

How U-Boats Send Radio 1,000 Miles

By H. WINFIELD SECOR

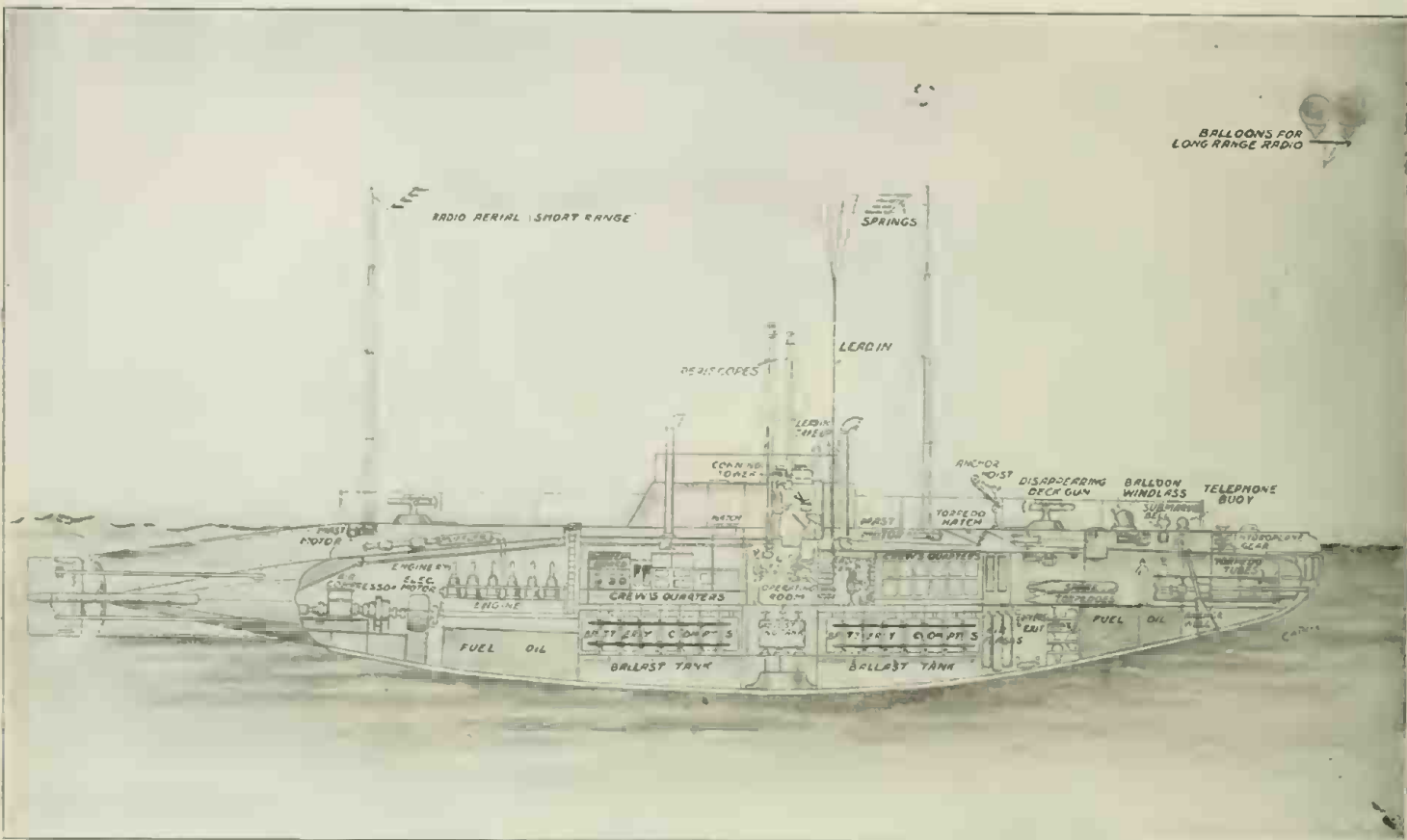
THE Germans have developed submarine radio-communication to a fine art—they had to. This is so for obvious reasons—chief among which is that the success of the U-boat campaign depends to a large extent on keeping in wireless communication with the individual sub-sea boats and the possibility of certain of their number transmitting intelligence to the nearest land base. At first the submarines made use of folding or telescopic masts which did not elevate the radio antenna very far above the deck—not more than 20 to 30 feet in most

in the balloon antenna and the balloons are taken inside, hatches closed, and the craft submerged—all in almost less time than it takes to tell about it. It is difficult for an enemy ship to see the balloons as they are cleverly camouflaged, being painted partly white and partly blue, so that against the sky they are practically invisible. The antenna wire is, of course, quite fine and invisible at even a short distance away.

It has been a mooted question for some time as to just how far such a radio-equipped sub-sea fighter could send a message. The receiving range with such a balloon sus-

would be to connect up the high capacity dynamo to these engines, and this in turn to the special high power radio transmitter. Such a set, including the dynamo, would not occupy such a large space as might be imagined off-hand. Also the newer U-boats are veritable submarine-cruisers, several hundred feet in length, which, of course, gives a much greater space for the radio equipment.

Many ingenious folding and other types of masts have been perfected for medium and short range radio work on the submarine. Several of these masts are illus-



Sectional View of Modern Submarine Showing the New Telescopic Collapsible Masts Supporting the Radio Antenna, as Well as Motor Actuated Cable Windlass for Rapidly Reeling in Balloon Aerial Wire. The U-boats Are Said to Be Using the Balloon Aerial for Communicating by Radio Over Distances of Several Thousand Miles.

cases. For ordinary inter-communication between submarines this collapsible antenna served its purpose admirably. Where long ranges were to be negotiated, either in receiving or transmitting, however, it became a real problem.

One of the latest Teutonic improvements in this arm of the naval service is the utilization of balloons for elevating the U-boats' antenna wire to a height of 1,000 feet and more. In this way vast distances can be covered and valuable intelligence sent by radio to a second relay submarine if necessary, so that it is not improbable that the news of ships' sailings from American ports could have been radioed to Germany by the aid of three or four U-boats.

Our front cover illustration, as well as the ones herewith, show clearly just how the balloons, two in number and fastened to a rigid equilibrium member, carry up the antenna wire to a height of several thousand feet if necessary. The antenna, at its base, is wound on a special electric-motor driven drum. This drum is instantly controlled by the throw of a switch, so that if a ship comes into view, it can rapidly reel

ended aerial is easily several thousand miles, using modern amplifiers and other refinements in the radio art. The writer asked several well-known radio experts their opinion on the possible sending and receiving activity of a balloon-aerial equipped U-boat and they practically all agreed with the ideas expressed by Mr. F. H. Kroger, chief engineer of one of the leading American radio companies, that; with fair weather conditions, and with the proper radio transmitting apparatus tuned to a high wave length, it would be possible for the submarine to send a wireless message 2,000 miles, and possibly 3,000 to 4,000 miles under extremely favorable conditions. The transmitting set used might, of course, be a special one rated at 15 to 25 kilowatts. If the sub-sea boat wanted to transmit an important message, she would in all likelihood choose the night-time. She could then emerge and fly her balloon aerial with reasonable safety. And for a long range message requiring as much energy as mentioned above, it should be remembered that there is available all the engine power required. All that would have to be done

trated in the drawing herewith. An interesting practical telescopic mast was patented by a Yankee inventor several years ago (U. S. patent No. 1,099,861) and is shown in detail at Figs. 1 and 2. The inventor, Mr. Joseph Raes, covered several modifications of the basic idea in his patent. In one type a continuous flexible metal cable is used, Figs. C and D. By following the path of the cable in the drawing it is seen how, when a pull, as produced by a motor, is applied to the lower end of the cable, it causes all of the sliding telescopic members to be elevated. The upper end of the cable is secured to the bottom of the top telescopic member. When pressure is removed on the cable the mast descends by gravity.

A similar type telescopic mast is shown at Fig. B, only in this case the individual sections are raised and lowered by a clever arrangement of gears and shafts. This elevating scheme would be considerably slower than the previous cable-operated type.

The author suggests herewith a pneumatic telescopic radio mast of the type illustrated at Fig. A. This is similar in principle to the pneumatic (compressed air) lifting

cranes used in manufacturing plants, foundries, etc. With the proper pressure of compressed air, it is only necessary to close the suction blower pipe valve, open the high pressure air valve attached to the pipe line from compressed air tank or flasks, and the mast rises up by expansion of the air within it. When it is desired to lower the mast quickly, the compressed air valve is closed and the suction blower line valve slowly opened; the air is thus removed and the mast collapsed. Ordinarily, no suction would be required to lower the mast; merely a valve opening to the atmosphere thru which the compressed air could rush to the outer air.

An ingenious collapsible radio mast was invented in Germany some years ago and several of them have been used in this country. It was perhaps the lightest ever designed thus far—possibly too light for submarine requirements—but it possessed the element of speed. It employed four flexible strips of metal rolled on drums at the base. These strips were notched on both edges and when the handle was turned, the four notched strips of thin steel intermeshed with each other, making a lock-cornered square tubular mast about 8 inches square. It was found possible to raise a platform containing two men on it to a height of 80 feet for observation purposes when necessary. Two men could raise the mast in a short time by turning a geared crank handle.

The accompanying illustration of a modern submarine shows how the various compartments are arranged. It was prepared from official plans of such a craft. The location of the collapsible radio masts is given, as well as the position of the motor-driven winch for hauling in the antenna balloons. An interesting feature not generally known is that submarines are now fitted with submarine telegraph apparatus which operates by means of sound waves sent thru the water from powerful electric vibrators mounted on the hull of the submarine. Sensitive microphones suitably mounted on either side of the hull enable the commander to tell when a ship is approaching, even at a considerable distance, by the sound of her propellers which is transmitted thru the water.

Then there is the latest safety feature—the telephone buoy. If the submarine should sink and become unmanageable, the crew can pull a lever which releases the telephone buoy, which rises to the surface of the water. Any craft passing in the vicinity of the sunken sub-sea boat can open this buoy and, by means of the telephone inside it, speak to the imprisoned crew. Submarines send out sound signals of distress thru the water also, which may be intercepted by another submarine or by a warship or steamer.

A WAR-TIME SUGGESTION TO RADIO AMATEURS.

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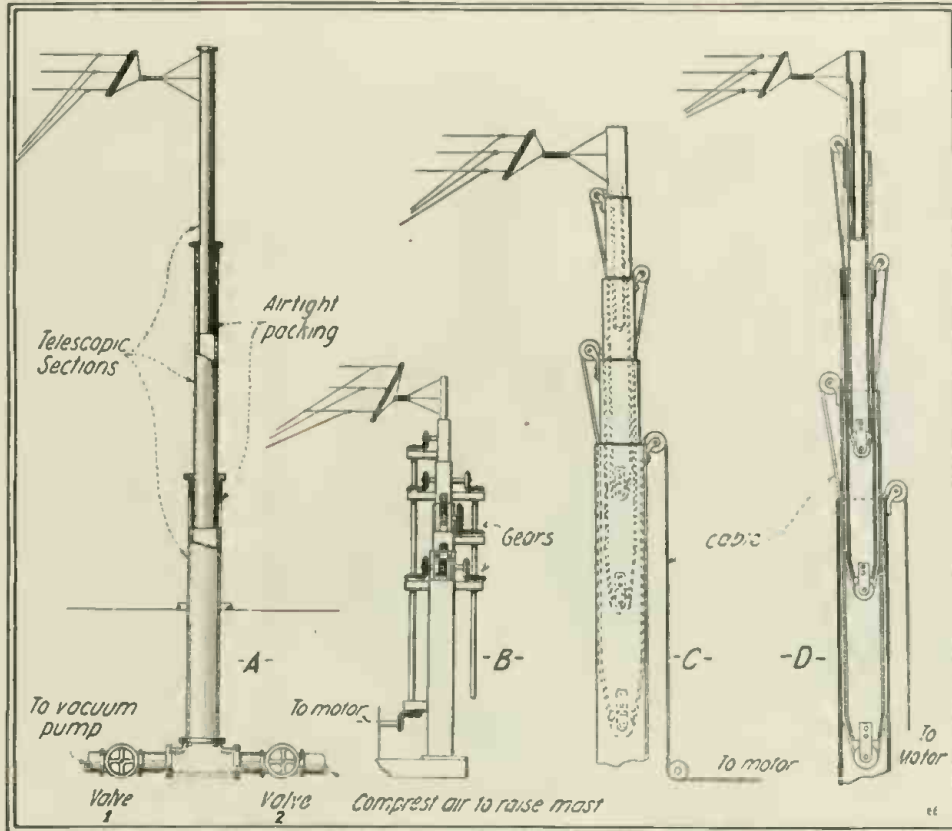
FELLOWS, in writing this, I want to address it to the Amateurs—the real dyed-in-the-wool "hams," who have started in the right way—a spark coil of uncertain antecedent, a few discarded dry

tho, we amateurs have built up our present organization upon our own lines. As our problems were presented we worked and finally overcame them. They were our problems—we fought them as such. Meanwhile the commercial companies met their barriers also and overcame them. Now doesn't it seem reasonable that the commercial companies, having to build their organization to the highest stage of development, as theirs is a cold, commercial proposition, many people being dependent for their living upon the success of wireless as a commercial enterprise—doesn't it seem reasonable to you fellows to grant that these companies have a higher, more efficient service than the amateurs? Of course they have, as they must have to remain in business.

Supposing a commercial telegraph company accepted a message from Portland, Oregon, to Los Angeles, Calif., would they deliver it at its destination, a week or so after the filing? Would a company send a message from Seattle to Portland, Oregon, and effect the transmission in a few minutes but hang the message up at its destination and deliver it four days later? How long would they remain in business if they did? Yet these are both actual

amateur examples of occurrences on this coast in one week! In the former case: no excuse as a line of communication is available (or was at that time) between those two points at all times, with numerous relays if necessary. In the latter case: also inexcusable as direct 'phone connection between the receiving operator and the addressee was to be had. The latter finally heard of the message in a round-about way and after some trouble and inconvenience, finally got it.

Altho I'm in the commercial game now, yet I'm a "ham" at heart always, and want to see them make a name. I keep in close touch with the fellows, altho I'm "all over the ocean" at times, so to speak. It's only since breaking into the commercial game that I saw the faults of our organization and I would suggest that our best "hams" spend a little time in commercial service—even only a few trips on some vessel. Operators are scarce and jobs plentiful and I'll warrant you'll have your eyes opened and it will result in better service in the future among our own stations. Think it over, fellows. If you don't feel like joining the U. S. Navy, why not try the U. S. Naval Reserve Force. They are looking for good radio operators every day. Come on, fellow "Radio-bugs"—put on your hat and take a walk to the nearest recruiting office—and don't forget the great chances looming up now for a berth as radio officer on the vast merchant marine fleet Uncle Sam is building. Look into this—it will pay you.



Some Examples of Collapsible Radio Masts Adaptable For Use on Submarines. The Types Shown Include the Compressed Air, Steel Cable and Gear Actuated Telescopic Forms. A Motor Operates the Gear and Cable Types Directly.

cells from the family Ford, a lump of silicon—you know the type. Fellows that started with gigantic problems to face, no one to help and who have "stuck to it."

We have today, altho at present closed by our Government, such an efficient chain of amateur stations in this great country of ours, that were it forecasted ten years ago, would have brought derision down upon one who would be so bold as to suggest it. And if you will look up the "star" stations, you will find that they are practically all in the hands of fellows that ten—yes, even five years ago—were struggling thru many failures, working out their own problems, nary a beacon to guide them in the right way. Look where they stand today—foremost among the country's youthful scientists and possess of an enviable knowledge of that most fascinating of mysteries—WIRELESS!

I have watched and grown up with them for the past eight years myself so am basing this on facts. While my stations never hung up any extraordinary records for transmission, due to several handicaps from outside sources which it was impossible for me to overcome, yet my interest has been just as keen thru all the years and I hailed each new record with as much delight as if it were my own. I did have sensitive receiving apparatus, however, which I kept strictly up-to-date and have spent many, many pleasant evenings (and wee hours) with the "cans" on and am proud to consider myself one of the "self-mades."

To come to the subject of this article,