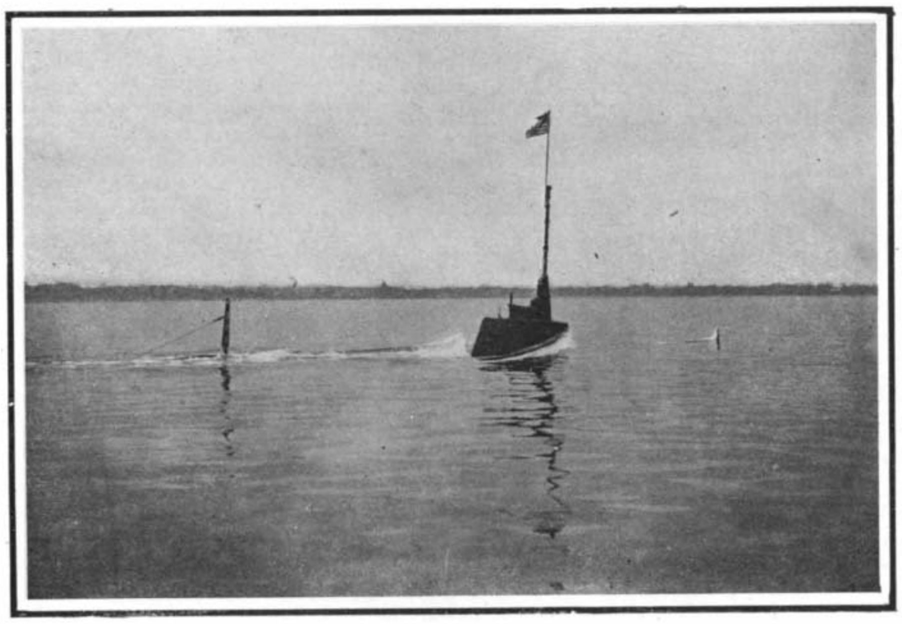
The form of hull is generally described as cigar-shaped. It is built of the very best quality of mild steel, and the workmanship is of the highest order, for the reason that every seam and rivet must be perfectly tight, in view of the service which the boat is called upon to perform. Not only do vessels of this type undergo all the stresses of sea and weather which other vessels are subjected to, but in addition they are required to navigate at considerable depths below the surface of the water. At these depths the pressure of the water is great, so that the hull must be made sufficiently strong to withstand it.

Up to the present, it has been found that the most efficient size for a boat is about 140 feet long and 14 feet in diameter. With such dimensions, a boat can be built which will fulfill all requirements which the naval authorities of the world demand from it. That is to say, it can cruise on the surface for long distances at a speed of fourteen knots. At lower speeds its radius of action extends to several thousand miles. For submerged work large storage batteries are provided, which furnish energy sufficient to drive the boat from ten to eleven knots for a period of over an hour. The same electrical energy will drive her at a lower speed for a much longer time. The latest submarines, built for the government by the Fore River Company, at about five knots speed can run completely submerged with nothing visible above water, for a distance of 150 miles.

There are two distinct conditions in which the boat may be used. In the first, commonly known as the surface condition, the boat is prepared for cruising. A considerable portion of her hull is above water, a removable navigating bridge is in place, and she is driven by large, powerful, internal-combustion engines. Under these conditions she is managed in about the same way as any vessel built to run upon the surface. As for sea-going qualities, our submarines have been found in practice to be excellent. In ordinary weather they are fully as comfortable as any surface craft of the same dimensions, and even in the heaviest weather they are entirely seaworthy.

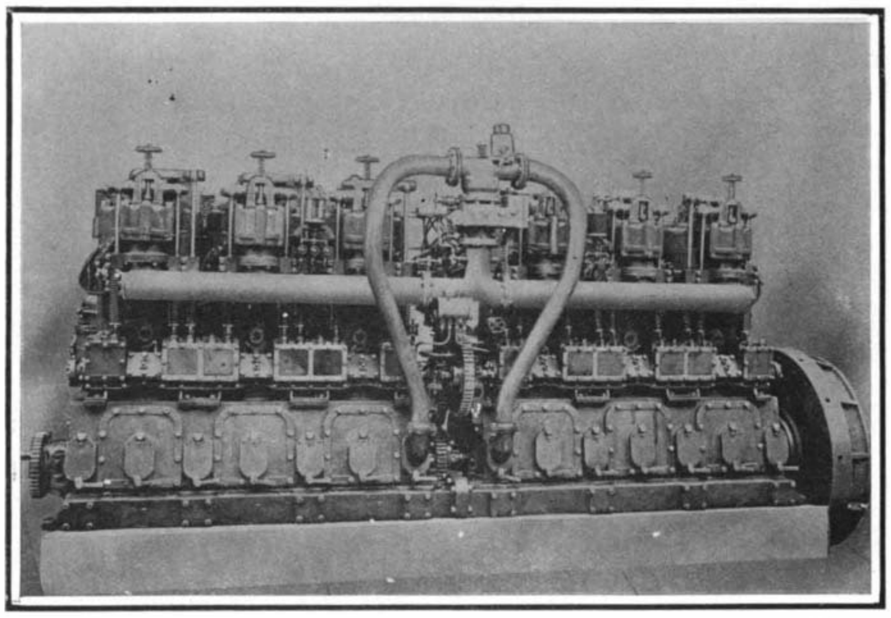
The second distinct condition exists when the boat is submerged. To pass from the surface to the sub-

(*Continued on page 305.*)



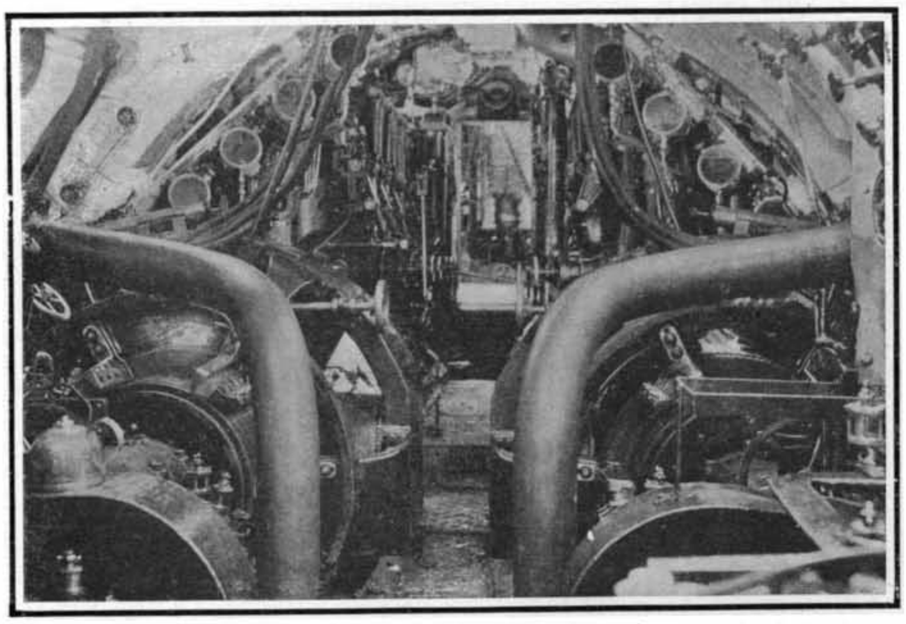
The dark object in the center is the conning tower. The periscope to which the flagstaff is attached projects above water when the boat is submerged and by its means the commanding officer can view surrounding objects as clearly as though he looked through a field glass at the surface.

Submarine beginning to dive.



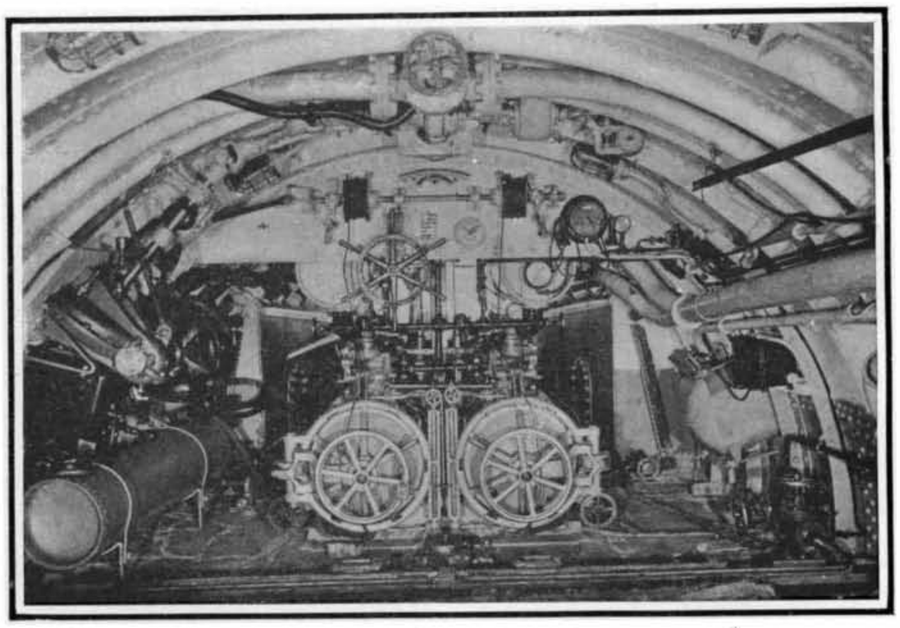
These engines are used only in traveling at the surface. They can drive the boat at 14 knots. For submerged work they are uncoupled and the boat is driven by two electric motors. The latter take their energy from storage batteries which have been charged by the gas engines.

One of the twin internal-combustion engines of the submarine.



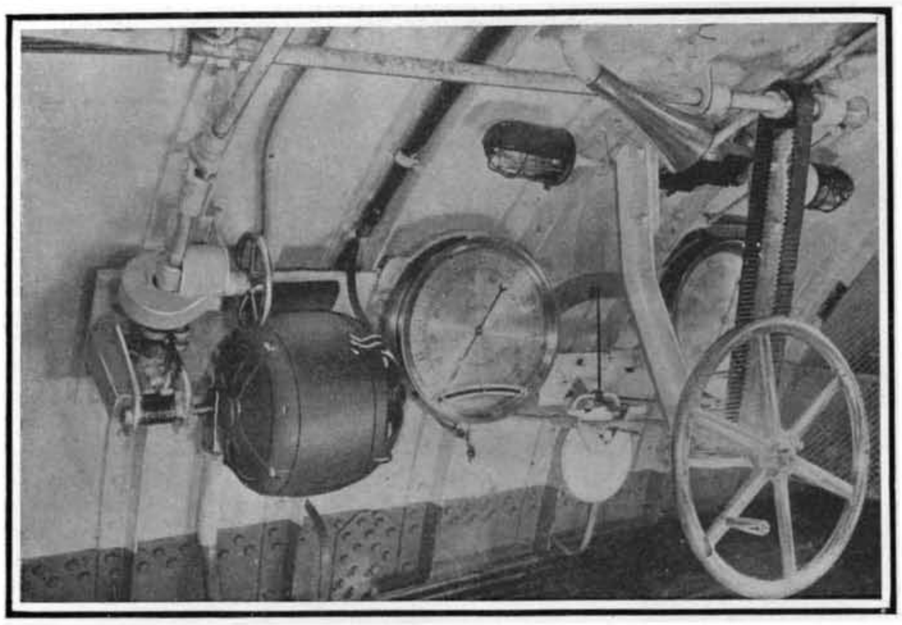
To right and left are the electric motors which drive the boat, when submerged, at 10.5 knots per hour.

Looking aft in engine room.



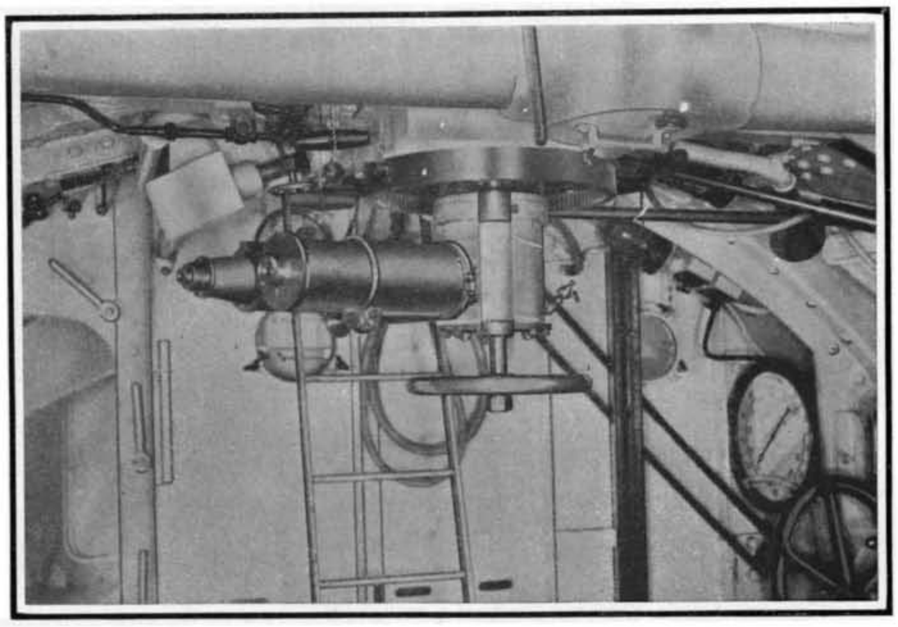
In the center are the two torpedo discharge tubes. To the left is the electric motor and gear by which the doors in the nose of the submarine are opened for discharge of torpedoes.

View on main floor looking forward.



The hand wheel to the right operates the diving rudders used for steering in a vertical plane. In front of the wheel is a gage whose pointer shows the depth in feet of the boat below the surface. The curved dark line below pointer is a spirit level which shows the inclination of the boat.

Diving wheel and depth pressure gage.



This shows the roof, not the floor, of the submarine interior. The horizontal eyepiece and the vertical telescope tube are rotated by means of the hand-wheel whose pinion engages an internal gear ring.

Eyepiece at bottom of periscope.

THE LATEST SUBMARINES OF THE UNITED STATES NAVY.

attains the level of the break in the meridian. The laws of refraction and total reflection can then be studied by directing luminous pencils toward the center of the globe, in the equatorial plane, and viewing them with the eye placed in the same plane.

In his electroscope (Fig. 4) Chassagny has made use of the fact that platinized glass is sufficiently transparent to allow objects to be seen clearly through it and yet reflects bright images of objects nearer the eye. A vertical and rigid strip of copper and a flexible strip of aluminium foil are suspended from a copper rod and inclosed in a case of which two opposite sides are of glass and the rest of metal. The rod carries a charging disk at its upper end and is insulated by passing through a block of paraffin, which rests on the top of the case. One of the glass sides is platinized, and outside it is placed a graduated quadrant which is seen by reflection, while the deflected strip of aluminium is seen through the glass.

Chassagny's galvanometer (Fig. 5) is inclosed in a wooden case, which is attached to the wall. In a strong magnetic field, formed by placing the like poles of two horizontal horseshoe magnets almost in contact with each other, is suspended a coil of wire of electrolytic copper. The intensity of the field is further increased by a soft iron cylinder, supported independently inside the coil. A large mirror, attached to the coil, reflects the image of a lamp to a screen, where the movements of the spot of light can be followed by the whole class. The galvanometer is provided with three shunts.

In Chassagny's apparatus for the study of electromagnetic induction (Fig. 6), a coil of wire is attached, with its plane vertical, to one end of a lever which can turn round a horizontal axis, and is balanced by a counterpoise on the other end. A vertical horseshoe magnet, with its poles directed upward, is placed so that the coil can be brought between the poles, or raised above them, by turning the lever on its axis. The positive and negative currents produced by these movements are indicated by a galvanometer connected with the coil. An alternating current is produced by allowing the lever to oscillate freely. Other experiments in induction may be made by sending through the coil a current from a battery.

M. Chassagny has devised a number of other ingenious instruments, including a very practical rheostat, a eudiometer, a baroscope, etc.

THE LATEST SUBMARINES OF THE UNITED STATES NAVY.

(Continued from page 296.)

merged condition, certain valves in the interior of the boat are opened. This allows the water from the sea to run into great tanks built within the boat, and thus virtually sink her. These tanks are closely gaged, so that just the required amount of water is taken in. Under normal conditions, when the boat is at rest with the ballast tanks filled, she will have a few hundred pounds reserve buoyancy, which is represented by the top of her conning tower protruding above the water. If desired, this buoyancy may be entirely destroyed by admitting a small additional amount of water, equal in volume to the volume of that part of the conning tower above water. While in the submerged condition, all communication with the outside atmosphere is necessarily cut off. The crew, usually about fifteen men, then breathes the air contained in the body of the boat. The amount of air originally contained within the hull is sufficient to support life with comfort for at least twenty-four hours. But, in addition to the air thus contained, the boat carries a large supply of compressed air in steel flasks, which, if used for breathing purposes, would be sufficient for a number of days.

After having brought the boat to the submerged condition in the manner

(Continued on page 306.)

Classified Advertisements

Advertising in this column is 75 cents a line. No less four nor more than ten lines accepted. Count seven w to the line. All orders must be accompanied by a remi Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to gi e the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

BUSINESS OPPORTUNITIES.

WILL FURNISH capital for promoting good patent, franchise for public utility, or other good enterprise Must come well recommended. Address P. L. Gallagher Prudential Building, Newark, N. J.

Inquiry No. 8868.—Wanted to buy nickeloid for buttons.

MANUFA RS.—Let me tell you what a fortune I have for you. I have a new patent manure spreader which I will sell at a reasonable price to any business man or to factories. It is both simple and practical. It is built in 70-inch side and works to perfection. If interested, write personally to G. G. Huisman, Kamrar, Iowa.

Inquiry No. 891 . For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

MANUFACTURERS, CAPITALISTS—I will sell outright or manufacture on royalty a most valuable invention. For full particul address M. R. Schultz, Southampton, N. Y

A RARE OPPORTUNITY se ts itself for a high class salesman to handle an article of utility needed on every street, in every ho e and tore as well as halls and churches. Substantial commissions or straight purchase plan. Standard Chicago, 9 W. Michigan St., Chicago.

Inquiry No. 8960.—For the address of the Windsor Mfg. Co., manufacturers of waterproof collars and cuffs.

PATENTS FOR SALE.

FOR SALE.—Valuable hoop-shaving patent, improves quality and greatly reduces cost of manufacture. For further information and particulars, inquire Room 1709, 11 Pine Street New York.

Inquiry No. 8922.—Wanted the address of Worthington Boiler Co.

FOR SALE.—Patent No. 869,176. Door knob to adjust to doors of various thicknesses. No sma l screws to lo en and drop out. Can be made cheap. Addr s J. T. Hendeson, Box 24, Niagara Falls,

Inquiry No. 8966.—Wanted the address of the Cohendet Motor Co.

FOR SALE.—Self-spinning top. Mechanism all inside; will spin five minutes with one winding. Will sell outright or on royalty. U. S. Patent 931,487, August 17, 1909. T. N. Reed, Itasca,

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

FOR SALE.

FOR SALE.—Engine lathe, swings 9½ in., takes 25 in. between centers. Complete with full set change gears to cut all size threads, 8 to 40 in. Price only $43.50. Address L. F. Grammes & So Allentown, Pa.

Inquiry No. 89 0. For information regarding shoes not made of leathe but similar to the same and are as durable.

BOOK AND STATIONERY BUSINESS, established 20 years, location in thriving city of 8,000, splendid field and well developed neighborhood, western Minnesota; must be sold because of ill-health. Will sacrifice heavy discount on actual value. A competence for the right man, and less than $2,000 swing it. H. I. Wheelock, Fergus Falls, Minnesota.

Inquiry No. 8996.—Wanted addresses of manufacturers of machinery for working orange wood cure sticks.

FOR SALE.—Brand new aeronautic motor. 30 H. P. A 4-cylinder, air-cooled, 2-cycle engine weighing less 4 lbs. per H. P. Built by one of America's pioneer best motor constructors. Will sell cheap to quick purchaser. Address H. A. Powell, Stratford, Conn.

HELP WANTED.

WANTED.—A practical and experienced man, thoroughly conversant with up-to-date stock and cost systems for iron and brass manufacturing plants. A permanent and lucrative position for a good man. Apply by letter, stating experience and qualifications, to "System," Box 773, New York.

Inquiry No. 9001.—For the address of pro ve manufacturers of fruit jars.

WANTED BY NOVEMBER 1st.—Superintendent for wood working machinery plant, must have good education and be well up in e shop practice and designing. Applicants will please state age, experience and salary required. Hespeler Machinery Co., Limited. Hespeler, Ont., Canada.

PARTNERS WANTED.

WANTED.—Partner with sufficient capital or a business firm or corporation to manufacture article under Patent No. 855,032 on a royalty basis or for sale. Goods are staple and cheaply made. Partner, Box 773, N. Y.

Inquiry No. 9010.—Wanted to buy a Rector Help-a-Phone."

MISCELLANEOUS.

HAIR GROWS when our Vacuum Cap is used a few minutes daily. Sent on 60 days' free trial at our . No drugs or electricity. Stops falling hair. Cures dandruff. Postal brings illustrated booklet. Modern Vacuum Cap Co., 556 Barclay Block, Denver, Colo.

Inquiry No. 9012.—Wanted to buy papier mache boxes in the shape of water melons, colored to resemble melons, etc.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department. Box 773, New York.

Inquiry No. 9014. or manufacturers of machinery, supplies, , to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

Inquiry No. 9018.—Wanted, the address of parties manufacturing gold plat for use in cheap fountain

Inquiry No. 9022.—Wanted, to buy a light, small otor not exceeding three pounds in weight, including everything in going order.

Inquiry No. 9023.—Wanted, to buy silk machines re-reeling, twisting, doubling, to the final process of making it into clothes.

Inquiry No. 9025.—Wanted, address of manufacturers in Germany.

Inquiry No. 9026.—Wanted, address of parties who make "invar" or other metals having a low coefficient of expansion.

Inquiry No. 9027.—Wanted, the addre of manufacturers of small wooden articles.

Inquiry No. 9028.—Wanted, to buy a w hing machine that is run by a coil spring motor.

Inquiry No. 9029.—Wante , catalogues and all information on machinery for braiding straw in manufacturing straw hats.

Inquiry No. 9030.—Wante , the address of firms manufacturing a wood fiber bottle and case made from same material.

Inquiry No. 9032.—Wante , the address of parties who supply carriage and wagon makers with white gum w blocks for making hubs for ve icle wheels.

Inquiry No. 9033. Wanted to buy machinery, etc., to install a plant for manufacturing condense malted and evaporated milk.

Inquiry No. 9034.— r manufacturers of ery that could reduce stumps to kindling wood.

Plow scrapers, set for forming, J. F. Pritchett	936,353
Pocket receptacle, L. C. Kerrick	936,327
Pool or billiard table, C. E. Turner	936,585
Portable elevator, G. B. Koontz	936,641
Posts, device for attaching wires to, Wilcox & Burkholder	936,751
Power shovel, J. Kiesler	936,727
Power transmission, electrical, C. L. Chisholm	936,304
Power transmission mechanism, B. F. Mayo	936,338
Power transmission mechanism, A. Kovacs.	936,458
Precious metals from ores, extracting, I. Kitsee	936,545
Printing presses, pneumatic folding mechanism for, S. G. Gos	936,711
Propeller, T. Amnelius	936,508
Propeller, chain, J. S. Orr	936,349
Pruning shears, C. W. Washburn	936,390
Puller. See Bolt puller.	
Pulley, T. X. Jones	936,778
Pulley, window shade catch, Hoover & Fries	936,900
Pulverizer, soil, C. E. Griffin	936,712
Pump, R. Conrader	936,605, 936,606
Pump, power, W. H. Rayner	936,359
Punch presses, table for, F. Thompson	936,832
Pyrographical tool, H. M. Holton	936,720
Rail for railway tracks, tubular, P. P. Cookingham	937,022
Rail joint, L. Larson	937,003
Rail joint and tie plate, A. L. Barns	936,850
Railway crossing, noiseless, J. E. Reyburn.	936,477
Railway crossing signal, G. A. Silver	936,372
Railway semaphore signal, dwarf, H. M. Abernethy	936,283
Railway signal system, wireless, E. R. Brodton	936,405
Railway swit operating mechanism, C. W. Squires	936,381
Railway system, motor cycle, J. N. Vandegrift	936,682, 936,683
Railway tie and rail fastener, J. P. Donovan	936,989
Railway tie, metal, H. J. Buell	936,519
Railway tracks, apparatus for depositing and on, W. D. Ross	936,567
Railway vehicles, means for controlling the movement of, J. H. Just	936,325
Ranges and stoves, towel rack for, F. R. Henry	936,890
Ratchet wrench, J. Knowles	936,640
Razor, safety, E. H. McIntire	936,654
Reclining chair, C. A. Warner	936,589
Reel for coiling flats or other rolled sections, F. H. Daniels	936,610
Regenerative furnace, J. B. McKennan	936,930
Reversing mechanism, F. J. Ball	936,694
Rifle sight, J. D. Pedersen	936,807
Ripping device, G. E. Post	936,474
Rivets, hand tool for extracting, Summers & Cooper	936,580
Rock breaker, C. C. Lane	936,729
Roof flange, adjustable, H. C. Folger	936,991
Rotary engine, J. R. Kinney	936,543
Rotary engine, A. Neumann	936,933
Rotary motor or pump, J. R. Kinney	936,542
Rubber, reclaiming devulcanized, E. E. A. G. Meyer	936,468
Rubbing post, S. B. Wasson	936,687
Rule and linotype slug holder, election square, B. D. Devo	936,612
Runner, detachable, S. Hand	936,449
Sand, apparatus for cleaning and separation of, E. M. Nichols	936,801
Sash lock, Farmer & Church	936,616
Saw, band, A. Anderson	936,596
Saw handle, W. W. Taylor	936,491
Saw handle, crosscut, J. Kallehner	936,913
Sawmill, band, H. G. Dittbenner	936,314
Sawmill set works and dog, automatic power, N. E. Rice	936,944
Saw setting tool, L. G. McKam	936,800
Scale, computing, A. De Vilbiss, Jr.	936,867
Scraper, forked or tined, G. F. Koenig	936,457
Screen, N. Brandt	936,859
Screw, set, C. G. Lundholm	936,549
Sealing device, packing case, C. O. Batchelor	936,289
Sealing vessels, J. A. Hicks	936,893
drill, Campbell & Howard	936,408
Selective ringing k y, C. A. Simpson	936,373
Service box, H. C. Hubbell	936,536
Sewage and the like, apparatus for the bacteriological treatment of, G. A. Lucas.	936,464
Sewing machine, multiple needle, Diehl & Hemleb	936,426
Sewing machine needles, presser foot attachment for, J. H. Titus	936,386
Shade adjuster, T. X. Jones	936,779
Shade bracket, window, A. A. Hazard	937,027
Shade holder, J. H. Dale	936,421
Shaft bearing, R. R. Amos	936,286
Sharpener, razor blade, D. M. Perine	936,935
Sheet metal handle, E. Ohnstrand	936,802
Sheet metal packages, apparatus for forming, A. R. McArthur	936,799
Sheet supporting device, F. K. Fernald	936,876
Ship cleaning device, W. Martin	936,466
Ships' plates, making composite, G. C. Berg	936,514
Shoe dauber, J. L. Weir	936,590
Shoe upper fastening device, T. F. Whelan	936,391
Shooting glasses, C. E. Cook	936,987
Shovel. Power shovel.	
Show case frame, A. A. Havenhill	936,451
Shutter bower, O.	936,992
Sight locating device, J. P. Saxe	936,570
Signal and tail light, P. C. Woodnutt	936,394
Signal mechanism, W. W. Van Horn	936,835
Sink stop, O. J. Deegan	936,313
Slags, deoxidizing, O. Thallner	936,382
Small arm, automatic, W. J. Whiting	936,967
Smelter furnace, J. P. Welch	937,030
Smelting furnace, ore, W. Kemp	936,781
Smelting ore, J. P. Welch	937,031
Socket piece for studding, etc., W. P. Rice.	936,945
Soldering tool, L. Schemnitz	936,816
Solenoid switch, rocking, A. T. Marshall	936,648
Sound reproducing machines, automatic needle disengaging and stop mechanism for, G. A. Oppenheimer	936,348
Sound reproducing machines, record for, E. M. Berliner	936,976
Spark plug, J. O. Anderson	936,507
Speed changing mechanism, F. C. Brunhouse	936,300
Speed changing mechanism, W. A. Pringle.	937,034
Speed driving mechanism, variable, P. T. Kenny	936,326
Speed mechanism, variable, R. E. Rosewarne	936,363
Spindle, compound, F. Seymour	936,672
Spool, W. E. Evans	936,526
Spool, compensating, F. E. Cole	936,306
Spring, E. H. Wood	936,971
Spring link, A. B. Day	936,865
Square, bevel, D. E. Brandt	937,020
Stacker, hay, L. J. Lindsay	936,332
Stamp affixing machine, Hotchkiss & Beach,	936,630, 936,631
Stapling machine, E. T. Greenfield	936,990

above described, powerful electric motors are started by throwing in a switch. The e motors derive their energy from storage batteries c tai ed in the boat, and drive the propellers. The same storage batteries furnish current for numerous auxiliary motors used for pumping, steering, handling torpedoes, etc.

The motion of the boat when under way is controlled by two sets o rudders; one of these sets, kno n as the vertical rudders, directs the boat's course to port or starboard just as does the rudder of an ordinary ship. In addition, there are provided horizontal rudders, which serve to co trol the motion of the boat in a horizontal plane; that is to say, the depth at which she runs is regulated by these rudders. For steering in the horizontal plane, instruments are provided, so that the boat may be navigated with the same degree of accuracy as boats on the surface. The first of these instruments is known as a periscope. This consists of a vertical tube which extends from above the surface of the water to a few feet within the submarine. At the top of the tube is an object glass; at the bottom an eye-piece. Two reflecting mirrors, one at the top, the other at the bottom of the vertical tube, cause the image to be transferred from the object glass to the eye-piece. The operator can turn the periscope so as to sweep the whole horizon. To the writer, who recently made a five-hour trip in one of our latest boats, the view was as clear as though he were at the surface looking through an ordinary field glass. Hence when running submerged with the top of the periscope just out of the water, the navigator can see with perfect ease surrounding objects. If for any reason it should be desired to run at a still greater depth, compasses are provided by which the course may be steered with accuracy. For steering, submerged, in the vertical plane, instruments are provided which in a way take the place of the compass. One of these is a large pressure gage, which indicates the depth at which the boat is running. Another is a form of spirit level, which indicates the inclination of her axis. By the use of this, the man controlling the horizontal rudder is able to r n at a perfectly even depth. While in the submerged condition, the boat is of course amply illuminated by electri lights. There are no ports or windows in the boat, and so far as sensations are concerned, one is unable to determine whether he is running on the surface or submerged.

The arm of the submarine is the automobile torpedo. A number of these may be carried. They are discharged through torpedo tubes located in the bow of the boat. Any modern type of automobile torpedo may be used. In view of the fact that the submarine is enabled to approach unseen to within a few yards, if desired, of the most powerful battleship, a long-range torpedo is not required. For this reason the weight devoted to motive power in the ordinary torpedo may be largely used to increase the destructive power, so that the proper arm for the submarine would be far more powerful and destructive than the ordinary auto obile torpedo.

While the project of the submarine is comparatively old, it has so happened that but few of them have been used in real war. The first case on record is that of a little hand-power submarine boat built by David Bushnell in 1776. Having obtained permission from the American general in command to use this submarine against the English fleet anchored north of Staten Island, he instructed a sergeant named Ezra Lee in its use. After several attempts, Lee made an attack on one of the ships. His purpose was to fix a torpedo to her side, then go away and allow it to explode, thus destroying the ship. Unfortunately, the ship was sheathed with copper, and he was unable to attach his mine. Lee then drifted away from the shi , having abandoned his mine, which, after drifting about for an hour, exploded, throw

(*Concluded on page 307.*)

ing up a great volume of water, and thus warning the English of the great danger they had escaped.

Another case on record is that of the Confederate submarine "David," which, during the blockade of Charleston in the civil war, was manned by volunteers, and by hand power was propelled out to the U. S. S. "Housatonic," which she destroyed by the explosion of a mine in contact with her hull.

During the Spanish-American war the modern submarine had not made its appearance. During the Russian-Japanese war both sides ordered boats, but the war was finished before these vessels became available. At present all the leading naval powers are acquiring submarines in large numbers, so that during the next war we may expect to see them figure largely in the various operations.

In the trip in a submarine above referred to the Editor was impressed with the smoothness and accuracy with which the submarine went through her submerged evolutions. The movements, quick response, etc., of the boat were such as to inspire complete confidence in her stability and general efficiency.

There can be no question that the submarine has at last "come into its own." Among the captains of the battleships and the line officers in general at Provincetown, there was noticeable a growing respect for these craft, due to the varied and accurate work which the flotilla had accomplished during the summer maneuvers. There has been a steady but slow growth in the speed of the submarine. Its control is now perfect, and its radius of action is being rapidly increased. Our largest boats have a radius of about one thousand miles; and two are under construction on the Pacific coast which will have a cruising radius of about three thousand miles. This means that the submarine is taking on full seagoing qualities. It must no longer be regarded as restricted to seacoast operation. The time is not far distant when an admiral searching for the enemy upon the high seas may include a submarine flotilla in his fleet. The profound significance of this fact upon strategy and tactics will be appreciated by every naval expert.

In his study of living beings, the physiologist has one guiding principle which plays but little part in the sciences of the chemist and physicist, namely, the principle of adaptation. Adaptation or purposiveness is the leading characteristic of every one of the functions to which we devote in our text-books the chapters dealing with assimilation, respiration, movement, growth, reproduction, and even death itself. Spencer has defined life as "the continuous adjustment of internal relations to external relations." Every phase of activity in a living being is a sequence of some antecedent change in its environment, and is so adapted to this change as to tend to its neutralization and so to the survival of the organism. This is what is meant by adaptation. It will be seen that not only does it involve the teleological conception that every normal activity must be for the good of the organism, but also that it must apply to all the relations of living beings. It must therefore be the guiding principle, not only in physiology, with its special pre-occupation with the internal relations of the parts of the organism, but also in the other branches of biology, which treat of the relations of the living animal to its environment and of the factors which determine its survival in the struggle for existence. Adaptation therefore must be the deciding factor in the origin of species and in the succession of the different forms of life upon this earth.

In consequence of the part played by the gas-lighting equipments of the trains involved in some recent accidents, states a contemporary, the Prussian railway authorities have decided to convert all their sleeping cars now fitted for gas lighting (some 170 cars) for electric lighting.

Steam trap, W. Wanstall 936,963
Steamer, egg, B. Wells 936,965
Steel castings, manufacture of, J. K. Griffith 936,623
Sterilization vessel, G. Van Eyck.......... 936,767
Stitching machine, book, F. Kugler......... 936,643
Stock and die, J. E. Dundore 936,311
Stone sawing machine, Wallner & Owens. 936,748
Stove, portable, W. B. Seeley............. 936,482
Stovepipe cutter, C. H. Hanshue 936,450
Strainer, G. F. Grimm 936,997
Strap seal, Baruch & Dessauer............ 936,852
Sweeper, vacuum, Matchette & Monkos.... 936,465
Swing, G. W. Schilling 936,818
Switch, C. Carson 936,601
Switch points, mechanism for rolling, W. D. Eynon 936,436
Switch stand, B. R. Scott 936,819
Switching device, O. Rennert.............. 936,666
Tag and buckle, combined, R. G. Hitt..... 936,896
Talking machine, R. L. Gibson............ 936,531
Tape scoring apparatus, C. Thibodeau...... 936,383
Tapping means, liquor, J. F. Terry 936,877
Target practice apparatus, H. H. Cummings, 936.418, 936.419
Taximeter, C. H. Pearson 936,559
Telegraph, printing, J. C. Barcklay. 936,849, 937,032
Telegraphone, H. R. Stuart 936,490
Telephone, H. Eccles 936,432
Telephone system, F. C. Unger............ 936,495
Telephone trunking system, C. A. Simpson 936,374
Telescope, terrestrial, G. A. H. Kellner.... 936,541
Thimble, sewing, C. E. Iles 936,902
Thread finishing machine, silk, E. Pohl..... 936,473
Ticket and holder for same, continuous railway, Proctor & Elkin.................. 936,354
Ticket, railway or other, A. Moyon........ 936,925
Tie plates, making rolled metal, W. L. De Remer 936,423
Tile making machine, W. J. McCracken.... 936,928
Time recorder, J. Alsenz.................. 936,691
Tire, W. B. Connell 936,416
Tire, H. L. Walbridge 936,837
Tire, D. Moriarty 936,924
Tire setting machine, D. R. Evans........ 936,435
Toaster, electric, W. S. Andrews......... 936,597
Toilet closet, R. A. Brooks............... 936,516
Tongs, A. Bing 936,980
Tongs, lifting, J. Parrett 937,028
Tongs, pipe, E. M. Hedlund............... 936,319
Tool, finishing, J. J. Barth............... 936,695
Tool, pressure driven reciprocating, A. Palmros 937,009
Tooth, artificial, F. Rose.................. 936,361
Tooth, artificial, J. W. Ivory.............. 936,903
Toy, automatic, C. W. Cheney............. 936,602
Toy cannon, C. L. Wood.................. 936,689
Track laying apparatus, R. C. Spandau.... 936,679
Train controlling mechanism, O. Gibson.... 936,443
Train manipulation, system and device for indicating, L. B. Stillwell............ 936,488
Trains, resetting mechanism for recording, O. White 936,591
Transfer press, Sloane & Owsley.......... 936,954
Transportation system, C. Worthington.... 936,395
Transportation, system of river, Lane & Mathews 936,336
Trap, J. Pozsony 936,808
Trap door lift, A. G. Boggess............ 936,294
Trolley, G. G. Miller.................. 936,341
Trolley clip, J. C. Michaelson............ 936,340
Trousers supporter, S. Levin.............. 936,787
Truck, J. H. Smith.................. 936,825
Truck frame, A. L. Hastings.............. 936,626
Tube cleaning apparatus, J. G. Frerichs.... 936,620
Tube filling and tamping machine, T. A. Edison 936,433
Tunnel attachment, J. A. Horne.... 936,628, 936,629
Turbine for driving boiler tube cleaners, H. T. Weinland et al.................. 936,498
Turbine, steam, R. A. McKee.............. 937,006
Turn table, J. R. Beattie.................. 936,854
Twisting machine, T. Nunn............... 936,346
Type setting and distributing machine, A. G. Halfpenny 936,776
Typewriter cabinet, J. D. Cleaton......... 936,864
Typewriter printing mechanism, R. W. Uhlig 936,833
Typewriter ribbon feeding mechanism, R. W. Uhlig 936,834
Type writing machine, J. Felbel............ 936,617
Valve, air control steam, J. A. Hecks.... 936,535
Valve, gate, E. D. Jefferson.............. 936,454
Valve, steam engine, J. C. Glenn.......... 936,773
Vehicle seat, J. Benson.................. 936,513
Vehicle top, collapsible, C. J. Tucker...... 936,960
Vehicle top door, F. E. Heylmann......... 936,892
Vehicle wheel, V. E. Van Cantfort......... 936,587
Vehicle wheel, J. H. Scott................ 936,820
Vehicles uphill, device for assisting, S. H. Stevens 936,828
Vending machine, M. H. Johnston.......... 936,726
Vending machine, liquid, Sage & Mitchell.. 936,365
Ventilator. See Car ventilator.
Violin, J. E. L. Winecoff.................. 936,505
Violin tailpiece, N. C. Hale.............. 936,624
Wagon, dumping, W. S. Livengood........ 936,730
Wagon seat riser, R. N. Collins.......... 936,414
Wall bracket, W. C. Morrill............... 936,552
Wall of plastic material, such as concrete, etc., retaining or quay, G. P. Wood.. 936,843
Wall plug, H. I. Jeffers.................. 936,322
War machine, J. Bouscal.................. 936,296
Wardrobe for bedsteads, H. B. Williams.... 936,969
Washboiler, I. Mozley.................. 936,926
Washer, gasket, H. Mueller............... 936,554
Washing machine, H. S. Judd.............. 936,634
Washing machiue, H. Kraut............... 936,642
Washing machine, J. J. Fuchs, Jr........... 936,770
Watchmakers' lathes, tool rest for, F. W. Derbyshire 936,422
Water, Attachment for regulating and indicating the temperature of running, C. E. & W. H. Krueger.................. 936,548
Water closet, H. W. Ward................. 936,388
Water closet, J. C. Duner................. 936,706
Walter closet coupling, H. S. Maddock...... 936,919
Water closet, ventilated, J. K. Pennington.. 936,561
Water purifier, electric, M. R. Frei........ 936,993
Water tube boiler, R. Hutchison.......... 936,723
Wedge blocks and doyle pins, apparatus for cutting, S. Smith 936,744
Weigher, automatic grain, A. G. Yerk.... 936,593
Weighing apparatus, automatic, W. E. Nickerson 936,557
Weighing machine, W. W. Rosenfield...... 936,362
Weighing machine, automatic, C. A. Douglass, et al.................. 936,613
Weighing machine for liquids, hydraulic, A. Rak 936,358
Well cleaning out device, T. B. Hyland.... 936,901
Wheel, F. E. Felts.................. 936,708
Wheel, A. C. Gillam.................. 936,994
Wheel chock, G. N. Crawford............. 936,417
Wheelbarrow, L. Wigh.................. 936,968
Wickerwork, E. M. Calef.................. 936,520
Wind screen, G. H. Beaton................ 936,853
Windmill mechanism, I. C. Rust........... 936,568
Window screen, A. B. Hill................. 936,895
Window tent, J. G. Allen.................. 936,846
Wire basket, Porter & Jenkins............ 936,736
Wire crimping machine, meshed, A. Shuman 936,673
Wire fabric making device, F. H. Hamblin 936,625
Wire hanger, F. L. Sessions............... 936,370
Wire netting stretcher, H. J. Byrnes...... 936,600
Wire stretcher, E. A. & C. W. Wheeler.... 936,749
Wood, preserving, J. M. Nelson, Jr....... 937,008
Woolen, E. Leurent.................. 936,461

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., Inc., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., Inc., 361 Broadway, New York.