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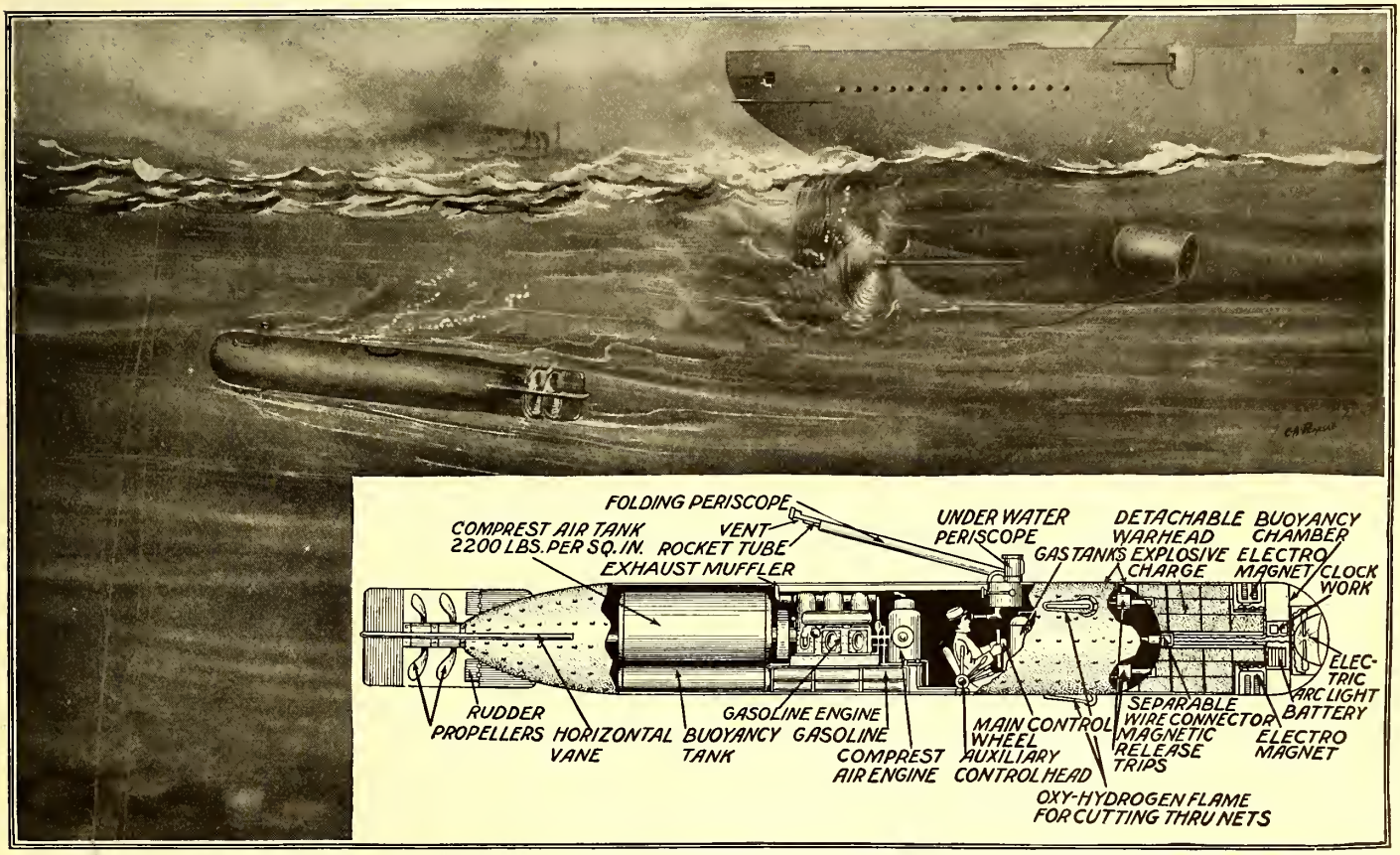
A One-Man Electric Submarine

By H. WINFIELD SECOR

WHILE Henry Ford has been urgently advocating the use of a one-man submarine of more or less efficacy, and comprising among other things a long collapsible pole extending from the miniature submarine, on the end of which there is supposed to be placed a torpedo or bomb which is to be exploded by the operator within the submersible, a number of other enterprising inventors have been engaged on a similar yet somewhat different problem. One of the most promising of these designs for a one-man submarine is that of Mr. Eric R. Lyon, the engineer who was responsible for the mastodonic two-hundred-foot high electric gyro-cruiser featured in our February, 1916, issue.

The accompanying illustration shows a detailed view of a one-man electro-mechanical submersible along the lines laid down by Mr. Lyon, and also an artist's conception of one of these demons of war making its attack on the hull of a mighty Dreadnought, with a magnetic bomb properly timed to explode a few minutes after its attachment, in order to give the operator of the one-man submersible sufficient time in which to get far enough away from his victim to protect himself.

In the first place, it is the inventor's idea to make up these miniature submersibles of about the same size as the modern automobile torpedo, or measuring say 25 feet long by 3 feet in diameter. This compares approximately with the dimensions of the latest type U. S. torpedo with a range of ten thousand yards or 5.7 miles. When comprest air is utilized for propulsion, the air being stored in the tank at two thousand pounds pressure to the square inch, the comprest air engine used in the modern torpedo (and which could be adapted to the one-man submersible) is rated at two hundred horse-power for the above range, if the craft is to make a speed of 42 knots or approximately 50 miles per hour. In the event that the navigator of such a submersible should have to make a detour in order to get back to the mothership or to his shore base, it would be advisable to equip the boat with an auxiliary gasoline engine as shown in the accompanying illustration. Most probably under ordinary conditions, the operator of this new war engine would have no trouble in getting back to his base of operation by means of the comprest air equipment. It has been claimed by Mr. Ford and other investigators that it is now possible to operate a gasoline engine under water by means of special absorption apparatus attached to the exhaust manifold of the gasoline or other engine, and that this means of propulsion can be attached to submarine war vessels. If such is the case, then it



The One-man Electric Submarine Here Shown in Detail and Also in Action Has Considerable Promise. It Can Dart Thru the Water at Torpedo Speed (50 miles per hour) When, Having Attached Its Magnetic "War-head" Containing the Gun-cotton and a Time Fuse to the Hull of an Enemy Vessel, It Can Easily and Quickly Make Its Escape at Mile-a-minute Speed. It Should Prove Ideal for Coast and Harbor Defense.

"ELEVATING" CENTRAL.

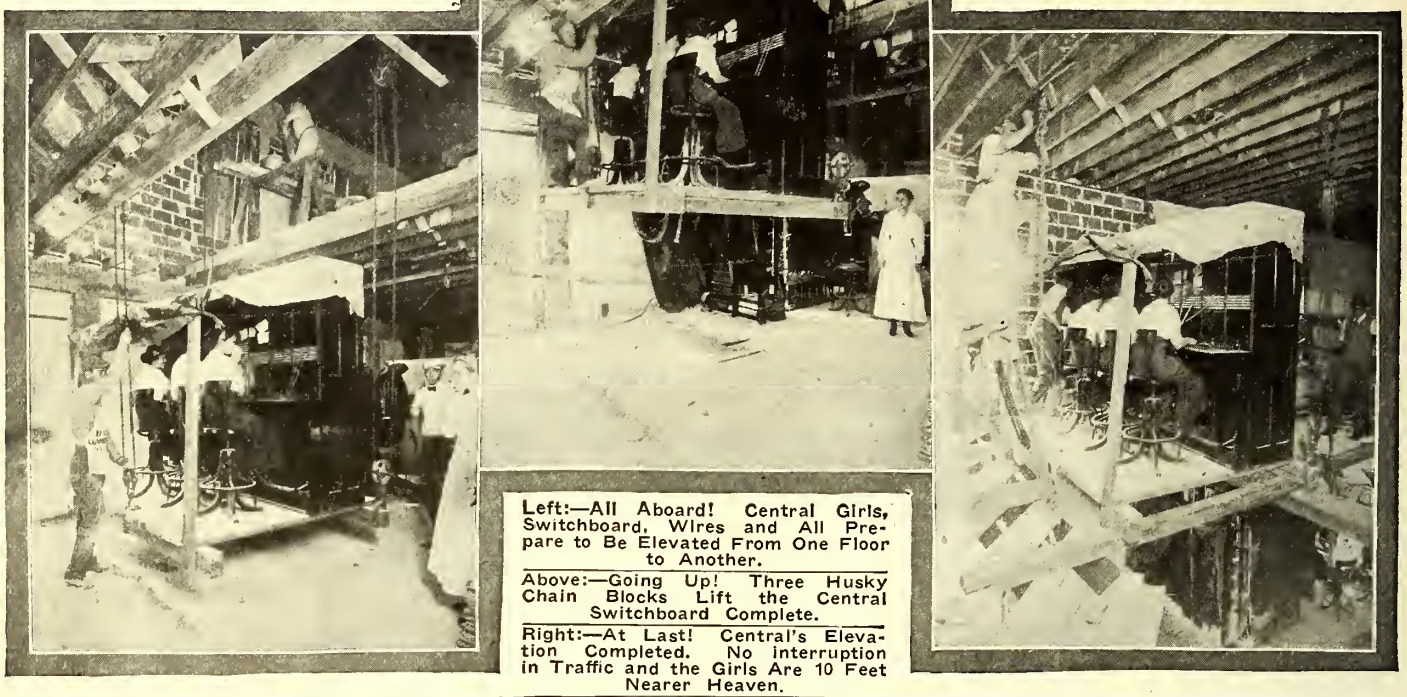
The upper stories of the West Palm Beach Telephone Company's office in Florida, which has just had two floors added to it, was the scene of a remarkable engineering feat recently.

Under the new arrangement it became necessary to remove the big switchboard, at which the operators sit and make the connections that enable people to communicate with each other on an infinite variety of subjects, important or affectionate or merely frivolous, from the third to the fourth story. The move was made in the following simple but effective manner.

A platform composed of two pieces of 4x6 timber, on which was laid a floor of 2x12 planks, was built under the heavy switchboard—wide enough to accommodate the operators' chairs around the edge of the board. Slings were then placed about the whole business, to which a tackle and three heavy differential blocks, each capable of handling a weight of four tons, attached to a sling of log chains fastened to a heavy beam at the top of the fifth story.

The switchboard, with the girls seated at it, and still carrying on their work, was hoisted thru a hole in the floor of the fourth story.

The work was carried on without a hitch, and the girls remained suspended until the floor had been rebuilt under the switchboard. There was not the slightest interruption to business from first to last during the ascent. Nor did the subscribers, talking over the switchboard, suspect in their wildest utterings, that "Central" Switchboard Girls—chewing gum and all—were moving skyward, angel-like, all the while.



Left:—All Aboard! Central Girls, Switchboard, Wires and All Prepare to Be Elevated From One Floor to Another.

Above:—Going Up! Three Husky Chain Blocks Lift the Central Switchboard Complete.

Right:—At Last! Central's Elevation Completed. No Interruption in Traffic and the Girls Are 10 Feet Nearer Heaven.

will mean that the one-man submarine will become all the more practicable.

Coming down to the means whereby this novel engine of war is to be used in carrying out offensive operations, we see upon looking over the detail drawing that in front of the submarine there is a detachable *war-head* in the form of a steel cap which fits against the parabolic nose of the submarine very tightly. This war-head contains the usual quantity of gun-cotton or other high explosive. Suitable quick-acting magnetic clutches enable the operator to instantly release the entire war-head at any desired moment.

This submersible not only carries two distinct forms of prime mover, but also carries the necessary gas tanks to supply a set of ultra-powerful oxy-acetylene flame nozzles, suitably disposed about the forward part of the vessel on the exterior, and by means of which the operator can *burn his way thru any ordinary submarine net entanglement.*

This feature is one of the latest scientific discoveries and involves the operation of an oxy-acetylene flame *under water,* which is made possible by blowing a stream of comprest air around the gas nozzle, and in this way forming a flame pocket in the water so to speak.

Mr. Lyon is very enthusiastic on this particular innovation, and has drawn plans for a one-man submarine which utilizes an extra powerful and especially contrived set of these high power oxy-acetylene nozzles with which to burn a hole thru the bottom of a Dreadnought, causing it to founder sooner or later.

Among the other interesting features of the idea here pictured we find a collapsible periscope which may be folded down into a suitable pocket provided in the top of the hull, and attached to which there is an air tube and also a (distress) rocket shute. When running submerged, a special air machine is used to supply the necessary oxygen to the navigator. A powerful electric searchlight is fitted to the front of the detachable war-head and by means of the small periscope shown the operator can see ahead at a considerable distance under the water. A compact but powerful battery is contained in the war-head which can supply sufficient energy to energize the electromagnets which hold the explosive chamber to the hull of the enemy war vessel once the operator has managed to approach close enough to accomplish this result.

The war-head also carries a special electric time switch, which functions a few minutes after the war-head has been attached magnetically to the hull of the enemy vessel, and which causes an electric spark to detonate the gun-cotton charge.

It has been argued by a number of naval experts that the *One-man Submarine* is doomed to failure for several different reasons. This, however, does not seem to be the case so far as we can see, and providing the submersible is properly designed in its details.

Let us take a concrete case for example to show how the Lyon one-man ship destroyer would go about its task.

Assuming that these engines of destruction, of which there would be most probably several in each attack to make doubly sure that the enemy would not escape, have been despatched either from a fort or other point on the coast, or from a mother-ship several miles distant from the enemy, the intrepid navigator of the 50-mile-an-hour submarine starts forth on his perilous journey. With only his periscope exposed and at a distance of several miles, it is well known that a periscope projecting a foot or so above the water presents an almost impossible target for ordinary gun-fire, and moreover, as the vessel darts forth on its way and as the range decreases between himself and the enemy, the buoyancy and submerging tank motor-pumps are manipulated so that only occasional sightings are made with the periscope. It thus becomes very problematical whether the enemy could hit the submarine. Also at a distance of say one mile, and in accordance with standard submarine maneuvering the submarine officer then proceeds to take accurate sightings of the enemy both with regard to the range and the direction geographically, after which he submerges and may proceed at high speed at a depth of fifteen to twenty feet below the surface of the water (the same as modern torpedoes) and in a little over a minute or so, and providing he has gaged the enemy's position accurately, he will find himself in the vicinity of the bottom of the hull. Owing to the high speed possible with this miniature submarine, built like a torpedo, it should be possible for the navigator (in the event that he does not strike his mark, when he has gone the range calculated up-

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EXPERIMENTAL PHYSICS.

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a pointer which moves around and points to a circular scale which has been calibrated to read the same as the ordinary mercury barometer.

EXPERIMENT 23—

A thin bottle (preferably a Florence flask) is tightly *corked* with a rubber stopper, thru which a thin glass tube is connected. If this is inverted into a glass containing water to which a few drops of red ink have been added and the bottle is now heated, gently the air in the bottle will expand and some will pass into the water (see Fig. 19). If now the bottle is allowed to cool, some of the liquid will rise in the tube. If the colored water rises above half way up the tube some of it can be let out by raising the tube above the level of the water in the glass. This apparatus can now be used as a crude thermometer for obviously if heat is applied to the bottle, the air in the bottle will expand and push the water in the tube back towards the glass; if a colder temperature is applied the reverse will happen and the water will rise in the tube. The *hotter* the temperature the *lower* the level in the tube and the *colder* the temperature the *higher* the level in the tube. This experiment was first performed by the great Galileo and was the first method of measuring temperatures.

EXPERIMENT 24—

If a little ice is gradually added to some water in a highly polished vessel (a piece of the family silverware just answers the purpose) while the water is being stirred and a thermometer is kept in it, a temperature will be reached when the polished surface *fogs, i.e.,* (moisture forms on it). This temperature varies according to conditions of the atmosphere and is called the *dewpoint.* This moisture does not leak thru the vessel as is commonly supposed but *condenses from the atmosphere.* We are all familiar with this phenomenon, having observed it every summer whenever ice water is served. The explanation is as follows—moisture is continually evaporating into the atmosphere and when the atmosphere contains *as much moisture as it can hold,* it is said to be *saturated.* The same amount of air can hold more and more moisture as the temperature is increased and *vice versa.* Hence if the atmosphere is saturated and the temperature is decreased, some of the moisture will have to condense as the atmosphere cannot hold more moisture than *as much as it can hold.* Likewise if the atmosphere is not saturated *cooling it will saturate it* and further cooling will cause moisture to condense.

The cooling of the grass, trees, stones, etc., at night more rapidly than the atmosphere itself cools, causes the *formation of dew* (a condensation from the atmosphere). If the air near the earth also cools, the condensation also takes place on the dust particles near the earth and this condensation is called a *fog.* If this *fog* forms at some distance above the surface of the earth, it is called a *cloud.* If a considerable amount of moisture condenses in the cloud the drops become large and because of their weight fall as *rain.* Rain passing thru cold regions freezes into *hail.* If the temperature of condensation is below freezing the moisture condenses into crystals called *snowflakes.*

(*To be continued*)

A ONE-MAN ELECTRIC SUBMARINE.

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om) to make several short, quick trial maneuvers, until he bumps into the hull of the enemy vessel. Also he can see a distance of 25 to 50 feet or more under water by means of the powerful electric searchlight, and once against the hull of the enemy Submarine or Dreadnought, it is but the work of a moment to excite the electromagnets in the war-head which instantly grip the steel plates of the enemy vessel with a powerful hold, and to release the war-head by means of the electro-magnetic clutches previously mentioned. The operator then scurries away at a mile-a-minute speed, and if he is but one quarter of even one-eighth of a mile away when the war-head explodes, he will be safe. In the event that the comprest air and gasoline engine driving machines should both fail on his return trip, he can send out distress rockets thru the rocket shute attacht to the periscope column, and thus be rescued by a boat from the mother-ship or by patrol boats sent out from shore.

Amateur Radio Stations Licensed by the Bureau of Navigation During the Month of September, 1916 (Concluded)

FIRST DISTRICT

Call Signal	Owner of station	Location of station	Power kilowatt
8DE	Frost, Norbert	552 Glenwood Ave., Buffalo, N. Y.	.5.5
8OF	Hewitt, C. Tefft	7942 Westmoreland Ave., Swissvale, Pa.	
8KE	Houk, Robert J.	73 Douglas St., Tiffin, Ohio	.5
8AMX	Moyer, Edward A.	640 N. Sandusky St., Bellevue, Ohio	.5
8BG	Peacock, Howard	Barker, N. Y.	.5
8OC	Simons, Harold C.	617 May St., Lansing, Mich.	.5
8RF	Slape, Frank	106 Eureka St., Pittsburgh, Pa.	.5
8PH	Thomas, William K.	400 Minton St., Pittsburgh, Pa.	.5
8HX	Towsley, Paul W.	1019 Bement St., Lansing, Mich.	.5
8AMC	Warden, William F., Jr.	R. F. D. No. 11, Cuyahoga Falls, O.	1

NINTH DISTRICT

9AJW	Baer, Elwynn W.	1710 4th St., Madison, Ill.	1
9AIL	Becker, Alby	3146 32d St., Catlettsburg, Ky.	.5
9GH	Branom, Albert L.	208 Giddings Ave., Jerseyville, Ill.	.5
9AKB	Davis, Laurence O.	Hazard, Ky.	.5
9AJT	Dubuque College	Dubuque, Iowa	1
9AJR	Fox, Harry	3116 N. 24th St., Omaha, Neb.	1
9AKF	Gitchoff, Anton A.	500 5th St., Madison, Ill.	1
9AKG	Hamlett, Robert T.	Fulton, Ky.	.5
9AKJ	Hammond, George R.	219 S. 5th Ave., Selwein, Iowa	1
9AJO	Hardy, Reginald	441 49th Ave., West Allis, Wis.	.5
9AJS	Herr, Carl E.	540 9th St., Red Wing, Minn.	1
9VD	Herron, Carson L.	1712 Court St., Le Mars, Iowa	.5
9AKA	Holmberg, Harry E.	Bottineau, N. D.	.5
9AKE	Keller, Warren H.	101 Lincolnway, La Porte, Ind.	1
9AKH	McBride, Kenneth	101 Bowen Ave., Independence, Mo.	1
9AKD	Markley, Max	416 W. Central Ave., Bluffton, Ind.	.5
9HG	Nelson, Earl P.	1320 Commercial St., Waterloo, Ia.	.5
9AKC	Niessen, Leonard P.	430 Layton Blvd., Milwaukee, Wis.	.5
9VQ	Poser, Stanley F.	730 1st St., Milwaukee, Wis.	1
9AJU	Robinson, Roy E.	3257 Alcott St., Denver, Colo.	1
9AKK	Eyder, Earl	806 S. College St., Springfield, Ill.	.5
9AKI	Tuhtar, Eugene W.	503 6th St., Milwaukee, Wis.	.5
9AKL	Werlein, Edwin	4060 Lincoln Ave., Chicago, Ill.	1

MAGNETIC INDICATOR FOR CRITICAL TEMPERATURES.

The fact that steel loses its magnetic properties on attaining the critical temperature forms the basis on which has been designed an instrument which infallibly indicates the instant when a mass of steel has attained the decalescent or hardening point. The instrument consists of a contact box containing magnet and coils, mounted on one end of a rod provided with handles and heat shield. The other end of the rod carries a fluxmeter, the needle of which indicates the gradual approach of the steel to the non-magnetic or critical point.

THE THERAPY OF LIGHT AND THE NEW "R-RAY."

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radiation is somewhat similar to the Ultra-violet ray, inasmuch as an arc is used; but two different arc electrodes are employed in this work. The arc is produced between an electrode composed of quartz and mercury with a second electrode of ordinary arc carbon. Fig. 1 shows one of the complete arc lamps used in these experiments.

Viewed as a spectrogram the R-ray occupies one side of the Ultra-violet region, and grades uniformly from the first octave to out and beyond the visible portion. Also here we find radiations that cause air and matter to have such affinity that they are instantly absorbed, and investigation of their characteristics can only be conducted in a vacuum.

As resultant deductions of therapeutic interest in considering the properties of the R-ray, we find the following:

(1) They are readily controllable and give penetrative therapeutic light of uninterrupted intensity.

(2) They are rich in Ultra-violet rays of shorter wave lengths than the emissions from any other known arc.

(3) They differ materially from X-rays in that they may be deflected and focussed on any given area, so as to combine their inherent heat-ray value with their visible and invisible light radiations.

(4) They are more readily absorbed by matter than any present known arc ray, and as such secure vibratory reactions in deep-seated cellular organisms.

In order to show the position of the unmapt region wherein the R-ray lies, and as compared with the vibrations of other sources of radiation, the chart, Fig. 2 was made. It will be found very interesting to those who are pursuing the study of different sources of radiations.

The chart indicates the wave lengths of radiations ranging from the visible part of the spectrum to X-rays and the Gamma rays of radium.

To fully understand this chart, the following notation is used: the numbers across the top give their respective wave lengths in Angstrom units (one Angstrom unit is equal to 1/10 of a meter and this unit is abbreviated as A.U.). Thus the wave lengths are given in *tenths of a meter,* using here the language of the scientist. The Angstrom unit is equivalent *actually* to 10^{-10} meter, one meter being equal to 39.37 inches. The numbers below represent the number of octaves which these rays range over.

The region of about six octaves, beginning at 4 and ending at 10, represents the unmapt portion. This separates the extreme ultra-violet from the commencement of the very soft X-rays. The most easily absorbed X-rays, whose wave length has been determined, are the characteristic rays of burning aluminum with a wave length of 8.4 A.U. Passing up thru several octaves of X-rays, the limit indicated by the line "N" is reached; these represent the hardest i.e., the most penetrating X-rays, which have so far been produced. The line "M" represents the *medium* penetrating ray. It will be noticed that some of the gamma rays as produced by the disintegration of the radium atom, are of longer wave lengths than some of the shorter X-rays.

The region ranging between octaves 4 and 10 are vibrations which are easily absorbed by matter. They vary in wave length from approximately 900 to 9 A.U. The region between wave lengths 3,800 to 1,900 is the portion of radiation which is of therapeutic interest.