THE WIRELESS AGE

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RADIO COMMUNICATION

Incorporating the Marconigraph

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THE WIRELESS AGE

SEPTEMBER, 1914

THE RADIO REVIEW

THE character of naval warfare was profoundly modified when steamers replaced sailing vessels. Up to that time the windward position had been all important, so that a man-o'-war could manœuver for advantage of position in attacking an enemy. Steam nullified the advantage of the windward position and introduced new tactics.

Wireless in Naval Warfare

The introduction of armor and high power guns wrought the next modification. Battles became long range engagements, and the old order to ram and board passed away.

And now wireless, by which the movements of vessels at sea can be controlled from land almost as easily as the movements of armies, is looming up as the big factor in the present war. A warship out of sight of land is no longer lost to the world until it reappears at some harbor with a cable. Its course can be directed, and the course of whole fleets can be directed, from headquarters in the light of information as to the position of the ships of the enemy.

Many of the greatest sea battles in history have been won or lost through delay in mobilization, and the outcome of nearly every great struggle has hinged upon the prompt execution of the commander's orders. With modern warfare virtually controlled by the new means of communication we can expect to hear less of the daring of the individual dispatch bearer and more of the ingenuity of the operator who skillfully adjusts his instruments and disguises his spark so that the orders penetrate and pass beyond the enemy's lines without recognition.

A HUNDRED years ago the United States was at war with England, and the burning of Washington, the battle of Fort Erie and the attack on Baltimore, during which Key wrote his "Star-Spangled Banner," were events of thrilling interest. But news traveled slowly 100 years ago. It was days before New York knew what had happened, and then only through the use of relays of couriers rushing on horseback over roads that were none of the best. Since then we have developed a mechanism for the collection and distribution of news. Between the message of victory in Manila Bay, flashed more than half way around the world, and the utter lack of knowledge of the great battle of Waterloo by people, much more vitally concerned, only a hundred miles away, there lies a

Stepping Back 100 Years

century in which men have used their inventive faculty more than during any similar period in the history of the world, and during which those men who seek to report and record the world's activities have covered the earth with their perfected organizations.

And now, due to the wire and wireless censorship, the mechanism is almost useless and we are back not so very far from where people were a century ago.

The rigorous censorships established by combatants have interfered with efficient news gathering until to-day the minds attempting to the limit of their capacity to grasp and understand the events in Europe can secure but the sorriest and most unstable data from which to extract a true conception of what is going on. It is but another instance of the retroactive effects of war that the great recording instrument so carefully built up is now rendered useless.

Saving An $11,000,000 Treasure Ship

ONE day a few weeks ago a great liner started from New York to Bremen in the same commonplace way in which she had started so many times before, carrying tourists, sightseers, health-seekers; but in addition she was a treasure ship, carrying nearly $11,000,000 in gold consigned to European bankers. After three days the moon suddenly shifted from starboard to port, and while the passengers were marveling at the phenomenon, the captain informed them that the nations of the world were at war, that he had been notified by wireless, and that he was fleeing back, not to New York, but to any port into which he could escape unobserved.

She was disguised, veiled in canvas, and stole through the darkness without so much as a candlelight showing. More than half way to Europe, she had turned, and now she prowled along backward, the sea alive to her passengers' imagination—and perhaps, in fact—with cruisers hunting for her and the wealth she bore. Through the fog she sped at high speed, dark and unseen, her passengers prisoners on her masked decks, no man knowing her destination, no man knowing when a short across her bows would mean that the game of hide-and-seek was up.

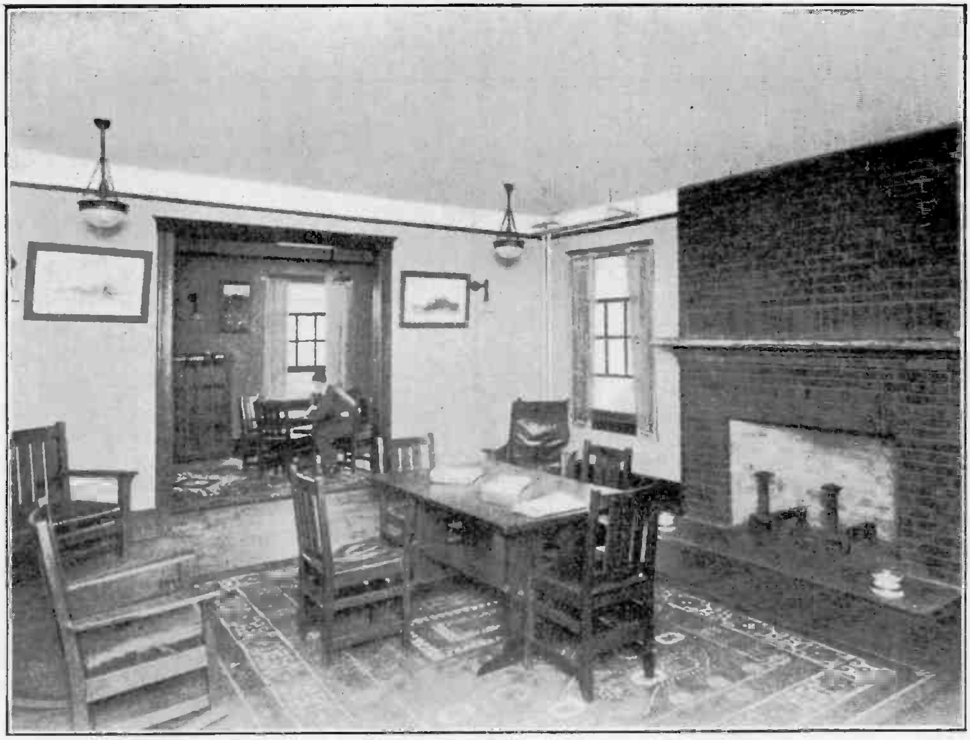
Meanwhile the whole world was watching for her, speculating on her fate; she was reported in one quarter, then in another; she had landed here, she had landed there, she had been captured.

Finally, the liner turned up in the harbor of a summer resort, to be greeted by the tangoing, tennis-playing population of summer butterflies flocking down to the shore to see the unprecedented sight, wondering what liner had gone crazy and left its course, and then discovering that it was the ship for which all the world was looking.

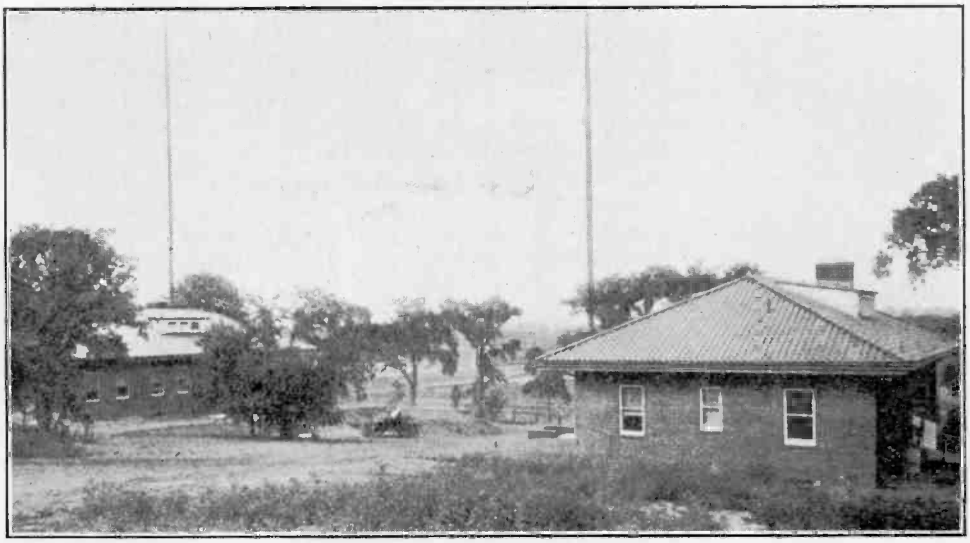
This incident of the opening of hostilities brings wireless telegraphy to the foreground in a distinctive manner. Nothing could demonstrate more clearly its great value to commerce—even in time of war. A fortune was saved. Eleven million good American dollars were returned intact to New York bankers, a vast fortune that would otherwise have gone into warfare's melting pot. Had the treasure ship been captured or sunk, the responsibility would have rested with the steamship company or its insurers. Recompense would have been forthcoming, but just when seems rather problematical when the extent of the European hostilities is considered. In any event, it is recorded that the American bankers breathed great sighs of relief when the vessel made port safely. Some expressions of gratitude toward wireless were also heard. From which it may be construed that wireless has more than one humanitarian aspect.

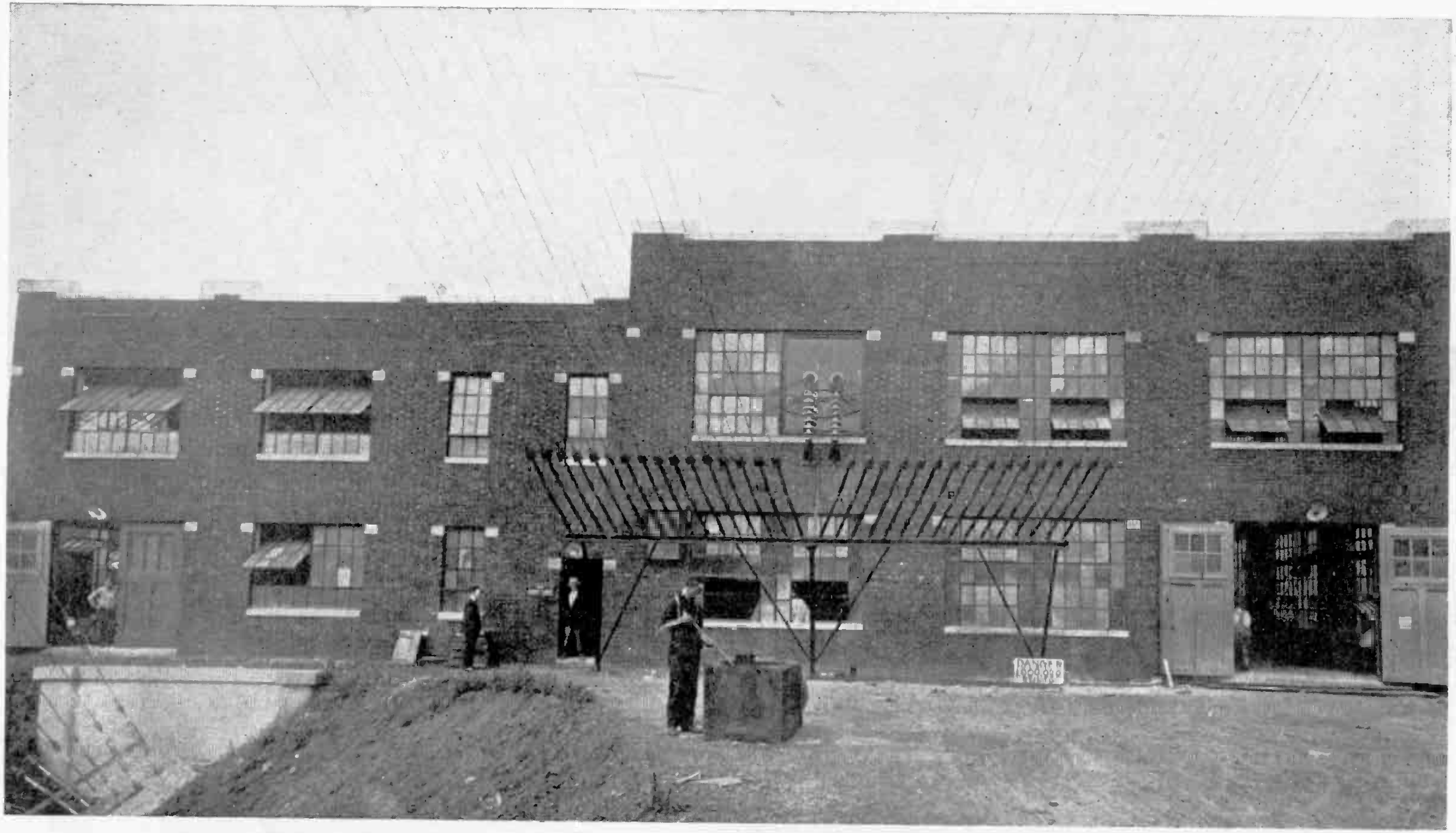
The New Brunswick Station

The photograph at the top of the page presents a view of the hotel which has been erected for the use of the men detailed at the New Brunswick Marconi station. This station is the transmitting half of the link which will communicate with Wales. The New Brunswick station is located two miles from New Brunswick on a road that winds along the banks of the Raritan river and the Raritan canal. The visitor approaching the site from the south is treated to a glimpse of a meadow which extends from the road to the canal bank. The land takes a sharp upward turn at the west of the road and then keeps on a level for a mile or more. By looking up this rise the cottages for the chief and the assistant engineer (shown in photographs on another page) can be seen. At a point further up the incline is the hotel. The operators needed to work the auxiliary receiving apparatus and the riggers to keep the aerials and mast system in proper condition will make their home here. The hotel, which is constructed of red brick with a concrete and tile roof, is two stories in height. Provided with broad verandas and windows which command an excellent view of the surrounding country, it makes an ideal home for the Marconi men. It has about fifteen sleeping rooms and is tastefully furnished throughout.

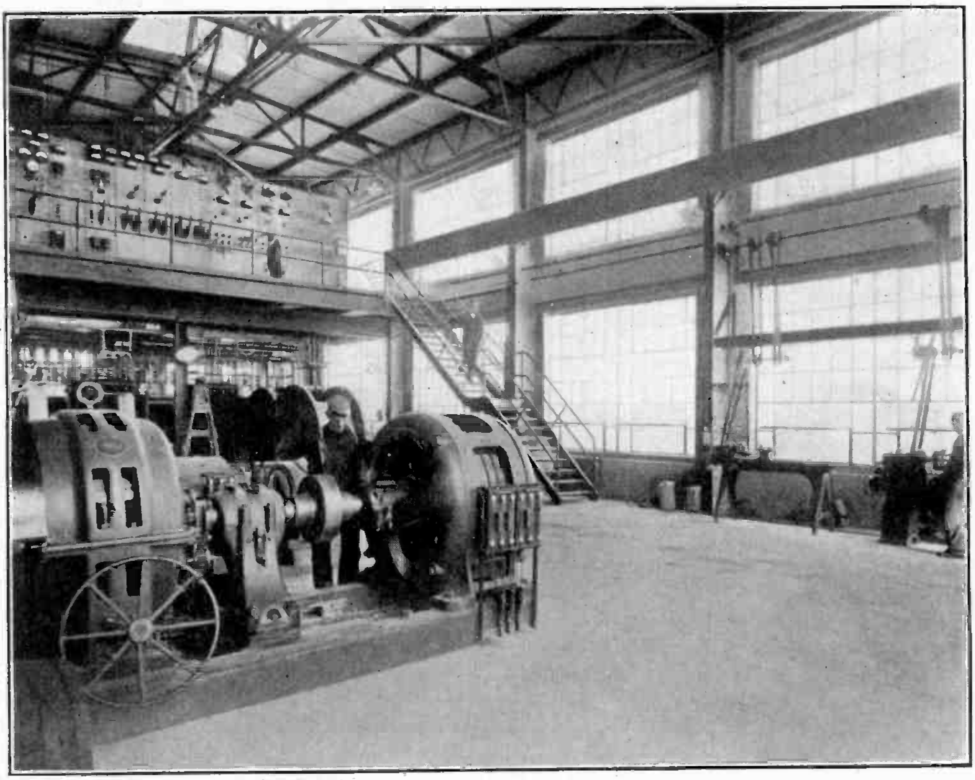


The illustration above presents a view of the living room and a glimpse of the library in the hotel. From the windows of these rooms can be seen the Raritan river and the Raritan canal. In the photograph below is a view of the cottages for the chief engineer and his assistant.

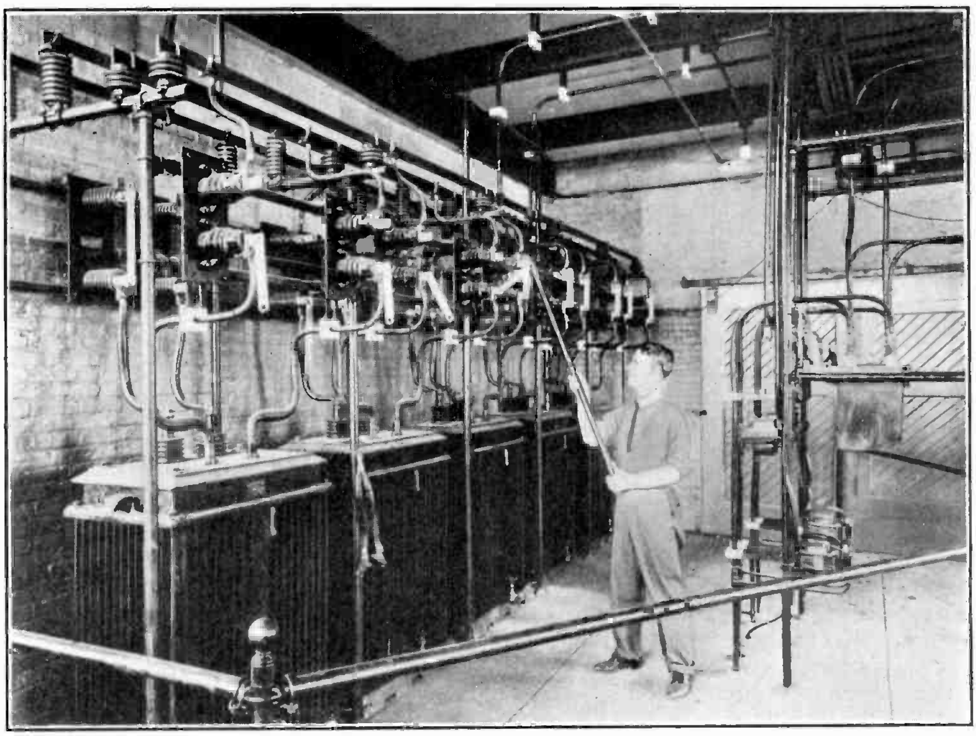




This photograph shows a front view of the power house, the main building at New Brunswick. Here the electricity is changed in form from the sixty cycle 24,000 volt current to the high frequency oscillating current required to send the dots and dashes across the ocean. The building, which is made of brick, contains the condenser and discharger rooms and offices. In the illustration can be seen the aerials anchored to the foundations and lead into the building.



An interior view of the power house, showing the 500-horsepower motors, is presented in the photograph above. About half a dozen men will be employed in the power house. The switchboard gallery, from which the electrical apparatus of the station is controlled, is in the background. From this board the machinery can be stopped or started and the lights turned on or off. Below is the control table of the station. On the table are a wave-meter and a decremeter. The engineer in charge is able to control and keep in touch with the operation of all the apparatus connected with the station from this table. When the trans-oceanic service is opened he or an assistant will be constantly on duty there, ready to send orders or to meet any problems that may arise.



The five transformers which take the current from the generator and step it up in voltage sufficiently high to charge the condensers. They carry the full power of the station whenever signals are being sent. The type of bus bar construction shown is typical of the work throughout. All parts are accessible and so arranged that any transformer may be quickly cut out and a spare unit substituted without shutting off the current.

The War on the Ocean

In Which Wireless Was Employed to Advantage

INTO Bar Harbor, Me., which seldom sees anything more pretentious than coastwise craft, there crept at 6 o'clock on the morning of August 4, a great ocean liner. It was the North German Lloyd steamship Kronprinzessin Cecilie, carrying more than $13,000,000 in specie, $10,679,000 in gold and the rest in silver, and 1,216 passengers which had been turned back by wireless orders from the steamship company's offices in Bremen, Germany, when within two days' steaming of her first port of call, Plymouth, England, for fear of capture by British or French warships.

The turn was made on the night of July 31. From that time until the great ship's nose penetrated the waters of the three-mile limit—the neutral zone—on the Maine coast, the Cecilie's screws were kept turning at full speed day and night, not abating a single revolution even in the fog that for hours enveloped the fleeing treasure ship. The run back was made with all lights blanketed or extinguished and as silently as possible, the foghorn being blown only at infrequent intervals, and at the risk of collision with vagrant icebergs or other vessels.

The Passengers Notified

When the ship was put about Captain Charles Polak called the men passengers into the smoking room and told them that a general European war was impending or had been declared, and that he had received orders to make for America and safety. Captain, crew, and passengers heaved a sigh of relief when the ship dropped anchor in the harbor and greeted the Bar Harbor hills with three long blasts of her siren.

The big steamship was in latitude 46.46 north and longitude 30.21 west when orders were received for her return. She was then about 900 miles from the English coast. A dance was in progress when the captain called the men into the smoking room and told them the news, adding that he had plenty of coal on board for the return voyage and that he would endeavor to reach a neutral port. The captain did not tell them that he had overheard the wireless of French vessels giving his whereabouts, or that he had heard that four British cruisers had come out to meet the Cecilie.

Hid in the Fog and Darkness

With a dense fog coming up, her whereabouts was concealed, and the liner turned back in the darkness. The outside lights were extinguished and the portholes all carefully stopped, so that no light might betray the presence of the ship. The captain kept the liner going at top speed in the fog, believing that somewhere behind were cruisers bent on his capture.

After the second night of such headlong running with lights extinguished, the passengers, with the Titanic disaster in mind, began to show signs of uneasiness. A committee of the men went to the captain and declared that he was needlessly endangering the lives of all aboard; that human life was of far more importance than the gold that this modern treasure galleon carried. Captain Pollak assured them that there was little danger, as he was running far north of the usual steamship course. This failed to allay their fears, but the only concession the captain would make was to blow the foghorn occasionally.

No wireless messages were sent by the ship after the order to turn around was received. There was a rush for the wireless station by the passengers, but the captain refused to allow any messages to be sent, fearing that the ship's position would be betrayed.

On her sensational run for safety, every port hole of the Cecilie was blanketed with canvas, so that not a gleam of light might betray her whereabouts. Her four stout stacks were tipped with black paint, so that she might resemble an English steamship and thus escape suspicion.

The Cecilie left New York bound for Bremen via Plymouth and Cherbourg, with 350 first-class, 130 second-class and 736 steerage passengers. About a third of the first-class were Germans, who sailed to anticipate the war crisis. Most of the rest were Americans.

While the dance was in progress on the night that the course of the vessel was changed, one of the passengers noticed that the position of the moon had unaccountably shifted to the port side of the ship. Before the significance of this was realized the captain called the men into the smoking room and made his announcement of the turn about.

There was nervous laughter, applause, oaths, congratulations, protests, which gave way to a grave state of apprehension as the seriousness of the situation became apparent. Electric lights were turned off and the ship was covered from bow to stern in a shrowd of canvas. This smothered whatever beams of light escaped through chinks in the stateroom windows.

Ship Silent as a Derelict

To some sleep was impossible. The dark, foggy nights were long vigils until the morning's sun burned its way through the mist that had hung over the North Atlantic. To those who promenaded the shut-in decks on the long watches, the ship was like a ghost ship, with only the animating throb of its engines to make it different from a derelict. The only gleam of light that relieved the dead blackness was where the ship's friction stirred the sea into phosphorescence.

"We were about 900 miles off the English Coast, and should have made Plymouth in two days," Captain Polak said, "when I received a wireless from the home office of the line, sent via England, telling me that war had been declared and ordering me to return. I immediately started back. I did not know where to go, but caught a wireless from Sayville, L. I., and messages from other ships, saying that we were being watched for by cruisers on account of the $10,600,000 on board, consigned to English and French bankers.

Wireless Gave Warning

"At one time we caught wireless messages which told me we were within a comparatively short distance of the French fishing cruiser Friant and the British cruiser Essex. I expected at any moment to see their smoke above the horizon. A thick fog bank rolled in on us, providentially, and I believe this is the only thing that saved the ship from capture. We were afraid to send messages ourselves for fear of being located.

"We got news from the Long Island coast and from as far south as Norfolk. The messages said we were being watched for. I did not dare to ask if the route to New York was clear, for fear of betraying my position. I finally decided to turn north and make for Bar Harbor, which was nearer and safer than Portland."

Two big trans-Atlantic liners flying the British flag, bound from Liverpool for New York, put into the Halifax (N. S.) harbor on August 6 as a haven of safety from German cruisers. The unexpected arrivals were the Cunarder, Mauretania and the Cedric of the White Star Line. Both had been warned by the British cruiser Essex through Marconi wireless of the presence of hostile vessels in the North Atlantic waters they were about to traverse on their further voyaging to New York, and were advised to make all haste for Halifax.

The Essex herself convoyed the Cedric into port.

The Mauretania brought more than 1,600 passengers and the Cedric more than 1,000. The Mauretania's first-class passengers were landed and sent to their destinations with all possible speed by special trains. The mails also were sent by special trains.

It was the most dramatic voyage in the history of either ship. The Mauretania reached Halifax four days and ten hours after leaving Liverpool.

The Mauretania sailed from Liverpool at 4:55 P. M. on August 1, amid the utmost excitement. Many would-be passengers were left behind on the piers. From the moment the big liner left British shores the officers were on the alert, and Halifax was held in mind as an alternative port if contingencies demanded.

In the midst of thick fog, while off Sable Island, a marconigram from the Essex conveyed urgent warning to make full speed for Halifax. At that time the Cunarder was 380 miles from New York and 140 from this port.

A German Cruiser on Watch

Somewhere lurking in the darkness and fog was a German cruiser, but watching guard over the lanes of travel along which commerce was speeding were British warships, warning the liners by Marconi wireless where danger lurked for them.

The steamer had first taken the New York route, and had to change her course to direct north when she was advised by the Essex that danger lay further south. The actual time to Halifax was four days and ten hours, which could have been reduced six hours if time had not been lost on the indirect route. Besides this, six hours were lost in steaming because of fog and in dodging steamers and cruisers, thereby bringing down to three days and twenty-two hours the time in which the Cunarder could have covered the distance from Liverpool to Halifax.

The water front was crowded as the Cedric steamed up the harbor closely followed by the dark gray cruiser Essex stripped for battle. There were repeated cheers from the crowd as the Cedric dropped anchor, and the Essex proceeded to the dockyard to take on coal. The Cedric's decks were thronged with passengers, all happy at having reached port safely. It was 5:44 P. M., Halifax time, when the Cedric dropped anchor. She had been out six days ten hours and fifty-two minutes.

The captain's statement was brief:

"I have nothing to say except that a message was received from H. M. S. Essex, Wednesday night, ordering the Cedric to proceed to the port of Halifax," he said. "We did not sight any German cruisers. Possibly the fog of that night aided us to escape."

Only the officers and crew of the Hamburg-American liner President Grant, which came in from sea on August 2 in response to a wireless recall sent out by the local office of the line were in serious mood when she docked in Brooklyn. The 105 cabin passengers, chiefly Americans, were elated and congratulated themselves and one another that they had not continued the trip toward Hamburg by way of Plymouth and Cherbourg, running the risk of being held up by the enemies of Germany and probably spending a long time in a foreign port waiting for transportation back to New York.

A Run for Safety

The President Grant, of the North German Lloyd, kept close to the three-mile limit on her run for safety. Captain Meyerdiercks had received wireless messages during the afternoon that led him to suspect that there might be cruisers of the British squadron in North American waters that might pounce upon him in the event of a sudden breaking out of hostilities between Germany and England, and he kept a sharp lookout.

A wireless message was picked up that indicated that one of the British West Indian squadron was searching for the President Grant. Her skipper made light of the message and kept right on, going full speed for Sandy Hook.

Captain Meyerdiercks said he had received the recall message from his office when he was about 435 miles east of the Ambrose Channel lightship, or about 450 miles from the line's Brooklyn pier. The message was in cipher, showing that the line believed it was not a good thing to let the world afloat know that the Germans feared for the safety of the ship. The skipper was startled after he had translated the cipher. This took him about ten minutes. He had continued on his course meanwhile, not dreaming that an emergency had arisen that would force him back to this port. He reflected over the utter strangeness of the order for a while and was for a moment inclined to suspect that he might be the victim of a hoax. But he knew that only the line's agent could send him an order in its cipher code, and so twenty minutes after he had received the message he turned on his course and steamed full speed for Sandy Hook.

Notified by wireless while in mid-ocean of the great European war, the North German Lloyd steamship Wittekind, Capt. F. Sembill, which sailed from Hamburg on July 24, with Montreal as her intended destination, ended her trans-Atlantic voyage in Boston on August 9. Upon being informed of the war and with warnings to look out for English warships, Captain Sembill shifted his course, and despite a dense fog and the fact that he was in the iceberg zone, he made all speed for Boston, a neutral port.

Icebergs and Warships

He faced a double danger, the icebergs and the warships of the enemy. The fog, which held throughout the trip except for two nights, was also a danger, but it was a protection as well, and the officers of the Wittekind agreed that the fog probably saved them from capture.

Messages from the British cruiser Essex were caught by the Wittekind's wireless operator and at one time it was evident that the warship was not far from the path of the German steamship. The captain ordered all lights extinguished and the port holes covered. He had the Wittekind's single smokestack repainted with the markings of an American line—one dark stripe between two white stripes.

Once they sighted what was apparently a fishing fleet. Captain Sembill ordered the German ensign at the ship's stern lowered and in its place he unfurled the United States emblem. He feared that the fishermen would report the presence of a German steamship to the enemy and so resorted to this subterfuge.

The Wittekind is of about 3,600 tons and having a single smokestack would easily pass as one of the American Line fleet.

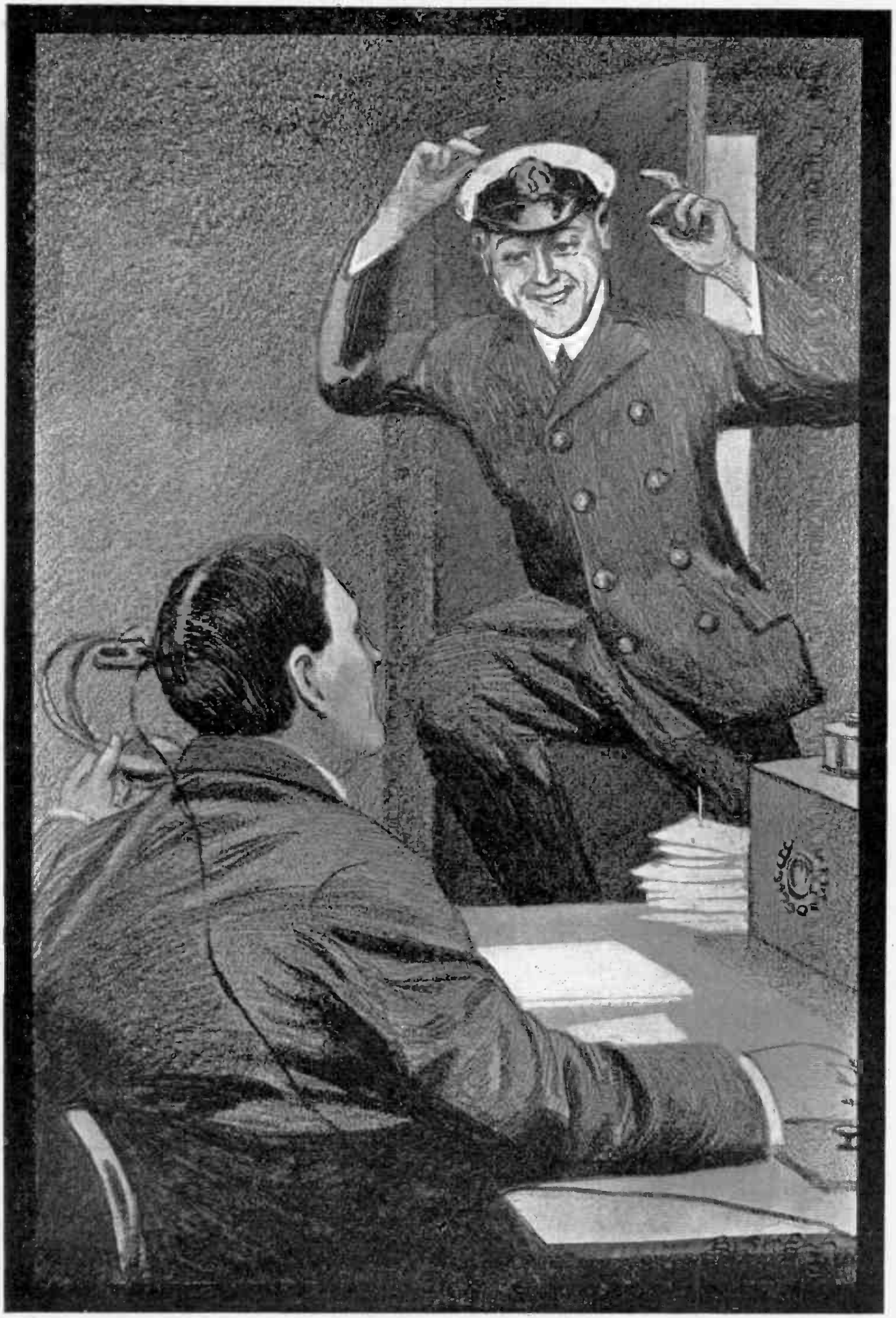
The Fog Horn Silent

The vessel plowed through the fog and the iceberg zone without once sounding the fog horn. Some of the passengers said that they passed a huge iceberg, its formation resembling an ostrich, as one of them described it.

The canvas tops of all the lifeboats were taken off and each boat was provisioned against emergency. Fresh water and zwiebach in liberal quantities were placed in each boat and the ropes were rearranged for quick handling.

The North German Lloyd liner Grosser Kurfuerst, which sailed from New York for Bremen with twenty-five first cabin and sixty-three second cabin passengers, mostly Germans returning to their homes, was 500 miles off the Hook when summoned by wireless to return to port. Captain Dietrich did not notify his passengers until the next morning, but some of them discovered through the queer conduct of the moon that they were going west. Nearly all the ship's 503 steerage passengers were reservists bound for Austria and Germany to join their respective colors. The passage money of all was refunded. The Grosser Kurfuerst had aboard about 9,000 tons of general merchandise that was destined for Bremen.

The North German Lloyd liner Friedrich der Grosse, which sailed from Baltimore for Bremen with a cargo said to be worth several millions of dollars and 121 second cabin, 22 third cabin and 125 steerage passengers, arrived in New York harbor on August 2 and anchored in quarantine. Captain Fritze had received wireless cipher orders to steam for this port. It was apparent from what passengers said that Captain Fritze feared that he might be overhauled or intercepted by a British war vessel, as he ran at night without running lights and curtained all the ports of the ship.



"Midst thunderous belch of reeking shard the world's history is being made anew!" I said, quoting from the yellow slip of copy

HOW WIRELESS BLOCKED A SEA FIGHT

SOME UNWRITTEN HISTORY OF THE RUSSO-JAPANESE WAR

BY WARREN H. MILLER

"YES, sir, we fellows got three nations into as pretty an international row as you ever saw—but we got the news alrighty, alrighty!"

The speaker was Dent, a clean-cut young wireless operator, abounding with energy and enthusiasm, and from the way he led off I knew we were in for a story. Men of his stamp are always doing interesting things.

"I always supposed that the naval engagements of the Jap-Russian war were reported by cable," I ventured, more to bring him out than anything else.

"Cable, nothin'!" growled Dent. "If the world had waited for Togo's and Rodjestvensky's cabled reports of those battles, we'd have been waiting yet—and *then* we would have had no more real truth than would be good for us! No; the Hon. Ass. P. says to Pop Anvers, 'Pop, you get the stuff,' says they. 'No hearsay reports of young "war" correspondents peacefully bottled up in Tokio; we want nothing but real eye-witness news of every naval engagement that takes place. All the money in the world is yours—hop to it, old timer, and get us the stuff—by wireless!'"

"By 'Hon. Ass. P.' you most flippantly designate the great and only Associated Press, I presume," I murmured.

"Sure thing. Those were the baby days of wireless, when sending 200 miles was a great thing and nearly all the world was using the old-fashioned metal-filing coherer, which couldn't take over ten words a minute. But we, in America, were already past that stage, and so Pop packed up two sending and receiving sets suitable for a small news tug and a land station, enough material for a good land aerial and we all beat it for China. We had electrolytic responders for our receiving apparatus. They were new then and they could take thirty words a minute—just about three times the speed of the old coherer."

"Let's see, your nearest cable station was Wei-hai-wei, wasn't it?"

"It was—not; the nearest telegraph point where we could get out of China uncensored was Chee-foo, fifty miles from Wei-hai-wei. We had a chain of Chinese runners, each man doing fifteen miles with the packet of despatches—yes, sir, that's how you all got your daily 'cable' reports of the naval end of the war at your breakfast tables every morning. Wireless from the seat of battle 200 miles to Wei-hai-wei, runners to Chee-foo, telegraph to Shanghai, and cable to the world's news centers. Three relays; *some* hustle, for those days!"

"How did you get permission for an aerial station at Wei-hai-wei?"

"Bought a town lot of the mandarin, who was in the real estate business on the side—oh, you can't beat Pop at foxy games!—otherwise we'd have been fooling with official red tape yet, but no mandarin could be expected to refrain from selling a mere parcel of real estate to foolish foreign devils, for good iron dollars; now, could he?"

"No, certainly not, in reason," I murmured ironically.

"Then we put up an aerial mast 175 feet high, jointed up of native bamboo like a big fish pole. Considerable job to rig it with Chinese facilities, too; but nothing ever stops Pop. He got it up in a week, and well he might, as the war was getting away from us fast, and we had no time to lose. Meanwhile Pop chartered the Hai-Mun or the 'High Moon' as we soon renamed her, and I went aboard and put in our second wireless set. She was an insignificant sort of a little tub, a kind of Chinese steam yacht, only 125 feet long, reasonably fast and able in a seaway. She *had* to be, in some of the weather we were in in the troublous Yellow Sea. I hid the sending and receiving set in the lazarette and made my aerials as inconspicuous as possible, besides putting in a small decoy yacht set, for we were sure to be boarded by both Japs and Russians, particularly prowling torpedo boats. Then we lit out for Port Arthur, and elbowed into that war, for all the world like a drunken cowboy into a quaker meeting."

"Did you get there in time for the battle between the two fleets off Port Arthur?"

"*Did* we! We *were* the battle of Port Arthur, man! We gummed the whole works the minute we began sending! We were some cute little disturbers all right! Before *we* arrived the war was being conducted in an orderly fashion, with each admiral signaling his squadron maneuvers and sending his torpedo boat flotillas about in peace and harmony. They were playing a game of grand strategy, and real scientific warfare—until *we* arrived and began to mingle in.

"Well, sir, we sat down on the horizon and began to tell the world how fine it all was, in pure, unbroken English, at thirty words a minute. Right then we didn't realize that every coherer on both the Jap and Russian fleet was jammed fast the minute we began to exude blurbs of rhetoric. Those old iron-filing coherers, as you'll remember, worked by the iron filings all stiffening up and taking a set every time a wireless wave hit your aerial. Then there was a little tapper which automatically tapped the glass tube containing the iron-filings, tumbling them in a heap again. If the filings took a long set, it was a dash; short set, a dot—Morse code. All this took time; time to let the filings take a set (just as if a magnet were held over them) and time to let them tumble in a heap when tapped. The best it could do was ten words a minute, and when our fast sender butted in with thirty words a minute, all the filing tubes in both the Russian and Jap fleets took a set and *stayed* set until we got through!

"Not that Pop cared a whoop! He was writing an Epic, a sulphurous one; his head was in the clouds and Literature had taken him into her bosom . . . great stuff, believe me! And me sending it to Wei-hai-wei hot off the yellow copy slips. You saw it all yourself in the papers next day—"

"Didn't they have any wireless tuning facilities in those days? Something that would only respond to one wave length?"

"Tuning, nothing!" snorted Dent. "Those old coherers had practically no selection.

"With our new electrolytic receiving set we could read every word that was said in both fleets. Presently Rossli, our Swiss interpreter, who could talk seventeen languages, began to dance about the lazarette, snapping his fingers with delight.

" 'Hey, you!' he bellowed, 'jest you lissen to dis—'

" 'Don't bother *me*,' " said I. 'Pop's passing it out hot, and I haven't time to lose. Get this: "Midst thunderous belch of reeking shard the world's history is being made anew!"—great, ain't it,' said I, quoting from the yellow slip of copy.

" 'Great!' " he echoed disdainfully. 'I tell you Pop's gumming der whole danged battle! Here's a five-times-repeat message from Togo trying to recall his starboard column, vitch iss steaming straight up Port Arthur harbor an' like to get bottled up, an' here's Malakoff trying to get his fleet together and cut 'em off, an' not a ship in either fleet can hear a tam order, an' every one of dem is trying to tell the flagship dot dere coherers won't vork—all because of Pop and his tam newspaper history;—how can he write any *history* if he won't let 'em make it!'"

"'Trust a war correspondent for that'—I was just beginning to remark when we heard a dull boom that you all know was the blowing up of the Petropavlovsk; and I think to this day that *we* did it, for Malakoff was so rattled over the total disablement of his wireless that he clean forgot to look out for torpedo bearings. I called up the tube to ask Pop what the boom was about and then told him Rossli's news about our blocking fast all the coherers in both fleets. 'You want to revise that last copy, boss,' says I. 'You've got the Jap starboard column attacking the Port Arthur forts while as a matter of fact they're going in there in a mistaken order and Togo's busting his senders trying to get 'em back! I think we ought to can this stuff and let 'em fight it out, Pop, if you want my honest opinion about it.'"

"'Young man,' came Pop's voice down the tube just as sarcastic as you please, 'the Times composing room shuts off at three A. M. and it's after twelve there now. You've got just half an hour to send my story to Wei-hai-wei, and then its runner, telegraph and cable—three relays. Sorry for these poor boobs and their antiquated apparatus—but business is business, and we've got to get the stuff across if we have to run the whole battle for 'em.'"

Dent paused to light a fresh cigar. "For combined nerve and conceit, commend me to a war correspondent," he observed dryly.

"I suppose about that time both fleets took to wig-wagging and semaphores, eh?" I suggested.

"You bet! Just then Rossli fell down in a fit in front of our receiver tape. Never saw a man so near death from laughter in my life. 'Now . . . you *haff* . . . doned it!' he gasped. 'Dere mad clear tru over dere. Each admiral tinks de odder's sprung somethin' new, some kind of wireless wave destroyer. All devvels hass broke loose among dose coherers—now dey got a chanst to talk;—it's a tam shame, I tell you, dot's vot it iss!'

"'Sorry,' said I, opening the key and starting in again on Pop's Epic—some English-slinging, too, believe me—and from that time on the battle went along by wigwag and semaphore."

"There ought to have been some international law to stop you fellows," I growled; "hasn't the public got *any* rights that you newspapers are bound to respect? A battle between nations is a serious thing, let me tell you; everybody is in dead earnest and in no mood for foolishness. Even a couple of dogs will stop a fight to ferret out an insistent flea; it's a wonder both sides didn't detach a gunboat to hunt you out."

"Funny, wasn't it. There we lay, hull down on the horizon as innocent as any sampan. All they knew was that some powerful wireless impulses were blocking their coherers, and I do believe, up to the battle of the Sea of Japan, or Tsu Shima, as the Japs call it, each side thought the other was using some new-fangled apparatus to gum the other fellow's receiver. And here we lay, day after day, reporting minutely the naval movements off Port Arthur; and the worst of it was that everything they did or started to do was cabled right back to Tokio and St. Petersburg, besides being in every daily paper in the world! Oh, but the Japs were wild! You know how proud they were about having all the war correspondents bottled up in Tokio and hand-feeding them sterilized information from the Seat of War? And here were all their naval secrets being passed around daily like common hand-bills! It hurt their pride; that's where you get a Jap every time! They were sure some sore and puzzled.

"Boarded? Sure, we got boarded; about twice a week. Every Jap torpedo boat in the Yellow Sea took a crack at us," grinned Dent in answer to my next question. "And, of course, we were just a British pleasure yacht cruising to the Philippines . . . maybe Pop couldn't put on airs when he wanted to. Wireless? Sure; a yacht set, thirty miles capacity, gentlemen—that was his game every time our aerial was hinted at too pointedly.

Frank and above-board Pop was every time. Besides, they couldn't seize a yacht of their best ally and tow her into port, could they?"

"Lovely business!" I murmured. "How long did you keep it up?"

"Well, Pop got his at Tsu Shima, or the Battle of the Sea of Japan, as you call it. We knew all about the movements of *both* Rodjestvensky and Togo because, you see, when our thirty-word-a-minute sender wasn't filling the whole domain of the air with the hated English language, our new electrolytic responder was taking every message sent from all those slow coherers, with all the suave ease of a gentleman pirate. So over we romped to Tsu Shima in time to be early at the party. Swell time of it we had in that typhoon that scattered Rodjestvensky all over the map, too! But Pop was out after the stuff and wasn't to be stopped by every piffle of wind and puddle of water. We could hear the whole works. Rodjestvensky making his dash from Shanghai to Vladivostok, every man in the fleet scared stiff and hoping only to get through the Korea Straits without being seen. Togo laying off to the north with his scouts looking everywhere for the Russians. Funny, too, that little old Jap's fleet had only half the strength of the other man's—he ought to have been the scared one, with only four battleships to Rodjestvensky's eight, and seventeen heavy guns against forty-one for Russia—"

"Cut out the naval statistics and let's hear about the fight," I interrupted with all the landman's horror of gun figures, "we all know that Togo trimmed them signally—how did it look to you?"

"Fine! Togo had all the preponderance in eight-inch guns and the lesser quick-firers, and that new Jap shell was a wonder. That's what won the fight. Getting back to the yarn; the Russians stopped their wireless altogether the night before the row; afraid the Japs would pick them up and discover their presence. We could hear the Jap torpedo fleets calling to each other all through the night—so could the Russians for that matter, and mighty still they kept, too! Next morning there was a heavy mist and the Russians actually got through the Straits unobserved. Then a Jap auxiliary cruiser, the Sinans Maru, blundered right into the two Russian hospital ships in the mist, and then, wow! but she did make the wireless fly! She saw their whole fleet, and we heard her news being relayed farther and farther north, from one scout to the next.

"Rossli and I danced around the tape as we translated Japanese excitement by the yard. 'Mein Gott, man, do you know that Pop has the whole battle in his hands right now. Let him just open *our* key and begin talking—*anything*—and he shuts off those messages before they ever can reach Togo!'

"Yes, sir, we held the fate of Russia in our hands at that moment. We could have blocked those messages just as easy and let the Russians get by. Pop came into the lazarette just then and Rossli implored him to do it, for he had no use for the Japs, or anything that looked like a Jap. But Pop was there to get the stuff, not to pinch a poor little budding battle in the bud; besides he was too busy figuring out the safest place for the little Hai-Mun when the fun should begin. So we remained as quiet as the tomb.

"Next we picked up Togo, coming along strong, fifteen knots an hour, with his four battleships and two heaviest armored cruisers forming the principal squadron, while Kimamura with six more armored cruisers formed the flying squadron, just as in the fight at Port Arthur. Then Rodjestvensky broke his long silence and we heard him order his fleet to swing together into one line. Soon we could see them out over the sea and that they were evidently getting things mixed, for Rodjestvensky's forward column was in one line and the rest in another. Then the Japs came up over the horizon in splendid formation; six battleships led by the Mikasa, followed by the six armored cruisers, and behind a third squadron of twelve unarmored ones. It was a fine sight as they rushed along, crossing our bows, and a little after one o'clock they cut dead across the forward Russian line. The Mikasa turned, and after her the Shikishima. Then the whole Russian line opened up! Pop and I stood on the deck of the Hai-Mun with our eyes glued to our glasses.

"'Bum maneuver on Togo's part,' growled Pop. 'Each Jap ship will have to turn where the Mikasa turned, and the following half will be blanked by the leading half of his fleet.'

"I didn't agree with him, for that turn of Togo's, right at the Russian fleet, brought him in close, where all his small guns could get in their work. Those Jap shells were wonders. They burst the moment they touched anything, even water, and the stuff made a flash of liquid white-hot flame that would melt steel. Before the first ten minutes of the fight were up the Suvaroff, the Russian flagship, was afire in a dozen places, and the bright livid flashes of those shells danced and played all over her upper works! The four Jap battleships concentrated on her, and in half an hour they had her helpless with her rudder disabled and her forward funnel and military mast in shapeless heaps; all her signal gear, aerials, semaphores and signal halyards were shot away, and the clouds of smoke and shell gases went down her ventilators and suffocated everyone in the engine rooms. Still she kept on firing, moving around in circles and striking out like a blinded pugilist, while the fight went on without her. The Alexander and Borodino, both on fire from shells, now led the Russian line taking the fleet in a great loop away from the blind Suvaroff with the admiral aboard her, while the Japs swooped around them in a still bigger loop. Every Jap boat as it passed her handed out all the broadside there was time for without breaking formation, but still the battered hulk fought on."

"What of the Russian gun fire: couldn't they hit anything?" I asked wonderingly. "They had nearly three times as many big guns in their fleet."

"Oh, yes; they seemed to hit all right, but it's one thing to punch a man with a lot of big armor piercers, only a few of which explode, and it's another to hand him a swift flock of cans of bursting dynamite. There's no questioning that those new shells won that fight, for because of their superior speed the Japs actually got into several bad mix-ups, particularly when they all tried to head the Alexander off.

"Well, anyhow, the Oslyabya, one of the best Russian battleships, sank about three o'clock, just as the Alexander was leading their line back, with the Japs coming along parallel between us and them. She made a brave effort to rescue the Suvaroff, but the Jap gun fire was too strong, and so they all turned off to the south leaving her to the fate of the Jap torpedo boats.

"That ended the battle, so far as Pop was concerned. 'Togo wins my boy,' said he, 'you for the lazarette, as it's time we got to press. It's only a question of minutes before the Alexander and Borodino go under, and the rest will be torpedoed or captured before I get the copy around to them.'

"Pretty soon the first sheet of copy came down, and I opened the key for Wei-hai-Wei. I knew we couldn't hurt the Russians any, for all their wireless was shot away long ago. But I could see trouble ahead for the Japs. . . .

"In just *ten minutes* of our sending Togo and Kinamura got separated into two columns, the Suvaroff got her fires under control and actually began to form her fleet into a defensive T-shaped line and the battle was all up in air again!"

"No!" I ejaculated incredulously.

"Fact. Rodjestvensky *still* had more ships and guns than Togo, his fleet was more compact; it was getting too dark to signal wigwag or semaphore, and our confounded news despatch had put all his wireless out of business!"

"An outrage, nothing less!" I barked heatedly.

"Three nations thought so, too, when the matter came up internationally," observed Dent dryly, "but just then what really saved them was that the Russians put their foot into it, as usual. One of their torpedo boats came out to us from guarding the transports and hospital ships at the rear of the fight and arrested us! She'd had her wireless gummed, too, and as the same thing had happened to her at Port Arthur, with us hull down on the horizon just as we were then, she put two and two together, and boarded us. 'Where iss deese vireless!' was the very first question the lieutenant asked as he stepped aboard. He wasn't a bit polite about it, either.

"Pop was as suave as milk and honey, and showed him our yacht set with all the unction of a full ambassador.

"'Yuh, dat iss all righd; now ve see deese real t'ing,' grinned the officer, who had wised up to the yacht set bluff since the Port Arthur boarding. Pop tried the injured innocence act, the stiff and formal 'you-are-mistaken-sir' thing, dared him to search the ship under the British flag, put up the violation of neutrality holler—but he couldn't make any of them stick. The lieutenant was obdurate, and presently two of his men reported our little news mine in the lazarette. The 'cable' story of the battle of Tsu Shima ended, then and there. I was sending Pop's copy two letters a second, the sparks buzzing merrily, when I looked up to see the lieutenant standing in the door of the lazarette with his eyes sticking out like a crab's. Of course, he recognized that American apparatus as soon as he saw it—many a laboratory lecture had been given about it—but here it was, actually working commercially. He forgot all about the battle in the intensity of his professional interest. He didn't ask many questions; just stared with all his eyes.

"Yep; he nearly forgot the fight watching me send at that terrific speed," Dent went on. "Thinking fast, I figured that great industrial inventions make the bravest warriors sick of such a trivial and barbarous affair as war. So I jollied him along on that line of talk and finished Pop's copy with one hand while agreeing with him with the other.

"After which the Japs got a look-in on the conversational facilities of the circumambient aether—"

"What did he do? Put a prize crew aboard, or destroy the apparatus?"

"Why, Pop scared him out of the idea of harming any apparatus under the protection of the British ensign, and the lieutenant thought it went beyond his limited authority, too, so he wound up by forbidding us to use it; and, leaving a couple of men aboard, he hurried back to his station by the transports, for the battle was coming our way and the Japs were doing fine—now that our flow of English unabridged had been choked off!

"But the lieutenant had seen the whole works, so our game was up. The battle ended with a grim picture of lines of Japanese warships silhouetted against the evening sky, with ship after ship of the Russians foundering down into the dark waters of death, while the bright flashes of guns and shells lit up the twilight. By the time we got our lieutenant's men drunk on vodka and had reported the big finale to Wei-hai-Wei, he himself was captured while going to the Suvaroff to take off the admiral. Then he told all about us, to both his own people and the Japs, and soon after there was an international powwow over it; and, just to make assurance doubly sure, the Russians in Wei-hai-Wei sawed through Pop's bamboo pole one night, while the Japs, not to be outdone in courtesy, clapped Pop into prison.

"The war managed to go on without him. It wasn't half as interesting, though. England kicked, by and by, and they let him out—just in time for the treaty of Portsmouth.

"Ill effects? Not a chance! You simply don't know Pop. I'll wager right now he's looking through a field glass at some of that European battle smoke. If he isn't, he soon will be. Then we'll get some *news*. A little thing like censorship doesn't bother Pop. Cutting all the cables don't annoy him any more than a mosquito's bite; and if there's any news, right over to the U. S. of A. it will come, you can bet. Just be patient; the newspapers will be printing the real dope yet. But it's a pretty safe prediction that the news gatherers won't be able to butt in and make history as we did in the baby days of wireless!"

IN THE SERVICE

Edward B. Pillsbury had the question of choosing a vocation settled for him early in life. While some of his boyhood companions were discussing their qualifications for positions ranging from a place in the White House to that of a merchant prince, Mr. Pillsbury was silent. His future was mapped out for him, and he knew it, for as he expresses it, he came of a "telegraph family." The itching to handle a key showed itself when he was very young and at twelve he was manager of a telegraph office; now he is assistant traffic manager of the Marconi Wireless Telegraph Company of America.

In New England where he was born—to be exact in Belfast, Me., fifty-eight years ago—there is a proverbial thirst for knowledge. Young Pillsbury was no exception to the general rule, his ambition taking the form of a resolve to acquire a thorough knowledge of telegraphy. If he had not directed his aims thus, a family tradition would have been destroyed, for two of his brothers and two of his sisters were engaged in the telegraph business. So at the age of nine he became a messenger in a telegraph office. The time he could spare from his routine work he successfully employed in studying telegraphy.

Three years after he had obtained his employment as a messenger he was made manager of the Western Union office in Belfast. With promotion and responsibility came problems to solve. The messenger in the office was four years older than Pillsbury and the former could not reconcile himself to the fact that he was under the direction of a younger boy. Result: The sixteen-year-old messenger was compelled to seek other fields for his activities.

Two years afterward Pillsbury was transferred to Bangor, and for the next two years the young operator spent what leisure time he had in studying for admission to the University of Maine. He left the University to accept a position as an operator for the Southern & Atlantic Telegraph Company at Montgomery, Ala., but returned in 1900, when he received the degree of Bachelor of Science.

In 1886 he went to the Postal Telegraph-Cable Company, eventually becoming general superintendent, Eastern Division, with headquarters in New York City. He continued in the service of that company until he resigned to enter the Marconi service.

While in the Marconi service he has been studying the system with a view to making helpful suggestions. One of his ideas which will be put into execution calls for the use of the Continental alphabet instead of the Morse on the land lines of the trans-Atlantic stations. He also made a suggestion to do away with the use of envelopes in delivering trans-oceanic messages. The marconigrams will be folded and sealed instead of being placed in envelopes, following a system in vogue on the continent.

Like the newspaperman with a "nose for news," Mr. Pillsbury has an unerring instinct for good operators. On him fell the selection of the men to receive and transmit messages at the trans-Atlantic stations.

"I can tell a good operator," he said, "by the way he talks, by the way he carries himself and by the methods he employs in working."

The Censorship of Messages

THE Marconi Wireless Telegraph Company of America, through its president and general counsel, John W. Griggs, formerly United States attorney-general, has made a protest to Secretary of the Navy Daniels regarding the censorship placed on wireless code messages assumed to be in the service of belligerents. The protest of the company is based on the ground that it is a corporation serving the public; that its messages are privileged, as are the mails and telegraph lines, and that the United States has no right to interfere with the transmission of wireless messages. The following letter was sent to Mr. Daniels by Mr. Griggs:

August 19, 1914.

To the Honorable the Secretary of the Navy,
Washington, D. C.

Sir:

On August 12th I addressed to you a telegram of which the following is a copy:

The Secretary of the Navy,
Washington, D. C.

The Marconi Wireless Telegraph Company of America respectfully represents to the Secretary of the Navy that it is receiving messages to be sent by wireless to foreign countries; that the censor of the Navy Department assumes the right to forbid the sending of certain of such messages; that this company is under the ordinary duty of a forwarder of communications when paid for; that we are aware of no statute of the United States or of any treaty or rule of international law which justifies the intervention of a government censor or the stoppage of this company in sending messages in the ordinary way.

The Public's Rights Involved

We ask, therefore, to be referred to the legal authority under which your department assumes such right of censorship. We wish to respect the policy of our own government, but when our corporate rights and duty and the rights of the public are involved, we must respect only the law which governs the case.

On August 13th I had the honor to receive from you a reply as follows:

If you will send representative to Washington will be glad to take up before Attorney-General questions of law relating to the censorship of wireless messages by Navy Department under executive order of the President dated August 5th.

(Signed) Josephus Daniels,
Secretary of the Navy.

Authority for Censorship Sought

The object of my telegram was to obtain from your Department a statement of the legal authority under which you had instituted and were exercising a censorship in the radio stations of the Marconi Wireless Telegraph Company of America. At that time I was unable to refer to any statute, treaty, or rule of international law which justified such an intervention on the part of the Executive Department with the business of my company. At the same time I recognized the propriety of the Executive Department endeavoring to the utmost to enforce the obligations of international law incumbent upon this Government as a neutral in the present state of war in Europe, and if there had been any authority to which you could have referred me justifying such intervention by your Department, I should have been glad to have had it pointed out to me. In the absence of any affirmative claim of legal authority on behalf of your Department, it would seem to be unnecessary to discuss directly with the Attorney-General questions of law which might be considered pertinent, when no such questions had been raised by any formal citation or statute or other legal rule of action.

However, as meeting your evident desire to have our views submitted to the Department of Justice, I am now stating to you the opinion which this company holds with reference to the subject under discussion.

The matter divides itself into two parts:

In the first place, is there any treaty, rule of international law, or statute of the United States which forbids a wireless telegraph corporation engaged in business in the United States to transmit messages from its stations in the United States to ships or land stations of any of the belligerents engaged in the present war?

The question is not whether the United States could act in this capacity, but whether a private corporation or a private individual engaged in carrying on such a business for commercial purposes may lawfully communicate in this way.

The statutes of the United States have prescribed with particularity the things which may not be done within their territorial boundary by private individuals in violation of neutrality. No statutory inhibition is placed upon wireless or other communication with the ships or stations of belligerents. Nevertheless, statutes regulating wireless telegraphy have been recently passed, and if Congress had been of the opinion that a regulation of this kind is necessary, it would doubtless have made such a provision in the law. Its failure to do so indicates the desire of the legislature to have communication under such circumstances as I have mentioned free.

No Rule Forbidding Communications From U. S.

There is no rule of international law that forbids communication between a neutral country and a belligerent in a foreign war. The people of this country are free to carry on with any of the European countries now in conflict, trade and commerce, to ship them arms, material of war, food supplies and other commodities which, if captured by an enemy, could be declared contraband of war. Telegraph and cable companies, railroad companies, steamships and mails from the United States are all engaged in direct trade and commerce with some or all of the belligerent powers of Europe, and there is no duty incumbent on the Executive to interfere with or prevent such trade, commerce or communication.

The Company Bound to Send Messages

Of course, if a wireless station were being operated by one of the belligerent powers from a neutral base in this country, a different question would arise, but the Marconi Company is an American corporation, has been engaged in business for years, its stations are licensed by the Department of Commerce, and it is, besides, a public service corporation bound to accept and send messages when proffered payment therefore.

I submit, therefore, that the transmission of radio telegrams from the wireless stations of the Marconi Company in America to steamships or land stations of any of the belligerents is not unlawful under the statutes of the United States, and is not in violation of any rule of international law.

In the second place, if it be assumed that in some respects or to some extent the Marconi Company were under legal duty not to send dispatches of a certain character or to certain destinations because such sending is in violation of some law of the United States rendering it liable to indictment; nevertheless, there exists no legal authority for the Navy Department, or any other department of the Government, to institute and maintain a censorship over the messages delivered at the stations of the Marconi Company for transmission. The fact that an individual carrying on a lawful business may possibly violate a criminal statute does not authorize the Executive Departments, in the absence of statutory enactment, to establish a censor over his business in order to prevent the commission of a crime. It would be quite as justifiable for the Government to place a censor in every newspaper office in order to see that no seditious article or criminal libel is printed. A person or corporation engaged in trade or commerce as a transmitter of messages or carrier of goods is liable for violations of the law, but is not subject, in the absence of a statute expressly authorizing it, to governmental inspection beforehand. A system of censorship is antagonistic to that regulated liberty of action which is the basis of our free government. Such a system could be justified only when our own government is engaged in war and it would then be an exercise of martial, not of civil, law. A censor, determining upon his own judgment whether a proposed act is lawful or unlawful, and permitting or forbidding it accordingly, assumes the functions of a court of justice, but without the right of appeal. In effect, he issues restraining orders of his own motion against parties that are unheard, and with no opportunity for future correction or reimbursement for damages.

This company favors a strict enforcement of our national duty as a neutral, but does not think that it is justifiable to broaden the scope of neutrality by adding new rules not sanctioned by general public law, especially when such new rules operate to the injury of private concerns carrying on trade and commerce, and thus augment those unavoidable indirect damages which are suffered by the people of a neutral nation on account of a deplorable war status between other powers.

WILSON'S PROCLAMATION

President Wilson has issued the following regarding the use of wireless telegraph stations:

Whereas, Proclamations having been issued by me declaring the neutrality of the United States of America in the wars now existing between various European nations; and,

Whereas, It is desirable to take precautions to insure the enforcement of said proclamations insofar as the use of radio communication is concerned;

It is now ordered by virtue of authority vested in me to establish regulations on the subject; that all radio stations within the jurisdiction of the United States of America are hereby prohibited from transmitting or receiving for delivery messages of an unneutral nature, and from in any way rendering to any one of the belligerents any unneutral service during the continuance of hostilities.

The enforcement of this order is hereby delegated to the secretary of the navy, who is authorized and directed to take such action in the premises as to him may appear necessary.

This order to take effect from and after this date.

Woodrow Wilson.

The White House, August 5, 1914.

Secretary Daniels has instructed navy-yard commandants to detail officers to wireless stations in their vicinity as censors.

These instructions for the officers charged with enforcing the president's order were issued by Secretary Daniels:

No cipher or code messages are permitted to be transmitted to, or received from, radio ship or shore stations of belligerent nations by any government or commercial radio station situated in the United States or its possessions, or in territory under the jurisdiction of the United States, except cipher to or from United States officials.

No cipher or code radio messages will be permitted to be sent from any radio stations in the United States via foreign stations if destined to a belligerent.

Radio messages containing information relating to operations, material or personal, of armed forces of any belligerent nation will be considered as unneutral in character and will not be handled by radio stations under the jurisdiction of the United States.

In general, the censoring official will assure himself beyond doubt that no message of an unneutral character is allowed to be handled

In order to insure that the censors may in all cases be informed thoroughly and correctly as to the contents of radio messages coming under their censorship, they will demand, when necessary, that such messages be presented for their ruling in a language that is understandable to them.

In case of doubt as to the character of a message, it should be stopped and its contents, with full explanation of details, be forwarded to the Department (Operation) by telegraph for instructions as to the proper procedure to follow.

Josephus Daniels,
Secretary of the Navy.

IN THE SERVICE

CONTINENT-TO-CONTINENT DIVISION

William A. Winterbottom knew a long while ago that opportunity knocks only once at the door, but he couldn't figure that this made any difference if it looked worth while to return the summons in kind later on. The first tapping which had any connection with wireless was so faint he almost ignored it. That was about thirteen years ago when he was seized with an impulse to enter the Marconi service in England, and had a chance to do so. But the impulse passed away. The second tapping was louder and more insistent. Conditions were reversed: he was summoning opportunity this time. And his thoughtful tattoo was beating on—what do you think?—nothing less than a copy of THE WIRELESS AGE. That was a year ago; to-day he is commercial manager of the American Marconi Company's Commercial Department, with headquarters in New York City.

Mr. Winterbottom is an Englishman; naturally, then, his start in the working world was made in England—but it was with the British branch of an American institution — an insurance company. From the insurance business he went into the British Telegraph service at Manchester. Here he learned to be an operator.

The Marconi Company was erecting its first stations about this time. Winterbottom, attracted by the glamour which surrounds the wireless field, resolved to enter the Marconi service. His application was favorably received, but he postponed the greater destiny to enter the service of the Commercial Cable Company.

Wireless out of his mind for a time, he applied himself to working in the interests of the cable company for the next eleven years, ten of which were spent in America. He went to the cable company as an operator, but the commercial department appealed to him as the better field, and he accordingly began to fit himself for a position in it. Eventually he reached his goal, taking charge of the traffic promotion work and directing the efforts of local managers and canvassers in the solicitation of business.

But it was written in the order of things that the latent interest in wireless taken by Winterbottom should be awakened. On a newsstand one day he saw a copy of THE WIRELESS AGE. It contained many interesting features, but that which riveted his attention closest were the photographs of the transoceanic stations. They included views of the operating buildings at New Brunswick and Honolulu, and photographs recording progress of the transoceanic construction work. Other articles in the magazine made Marconi wireless appear a very attractive field of endeavor and Winterbottom got busy right away. His record proved an open sesame to the office he sought, and wireless secured another commercial convert—a distinctly worth while one.

"Don't grumble, work," is one of Mr. Winterbottom's maxims. And the Marconi Company's new commercial manager isn't letting anything get by him. Although but a few months in the service, he already has an outfit on the roof of his home, which, he says, enables him to "literally keep in touch" with wireless matters.

The master clock in the time service department. It operates ninety circuits in New York City on which there are as many as 3,000 synchronized clocks

The New Home of the Western Union

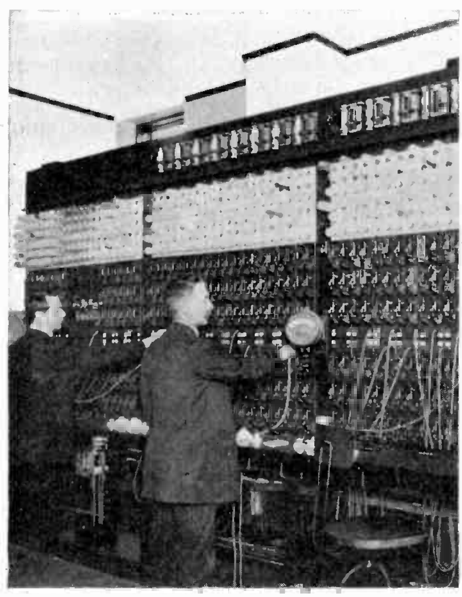
Some Details About the Operating Department of Land Lines

IN the early morning hours of June 28 the cut-over was made from the operating department of the Western Union Telegraph Company at 195 Broadway to its new quarters in the Walker-Lispenard Building, 24 Walker street, New York City. Previous to this a move had not been made since February 1, 1875, when the company moved from 145 Broadway to 195 Broadway. The building at 195 Broadway is now in the hands of wreckers. It had outlived its usefulness and had to give way to a more modern structure.

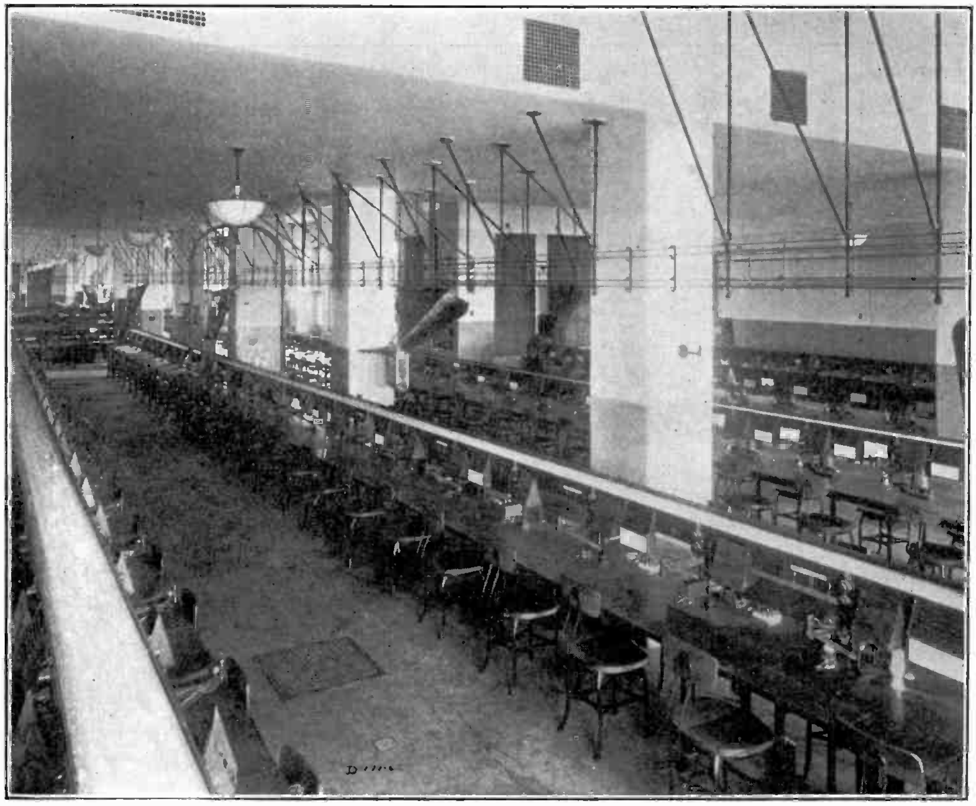
The executive offices of the company moved to 16 Dey street, but the official address of the company remains 195 Broadway.

The Walker-Lispenard Building at 24 Walker street, into which the general operating department was transferred, is a large modern fireproof structure of seventeen stories. The Western Union Telegraph Company occupies seven floors in the new building, the eleventh to seventeenth, inclusive.

Each floor has an area of about 14,000 square feet and is splendidly lighted. On the eleventh floor are quarters for the women employes, including a large rest room, a library, a hospital room with all modern surgical devices and locker rooms. On



The time service department is relied upon to send impulses over wires every second, actuating sounders in various localities. These second beats are utilized to regulate time pieces. This photograph shows the board controlling the time service



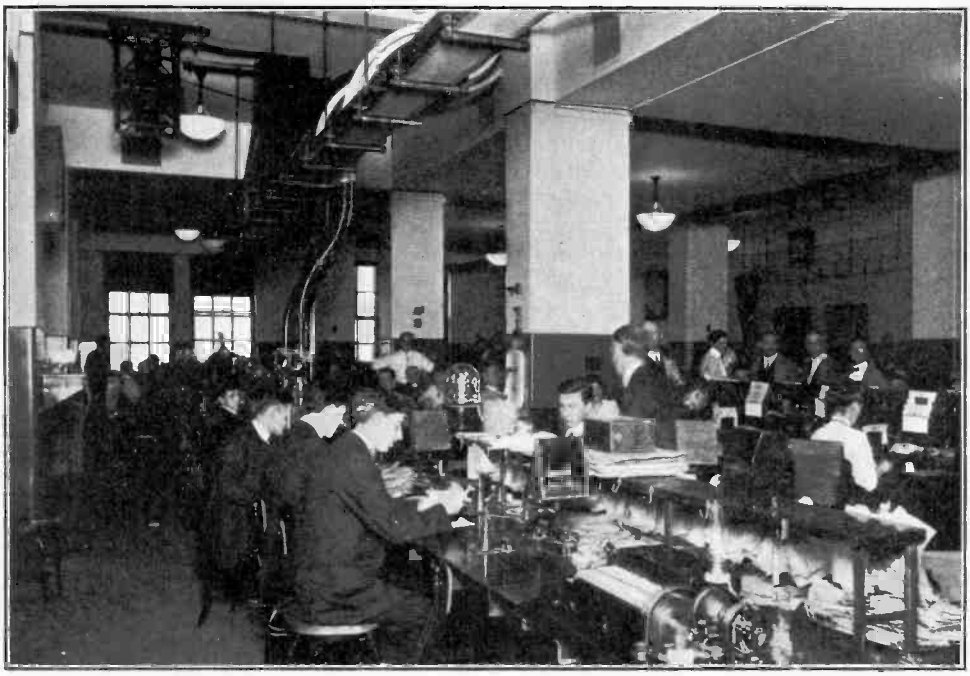
A view of the operating tables showing the automatic carriers and the chutes into which the messages are dropped

the twelfth floor there is a smoking and lounging room for the men employes, together with lockers and lavatories. The sixteenth floor is occupied by the bookkeeping department and on the seventeenth floor is a cafeteria restaurant with seats for 300 employes. The roof of the building is arranged for a roof garden for the use of employes.

The thirteenth, fourteenth and fifteenth floors are occupied by the operating department, of which a number of views are shown in the accompanying photographs. The thirteenth floor is known as the plant room. On this floor all the lines from outside points, which include the various loops around New York City and vicinity, come into thirty-four sections of switchboard. One of the photographs shows a number of sections of the main switchboard while another shows the rear of the same section and gives an idea of the method of cabling. At the left of this picture is a part of the main distributing frame, by means of which changes in connections from incoming lines to the switchboard can easily be made.

A view of one of the switchboard bays is displayed in a photograph. The switchboards serve the purpose of connecting any incoming wire with any operating position in the building or with any outgoing wire. Thus a wire from Chicago may be connected to a receiving operator in the building and also with Boston and Philadelphia and, perhaps, to several local points about New York City if that were desirable.

On the thirteenth floor are the multiplex and repeater apparatus. There are fifty-five Morse repeaters, thirty-five half Morse repeaters, three duplex repeaters and twelve half duplex repeaters. The repeater apparatus auto-



The commercial news department, from which stock quotation and general news tickers are controlled is shown above; below is a view of the multiplex which sends and receives four distinct messages simultaneously over a single wire

matically repeats a message put on the wire by an operator on the fourteenth or fifteenth floor to various distant points. Delicate adjustments are required from time to time for changes in weather and wire conditions, and it is more practical to have the apparatus for this use concentrated at one place in the hands of experts than it would be for each operator to have charge of the adjustments on the floor. It contains a master clock, which is kept absolutely correct by comparison each day over a wire with the United States Observatory at Washington, D. C. The master clock operates ninety circuits throughout New York City, on which there are as many as 3,000 synchronized Western Union clocks. From this department, at noon each day there is sent out a signal all over the United States by

The multiplex and repeater apparatus on the thirteenth floor. The repeater apparatus automatically repeats a message put on the wire by an operator on the fourteenth or fifteenth floors to various distant points

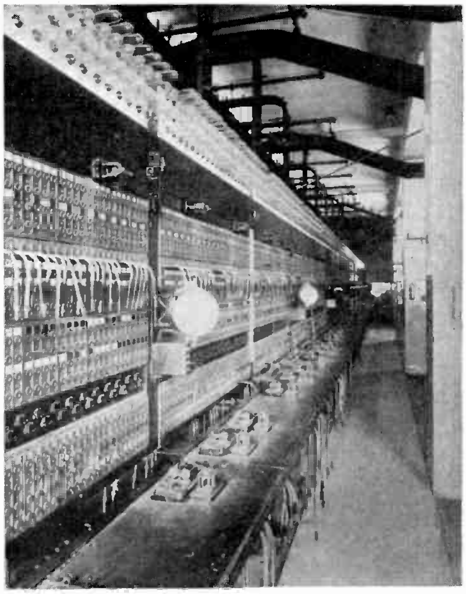
line over which he is sending or receiving.

The power plant, containing the motor generator sets, is also on the thirteenth floor. Alternating current received from the power company is here converted to direct current of the proper potential for telegraph use.

The time service department is an interesting feature of the institution. It is likewise located on the thirteenth which the correct time is known. Special wires are released for this purpose at five minutes before noon and on the stroke of the hour a signal is flashed over these wires. Thus this one clock sets the time for a large area.

Another service of this department is to send impulses over wires every second, actuating sounders in various localities. These second beats are utilized for regulating time pieces. A view of the board controlling the time service is presented in a photograph.

The fourteenth and fifteenth floors are occupied by operating rooms. The Morse operators sit at long tables;



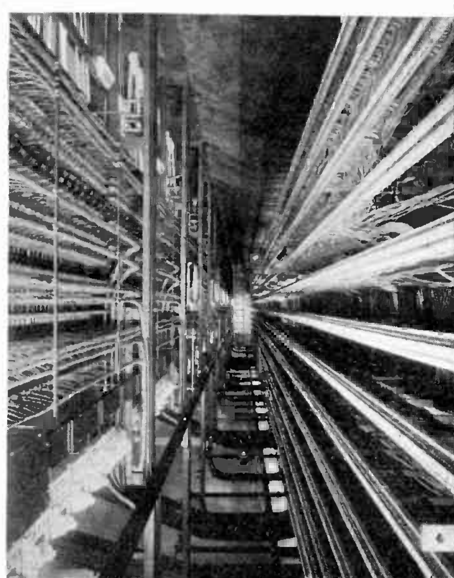
A view of sections of the main switchboard. All of the lines from outside points, which include the various loops from New York City and the vicinity, come into this switchboard

each has a key and a sounder in a resonator on a hinged arm. Typewriter drops are at positions. Altogether, on these floors there are 1,025 operating positions. These include 160 positions for forty quadruplexes. A quadruplex sends two messages and receives two messages over a single wire simultaneously, requiring two sending operators and two receiving operators at each end of the line. There are 386 positions for duplex operators. A duplex sends and receives a message simultaneously over a single wire, requiring one sending and one receiving operator at each end of the line.

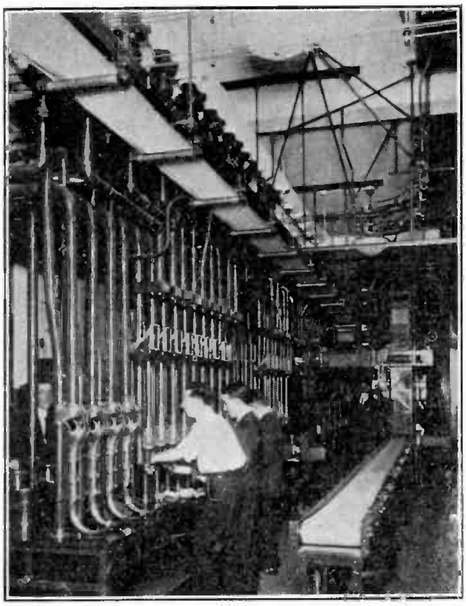
There are a number of positions on this floor in what is known as the commercial news department, from which stock quotation tickers and general news tickers are controlled.

There is an interesting installation of an instrument known as the multiplex, on the fourteenth floor. This apparatus sends four distinct messages simultaneously over a single wire. Transmission is not by means of the familiar Morse key; the sending operator writes upon a typewriter keyboard and the message appears automatically typewritten at the other end of the line. In an accompanying photograph the operator in the foreground is shown writing upon the typewriter keyboard, which punches holes in a paper tape and then passes through an automatic transmitting instrument. The second operator in the photograph is receiving and the automatic typewriter is plainly shown. With this apparatus on one wire sixteen operators are employed, four receiving and four sending at each end.

It is a curious fact that very little is known by the public of the improved methods of transmitting intelligence by wire. Most people think of the telegraph as a simple Morse key at one end of the line and a sounder



This photograph shows a rear view of sections of the main switchboard and a part of the main distributing frame by means of which changes in connections from the incoming lines to the switchboard can be made easily



The distribution center and automatic message carrying equipment

A view of one of the switchboard bays, the main line board appearing in the rear

at the other. As a matter of fact, there are at least eleven different types of transmitting sets for sending telegrams. These are of various degrees, ranging from the simple Morse key to the multiplex. There are in use several types of printing telegraphs, that is, instruments where the sending operator writes the message on a typewriter keyboard and at the other end of the wire the message is automatically typewritten by the receiving instrument.

The distribution center and automatic message carrying equipment are located on the fourteenth floor. Here are twenty-two incoming and twenty-two outgoing pneumatic tubes for receiving and sending messages to local offices in New York City. In the photographs are shown the long operating tables. Along the middle of each table, between the operators who sit at opposite sides of it, is a steel trough in which runs a moving belt. There are thirty-four of these tables with a belt on each. The belts deliver messages laid on them to six moving belts, which in turn deliver them to the distributing center. The belts thus take care of incoming messages received over the wire which at the distributing center are sent out through the pneumatic tubes or else redistributed to operators for sending out over the wire to various points.

The distribution of messages coming into the distributing center through the pneumatic tubes or from receiving operators which require redistribution to sending operators are conveyed to the proper sending position by sixteen lines of automatic carriers, very similar to the carriers used in department stores for conveying cash to the change desk. The transference of a message from a receiving operator over the belt to the distribution center and back by automatic carrier to the sending operator will not in any case take more than seventy-five seconds. Formerly a large part of this distribution work was done by girls who acted as messengers.

About 1,500 employes are required to take care of the traffic through the general operating department. This traffic amounts to about 150,000 messages a day. It exceeds this number on special occasions, such as the playing of a world's series of baseball games or other events in which there is universal public interest.

The Annual Meeting of the English Marconi Company

AT the annual ordinary general meeting of the English Marconi Company, held on July 21, in the Hotel Cecil, London, the directors submitted their report showing that the gross profits for the year amounted to £245,583 13s., and recommending the payment of a final payment for the year 1913 of ten per cent. on both classes of shares. A review of the growth of the Marconi system was presented, the American Company and its vice-president and general manager, Edward J. Nally, being favorably mentioned. The report is in part as follows:

"In October, 1913, the capital of the company was increased to £1,500,000 by the creation of 500,000 new ordinary shares of £1 each, ranking for dividends declared in respect of the period commencing January 1, 1914, and in all other respects *pari passu* with the existing 750,000 ordinary shares of £1 each. Two hundred and fifty thousand shares were forthwith offered to the shareholders *pro rata* at £3 5s. per share and the whole of the issue was subscribed and duly allotted. Of the remaining 250,000 shares, 222,688 were issued for cash in December, 1913, in connection with the arrangements made with respect to the shares acquired in the Compagnie Universelle de Téléphonie sans Fil.

"The share premium account has increased during the year by £511,958 4s. 4d., and now stands at £767,665 7s. 5d. Of this amount £397,057 15s. fell due in the early part of this year and has been received.

"The erection of the high-power station for the Norwegian Government is well advanced and should be completed by the autumn. A commercial telegraph service between Northern Europe and the United States of America is to be inaugurated, in which this company will be interested to the extent of ten per cent. of the gross receipts.

"In December last the Trans-Oceanic Wireless Telegraph Company, Limited, was incorporated, with a capital of £200,000, for the purpose of conducting a wireless telegraph service between this country and the United States. That company has acquired the new stations which have been erected in Wales for this purpose. These stations will be opened in the near future when for the first time a direct wireless telegraph service between London and New York will be established.

"We are glad to be able to report that Mr. E. J. Nally, former vice-president and general manager of the Postal Telegraph-Cable Company of America, has become the vice-president and general manager of the American Company. Your directors have had the advantage of receiving two visits from him, and are very hopeful that his business ability and experience in all matters concerning the cable and telegraph business, together with his energetic methods and organizing powers, will soon make themselves markedly felt in the development of the American business."

"The Canadian Company has made progress during the year and steps which are in contemplation should markedly improve its position in the near future.

"The French Company (Compagnie Française Maritime et Coloniale de Telegraphie sans Fil) has declared a dividend for the year 1913 at the rate of 10 per cent. on the ordinary shares, and 31.25 francs per share upon the Founders' shares.

"The Russian Company (La Société Russe de Télégraphes et de Téléphones sans Fil) is making steady and satisfactory progress. It has declared a dividend for the year 1913 at the rate of 6 per cent.

"Marked progress has been made during the past year in the development of the Wireless Compass or Direction-finder, and Fog and Submarine Signalling apparatus."

OPERATORS' INSTRUCTION

CHAPTER IX *(Continued)*

Fig. 1 gives a complete lay-out of the actual placing of the standard Marconi disc discharger transmitting set and receiving apparatus aboard a vessel. The sketch also includes the general over-all dimensions of the various pieces of apparatus. The aerial tuning inductance is mounted either on the side of the bulkhead or on the ceiling of the Marconi cabin. On the right of the table is mounted the oscillation transformer and the induction coil for the auxiliary set. The tank for the oil condensers and the motor generator with the disc discharger is placed directly underneath, on the floor. The telegraph key, aerial switch and receiving tuner are also mounted on top of the table, while the three sets of accumulator cells are placed on the floor to the left of the table.

The small charging panel for the auxiliary set is mounted on the bulkhead just above the operating table as indicated in the drawing. The starting box, generator and motor field rheostats and D. C. main switch are mounted on the bulkhead to the left side of the room as shown. It will thus be observed that all apparatus is conveniently placed for operation and is readily accessible for repairs.

The diagram, Fig. 2, is presented specifically for the benefit of operators attached to the Marconi service because it gives a complete circuit diagram of the actual connections of the complete Mar-

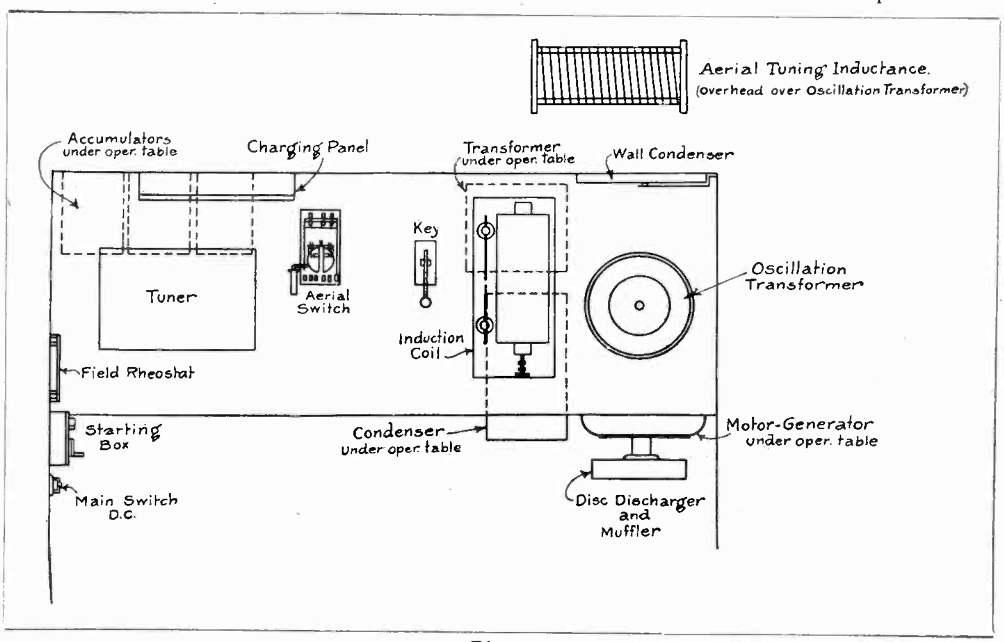


Fig. 1

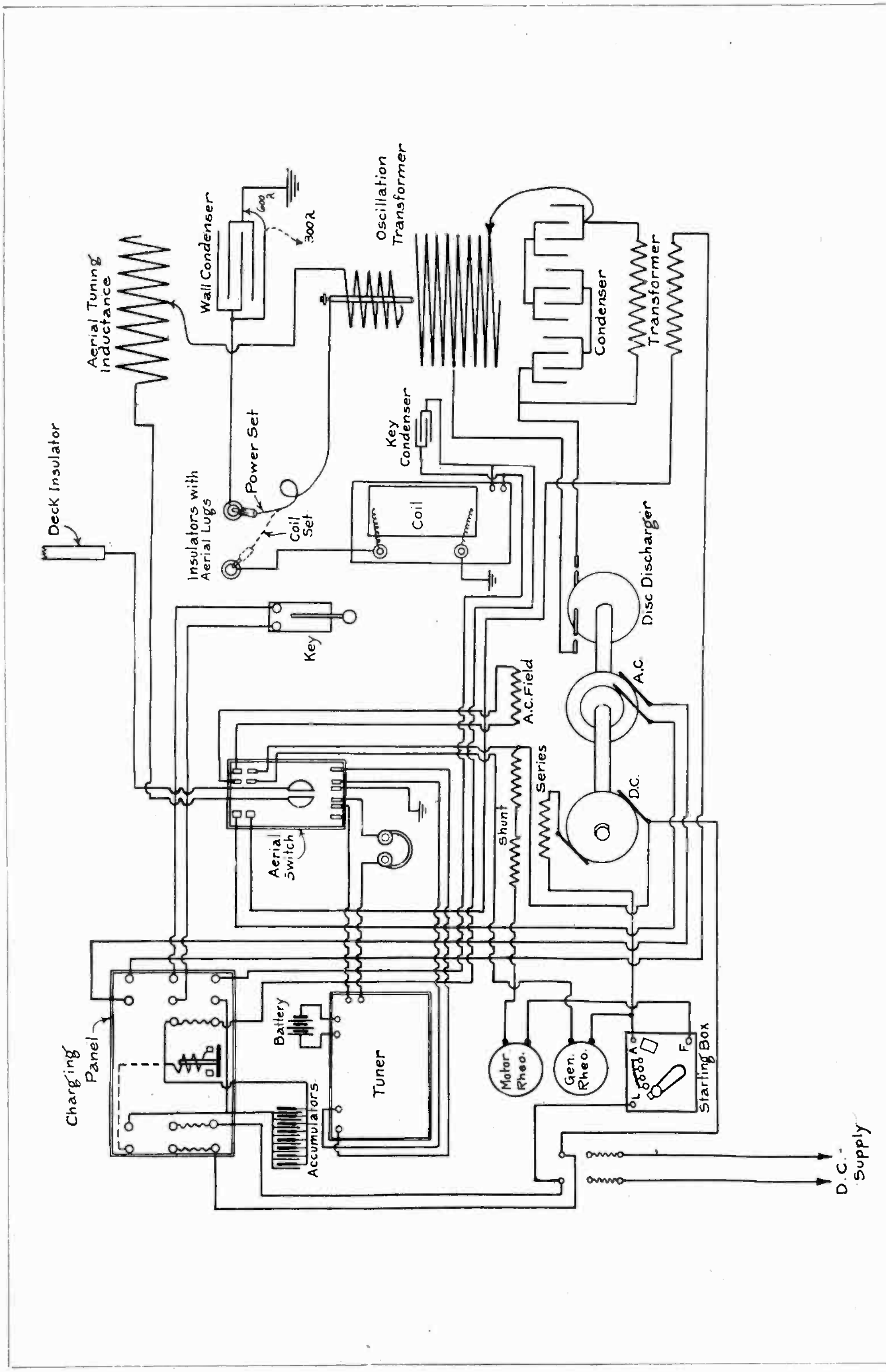

Aerial Tuning Inductance
Wall Condenser
Oscillation Transformer
Condenser
Transformer
Deck Insulator
Power Set
Insulators with Aerial Lugs
Coil Set
Key Condenser
Coil
Disc Discharger
Key
A.C. Field
A.C.
Series
D.C.
Shunt
Aerial Switch
Charging Panel
Battery
Tuner
Accumulators
Motor Rheo.
Gen. Rheo.
Starting Box
D.C. Supply

Fig. 2

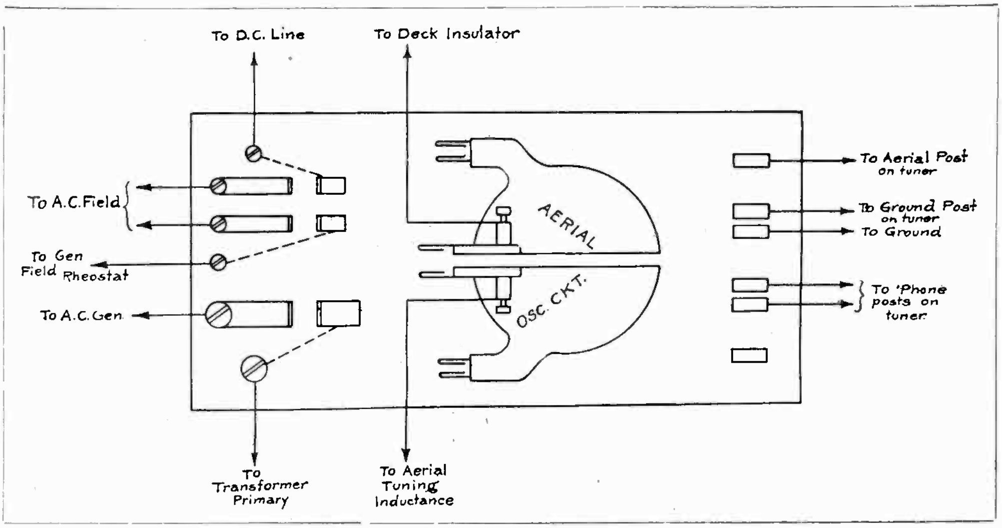


Fig. 3

coni 2-KW. set aboard ship. The diagram is laid out after the manner in which the apparatus is located in the radio cabin. The diagram should be thoroughly studied and a copy of it kept on file in the wireless cabin for reference in case of emergency.

The connections (shown in Fig. 2) between the type S switch and the receiving tuner are only correct for the old style valve tuner and must be changed to conform to the new type 103 or 104 tuners. As the fundamental circuits of the complete apparatus have been given in previous issues of Operators' Instructions, further explanation should not be necessary.

Fig. 3 is a detailed diagram of the type S aerial switch indicating the circuits to which the various lugs of this switch are to be connected. Fig. 3 is correct in connection with the old style valve tuner only and should not be confounded with the instructions given in Chapter VIII, May issue of THE WIRELESS AGE.

HIGHER STANDARD IN LICENSE EXAMINATION

The re-issuing of licenses for operators will begin next November. Men who have held their present licenses for two years will find when they are compelled to take the examination for renewal that the standard of the requirements has been raised considerably. There was little demanded of an operator a few years ago beyond the ability to transmit and receive messages. To-day, however, he is expected to be able to take good care of a set as well as to operate it.

It will be well for those who are to go before the radio inspectors for examination to be familiar with the current rules and regulations of the Marconi Company. The Circular Books, with which the ships are supplied, contain rules which if followed will reduce the work one-fourth.

The holding of any conversation or the transmission of verbal requests between stations has been prohibited by a recent instruction. Individual long distance working is a great hindrance to traffic and good operators are unanimous in saying that there is no individual glory in long distance working; the man who successfully transmits the messages is doing something better worth while.

Daily care of the apparatus adds to the efficiency of the operator's work. Care should be taken to see that the connections are good. The motor generator should be inspected and the dirt and grease wiped from it. It should be run for a few minutes to make sure that sufficient oil is circulating.

IN THE SERVICE

SHORE-TO-SHIP DIVISION

He came, he saw, he became a wireless man. This paraphrasing of an old apothegm may well be applied to David Sarnoff, contract manager of the Marconi Wireless Telegraph Company of America. To illustrate: When the Marconi Company had its offices in William street, New York City, Sarnoff, then a youngster, applied there for a position.

"I understand that you need men," he said.

"We don't need men, but we do need a boy," was the reply.

Sarnoff was hired as a boy, but a short time afterward he employed circumstances and his ability to lift him into the man class. This is the way it happened:

The manager was looking for the operator detailed in the office. He wanted a message sent at once. It came about that when he failed to find the operator his eyes lighted on Sarnoff. Could he send the message? Sarnoff could and he said so. This was not an idle assertion, for he had acquired a knowledge of telegraphy before entering the Marconi service. He made such a favorable impression, in fact, that a few weeks afterward he was assigned to take the place of the regular operator.

The research laboratory of the Marconi Company was then, as it is now, an intensely interesting place. Here the young wireless man spent his evenings and his spare hours, eagerly absorbing the knowledge which his study of the art and his association with the research engineers obtained for him.

In the meantime a vacancy had occurred at the Marconi station at Siaconsett, Mass., and Sarnoff was selected to fill it.

After eighteen months spent at Siaconsett he was transferred to the Sea Gate station, where he was eventually appointed manager. Then he was sent to the Arctic as wireless operator on a sealing vessel.

Fresh from exciting experiences in the North, he returned to New York, where he was detailed to duty in the Wanamaker's store wireless station. He felt that he had a deal of practical experience, but he was ambitious to improve his theoretical knowledge. So he enrolled as a night student in Pratt Institute, Brooklyn, taking a special course in electrical engineering. He successfully completed the course.

His next promotion was to that of inspector. Following excellent service in that position he was made chief inspector. Not the least important of his work for the Marconi Company was performed when he had charge of the initial tests for the direction finder and the installation of wireless on the Lackawanna railroad.

Mr. Sarnoff's tastes lean toward the commercial side of wireless telegraphy and he found opportunity to put his business-getting ideas into execution when he was made contract manager for the Marconi Company.

"The opportunities in wireless are greater to-day than they ever were for the right kind of a man," said Mr. Sarnoff, "but a man in order to make his services produce more value must first make himself more valuable."

Which goes to show that Mr. Sarnoff is a practical thinker as well as a practical wireless man.

The Function of the Atmosphere in Transmission*

By J. Erskine-Murray, D.Sc.

AN interesting article by Dr. Eccles on certain aspects of transmission through the atmosphere appeared in the Year Book for 1913, the treatment of the subject being mainly from the point of view of his own and other physical theories for the explanation of "freak" transmissions. In the following pages I have attempted rather to analyze typical cases of unusual wireless transmission and to deduce from these, in conjunction with the known and fundamental physical facts of the case, a true idea of the function of the atmosphere in transmission without the use of any explanatory hypotheses.

That the atmosphere ought to have some slight influence on the transmission of electric or "æther" waves from place to place on the earth's surface is obvious when one recollects that the air, though a very good insulator at pressures such as exist at the earth's surface, is nowhere a perfect insulator, and has quite different electrical qualities at the low pressures which occur at heights above thirty or forty miles to those it possesses at lower elevations.

Electrical waves must necessarily have a good insulator to pass through; they are guided by a conductor, but do not pass through it, only diffusing slowly into it and being dissipated as heat in the conducting material. The better the conductor the smaller is the depth of penetration of the waves into it and the less the loss of energy on this account. At the same time every conductor, whether a wire or a great mass like the earth, does conduct—that is to say, the electrical disturbance follows, and is guided by its surface.

In Hertz's experiments, and in Mr. Marconi's earliest form of apparatus true radiation took place—i. e., there was a free and unguided passage of an electric disturbance from one conductor to another conductor, through an insulating medium, the air, in which both were situated.

In modern Wireless Telegraphy free radiation does not take place when the stations are situated on land or sea, for the receiver is actually in direct connection with the earth and the latter forms part of the transmitter. Modern wireless is thus merely transmission from one part of a conductor to another part of the same. No return circuit, such as is used in ordinary telegraphy, is needed, because the disturbance is not continuous but alternating, and is of comparatively small wave length. I may quote from the 1907 edition of my handbook a definition which puts the matter succinctly: it is as follows:

> "Reduced to its simplest terms, the modern wireless telegraph is a large conducting sphere (the earth) with two conducting excrescences on it or near its surface (the aerial conductors). In one of these a sudden oscillatory movement of electricity is started, which spreads over the surface, causing to-and-fro currents in the other wire as it passes."

It will be understood, therefore, that as these have been my views since 1898, I was not one of those whom Dr. Eccles, in his article in last year's Year Book, speaks of as being surprised at Mr. Marconi's success in transatlantic transmission round the curve of the world.

If the lower atmosphere were as conductive as the sea is, wireless telegraphy from place to place on the earth's surface would be impossible, for the electric waves would not penetrate such a material to more than a few yards from the transmitter. Thus Wireless Telegraphy between completely submerged submarines is impracticable. The same is true in re-

* From "The Year Book of Wireless Telegraphy and Telephony," 1914.

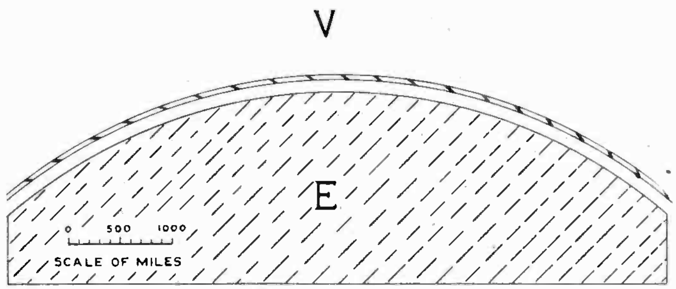


Fig.-1

A portion of the Earth and Atmosphere to scale. E, the Earth. V. Outer Space The shaded parts are conductors, the strip between them being the dielectric of Wireless Telegraphy. [From Erskine-Muray's Handbook of Wireless Telegraphy 1907.]

gard to wireless transmission in mines. Where the rocks are dry and insulating, transmission is possible through them up to a mile or two; but where they are wet and therefore conducting wireless telegraphy is impracticable. The non-conducting layer of air in contact with the ground and rising to some thirty miles above it is thus the stratum through which the electric waves can pass in traveling from station to station. Above lies the less dense air, which is certainly not a good insulator, and therefore must either absorb or reflect the waves which come up to it from the transmitter. There is now experimental evidence that at night this upper layer does reflect the waves down again, and thus signals are received at greater distances than in the day time; and Dr. Austin is of opinion that even in the day time the action is not always absorption only, but that occasionally there is a slight strengthening of the signals by reflection.

The first suggestion, of which I am aware, that indicates the importance of the upper atmosphere in the transmission of electrical waves over the earth's surface is contained in a paper which the late G. F. Fitzgerald read at the British Association Meeting in 1893. In discussing the probable period of an electrical oscillation of the earth as a whole, he remarks that "The period of oscillation of a simple sphere of the size of the earth, supposed charged with opposite charges of electricity at its ends, would be almost one-seventeenth of a second; but the hypothesis that the earth is a conducting body surrounded by a non-conductor is not in accordance with the fact. Probably the upper regions of our atmosphere are fairly good conductors." He then proceeds to calculate the period of oscillation, considering the earth and upper atmosphere as two concentric spherical conductors, and finds that if the height of the region of the aurora, i. e., of the conducting layer, be 60 miles, the period comes out at 0.1 second; while, if the height be 6 miles, the period becomes 0.3 second.

At the time this was written Wireless Telegraphy, in the modern sense, had hardly been thought of, and no application of Fitzgerald's idea was made to radio-telegraphy until 1902, when A. E. Kennelly in the Electrical World suggested that an upper reflecting layer might be the cause of the abnormally long ranges occasionally attained by night. Oliver Heaviside also, in his article on the Theory of Electrical Telegraphy ("Encyclopædia Britannica," 10th edition), says: "There may possibly be a sufficiently conducting layer in the upper air. If so, then waves will, so to speak, catch on to it more or less. Then the guidance will be by the sea on one side and the upper layer on the other."

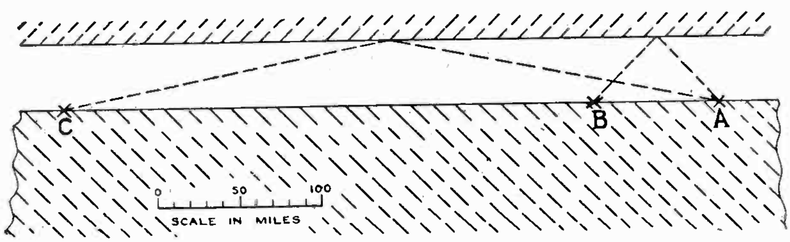
It is clear, therefore, that, in the opinion of Fitzgerald, the upper conducting air actually existed, and that Kennelly and Heaviside looked upon its existence as probable.

The diagram, Fig. 1, which forms an illustration to the chapter on transmission in the first and succeeding editions of the writer's "Handbook of Wireless Telegraphy," published at the commencement of 1907, was arrived at from similar considerations in combination with the known facts of the conductivity of gases at low pressures, of the height of the auroral discharge and of the constant presence of ionization in the upper atmosphere. It was thus an immediate deduction from the knowledge available at the time.

As regards the ionization of the upper atmosphere, I may say that, as early as 1892, I wrote a paper in which a calculation was made of the currents in the upper atmosphere which would be necessary to account for certain magnetic storms, and suggested that these currents might be due to streams of electrified particles entering the atmosphere from the outside. A great deal of work on similar lines has been done lately by Birkeland. That ordinary sunshine containing ultra-violet light ionizes air was well known, as also the fact that ionization does not die out at once.

The diagram indicates that if the under surface of the upper conducting layer were sufficiently sharply defined, the waves would be reflected downwards and might, therefore, increase the strength of signals received, the wave form becoming ultimately—i. e., at great distances—cylindrical instead of hemispherical, and therefore giving a much slower reduction in the strength of received signals than would occur if the waves were free to extend into upper space or were absorbed by and dissipated in the upper layers. I consider that the existence of this upper conductive layer is no longer a matter of doubt, and that the problems now in the process of solution involve only its form and functions. To be able to discuss these we must leave for the meantime the physical side of the question and look into the evidence obtained in the actual working of Wireless Telegraph Stations.

The first time that an obviously atmospheric effect was noticed was in 1902, when Mr. Marconi received signals from Poldhu on board the S.S. Philadelphia at nearly twice as great a distance by night as by day.



A. Victoria; B. Pachena Point; C. Ikeda Head.

Fig. 2

Since the conductivity of the surface of the sea is not appreciably different by day and by night, it is evident that the cause of this increase of distance of transmission at night must be some atmospheric variation. Mr. Marconi suggested that at the time the effect might be a local one, i. e., a loss of energy at the transmitting aerial due to ionization by day light of the air in its immediate neighborhood. This theory, however, does not fit in with the more recent observations of the phenomena which clearly indicate that the cause is situated in the atmosphere intervening between the stations, and is not due to variations in the amount of energy radiated.

Take, for instance, Edward's observations on transmission by day and night on the coast of British Columbia, and in particular the case of communications between Victoria, Pachena Point and Ikeda Head. These three stations lie in nearly a straight line, Pachena Point being about seventy-five miles and Ikeda Head about 400 miles northwest of Victoria. Electric waves in transmission from Victoria to Ikeda Head thus pass Pachena, and if they traveled by the shortest route, i. e., along the earth's surface, should be received there.

As a matter of fact, however, with the small power station originally installed, it was very difficult to communicate between Victoria and Pachena at all, either by day or night, whereas communication was easily maintained between Victoria and Ikeda Head almost every night, though not by day.

There appears to be only one rational conclusion which can be drawn from these observations—viz., that at night the waves which reached Ikeda Head actually passed Pachena high overhead without approaching the ground on which the station stands; that is to say, they rise from Victoria and are bent down again after they have passed over Pachena Point. There is no other way by which they could get to Ikeda Head without affecting the intermediate station. We have thus a direct proof from actual wireless operations that there must be some stratum of the upper atmosphere which, at least by night, is not transparent to electric waves, but reflects or refracts them downwards from its lower surface.

From the consideration of the physics of the atmosphere and from actual wireless observations we have thus obtained two quite independent proofs of the existence of the upper conducting layer depicted in Fig. 1.

The above are, of course, only instances taken from a very large number of observations, all of which go to prove the existence of a strengthening of signals due to reflection from the upper atmosphere. These "freak" transmissions occur in all latitudes, but mainly in the fine weather belts which surround the world between latitudes 20° and 45° on both sides of the Equator. It is also there that the atmosphere is, as we know from the work of meteorologists, in a comparatively steady condition, such as must favor the formation of a smooth reflecting layer. There is also evidence which shows that stormy weather is unfavorable to transmission.

It is notable that many of the greatest distances of "freak" transmission have been in large part over land and indeed over high mountains—a further proof that in these cases the main conductor is not the earth, but the upper shell.

It is also a fact that signals between stations at a comparatively small distance from one another are not appreciably strengthened at night, and this further confirms the idea that the increase at greater distances is due to reflection. In the case for instance of Victoria and Pachena Point the angle at which the waves would have to be reflected from the upper layer is about 45° or more in order to reach the latter station. So high an angle is, of course, very unfavorable to reflection, and a very small proportion, if any, of the waves received at Pachena Point could come that way. For Ikeda Head the angle would only be about 10°, which is very much more favorable; hence, as the phenomenon of better night transmission is observed at the latter, reflection is indicated.

We may take it, therefore, that it is practically certain that during the

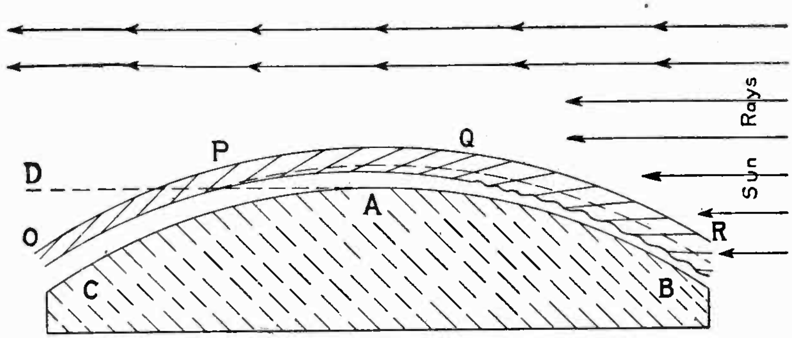


Fig. 3

C.A.B - The Earth; O.P.Q.R - the Conducting Shell; A.D - Line dividing Sunshine above, from Darkness below. A, Station where Sun is just rising.

night the waves are conducted to great distances by two conducting surfaces, the earth and the shell outside it. The argument put forward by Dr. Eccles against conducive transmission—viz., that a high receiving aerial is better than a low one—is really fallacious and neglects Poynting's proof that, in all electrical transmission, the energy travels via the dielectric and not in the conductor. Of course, a higher aerial will show greater energy in the receiving instruments in any case, for the integral effect of the electromagnetic forces on it will be greater than that in a small one, whether the waves be conducted or free. I have demonstrated this many times in lecturing on the subject by using a long horizontal straight wire to represent the conducting strip of ground between the transmitting and receiving stations, with two vertical wires attached to it as aerials.

It seems, therefore, that at night the lower surface of the conducting shell is often well defined, thus becoming a good reflector, while during the day the transition from the upper and conducting to the lower and non-conducting air is gradual—the surface in fact becomes fuzzy and incapable of giving a clear reflection.

We now come to the curious phenomena which take place at sunrise and sunset. Let us see what function the atmosphere performs in these after stating generally the results which have been deduced from Mr. Marconi's interesting observations at Clifden and Glace Bay and from those of later workers.

In a paper on the "Daylight Effect in Radio-Telegraphy," read to the Institute of Radio Engineers in July, 1913, Professor A. E. Kennelly sums up the experimental facts, and shows, as he says in his summary, that "changes of intensity of signals near sunrise and sunset are explained by reflecting effects which may be expected at the boundary surface or 'shadow wall' between darkness (air of small conductivity) and illumination (ionized air of marked conductivity)."

This is good if it applies only to the middle atmosphere, below the layer which as we have seen must be a good conductor even at night, and above the lower layers which under no conditions ever become appreciably conductive; but it neglects the fact that there are also long night ranges to be explained which demand something essentially better than merely a non-conducting atmosphere.

The real effect is therefore something like that shown in Fig. 3, a figure which I have frequently drawn on the blackboard for the benefit of a class during the past six years.

I have indicated that over the station A, at which sunrise is just taking place, the conducting shell is at least as sharply defined as during the night, and is, therefore, capable of reflecting; while at B, where the sun is high, the under surface of the shell is indefinite and no longer reflects. Between P and Q the shell slants downwards towards the earth, forming what Kennelly calls the shadow wall. It therefore strengthens forward radiation or condenses the received waves at A. Between O and P the shell is horizontal, as also between Q and R.

In order to follow the variations in strength of received signals which sunrise produces it is necessary to suppose that the earth, represented by the lower part of the diagram, rotates slowly clockwise. The stations will then pass from where, in darkness, the height of the shell is great to where, in full daylight, it becomes lower and less well defined; and in their passage their positions relative to the shell will indicate the variations in signals.

To study the sunset effect we may turn the earth counter-clockwise, starting with both stations in full daylight—i. e., on the right—and turning them gradually over into darkness. The point of view will, in this case, be from above the North Pole, while in the use of the diagram to illustrate sunrise it was from above the South Pole.

As. Dr. Kennelly points out, the boundary between light and darkness is a line which is only due north and south at the times of the Equinoxes. At other times of the year it has a northerly and easterly or northerly and westerly slant, according to the season of the year. This boundary line is, in fact, a great circle of the globe, the axis of which is always directed towards the sun, and therefore cuts the surface of the globe at some point on the Ecliptic. Sunrise and sunset effects, therefore, vary from month to month, and depend not only on the times of sunrise and sunset, but also on the angle between the fixed great circle along which transmission takes place from the one station to the other and the great circle separating day from night.

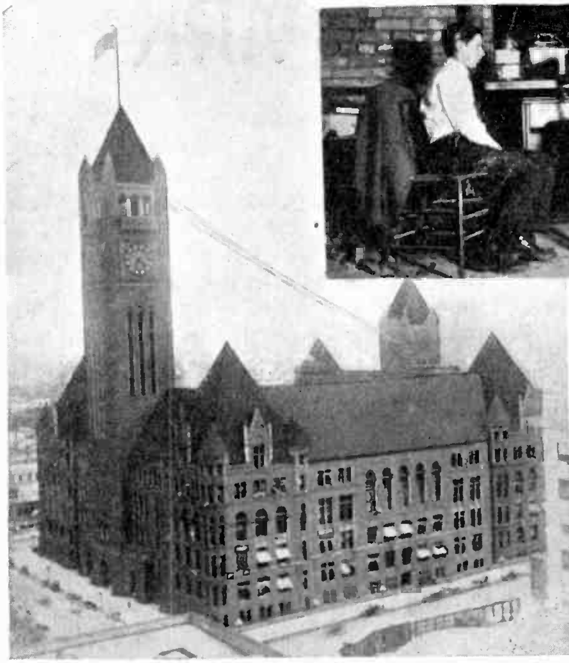
In conclusion, I would suggest that there is another factor in the case of which no account has hitherto been taken. This is the possibility that there may be resonance to some of the natural wave lengths of the oscillator, consisting of the earth and the shell. These wave lengths are many in number, and include a range of waves of lengths h, 2h/3, 2h/4, etc., etc., where h is the distance between the earth and the shell.

Thus, if the height of the shell be 50 km., these natural wave lengths would be 50 km., 33.3 km., 25 km., and so on; while if the height were different the whole series would be different. We have here, therefore, another possible explanation of the fact that, both with damped and undamped waves, it has been observed that at certain times certain wave lengths are more easily transmitted than others. I would suggest that, although this may be due to interference of direct and reflected waves, it may also be due, in part at least, to a change in the height of the shell, whereby the natural resonance wave lengths of the terrestrial oscillator are altered.

TIME SIGNALS FROM WASHINGTON TO OTTAWA

Listening to the seconds ticked off from Washington through the wireless telegraph apparatus recently installed at the Dominion Observatory was a feature of a recent meeting of the Royal Astronomical Society at Ottawa, Canada. Shortly before ten o'clock in the evening the Arlington town signals could be distinctly heard throughout the hall through the gramophone which was connected with the wireless receiving instrument at the Observatory. At five seconds to ten the ticking ceased, and at ten o'clock a long stroke gave the striking of the hour. This corresponds almost exactly with the hour at the Observatory. A lecture delivered by C. P. Edwards, superintendent of wireless telegraphy for the Dominion, was replete with interesting features.

A Station in the Minneapolis City Building



In the photograph above is shown the receiving apparatus of the Minnesota Wireless Association. To the left is the aerial, which consists of eleven copper wires and is 400 feet in height at the upper end. The station is said to have a range of 4,000 miles, and one of the members has copied Colon, Panama. The association meets every two weeks in the mayor's reception room in the City Building

THE Minnesota Wireless Association has just installed a powerful radio station in Minneapolis, under the direction of Philip E. Edelman, the president.

The station is located in the City Building, and the aerial, consisting of 11 copper wires, stretches between the two towers of the building, as shown in the accompanying photograph. The aerial is 400 feet high at the upper end. Mr. Edelman secured both the aerial and a fine operating room, located on the fourth floor of the building, for the association, both being donated. The apparatus installed was also largely donated, the plan having been to designate some part for each member to furnish.

The installation was made in accordance with modern practice, and the ground connection was secured by connecting heavy wires to the frame of the building and the pipes located in it. The station is claimed to have a range of 4,000 miles. Claude Sweeny, one of the members, has copied Colon, Panama.

For ordinary transmitting purposes ½ K. W. or less is used in order to restrict the range to the stations in communication. The time signals are very clear at this station and it is possible that they will be utilized for controlling the city clock, thus giving Minneapolis the first radio municipal time. Improvements are planned for the station and more complete and powerful equipment will be installed this fall. The station is at present operated under a special license with call letters 9 Z. E., and will be devoted largely to experimental work.

The Minnesota Wireless Association is in its fifth year. Meetings are held every two weeks in the mayor's reception room of the City Building.

ALADDIN IS OUTSHONE BY MAGIC OF WIRELESS SPARK

By JACK BECHDOLT

In the Seattle Post-Intelligencer.

Life's lesson is here with its fascination,
In this wireless thing that since creation
Has been laid away in nature's store,
Awaiting for someone to open the door.

And when we hear our big spark thunder,
Sending our signals away off yonder,
With the very speed of the wings of light,
Through rain or shine or darkest night.

Or when we hear our ear phones rapping
And answering signal comes clear and snapping,
We can't comprehend the wonder—the why,
Of this thing harnessed 'twixt earth and sky.

—CHARLES B. COOPER.

CHIEF Operator Cooper says that static has interfered somewhat with the meter. Possibly it has, but the idea of his verse is in tune with the spirit of wireless, one of the most thrilling mysteries of our day.

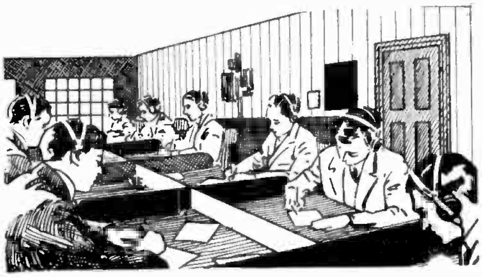
It is strange that we are so slow to recognize the romance of our own times. The troubadour in quest of adventure would lead a life as spiritless as that of a garbage wagon driver compared to the lot of the adventurous youth of to-day who puts in three or four months preparing for a government examination, then slips grandly away to sea holding at his fingers' ends the power to chat comfortably across several thousand miles of lonely ocean, talking from strange, sweating foreign ports with the familiar home office, listening in hours, when the man-made ship is a pitiful toy in the grip of the senseless giant of hurricane, to the comforting, familiar dull routine of ship's position reports or the recital of the day's news whispering down the gale which sings through the aerial.

At the bidding of boys fresh from the school room is a wizard more potent than any Aladdin conjured from his lamp. No magic carpet of old can eclipse the marvel of the enchanted spark that responds to the touch of a youth already half contemptuous through familiarity. It is not that we haven't enough romance in this day—rather we have a surfeit of it.

About thirteen years ago I was one of a crowd visiting the laboratories of the state university. A strange little key on one side of the room ticked off sparks which passed through the pushing visitors and registered upon a crude little receiver at the other wall. The little demonstration was one of the marvels of the day, a device based on the experiments of Marconi.

To-day a hundred young men report in and out of the local Marconi office as they come and go with the ships that ply west and north and south, and the records of their long distance communications have become so commonplace that they are no longer good news. Recently the Manchuria, out of San Francisco, spent four nights in mid-Pacific in communication with California and China, and during the entire voyage published the world's news fresh every morning in the daily paper as it was sent from one shore or the other. The spark has contracted this great ball of a world to the dimensions of a city block.

The young fellows are always the ones who have taken to the sea, but to-day the young American is more apt to go as guardian of the magic spark than before the mast. Federal laws requiring day and night service for the safety of passengers have opened a new profession for youth. Even before the new laws the steamship companies were finding the wireless a marvellous convenience, and even the old-time sailing ships,



The cub begins with a dummy key, learning the continental code

plowing along the lonely Alaskan shores as they take the cannery outfits North, carry the wireless and report daily to the home office in Seattle.

At the Y. M. C. A. is a school for young operators. There the cub begins with a dummy key, learning the continental code. When he has mastered this he graduates to real sending, with a wave so short it does not interfere with any professional communication. He hears lectures on the mechanics and theory of his strange trade, and he studies the standard text book prepared for the United States Naval Academy.

After the Federal examination and a certificate he is turned loose, ready for adventure. He is likely to find a berth on a tugboat to begin with and put in a month or so rolling off Cape Flattery. He may graduate to a fishing steamer or to a "second" on a liner, and so eventually through a first operator's job to a land station.

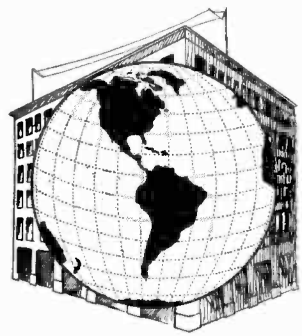
New as it is, the profession has a long history full of thrilling adventure. The young fellows who report in and out of the office in the Maritime building bring with them stories of strange ports both amusing and serious, and sometimes stories of "freaks" so uncanny as to defy belief.

Most decidedly it is a young man's job. Jack Irwin, superintendent of the local division, who was wireless operator with the ill-fated Wellman balloon expedition, has been at it but a few years. Chief Operator Cooper, who is a veteran, began wireless work twelve years ago in Canada. Its pioneers are scarcely at middle age and its heroes are apt to be the boys who last summer were graduating from short pants.

This North Pacific division alone has many traditions of heroism and quick thinking. For instance, there was Donald Perkins, lost on the State of California at Gambier Bay last summer. He relieved his assistant at the time the wreck wakened him and took the key, sending his S O S.

In the few brief moments the steamship floated he raised a land station. A lifeboat fell against his stateroom door and blocked it as the vessel listed. The assistant escaped, but Perkins stayed at the key.

There is George Hayes of the Olympia wreck. When that steamship piled up in a shrieking blizzard in Prince William Sound, balancing precariously on a reef, Hayes stayed at the key all night



The wireless has reduced this great ball of a world to the dimensions of a city block

and next day, talking with the land stations and sending to the passengers huddling terrified in the saloon below bulletins of good cheer as fast as they were relayed to him. As long as power lasted Hayes stayed on the job, despite cold and exposure.

W. R. Keller, of the Princess May, used his wits when that steamship climbed half way over a hidden reef and hung teetering. That was before the days of auxiliary power. Hayes scrambled down to the engine room, where the water came to his waist, and connected up the storage batteries for the call bells with a buzzer outfit in his wireless cabin. He made his call heard.

Another boy who probably has not yet forgotten his first job was operator on the fishing steamer Chicago. The Chicago piled onto an island in the Inside passage and listed so far over that the wireless aerial lay along the water.

The young operator could not stay in his cabin, but he climbed along the wall of the deck house as it listed far over and with a long stick reached through the window to his key. By some queer chance of wireless his call reached the Seattle station, then at the university grounds. It was heard at no other place. The message gave the steamer's name and plight, but no position. There were some anxious hours before the facts of the wreck were learned.

It is a marvelously romantic thing to have this genie of the wireless our servant of every day. but we have already forgotten the strangeness of it. The boys who serve the spark have ceased to wonder. They talk learnedly the lingo of their trade, a lingo full of terms unintelligible to any save the electrician, but of its mystery they say little. The miracle having been set to a serviceable occupation, they have ceased to find anything miraculous about it. Only the outsider can enjoy the romance.

WIRELESS AND WEATHER INFORMATION

The application of wireless telegraphy to the collection and distribution of information regarding the weather has received a further extension by the steps recently taken by the governor-general of Madagascar to warn mariners by means of wireless of the approach of cyclones. A service of wireless storm warnings has been organized by way of trial on the eastern, northwestern and western coasts of Madagascar. The telegram of alarm emanating from the observatory at Tananarivo will be issued during the whole duration of the probable passage of the cyclonic disturbance in the zone of action of the stations at every even hour (except between midnight and 6 A. M.) alternatively by the stations at Mayotte and of Majunga in case of a cyclone affecting the northwestern part of the island or on the Channel of Mozambique, and alternatively by the stations of Mayotte and of Diego in case of a cyclone affecting the northeastern and eastern parts of the island. The telegram of alarm will be preceded and followed by the warning — — — — . . . — — — — repeated at short intervals; this signal has been specially reserved for this purpose, and, should occasion arise, will indicate in itself, for want of more precise details, that there is a reason to fear the passage of a cyclone. The masters of vessels at sea, provided with wireless telegraphic installations, will be able to signal directly to the wireless telegraphic stations of the Colony of Madagascar any disturbance of cyclonic appearance which they may encounter, in order to extend as much as possible the range of this service of warning signals.

PROGRESS OF RESEARCH

The International Commission for Radio-Telegraphic Research, which was inaugurated at a meeting in Brussels in April last, has held a further meeting, at which its constitution has been adopted in definite form. W. Duddell is president; Professor Wien, vice-president; Dr. R. Goldschmidt, general secretary, and R. Braillard, assistant secretary.

A large number of technical matters were brought up at the meeting. Dr. Goldschmidt described the latest improvements at the Laeken station, and it was decided that a small high-frequency alternator be acquired. Reports were also read by Professor Schmidt (Halle) on observations by a barreter and galvanometer; by Mr. Vollmer and Professor Wien (Jena), Dr. Marchant (Liverpool), Mr. Lucas (Namur), and Mr. Wulf (Volkenburg), on photographic registration of signals.

Wireless and Two Marine Accidents

THE steam pilot boat New Jersey was sunk in a dense fog on the morning of July 10 at the eastern entrance to the Ambrose Channel, New York Bay, by the United Fruit steamer Manchioneal, bound for Kingston, Jamaica.

Captain Hendricksen of the Manchioneal held the nose of his vessel in the hole in the bow of the tug until her crew of eighteen men and sixteen pilots were taken off safely. The New Jersey sank three minutes after the steamer backed away and exactly ten minutes after the collision.

The Marconi operator on the New Jersey, E. J. Quimby, sent the S O S signal for aid, and it was picked up by H. Barbalate, Marconi operator at the Sea Gate Station, and relayed to the Morgan Line steamer El Sud, inbound. Daniel Cawman, Marconi operator on El Sud, answered that she was hurrying to the rescue.

In the meantime the crew and the pilots had got away in their own boats and two boats from the Manchioneal and another from the United States dredger Raritan. The only persons injured were two pilots, Captain S. H. Cooper and Captain August S. Johnson, who received severe bruises.

Captain Eugene McCarthy, a pilot who had taken out the steamer Kelvinbank, said he had just got on board the New Jersey when the accident occurred.

"It was 8 o'clock," he said, "and the boat was stopped in a thick fog just inside the whistling buoy, near the eastern end of Ambrose Channel. Most of the pilots were on deck, trying to see through the fog what was coming our way. Suddenly the steamer Manchioneal struck the New Jersey on the starboard side just forward of the beam. There were sixteen pilots on board. Mate Hauffman was in charge, with a crew of seventeen.

"The two yawls were lowered at once from our boat, and the Manchioneal, which held her bow to the hole, lowered two of her lifeboats in shipshape without loss of time or confusion. There was no time to save any effects, and many of the pilots and members of the crew lost their clothing, money and jewelry when their boat sank almost under their feet."

A cable dispatch from Londonderry, Ireland, dated June 29, says:

Three hundred and forty-eight of the 1,106 passengers of the Anchor Line steamer California, ashore on Tory Island, were landed here to-day. The others were taken to Glasgow.

In a thick fog the California ran on the rocks last night, while bound from New York for Glasgow. According to the passengers, there was no panic when the liner struck. The sea was calm, and the vessel apparently was moving less than seven knots an hour. The shock was slight, but the sudden stoppage of the California caused some commotion. The captains and officers speedily restored confidence, and as a precautionary measure the boats were swung out. They were not lowered, however.

About 1 o'clock in the morning the searchlight of a British destroyer, summoned by wireless, penetrated the mist. The California had been left almost high and dry by the receding tide. At low tide the islanders were able to get close to the bow of the vessel.

The Donaldson Liner Cassandra, which followed the California throughout the voyage, but lost sight of her in the fog, came into view two hours after the destroyer. Other destroyers soon reached the scene. From daylight the work of transferring the passengers proceeded. For several hours lifeboats plied back and forth, and the passengers were hoisted to the deck of the Cassandra in baskets.

Something to Think About

We get everything we prepare for, and nothing else. Everything that happens is a sequence; this happened today because you did that yesterday.

❧ ❧ ❧ ❧

Take time when time is—for time will away.

❧ ❧ ❧ ❧

A journey of a thousand miles is begun with a step.

❧ ❧ ❧ ❧

Wisdom is better than weapons of war.

❧ ❧ ❧ ❧

It is our own fault if we are overwhelmed by the tasks or difficulties or sorrows of life.

❧ ❧ ❧ ❧

Nothing is so foolish or wretched as to anticipate misfortunes.

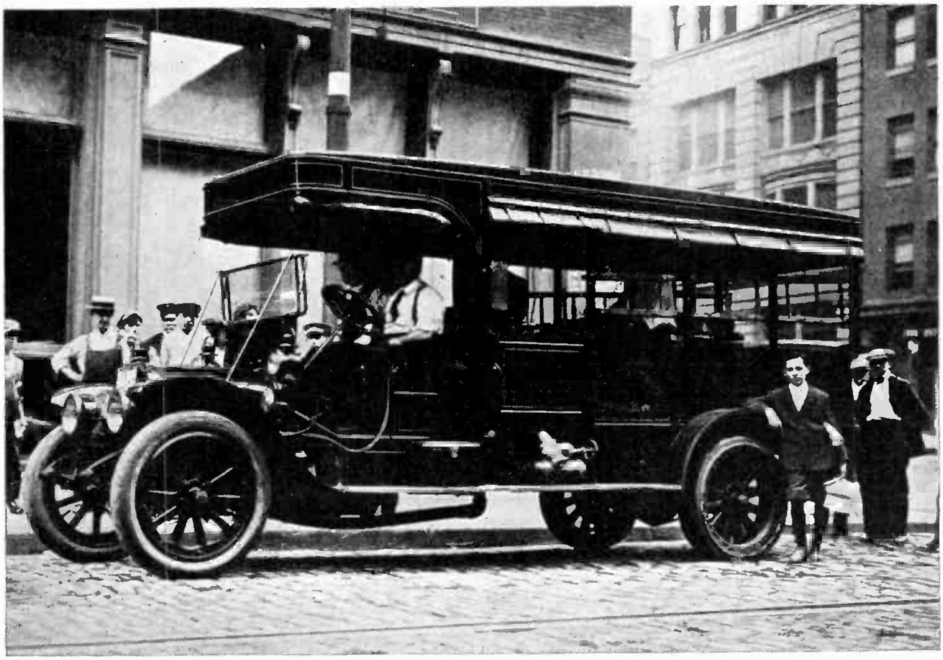
❧ ❧ ❧ ❧

Fear kills more than the physician.

❧ ❧ ❧ ❧

The wise and prudent conquer difficulties by daring to attempt them.

An Installation on an Automobile Truck



Baltimore city truck equipped with wireless

SOME very interesting experiments have been conducted in Baltimore, Md., with standard receiving apparatus installed on an automobile truck. The preliminary tests of the equipment installed by the Marconi Wireless Telegraph Company were made between the American Building wireless station and a truck used by the Electrical Commission for pumping water from manholes throughout the city.

Wireless signals were received by the truck equipment as far as seven miles in the suburbs, also while the car was running and standing at the manholes in the city limits. Then the truck was taken to the City Hall, where a demonstration was made, and later it was sent out according to routine equipped with the wireless outfit, in charge of wireless experts of the Marconi Company. It consists of a standard Marconi receiving apparatus, similar in detail to the equipment used on board merchant vessels. The receiving antenna consists of about 25 insulated wires hung in the roof of the car, directly under the cover.

The frame of the truck acts as the earth connection. The signals were plainly audible while the car was running on the streets. The experiment demonstrates the feasibility of installing wireless receiving equipments on automobiles in order that the business man can easily be in touch with his office while riding in his car.

On commercial trucks the system, as a means of saving time and wear and tear is obvious. The Fire Department is interested in the tests, as it is possible to equip engines and other apparatus with the receiving machines, and when sent out they could be instantly recalled, saving time and trouble, and increasing fire protection to the city.

How to Conduct a Radio Club

By E. E. Butcher

ARTICLE VII

THE writer of this series is frequently requested by amateur organizations to describe a simple method for the measurement of the inductance and capacity of an aerial, taking into consideration the limited amount of equipment at hand at the average amateur club. Such measurements may be easily made, but they necessitate the use of a wave-meter and a standard of inductance or capacity. A wave-meter may be readily assembled at the workshop of the club, but there is generally no means at hand for calibration.

It is therefore suggested that a wave-meter be constructed along the following lines and sent to the Bureau of Standards at Washington for calibration.

The variable condenser should be of the rotary plate type, having a 180° scale. It should have a maximum capacity of .004 mfds. The inductance coil may be made on a square wooden frame 4¾ inches by 4¾ inches. The frame is then wound closely with 15 or 16 turns of No. 18 D. S. C. wire, which may be coated afterwards with shellac or dipped in hot paraffin.

When this coil is connected to the terminals of the rotary condenser, the circuit will have a minimum wave-length

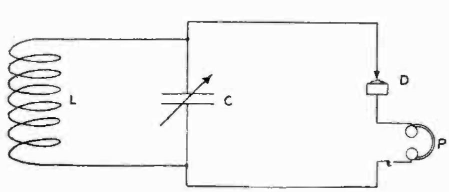


Fig. 1

of about 125 meters and a maximum wave-length of about 800 meters. The intermediate points of calibration will, of course, be determined at the Bureau of Standards.

Six points of calibration are quite sufficient, as a curve can be drawn, showing the intermediate values on the condenser scale, If it is desired to construct a wave-meter of greater range, a second coil, having three times the number of turns of the first coil, may be wound.

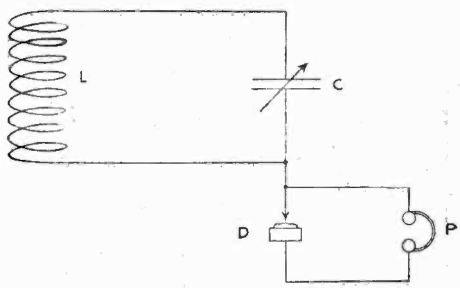


Fig. 2

Another set of wave-lengths will have to be determined for this coil.

When the coil and condenser have been completed, a detector may be mounted on the side of the variable condenser, also binding posts for connection to the head telephones. The connections shown in Fig. 1 should be used.

Determination of the Point of Resonance

For obtaining the point of resonance on the wave-meter, any of the following "hookups" may be employed:

In Fig. 1 the inductance coil is represented at L, the variable condenser of the wave-meter at C, a silicon or carborundum detector at D, and a pair of high resistance telephones at P. When the wave-meter is so connected and placed near to a transmitting set in operation, the capacity of the variable condenser is altered until a maximum of sound is heard in the telephones. This is the point of resonance and by reference to the chart, the wave-length of the circuit under measurement is obtained.

The crystal and head phones need not necessarily be placed across the condenser, but may be connected unilaterally, as shown in Fig. 2. A crystal connected in this manner is not so apt to affect the constants of the wave-meter itself.

If more visible indicating means are desired, a 2 or 4-volt straight filament battery lamp may be connected in series with the inductance and capacity, as shown in Fig. 3.

This method is generally used when taking readings of the spark gap circuit.

If a neon or carbon dioxide tube, N, is available, it may be connected in shunt to the variable condenser, as shown in Fig. 4, or may be hooked to the circuit unilaterally, as per Fig. 5. The point of resonance is easily determined by the maximum glow of the tube and particularly sharp readings are secured with the connection shown in Fig. 5.

Measurement of the Capacity of the Aerial

In measuring the capacity of an aerial, in addition to a wave-meter, a high voltage leyden jar of known capacity must be secured. If a standard navy leyden jar can be obtained, it will serve the purpose admirably, as all are coated to that height, which will give capacity of .002 mfds.; the capacity of the jar, however, is preferably of .001 mfds., and therefore two of these should be placed in series.

With the known condenser at hand, the capacity of the aerial is obtained by two measurements.

The spark gap, S, is connected to the secondary terminals of an induction coil. With the spark discharging across the gap, the wave-meter (with crystal and

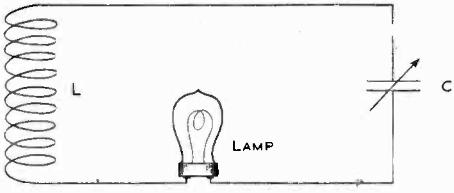


Fig. 3

head telephones, as per Fig. 6) is brought in inductive relation to the aerial and is preferably placed near to the earth lead. The capacity of the condenser is then altered until a point of maximum intensity of signals is found. This wave-length reading is known as the natural wave-length of the aerial which we will designate by W_1.

The known condenser, K_1, is then placed in series with the aerial as in Fig. 7. The spark gap is energized and a second wave-length reading taken, which we may call W_2. Obviously W_2 will be of smaller value than W_1.

After these two readings have been

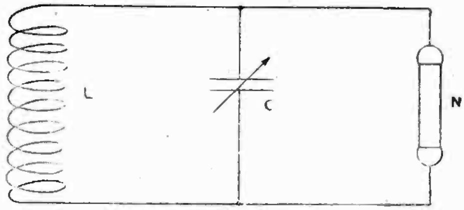


Fig. 4

taken, we may substitute their values in the following formula:

$$K = \frac{W_1^2 - W_2^2}{W_2^2} \times K_1 \quad \text{(No. 1)}$$

where

K = capacity of the aerial in mfds.

W_1^2 = square of the natural wave-length.

W_2^2 = square of the wave-length of the aerial with K in series.

K_1 = condenser of known capacity.

When the value of capacity is thus obtained, the value of inductance of the aerial may be calculated by the use of the following formula:

$$L = \frac{W_1^2}{3552 \times K} \quad \text{(No. 2)}$$

where

L = inductance of the aerial in centimeters.

W_1^2 = square of the natural wave-length of the aerial.

K = capacity of the aerial in micro-farads as determined in the first reading.

The value of L may be converted from centimeters to micro-henries by dividing by 1,000.

The values of inductance and capacity after determination may be checked up by the following formula:

$$W_1 = 59.6 \sqrt{L K}. \quad \text{(No. 3)}$$

where

W_1 = natural wave-length as previously measured.

L = inductance of the aerial system.
K = capacity of the aerial system.

Reduction of Wave-Length by a Series Condenser

Suppose, then, it is desired to determine what value of capacity in a series condenser is required to reduce the wave-length of the aerial to a definite amount. Having already determined the capacity and inductance of the present aerial in micro-farads, we may make use of the following formula:

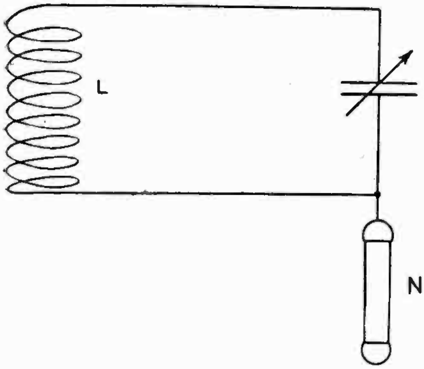


Fig. 5

$$K_3 = \frac{W_3^2 \times K}{3552\,LK - W_3^2} \quad \text{(No. 4)}$$

where

K_3 = the capacity of the series condenser required to reduce to a certain wave-length.
L = inductance in cms. of present aerial.
K = capacity in mfds. of present aerial.
W_3^2 = square of the new wave-length desired.

It is thus seen that a number of measurements of exceedingly useful value may be made in a simple manner.

Suppose it is desired to determine the value of inductance (1) necessary to raise an aerial of given wave-length to a new value; then letting

L = value of inductance of the present aerial determined as in No. 2 in cms.
W_1 = wave-length corresponding to this value of inductance.
W_3 = new wave-length desired.
1 = value of inductance to be inserted to obtain W_3.

then

$$1 = \frac{W_3^2 - W_1^2}{W_1^2} \times L \quad \text{(No. 5)}$$

W_1 being obtained from the wave-meter by excitation of the aerial with a spark gap in series.

The effective inductance of an aerial

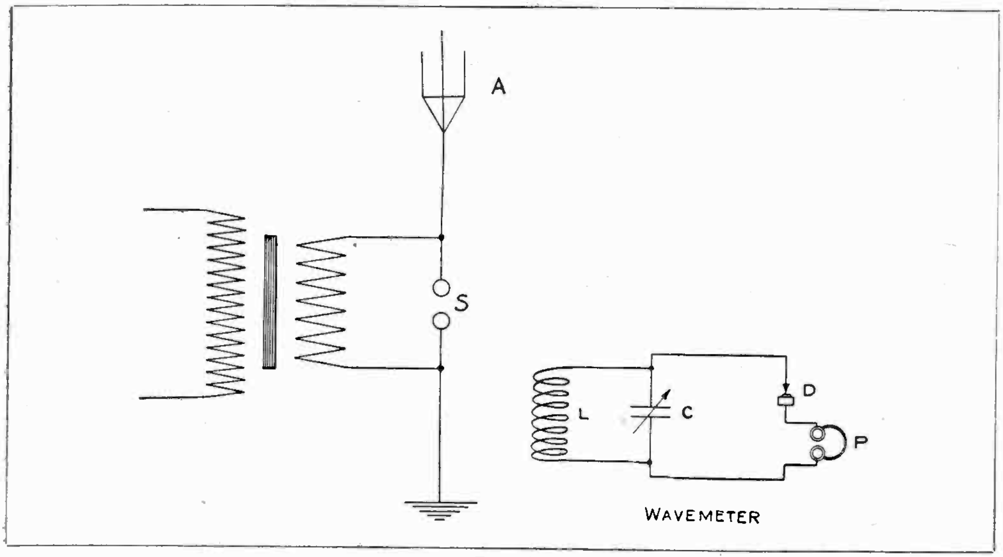


Fig. 6

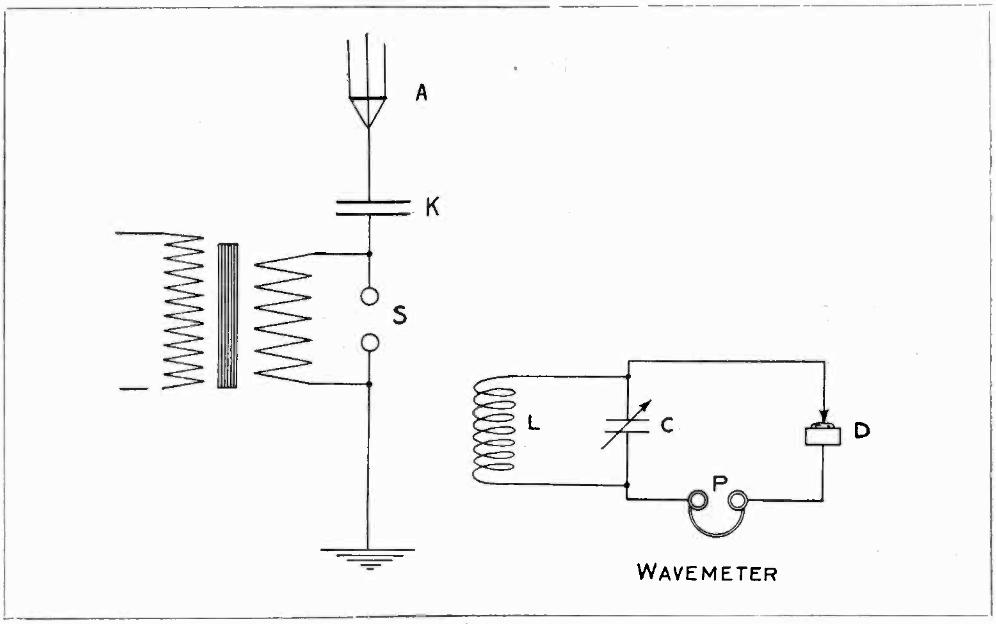


Fig. 7

may also be determined by the insertion of an inductance of known value in series with the aerial. The method is similar to that employed when obtaining the value of capacity by the insertion of a known condenser.

The natural wave-length having been obtained, as shown in Fig. 6, an inductance of known value 1 is inserted in series with the aerial, as in Fig. 8, and a new reading of wave-length is obtained which we may call W_3.

We may then substitute these values in the following formula:

$$L = \frac{W_1^2 \, 1}{W_3^2 - W_1^2} \qquad \text{(No. 6)}$$

where

L = inductance of aerial in cms.

W_1 = natural wave-length of the aerial.

W_3 = wave-length of the aerial with the known inductance 1 in series.

1 = inductance of known value.

For amateur use a standard of inductance may be made in the following manner:

A mandrel of glass or wood 5 inches in diameter is wound closely with 12 turns of No. 10 D. B. R. C. stranded wire. At a wave-length of 400 meters corresponding to a frequency of 750,000 cycles the inductance value was approximately 15,000 cms. or 15 micro-henries. This standard may be effectively employed in measuring the inductance of an aerial by the method described and is sufficiently accurate for amateur use.

A standard of capacity cannot be readily constructed on account of the variation in the dielectric constant of various grades of glass, but if the value is known the following formula may be employed:

$$C = \frac{K \, A \, 2248}{t \times 10^{10}} \qquad \text{(No. 7)}$$

where

A = area of dielectric in use.

T = thickness of dielectric in inches.

and

K = dielectric constant.

C = capacity in micro-farads.

The value of K varies from 6 to 9.

Operation of the Wavemeter

Many experimenters, when using a wave-meter do not take into consideration that, if the meter is placed too near to the circuit to be measured, the crystal requires periodical readjustment, owing to the strength of the oscillations. This is particularly so when the sensitive

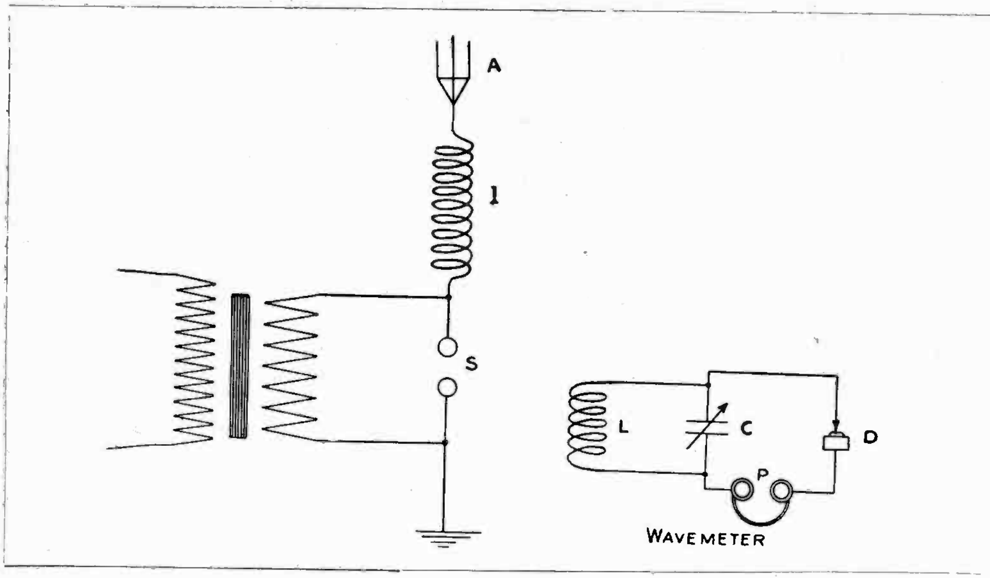


Fig. 8

crystals, such as galena or silicon, are employed.

The same precaution applies to the use of the small battery lamp as an indicator. If the wave-meter is placed too near to the spark circuit, the oscillations may be of such strength as to burn out the filament or puncture the insulation of the coil of inductance. Several trial readings are required, making sure that the coil is placed so that it is properly acted upon by the magnetic fields of the high frequency circuit.

When a crystal, connected unilaterally to the circuit, is employed for determining the point of resonance, the wave-meter must invariably be placed nearer to the circuit than when connected in the regular manner (Fig. 1). If so the inductance coil should be placed near to the earth lead.

Owing to the fact that greater radiation takes place from the open circuit than from the closed circuit, the wave-meter may be placed at a greater distance, when making the first measurement, than when making measurements of the closed circuit.

Calibration of a Wavemeter

If a calibrated wave-meter can be procured, the wave-meter described at the beginning of this article may be calibrated from it in a simple manner as per Fig. 9. In the diagram L and C are respectively the inductance coil and condenser of a standard wave-meter, which is set into excitation by the buzzer, H, and batteries, B. The windings of the magnets of the buzzer are shunted by the condenser, K, of about 1 microfarad capacity. A non-inductive resistance of about 100 ohms may be substituted for K.

When the buzzer is set into operation, the wave-meter, L C, becomes a miniature transmitting set, emitting waves of a definite frequency, which will be recorded on the wave-meter, $L^1 C^1$, when it is in resonance with L C.

The standard wave-meter, L C, is then set at various wave-lengths and the buzzer set in operation, being carefully adjusted for a clear tone. The capacity of condenser, C^1, is then altered until a maximum of sound is heard in the head telephones. Obviously $L^1 C^1$ has the same wave-length as L C and a record of the setting is made accordingly. Thus if six or eight readings are taken, covering the entire scale of C^1, points may be located on cross section paper and a curve drawn. Intermediate values of wave-length are readily determined from the curve.

For accuracy during calibration, the degree of coupling between L and L^1 must be kept as low as is consistent with the strength of signals. If response is

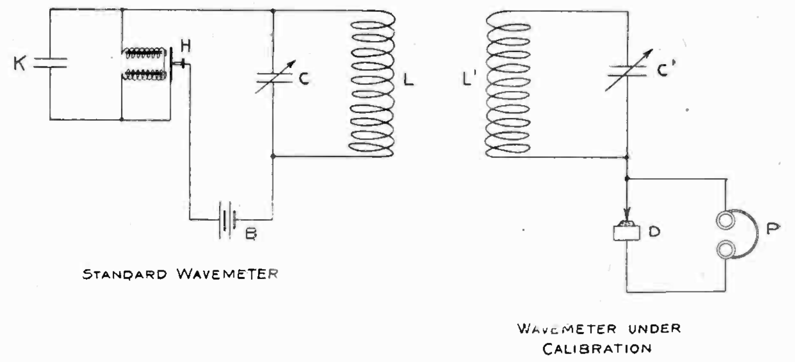


Fig. 9

not readily secured at the wave-meter, $L^1 C^1$, it may be that the values of inductance and capacity are such as to be out of resonance with the standard wave-meter, L C. If so, different values of inductance or capacity must be selected until a resonant response is secured.

The crystal rectifier need not necessarily be connected unilaterally to the wave-meter, but may be employed as indicated in the diagram (Fig. 1).

(To be continued)

BOMBAY WELL EQUIPPED.

Bombay, like all the principal ports in the world, is now fully served with wireless telegraphy equipment to meet present requirements, and this has been demonstrated in the work that has been carried out at the new wireless station on Butcher Island. When wireless facilities were first given to Bombay it was in the form of a low-power station at Back Bay, and as the apparatus had a radius of only 200 miles the value of the station was not sufficient to induce a great deal of business. If a steamer approaching Bombay, for instance, wished to communicate with the station this could only be done when the vessel was within a comparatively few hours of land, but with the new station on Butcher Island a message can be sent to Bombay by a passenger on a steamer when she is almost two days' journey from Bombay. A little over 600 miles is the furthest distance at which Butcher Island has been able to "pick up" a steamer, but at Karachi there is also a wireless station with a radius of 600 miles, and as a steamer coming from home to Bombay enters the zone of the Karachi waves first, time may be gained by sending Bombay messages through Karachi.

All these improved conditions have tended to increase the volume of wireless business transacted at Bombay, and at the present time an average of thirty inward and outward messages are dealt with per day. The principal source of business comes from passengers on the passenger steamers travelling to and from Bombay, and business usually reaches its most brisk stage when a home steamer is in touch by wireless. Although the Butcher Island station is further away from the point of receiving and despatching messages—the Bombay Telegraph Office—than the old station at Back Bay was, no appreciable time is lost in dealing with messages, as the station and the Bombay office are connected by cable. The Butcher Island Station is under the control of the Indian Telegraph Department, but the officers stationed there are military officials.

Advice From Amateurs

R. FERRIS, of Michigan, writes:

I have occasionally noticed queries from amateurs in respect to construction of flat plate glass condensers, which would indicate that trouble is often encountered. The following advice was taken from Stanley Curtis' article, "High Frequency Resonators," in the Electrician and Mechanic for July, 1911:

To coat the plates, place them in an oven and heat for five minutes; remove them and rub the surface with beeswax. The tinfoil should have rounded corners, and just before it is spread over the surface of the glass, a piece of copper or brass ribbon should be slipped underneath, making a lug for connections. Spread the tinfoil on the other side in the same manner, and when completed paint the edges with hot beeswax. Beeswax is far superior to shellac because it does not blister like shellac.

I have tried this method and can heartily recommend it, having constructed all my plates in this manner. I have never experienced failure with a single plate.

* * *

F. C. Beekley, of Pennsylvania, says:

A good many amateurs use photographic plates 8 by 10 inches, for single condensers, but experience difficulty in removing the film from the plate. Here is a process that works to perfection: Make up two solutions as follows: No. 1, sodium fluroide, ¼ ounce; water, 16 ounces; No. 2, sulphuric acid, ¼ ounce, water, 16 ounces.

Place the plate in solution No. 1 for about two minutes, then change to No. 2. The film should then slip off in about three minutes. It should not be necessary to scratch the film off.

Should the amateur wish to construct copper-plated condensers, he may do so in the following manner:

Have the glass plates silvered by some firm who make mirrors. Then copper plate on this, using the ordinary copper plate sulphate solution. This makes a highly conductive surface very close to the glass and is not likely to blister.

Black shellac will make your instruments look like a hard rubber finish. It may be prepared in the following manner: Use one package of black Diamond Dye to a ½ pint of orange shellac. If this does not give the desired lustre, put on a final coat of regular orange shellac.

* * *

Page Hazleton, of New Hampshire, writes:

Amateurs usually desire an aerial of the greatest possible height, and to obtain a light weight antenna of sufficient height for use with portable sets presents a problem difficult of solution. To fulfill this want, the writer constructed a kite such as is described in Volume 4, Part 4, of the Mount Weather Observatory Bulletin. This publication, which describes several good types of kites, may be obtained from the Superintendent of Documents, Washington, D. C., for 25c.

The kite was flown with No. 22 steel wire, which of course also acted as an aerial. The wire offered considerable resistance, but notwithstanding the aerial was found to be very efficient for receiving. All attempts at using copper wire for the aerial were found to be useless, for the wire was either too light to stand the strain or if heavy enough required several kites in tandem to raise it.

If the kite is very high, even on clear days, a Geissler tube will glow brightly when held on the wire, and unlooked for shocks may be felt. Therefore it would be well to have some sort of protective device for the receiving set.

Using this type of an aerial, I have heard all wireless stations of high and low power, between Key West and Glace Bay, besides several others using long wave-lengths whose location I have so far been unable to determine.

* * *

Orrin E. Dunlap, of New York, writes:

I notice in the May issue in E. A. M. Jr.'s query, you state that the stations VBG and VBF are not listed. VBG is the Marconi station at Toronto, Canada, and VBF is the Marconi station at Fort Burwell, Ont., Canada.

* * *

H. M. Umburger, of Michigan, says:

I find the discussions I often hear as to the sensitiveness of the various forms of receiving detectors amusing in the extreme. Personally, I have never seen the piece of galena or, for that matter any other crystal, that could approach the audion in sensitiveness. I would wager almost anything that those who have contrary views did not use the audion properly. The first night I used the audion (at home) I heard more stations in one minute than I had picked up with galena in three weeks. The tuning effect that can be accomplished by a variation of the voltage in the telephone circuit is remarkable.

COLORADO AMATEURS ORGANIZING A LEAGUE

A Mesa County (Col.) Wireless League, with stations at various points, as well as a central station in Grand Junction, is the latest plans of the wireless enthusiasts who are organizing the club in that city. Secretary Cox of the Y. M. C. A. has received numerous requests for further information. Wireless enthusiasts have sprung up from many places, and the plans for the club are being rapidly formed.

From and For those who help themselves

Experimenters' Experiences

FIRST PRIZE, TEN DOLLARS

A Spark Gap Possessing Several Advantages

This is a description of type of spark gap which I believe to be of novel construction. It possesses several advantages, such as freedom from noise and airtightness; it gives quenched effects and, owing to the extreme lightness of the moving parts, allows quick starting and stopping with a very small motor. Referring to the diagram, Fig. 1, the rotating wheel is 7 inches in diameter and shaped somewhat after an 8-pointed star. It is cut from 1/16-inch aluminum and mounted on a 3-inch fibre insulating hub as shown. The wheel may be cut with ordinary tin shears and bored with a hand drill. It is then placed between flat slabs or boards under pressure, which should flatten out the aluminum, giving a true wheel.

The casing for enclosing the wheel should also be turned from fibre, although hard wood may be used at less expense if care is taken in the cutting, with the additional precaution of making the walls somewhat thicker. The inside diameter of this drum is 8 inches and the depth ¾ inch; the walls may be from ¼ inch to ½ inch. The cover is turned from ¼-inch fibre and screwed on tightly, making the casing airtight. If the hole for the motor shaft is made an easy fit and all work well done, the shaft will run in the centre of the hole without contact or vibration. The cas-

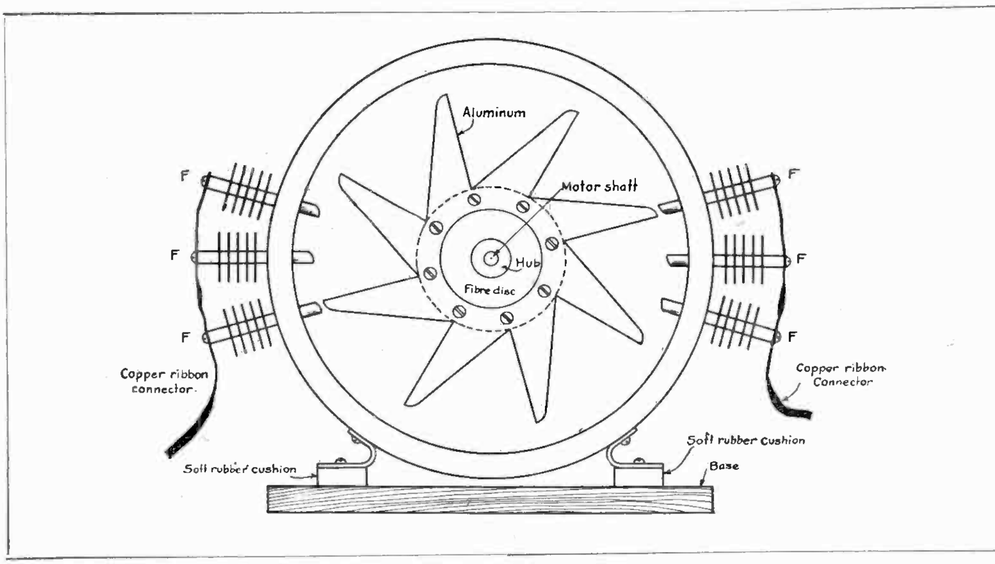
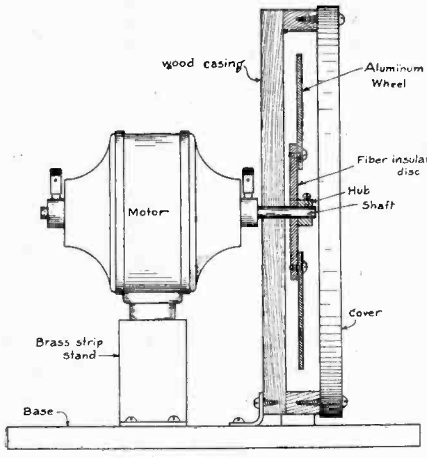


Fig. 1, First Prize Article

ing may be mounted as shown with brass angle pieces or in any convenient manner.

The fixed electrodes F are turned from brass and are supplied with cooling fins. They are made from 3/8-inch



Side View, showing gap in cross-section

Fig. 2, First Prize Article

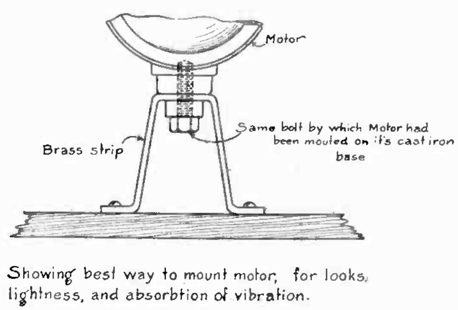
shanks with the outer ends tapped with an 8/32-inch thread to take a screw which is used to clamp the connecting ribbons from the condenser and inductance. The 3-pair arrangement of electrodes as shown, properly spaced, gives much better cooling than that afforded by the usual construction, for each electrode gets only every third spark during rotation. This gives, with an 8-tooth wheel, 24 sparks per revolution, producing a high tone with a low speed, whereas the ordinary gap would require a 24-tooth disc, a heavier wheel or as an alternative a small wheel and an extremely fast motor. My arrangement allows quick starting, which is further facilitated by using a 2-point switch in the motor circuit; that is to say, full power is thrown on the motor for quick acceleration, and when the switch is placed on the second point, a resistance coil is cut into the circuit.

The wheel should be carefully balanced on the hub before final mounting, shaving off the material on the heavy side. The motor I use is a high speed series Universal motor, which may be purchased at a cost of $5.00.

The speed regulator is made by winding No. 30 bare German silver wire on a 1-inch porcelain tube 10 inches in length. The wire may be easily spaced by winding two wires closely side by side, then fastening one and unwinding the other. The tube thus wound is suitably mounted and a slider attached to it, after the same manner employed in connection with tuning coils. If a very high voltage (15,000 or 20,000) is used, two or three plates of the ordinary quenched spark gap type should be used in series with the rotary, or if this is not done, the wheel may be made larger or two pairs of fixed electrodes may be used with a higher speed. The latter is probably advisable because in order to secure a good tone on any rotary gap, the electrodes must be set very close and the spark must not be allowed to jump two electrodes at one time, as would happen if the wheel were too small.

Fig. 2 is a side elevation of the gap, showing the mounting of the motor and the disc to the shaft. Fig. 3 is a detailed diagram of the base and the method of mounting the motor.

In regard to spark tones, it is my opinion that a low resonant tone is as pleasant as a high whistle, but I note



Showing best way to mount motor, for looks, lightness, and absorbtion of vibration.

Fig. 3, First Prize Article

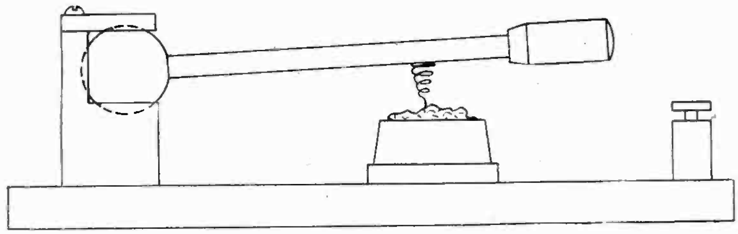
that the condenser capacity should be of small value if quenched effects are desired. I believe this gap will be a welcome relief to amateurs from the noise of the open rotary gap and from the ponderous flywheel type having a rotary disc with brass plugs.

D. F. Stetson, Minnesota.

SECOND PRIZE, FIVE DOLLARS

A Detector of Simple Construction and Great Stability

After reading the many articles on the construction of galena and silicon



Diagram, Second Prize Article

detectors in various publications, I thought it advisable to offer a description of a design (accompanied by a drawing) which has fully proven itself of value for use at any commercial station and at present is employed on the 2 K.W. radio tractors (auto trucks) of the United States Signal Corps. As to stability, it is all that can be desired. In a certain test which I witnessed, the detector was shunted by a 5 Mfd. condenser while the transmitting set was in operation, and I was surprised to note that it did not lose its adjustment in the smallest degree when the 2 K.W. transmitter was operated not more than one foot from it. Incidentally, when the generator and engine was started, the entire auto shook so that the spring contact of the detector vigrated violently; still the detector did not lose its adjustment. This, I believe, is a more severe test than it will receive in the average amateur station.

The upright consists of a piece of ½-inch square brass rod filed out as shown, the figure being to scale. A piece of 1/16-inch brass, ½-inch square is then cut and fastened with screws as shown. A ½-inch brass ball is next drilled and tapped for 8/32-inch thread and a piece of No. 8 brass wire 1¾ inches long is threaded at both ends for 8/32-inch thread. One end is placed in the ball and the other end has a hard rubber knob fastened to it.. The spring consists of about three inches of No. 28 silver wire coiled in three widely separated coils as shown. The projections into the brass rod for the ball to fit into are made with a 5/16-inch drill.

The upper part should clamp the ball fairly tight so that the spring will remain in any position it is placed, at the same time allowing a wide range of adjustment. The cup is one inch in diameter and fastened so it can be revolved. In it are mounted crystals of silicon and galena.

MORTON W. STERNS, Pennsylvania.

THIRD PRIZE, SEPTEMBER, THREE DOLLARS

A "Loose Coupler" of New Design

Of late I have seen described in THE WIRELESS AGE many types of inductively coupled receiving transformers, but none, I believe, are as easily constructed or are more efficient than the one I am about to describe. My design has two distinct advantages over the general type of this tuner: first, it takes up less space (a matter of importance in cabinet sets); second, it takes less time to operate the secondary switch and coupling.

If the cabinet is made of hardwood, say, quartered oak or mahogany, and is fitted with hard rubber knobs, scale and slider, it makes an instrument of beautiful appearance. The general idea of design of the cabinet and the instrument itself is shown in Fig. 1. It will be observed that the primary winding is similar to that employed in any tuner, while the secondary winding is made on a thin, narrow, circular disc placed inside the primary winding and so mounted that it can be readily turned at right angles to the primary or at any angle as desired.

The essential dimensions of the cabinet are shown in Fig. 1. The cut-out piece in the top for the primary slider is easily made. The two pieces of wood for the top should have dimensions of 2½ inches by 8¾ inches, and so placed that a space ¾ inch in width is left in the middle. The overhang should be to it at each side ⅛ inch away and have it pass completely around the core. At any point on the centre line drill a hole of sufficient size to allow a piece of 3/16-inch tubing to turn easily in it. Beginning ½ inch from the ends of the core, start the winding of the primary coil. On reaching the first line ⅛ inch from the center, bring the wire across to the other coil in such a manner that it does not cross the hole. Then continue the winding to within ½ inch of the other end.

The secondary coil is wound with No. 30 D.C.C. wire on a disc ⅜ inch in diam-

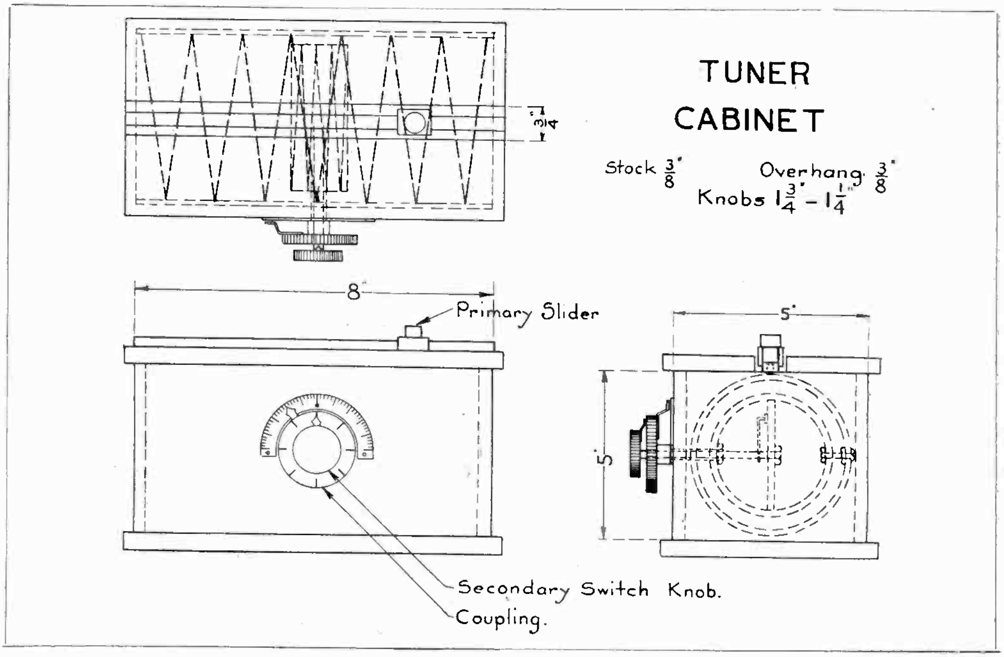


Fig. 1, Third Prize Article

⅜ inch on all sides. Blocks ¾ inch by ¾ inch should be fastened in the ends of the cut, making sure that the ends of the blocks set flush with the ends of the top, so that they have the appearance of being a part of the same piece. As the rod for the slider is fastened down on the blocks, the joint is not very noticeable. The primary is wound with No. 24 D.C.C. wire on a core 4 inches outside diameter, 3/16 inch in thickness and just long enough to fit tightly inside the cabinet (about 7¼ inches). Next find the centre of the core and draw a line complete around it. Draw a line parallel eter, 3/16 inch in thickness and 1¼ inches in width. The circular disc is mounted inside of this core and the switch points for the secondary taps are placed on it. Grooves are cut in the opposite side of the core of sufficient size to allow the disc to slip into its correct position. A little glue will hold it in position, but it should not be fastened until the secondary winding is made. This disc is preferable made of hard rubber ⅛ inch in thickness and should have a diameter of ⅛ inch more than the inside of the secondary core.

The size of the circle in which the

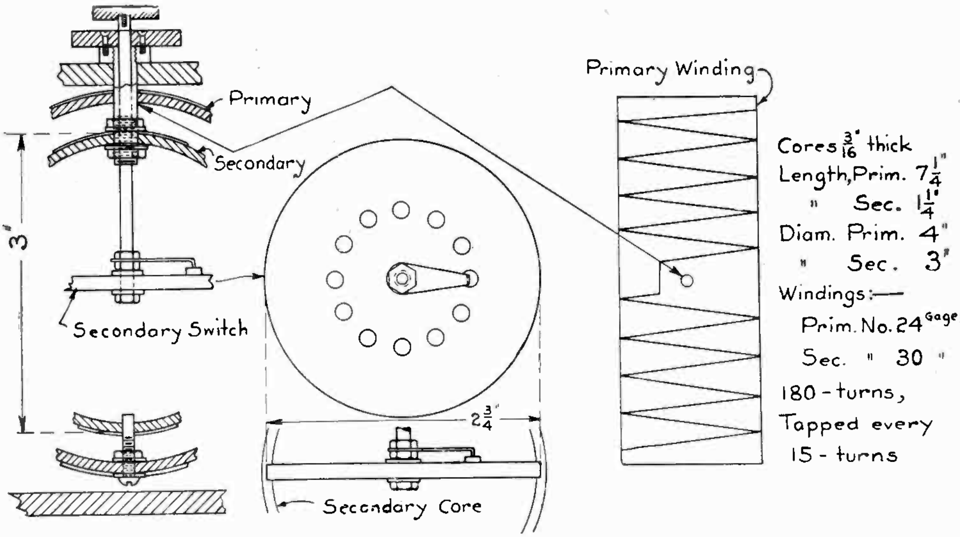


Fig. 2, Third Prize Article

taps of the secondary winding are placed will depend on the size of the heads of the switch point and consequently the dimensions of the lever will have to be left to the maker's discretion. A point should then be found on the circumference of the core half-way between the two grooves and a hole drilled just large enough to fit a 3/16-inch rod. The rod is then cut off to the length of 2⅜ inches and the end glued in the hole. A bolt is placed directly opposite this as shown in Fig. 2. This forms the other bearing for the secondary winding. A piece of ⅛-inch brass rod is then fastened to the smaller knob, placed through the rubber tubing and fastened, as shown, to the hard rubber secondary switch. The secondary leads should be of flexible wire and brought to two binding posts on the right hand end of the cabinet. The primary binding posts should be placed on the left hand. To complete the equipment, screw down the top and attach the primary slider.

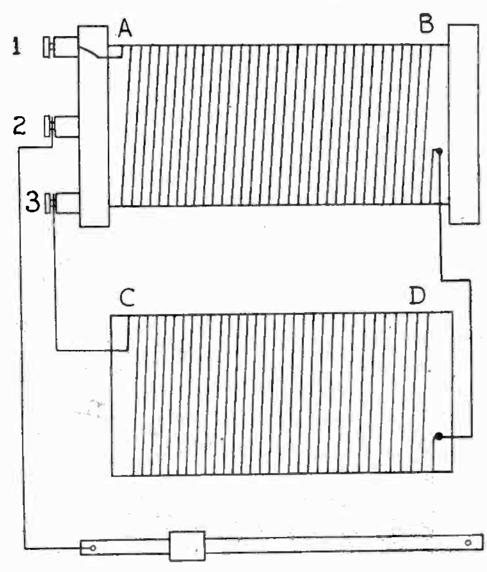
ALEX. COCHRAN, New York.

NOTE.—We see only one objection to this design. The secondary winding being placed in the center of the coil, it is possible that for certain wave-lengths the values of inductance in use for the primary would be small and the turns would be widely separated from the secondary windings, producing little or no effect. We therefore believe that the secondary winding should be placed on one end of the coil so that it is in the magnetic field of the primary turns, regardless of the number of turns in use in the primary winding. We are aware, however, that this would spoil the neatness of the design.—*Technical Editor.*

FOURTH PRIZE, SUBSCRIPTION TO THE WIRELESS AGE

A Novel Non-Inductive Potentiometer

This is a description (with sketches) of a non-inductive potentiometer which I have constructed and which I believe is of novel design. The completely assem-



Slider and Rod

Fig. 1, Fourth Prize Article

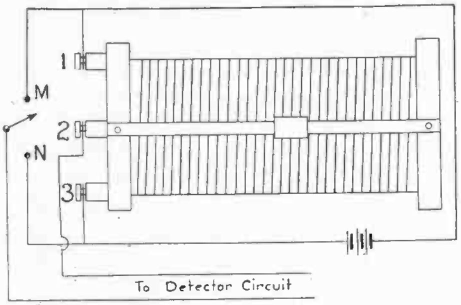
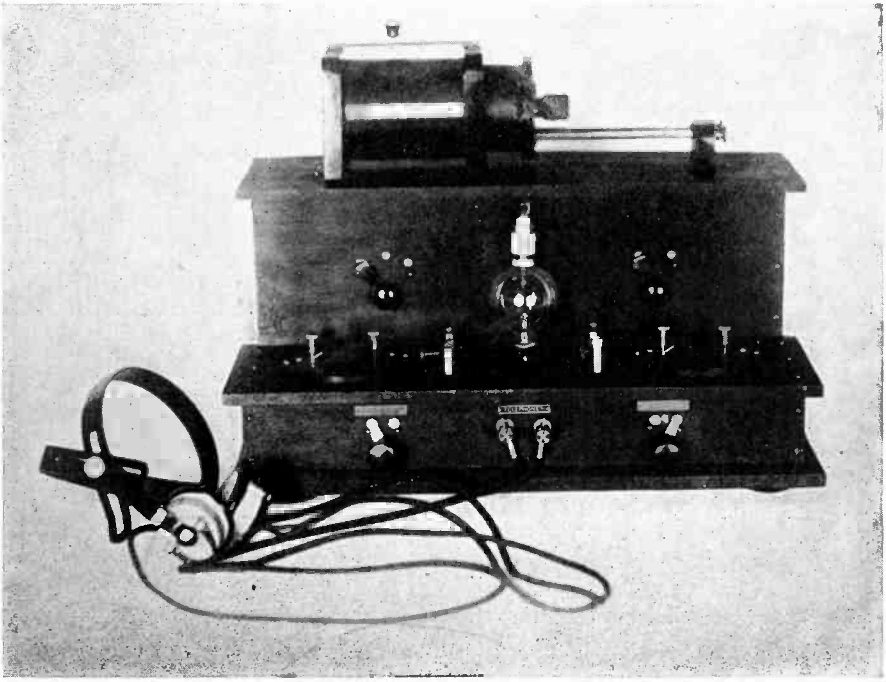


Fig. 2. Fourth Prize Article

bled instrument is shown in Fig. 2 and its schematic drawing in Fig. 1. The potentiometer consists of two windings, namely, AB and CD. CD is wound in the opposite direction to AB and is placed directly over the slider shown in Fig. 2, which makes contact with the coil, CD. The construction of this potentiometer requires a sixth of a pound of No. 30 bare German silver wire. The coil, AB, should take about half of this wire and should have resistance of about 500 ohms. Coil AB should be covered with shellac or any insulating material at hand. The remainder of the wire is, of course, put on CD. The turns of bare wire may be conveniently separted by spacing the wire with thread during winding.

The slider, S, may be such as employed with any receiving tuner. I use in connection with this poteniometer a 2-point switch, MN. If the switch is only placed on point M, the energy in the detector circuit must pass through coil, AB, which is the under-winding, having a resistance of about 500 ohms. Then, by variation of the position of the slider in the top winding, the resistance value of the potentiometer may be progressively varied from 500 to 1,000 ohms. If the switch only is placed on point N, only the upper winding, CD, can be used; therefore by the use of the slider, any resistance value from zero to 500 ohms is obtained. The entire potentiometer, however, gives a range of resistance from zero to 1,000 ohms. It also makes a very neat and compact instrument, removing to a great extent inductive effects, which, I believe, is a very common fault with potentiometers constructed of German silver wire.

Arthur Kenison, Massachusetts.

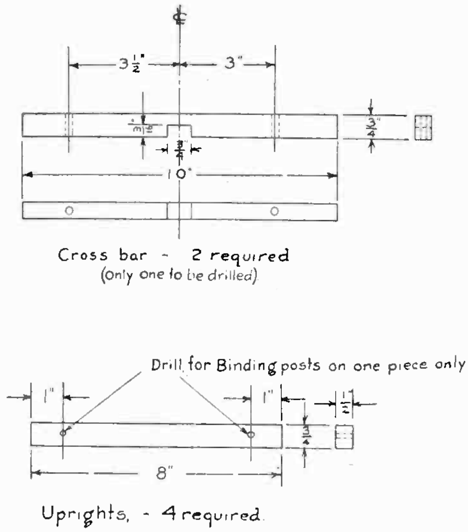


Photograph, Honorable Mention Article, Orrin E. Dunlap

HONORABLE MENTION

An Efficient Receiving Set

This article contains a description, accompanied by a photograph, of a com-



Honorable Mention Article, Roy Yates, Fig. 1

plete radio receiving equipment which I have designed and partly constructed. It has found great favor among the amateurs who have visited my station. I feel it would be well worth while to put it before other wireless enthusiasts and give them a chance to make a similar outfit, thereby deriving the benefit from a compact and efficient receiving set.

It has been possible under good conditions to hear NAX (Colon, Panama) and NAR (Key West, Fla.) and other distant stations on this set. Everything is well balanced and the connections are short and made of stranded wire, thereby decreasing the resistance.

The case is of ⅜-inch mahogany and measures 12 inches in width, 7 inches in height and 18 inches in length. The base is ½ inch, cut so as to extend ¼ inch. The top and sides are fastened with round head brass screws.

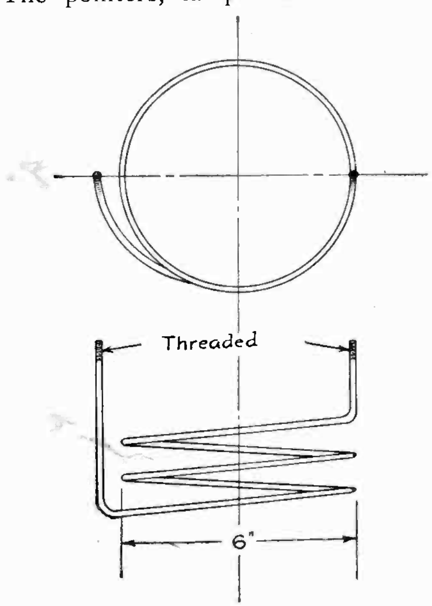
It will be necessary to buy or make a loose coupler. I prefer to purchase one, as it will be made correctly and, furthermore, I can then select a tuner suitable to my needs. When mounting on top of cabinet do not forget to bring through 1 connection from each end of primary, 1 from slider and 1 from the terminals of the secondary.

It is best to buy two 15 or 20 plate rotary variable condensers. Those used in this set are of the Clapp-Eastham type. The rheostat for the audion detector is the regular round battery type and is fastened on the back of the cabinet.

There are 2 switches: the one at the right of the bulb is in series with the bulb; the other connects with the flashlight cells which are located under the loose coupler in wood partitions.

Two holes are drilled on the lower front and in the middle for the telephone binding posts. The switch to the left of these binding posts throws either of the two galena detectors into use. When galena is used the telephones should be placed in the binding posts on the right side of the case.

All connections are made with silk covered stranded wire. This is easy to work with, as the insulation can be pushed back to make the connections. The pointers, lamp stand and binding



Honorable Mention Article, Roy Yates, Fig. 2

posts are all lacquered brass. The knobs are made of hard rubber.

This completes the description, and if followed out carefully (consulting drawing), there ought to be no trouble in

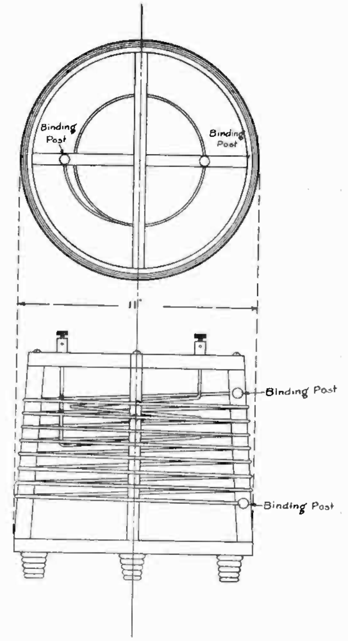


Fig. 3, Honorable Mention Article, Roy Yates

making it work and getting exceptional results.

Orrin E. Dunlap, Jr., New York.

HONORABLE MENTION

A New Oscillation Transformer Design

A properly constructed oscillation transformer is generally an instrument not to be found in many amateur stations. The following description tells of one the writer recently constructed. This transformer not only works efficiently, but has quite a "nifty" appearance. The pieces of wood needed are shown in Fig. 1. They are cut from ¾-inch quartered oak. The cutting may be done at the mill where the wood is bought for a few cents extra and a good job assured. Assemble the pieces as shown in the drawing, using 1½-inch brass screws. Next, sand paper well and dry the frame in an oven to expel all moisture. Apply a thin, even coat of a good grade of shellac and set away to dry. (In case of using varnish, be sure that it contains no mineral matter, as the instrument would be rendered almost useless. Shellac is preferable to varnish.)

Procure 25 feet of No. 6 and 5½ feet of No. 4 brass helix wire. Take the No. 6 wire and file the ends down. The ends are then threaded for the length of an inch with an 8/32 die. This is for attaching the binding posts. After the wire is wound on the frame the ends are put through the holes in the piece, B, in Fig. 1. The binding posts are then attached and screwed up until the wire on the frame is pulled fairly tight. Bend the No. 4 wire as shown in Fig. 2. The ends of this are also filed down and threaded the same as the No. 6. The wire is then attached to the frame as shown in Fig. 3. The ends are drawn through the holes in the cross piece and the binding posts attached. After placing three large insulators on the bottom you will have an instrument to be proud of.

Roy Francis Yates, New York.

Note.—We infer that the small coil is intended to be used as the primary winding (for the spark gap circuit), while the larger winding is connected in series with the aerial. We believe it desirable to boil the wood in hot paraffin as shellac is apt to retain a certain amount of moisture, causing leakage.—Technical Editor.

List of Officials

MARCONI WIRELESS TELEGRAPH COMPANY

OF AMERICA

NEW YORK

Woolworth Building, 233 Broadway

JOHN W. GRIGGS, *President*
EDWARD J. NALLY, *Vice-President and General Manager*
JOHN BOTTOMLEY, *Vice-President, Secretary and Treasurer*
FREDERICK M. SAMMIS, *Chief Engineer*
GEORGE S. DE SOUSA, *Traffic Manager*
DAVID SARNOFF, *Contract Manager*
JOHN YOUNG, *Auditor*
WILLIAM B. VANSIZE, *Patent Attorney*
G. HAROLD PORTER, *Purchasing Agent*
J. ANDREW WHITE, *Editor of Publications*

Operating Department - - - 29 Cliff Street

E. T. EDWARDS, *Superintendent Eastern Division*

SOUTHERN DIVISION—American Building, Baltimore. Md. C. J. Pannill, *Superintendent*
GULF DIVISION—Metairie Ridge Road, New Orleans, La. - A. Mowat, *Superintendent*
GREAT LAKES DIVISION—Schofield Building, Cleveland, Ohio. E. C. Newton, *Supt.*
PACIFIC COAST DIVISION—Merchants Exchange Building. A. H. Ginman, *Gen'l. Supt.*

Interesting Equipments

The steam yacht Wakiva, which has recently been equipped with a Marconi set, was put into service by her owner, H. S. Harkness, for the purpose of cruising in foreign waters to bring back some of his friends who had been stranded abroad when war was declared. It was decided not to begin the voyage until wireless had been installed on the vessel.

The San Silvestre was in Newport News for only thirty-six hours recently, but during that time she was equipped with Marconi wireless apparatus. Before she departed from England for this country arrangements were made with the English Marconi Company for the installation of a set on her arrival in the United States. The English company notified the American Marconi Company and the Southern Division was instructed to send men to Newport News to equip the vessel. She steamed out of Newport News as soon as the work had been completed.

The Gulflight, Gulfstream, Neches and Medina, which have been equipped with Marconi installations, are vessels in course of construction.

VESSELS EQUIPPED WITH MARCONI WIRELESS SINCE THE AUGUST ISSUE

NAME	OWNERS	CALL LETTERS
Louisiana	The Texas Company	KUL
Northtown	The Texas Company	KUN
Texas	The Texas Company	KUR
Northwestern	The Texas Company	KWO
Neches	Mallory Steamship Line	KEE
Medina	Mallory Steamship Line	KEE
Gulfstream	Gulf Refining Company	KTB
Gulflight	Gulf Refining Company	KUW
John D. Rockefeller	Standard Oil Company	KTO
Nantucket	Merchants & Miners Trans. Co.	KVN
Henry M. Flagler	Peninsula & Occidental SS. Co.	KOX
J. L. Luckenbach	Luckenbach Steamship Co.	KGT
Atlantic	Emery Steamship Line	KIR
San Silvestre	Eagle Oil Transport Company	MAK
Wakina	H. S. Harkness	KYI

GIFTS FOR WINTERBOTTOM AND KAST

William A. Winterbottom and Paul C. Kast, recently resigned from the service of the Commercial Cable Company at New York to enter that of the Marconi Telegraph-Cable Company, were handsomely remembered by their office associates. Mr. Winterbottom was presented with a fine traveling bag, and Mr. Kast received a silver-mounted pen suitably inscribed, and also a very handsome set of engrossed resolutions expressing regrets at his departure and good wishes for the future.

The article on the share market is omitted from this number of The Wireless Age because of the closing of the Stock Exchange, due to the European war.

HAWAII IN COMMUNICATION WITH CALIFORNIA

Announcement has been made at Honolulu by N. H. Slaughter, resident engineer for the Marconi Wireless Telegraph Company, that preliminary tests of the two great plants erected at Koko Head and Kahuku have been successful and that day and night communication with the Pacific coast has been established.

The station in Hawaii has succeeded in transmitting day and night messages, but owing to the non-completion of the California station full communication cannot yet be established. The California station is not ready to send. The delay in completing the California station is due to inability of the manufacturers to supply the immense amount of glass used in the condensers.

MARCONI KNIGHTED

A dispatch from London says: The King received Guglielmo Marconi at Buckingham Palace on August 24, and conferred upon him the honorary knighthood of the Grand Cross of the Royal Victorian Order. This is the newest order of knighthood, dating from 1896. It has five classes, of which the Grand Cross of the Victorian Order is the highest. The English members of this class take the title of "Sir," but honorary members are chiefly foreigners, and do not use the title.

"I received a telegram calling me to Buckingham Palace," said Mr. Marconi to a newspaper correspondent. "The King talked with me for twenty-five minutes on wireless telegraphy and all my latest discoveries and the application of them to the naval service. The King knew a very great deal on the subject. particularly about the use of wireless for naval purposes. As I was leaving his Majesty handed me the decoration of the Order. The King spoke very kindly to me about my work. I appreciate the honor all the more because his Majesty found time to confer it on me at this busy time in politics."

Mr. Marconi is the third Italian to receive this honor. The others are the Duke of the Abruzzi and the Marchese de San Guiliamo.

RECEIVING OFFICES FOR MARCONIGRAMS

The Marconi Wireless Telegraph Company of America has made arrangements whereby messages to Great Britain and Ireland, to be sent via its trans-oceanic service, will be accepted at the John Wanamaker stores in New York and Philadelphia as soon as the service is opened. The rate from New York will be seventeen cents a word, and from Philadelphia twenty cents. An announcement made by the Wanamaker store in New York is as follows:

"Marconi messages to friends and relatives on incoming ships will be accepted here for delivery at the official Marconi office here in the store—at the information bureau, main floor, old building. Trans-oceanic wireless messages to Great Britain and Ireland will soon be accepted here also. Deferred marconigrams, lettergrams and week-end lettergrams will be transmitted at considerable reductions below existing cable rates. To deliver marconigrams promptly it is essential that you furnish us at once with your registered cable address, which will be sent to the main Marconi office for filing. Those having charge accounts with us may have their Marconi messages charged on their regular monthly statement."

CANADIAN CO. EXPANDING

The Marconi Wireless Telegraph Company of Canada, Ltd., has found it necessary to increase its office accommodation, and the address of the company is now Room 507, Shaughnessy Building, 137 McGill street, Montreal.

The company's manufacturing business has also outgrown its accommodation, and new works have been acquired in Rodney street, comprising a three-story brick factory building, which will provide excellent accommodation for the staff.

WAR STOPPED VOYAGE

The proposed voyage of the Lundin power lifeboat across the Atlantic has been abandoned because it was feared that she would be mistaken for a submarine by craft of the warring European countries.

Marconi Men

The Gossip of the Divisions

Eastern Division

Harold Mack, recently returned from a trip on the British SS. El Cordobes, was assigned to the SS. Texas of the Texas Oil Company, which was equipped on August 1.

L. M. Burt, formerly second operator on the Sabine, was assigned to the Louisiana of the same company, equipped on August 1. C. M. Meyer, a school graduate, relieved Burt on the Sabine.

C. A. Biddinger, a school graduate, has been assigned to the El Valle of the South Pacific line.

John Lohmann and R. R. Squires have been assigned to the El Dia of the Southern Pacific line.

James Devenport has been assigned to the Desola as assistant to Operator Trautwein.

A. Bernhard and C. A. Werker of the Segurance have been transferred to the Algonquin. H. E. Ingalls and E. A. Arnold relieved them.

R. H. Poling and A. G. Berg were assigned to the Esperanza on August 6, when she went into commission again.

J. P. Eckhardt is relieving P. B. Lewis on the Radiant for one trip. Eckhardt has just recovered from a two months' siege of typhoid fever. He was formerly on the W. B. Keene.

J. C. Stewart of the Northland has been transferred to the Maracas. His place on the Northland has been taken by J. B. Harte, formerly of the Guiana.

H. B. Cowan of the Arapahoe has been transferred to the Maracaibo, being relieved by Operator C. L. Beach, formerly on the Maracas. E. A. Beane is second.

C. E. Burgess has relieved J. A. Worrall on the St. Paul.

P. Barkley has relieved F. J. Murphy on the Florizel.

B. P. Adams has been transferred from Belmar to Sagaponack.

N. D. Talbot has been assigned to the Admiral Dewey and I. L. Church to the Admiral Schley. These vessels sailed for the Pacific coast the early part of last week. They were equipped in the spring of the year and had been expected to leave daily since then.

F. S. Monschau, recently disembarked from the Orteric, to which he was assigned several months ago, has been temporarily assigned to the Jamestown, relieving Operator H. C. Tuttle, who is having trouble with his teeth.

F. J. Murphy is en route for Hayti on the Prinz Muaritz of the Royal Dutch West India Mail.

E. B. Hayward of the Marconi School, has been assigned to the Illinois of the Texas Oil Company.

R. T. Willy and R. Green have been assigned to the Antilla.

G. N. Robinson and C. T. Thevenet sailed on the Morro Castle on August 13. The Morro Castle has been laid up since July 13.

J. C. Maier has re-entered the Marconi service and was assigned to the Guiana on the 13th inst.

J. J. Simpson of Belmar has been assigned to the New York of the American line.

C. B. MacPherson, formerly of the Parima, has been transferred to the SS. Atlantic City, relieving Operator A. H. Lynch, who has been detailed to the S. Y. Wakiva, sailing for European ports. It will be remembered that Lynch was formerly operator of the S. Y. Wakiva stationed at Tampico, Mex. There are two Wakivas.

L. R. Rogers has been transferred to the Brazos, his place on the Bermudian having been taken care of by William Travers, formerly of the Brazos.

H. J. Meldrum, who was detailed to the Ludin Lifeboat, has returned to New York and is back at the Boston station again. From all accounts the lifeboat had every appearance of a submarine boat and might have encountered all sorts of difficulties had it continued on its trip to Europe.

J. F. Forsyth has relieved E. E. Oxner on the Currier, as a result of which Operator Ericson has been made first operator of the Nacoochee, assisted by W. J. Henry, who just entered the service.

J. R. Byers and G. Entwistle have been assigned to the North Star, which went into commission on August 6.

E. B. Seaman, who has re-entered the service, has been assigned as second operator to the City of Atlanta.

Since August 1 the following graduates of the Marconi School has been given employment: C. M. Meyer, the Sabine; C. A. Biddinger, the El Valle; John Lohmann, the El Dia; R. R. Squires, the El Dia; James Devenport, the Desola; H. Van Cott, the Northland; P. J. Goss, the Maracas; E. B. Hayward the Illinois; R. T. Willey, the Antilla; R. Green, the Antilla.

Southern Division

Operator W. P. Kelland, formerly of the SS. Ontario, has resigned to take a position with the Western Union at Norfolk. The attraction at Virginia Beach was too strong for Kelland.

Chief Inspector Eugene Murray has returned to Miami to complete the installation and test with Nassau on long wave lengths.

James H. Coolidge, youngest wireless operator holding a first grade commercial license

Operator W. J. Phillips has the misfortune recently to injure his right hand in attempting to start the engine at Virginia Beach, but is rapidly improving, after treament at the Johns Hopkins Hospital, Baltimore.

Installer M. C. Morris of Philadelphia with Installer Wyble from Baltimore recently equipped the British steamer San Silvestre off Lambert's Point in twenty-four hours.

Operators Rosenfeld and Brubaker of Philadelphia have been assigned to the San Silvestre for a voyage abroad.

The installation on the new Mallory steamer Neches was completed on the 11th. Operator L. H. MacDonald of Philadelphia will be assigned to her.

Miss Margaret Groton, bookkeeper at the Baltimore office, has returned after spending a week at her home in the country.

Operator Shallcross has been transferred from Miami to Cape May, and Operator Nelson from Cape May to Miami.

Manager Grantlin has been relieved at Miami, owing to poor health. He will be succeeded by Operator Chapman from Hatteras.

Operator J. Lessenco has returned to Baltimore from Virginia Beach. Lessenco has been on the extra list.

There are now ten new ship installations under way in this division. Good luck to our new contract manager.

D. J. Heilig has been promoted to the managership of the Philadelphia station.

This division was honored recently by a visit from Mr. and Mrs. Duffy of the Eastern Division. They took in all the points of interest at Baltimore and Washington.

Business is brisk in the sale of Ocean Wireless News. Special war bulletins are being sent out from Baltimore via wireless to Cape May and other stations for transmission to ships.

Operators on the SS. Dorchester were startled recently when the British cruiser ordered her to stop and fired three shots across her bow, off New York.

Great Lakes Division

R. C. Cutting, formerly operator and purser on the SS. Ann Arbor No. 3, has been appointed operator and purser of the SS. Ashtabula.

H. W. Walters, purser and operator on the SS. M. & B. No. 2, has left for his home at Port Royal, Pa., where he will spend a two weeks' vacation. Operator Miron Pesek is acting as relief operator.

G. Zanders, formerly operator and purser of the SS. Ashtabula, has returned to the SS. W. P. Snyder, on which he was detailed during the season of 1913.

The Marconi Training School at Cleveland, O., has been closed. C. I. Hoppough, who was instructing engineer at the Marconi School, is at his home in Smyrna, Mich., where he will spend a few weeks' vacation.

Operator E. C. Wahl has been appointed second operator on the SS. Northland, relieving Operator W. H. Chattfield, who has returned to his home at Ann Arbor, Mich.

Operator R. O. Hein has been transferred to the SS. City of Cleveland III as first operator. Operator G. Hospers relieved him on the SS. Western States.

Engineer A. E. Jackson recently made a trip to Detroit, Mich., accompanying United States Radio Inspector J. F. Dillon, to inspect the boats entering that part.

Engineer H. G. Smith was recently at Manistique, Mich., making alterations on the Manistique, Mich., station.

James H. Coolidge, fifteen years old, of Cleveland, O., a graduate of the Marconi School at Cleveland, is the youngest wireless operator holding a first grade commercial license.

Pacific Coast Division

W. P. Giambruno replaced G. H. Wheeler aboard the SS. Argyll August 5, Mr. Wheeler taking a vacation.

Mr. Smith relieved H. D. Jaggers on the SS. Asuncion July 29.

R. J. Phair relieved F. Mousley as second of the Bear July 29.

C. Bailey was assigned to the position of first aboard the SS. City of Sydney July 18.

L. T. Franklin joined the Celilo as assistant July 20.

E. D. Bryant, assistant on the Celilo, relieved A. M. Greenwell of the Astoria Station July 16.

A. M. Greenwell, who has been in charge of the Astoria Station for the past year, is taking a two weeks' rest cure. He will return to his position about August 11 and prepare himself for the benedict class. "CQ." Everybody copy.

O. Thiess was re-assigned to the SS. Enterprise July 28, relieving J. Miche, who is taking a two or three weeks' vacation at Monte Rio.

W. H. Friend, in charge of the Eureka Station, visited San Francisco during the middle of July for a couple of days. The Eureka climate seems to be very agreeable. Mr. Campbell of the SS. City of Topeka acted as his relief.

J. W. Ritter was assigned to the SS. El Segundo July 24.

A. E. Evans joined the SS. Falcon July 29.

J. A. Falke and E. T. Jorgensen relieved M. Smith and O. E. Johnson as first and second, respectively, aboard the SS. F. H. Leggett August 4.

N. A. Woodcock, formerly of the Seattle District, is now acting assistant to G. F. Roberts of the steamer F. A. Kilburn.

J. M. Langston relieved E. W. Lovejoy on the George W. Fenwick July 21.

J. H. Baxter, wireless operator and purser of the steamer Hilonian, rejoined his ship July 23 after a month's vacation.

F. C. Stucky was assigned to the Hazel Dollar August 5.

H. G. Austin was assigned to the Lurline July 21 as assistant to B. E. Fenn.

F. Mousley and H. R. Sprado were assigned to the Manoa August 3 as first and second, respectively.

J. F. Smythurst and E. Castle were assigned to the Nile as first and second, respectively, July 21.

P. R. Fenner is temporarily relieving I. W. Hubbard as assistant abroad the SS. Nome City.

H. Bodin and O. B. Mills will leave August 8 as first and second of the SS. Pennsylvania.

F. W. Shaw and C. E. McNess are temporarily holding down the SS. President.

G. H. Davis, a trans-Pacific appointee, is temporarily filling in as second operator of the SS. Rose City.

Congratulations to George Croasman, first of the Rose City. He's married, boys. It came off on the fourth.

H. D. Jaggers, who for the past fifteen months has rendered excellent service aboard the SS. Asuncion, was transferred to the SS. Richmond, the pride of the Pacific Standard fleet, July 29.

L. Fassett, formerly of the operating, later of the construction, latest of the operating, is serving on the SS. Santa Rita.

F. Deckard and R. Camp left San Francisco for Panama, July 28, as first and second of the SS. San Jose.

L. J. Tappan, formerly of the SS. W. S. Porter, joined the SS. W. F. Herrin August 4.

E. Smith was assigned to the SS. Wilhelmina July 27 as assistant.

W. D. Collins and M. J. Ensign were assigned first and second of the Yosemite July 23.

A. E. Gerhard, formerly of the Nile, is now temporarily in charge of the SS. Yale.

Seattle Staff Changes

Staff changes in the Seattle District during July were few, because all ships are in commission and busily engaged in filling the Alaska storehouse with supplies in exchange for the millions in gold and ore they are bringing out; also, all vessels have been crowded to capacity with an ever-increasing number of tourists, so that the operators have been too pleasantly busy with handling increased ship and tourist business to think of changes.

R. S. Powell, ex the SS. Senator, relieved G. V. Wiltse as first on the Mariposa.

A. E. Wolfe and Wiltse are now on the Admiral Evans, ex A. N. Marquis and A. E. Johnson, who resigned.

R. F. Harvey, a San Francisco operator, who has been second on the Humboldt, was transferred to the A. F. Lucas relieved by H. Lee.

William Christensen of the Seattle Station staff made one trip south on the Governor, being relieved by C. H. Trevatt, of that steamer. Chris says he didn't get sick, but he forgot to ask the second operator to keep "mum."

L. H. Simson, formerly second on the Queen, has been given charge of the tug Oneonta at Astoria.

J. F. Hammell, formerly employed in the San Francisco Division, is assigned as second on the A. G. Lindsay.

George L. Hayes, one of the best known of the Seattle District "old boys," who has been ill for a number of months, was recently assigned to the Stanley Dollar, but again found it necessary to be relieved from duty.

A. M. Greenwell, Astoria Station manager, is visiting his home in California. Mr. Hamilton is in charge, Mr. Smith is second, and Operator Bryant, ex the Cecilo, is filling in on third trick.

F. M. Ryan and H. Jones are first and second, temporarily, on the Senator.

H. Hatton and A. Lange have been transferred to the Spokane and the Northwestern, respectively.

P. C. Millard, ex second on the Spokane, has been promoted to take charge of the Tatoosh, relieving M. W. Michael, who takes Millard's place on the Spokane.

J. R. Irwin, superintendent of the Northern Pacific Division, has just returned from a two weeks' visit to San Francisco.

THE ROYAL GEORGE GETS SOS

While the steamship Royal George was in the Gulf of St. Lawrence bound for Montreal on July 22, an SOS call was received from the French steamer Sacha. Her position having been ascertained, the captain of the Royal George ordered full steam ahead for the point given, which was just off St. Pierre, Newfoundland. After proceeding for half an hour the Sacha signalled that she was out of danger, and that assistance was not required. It was learned later that there had been a serious fire on board, which, however, the crew had been able to extinguish.

WRECK OF THE INVERMORE

The steamship Invermore of the Reid Newfoundland Company, went ashore near Brigg Harbor, Labrador, on July 11, and is likely to become a total wreck. Her cargo included supplies for the Canadian Marconi Company's stations along the coast. A part of the supplies have been landed.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with india ink. Not more than five questions of an individual can be answered. To receive attention these rules must be rigidly observed.

Positively no Questions Answered by Mail

E. B. W., Belfast, Me.:

Replying to your first query, we can give you no specific advice concerning the strange station which you hear.

In Fig. 1 we have given you a complete circuit diagram of the Fleming oscillation valve and all accessories. R is a rheostat of about 10 Ohms; B is a 6-volt storage cell and C is a potentiometer of about 400 Ohms resistance. The fixed condenser, D, in shunt to the head telephones has a capacity of .0025 mfds. Variable condenser, V, in shunt to the secondary winding should have a maximum capacity of about .0001 mfds. Bear in mind that the Fleming valve gives best results when a large value of inductance and a small value of capacity is employed for a given wave length.

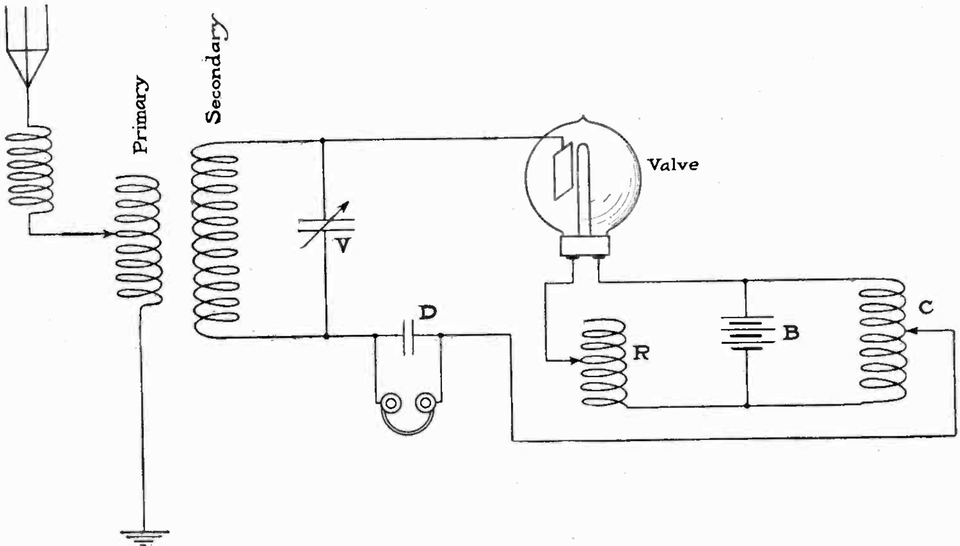


Fig. 1

Ques.—(3) How far should I be able to receive with a valve and accessory instruments in conjunction with an aerial 60 feet in length and 40 feet in height?

Ans.—(3) About 100 miles.

Ques.—(4) What are the stations BEC, MRT and MEC?

Ans.—(4) BEC—H. M. S. Suffolk; MRT—SS. Kafue; MEC—SS. Naragansett.

Ques.—(5) Approximately how far should I be able to receive when using a loose-coupler, silicon detector, fixed condenser, 1,000 Ohm receivers in connection with the aerial described in question 3, the earth wire being connected through a water pipe leading to a well and the country being somewhat mountainous?

Ans.—(5) Under the conditions it is very difficult to conjecture your range; possibly you may be able to hear 150 miles in daylight and during the winter months at nighttime you may be able to receive 1,000 miles.

H. D. A., Newport News, Va., writes:

Ques.—(1) Exactly what is a variometer?

Ans.—(1) According to your fourth query, we note that you have seen the sketch on page 745 of the June issue, which illustrates the principle of the variometer better than we can describe it. We have never seen in print an authentic definition of the variometer, but to our sense it refers to two coils of inductance so mounted that their magnetic fields can be placed in repulsion or attraction. Hence if the coupling between two such coils is continuously varied a variable inductance is produced.

Ques.—(2) What should be the length of

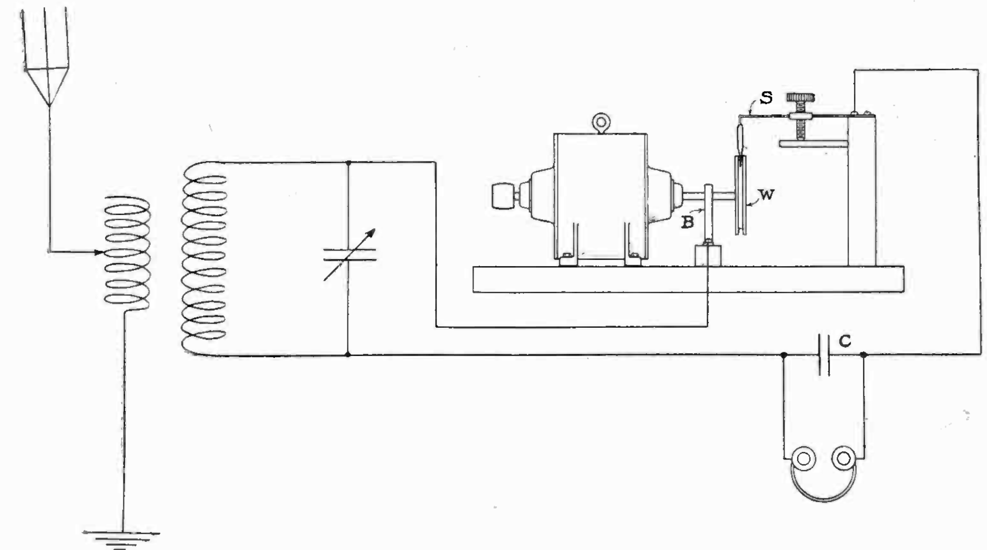


Fig. 2

this aerial to work on 200 meters, the other dimensions being 80 feet high at one end and 40 feet at the other; two wires 5 feet apart, the lead-in 25 feet and the ground 25 feet.

Ans.—(2) At the height of 80 feet the length of the flat top portion should not be more than 42 feet. This will give your aerial a natural wave-length of approximately 200 meters. We suggest that you make your aerial of 4 wires spaced 2 feet apart. If you desire to transmit on this aerial and also wish to employ an oscillation transformer, its natural wave-length should not be more than 160 meters. This will allow a few turns of inductance to be inserted for the transferance of energy. A 4-wire aerial 50 feet long and 40 feet in height will have approximately a natural wave-length of 160 meters.

Ques.—(3) I wish to construct a miniature receiving transformer to work on 200 and 600 meters and therefore wish to eliminate all unnecessary wire, etc. I am using crystal detectors. What is the very smallest wire I can use to secure good results and exactly how many feet must I use in the primary and how many in the secondary? This transformer is to be used with the above aerial.

Ans.—(3) The primary winding should be made on a tube 4 inches in diameter and should be wound closely with 45 turns of No. 24 wire. The secondary should have 65 turns of No. 36 wire and should be made on a form 3½ inches in diameter. The secondary winding should be shunted by a variable condenser having a maximum capacity of .001 mfds. If a number of taps are taken from this winding, a range of wave-lengths will be had from 200 to slightly above 700 meters, depending on the value of the capacity used in shunt. Of course if you employ very tight coupling, you do not need a condenser in shunt with this winding to obtain a wave-length of 600 meters.

Ques.—(4) Would it be an advantage or disadvantage to wind the wire for the transformer referred to on two coils as in the variometer on page 745 of the June issue?

Ans.—(4) Inductances of the variometer type could be employed, but are not advisable in a tuner of such small proportions. It is preferable to vary the inductance by multiple point contacts or by a multiple point switch.

Ques.—(5) Where can I get thorough instructions for the operation and construction of a tikker? Where I can I purchase one?

Ans.—(5) We do not know of any publication in the United States which gives as thorough instructions as you apparently desire. Mention of the tikker is made in the "Naval Manual of Wireless Telegraphy for 1913" and a brief description is given. The tikker is used as a circuit interrupter, however made. One of the most promising types at present in use is the sliding wire tikker, which is shown in Fig. 2. W is a brass wheel about 3 inches in diameter rotated at a speed of 2,500 revolutions per minute. S is a piece of steel wire so made that its pressure on the wheel, W, can be firmly adjusted. B is a brush which makes contact with the shaft supporting the brass wheel. The telephone condenser, C, is of large capacity,—about .03 mfds. The wheel is then set in rotation and adjustments to the spring are made until the note of the transmitting station is of the nature of a humming sound, sounding much like the escaping of steam from a radiator.

We do not know where you can purchase a tikker. There is no reason why you cannot construct one yourself.

* * *

A. B. C., Lamoni, Iowa, inquires:

Ques. (1) Please tell me how far I should be able to receive with the following set (day and night range):

My aerial is of the inverted L type composed of 6 strands 150 feet long, spaced 3 feet apart and stretched over a 120-foot smokestack and a 70-foot mast. The lead-in is at the lower end. My apparatus consists of a Blitzen receiving transformer, a loading coil (E. I. Co.'s 5,000 meters variable), a Blitzen rotary variable condenser, two fixed condensers, 3 detectors (radioson, silicon and galena), 3,000 ohm E. I. Co.'s government telephones, ground lead 6 feet, No. 4 copper wire soldered to a 1-inch water pipe.

Ans. (1) Day or night time during the winter months you should be able to hear stations on the Atlantic coast. Your daylight range for receiving is approximately 100 miles, possibly more, but as there are no commercial stations in your vicinity, we do not know whom you expect to receive from.

Ques. (5) Please give a hook-up for the first and second queries.

Ans. (5) Herewith is published a hook-up covering this apparatus (Fig. 3). There is no distinct use for two different condensers, so we have connected them both in parallel. The switch, S, allows the battery current to be passed through the radioson when it is in use. Another switch could be employed to connect the head phones in series with the battery when using the radioson.

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R. S. H., Albany, N. Y., writes:

Ques.—(1) Kindly show by diagram the latest method for construction of the primary

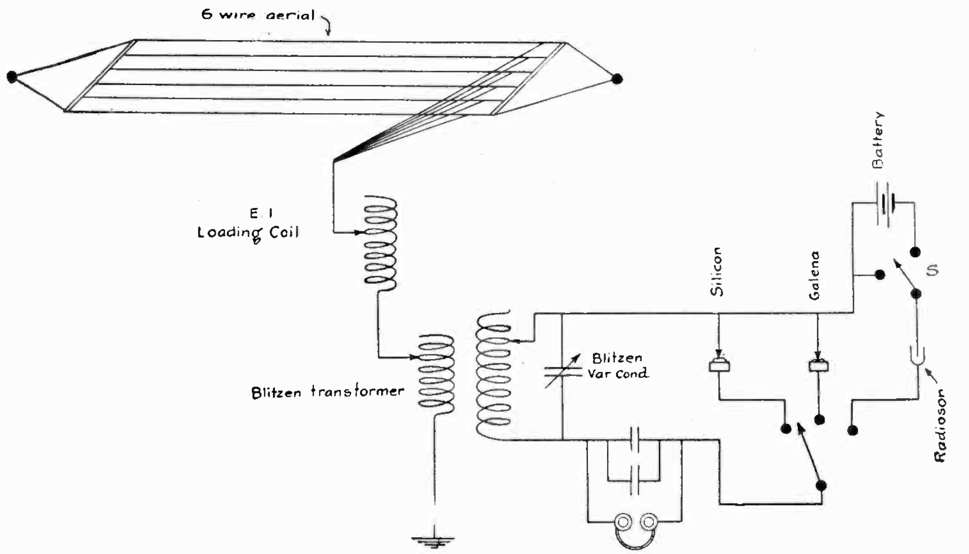

Fig. 3

Ques. (2) What improvements and instruments would you recommend for long distance receiving and for sharp, close tuning?

Ans. (2) If you wish to do extremely long distance receiving work, you had better purchase an audion detector or audion amplifier, which also has the property of giving extremely close tuning. As regards the instruments themselves, we have nothing further to suggest as the set seems to be quite complete.

Ques. (3) For long distance receiving what type of aerial is the best, the T or inverted L type?

Ans. (3) It depends upon local conditions. For the average amateur's aerial, we would suggest one of the inverted L type. If, however, the flat top portion is extremely long in comparison with the vertical portion, you will experience decided directional effects.

Ques. (4) How are the following detectors classed for sensitiveness and stability of adjustment: Audion, electrolytic, silicon, perikon, ferron, galena, peroxide of lead and radioson?

Ans. (4) From experience they may be classed in the following order: Audion electrolytic, perikon, silicon, galena, ferron, peroxide of lead, radioson.

of a Navy type loose-coupler. Also state what the size of the primary should be for amateur's use.

Ans.—(1) See the second prize article in the June issue of THE WIRELESS AGE, where a simplified improvement is made on that employed in the Navy tuners. The latter part of this query cannot be definitely answered for we do not know over what range of wavelengths you desire to receive nor do we know the size of the aerial on which it is to be used.

Ques.—(2) Please list several companies from which I may obtain perikon crystals.

Ans.—(2) Wireless Specialty Apparatus Company, Boston, Mass.; Messrs. Eimer & Amend, 205 Third Ave., New York City.

Ans.—(3) We are unable to give you any information concerning the strange station you hear each night at 8:30.

Ques.—(4) Will you kindly advise why I am only able to get a fat spark when I disconnect the ground wire from the lightning switch; the switch base is of slate. Could the difficulty lie there? I have several friends who find the same trouble.

Ans.—(4) We cannot answer this query definitely without a sketch of connections or a more complete description of the apparatus employed. It is very likely that leakage of some sort is taking place. We suppose, of course, that you are aware that when the antenna and earth leads are connected to the spark gap of the induction coil, the spark discharge is considerably decreased in length, but is of greater volume.

* * *

R. E. D., Milwaukee, Wis., writes:

Ques.—(1) Give a diagram of how the magnetic lightning switch described in the June issue may be used with the looped aerial with and without an anchor gap.

Ans.—(1) This switch is entirely unsuitable for use with looped aerial either with or without an anchor gap.

Ques.—(2) What is the maximum wave-length the improved loose-coupler described in the first prize article of the April issue will respond to?

Ans.—(2) With the secondary winding in shunt to a large variable condenser it should respond up to 6,000 meters. The range of wave-length to be expected in the primary will vary according to the size of the aerial used. Having no information in this respect we can give no definite advice.

Ques.—(3) What kind of covering has the wire on the one-to-one transformer described by E. E. Butcher in the January issue?

Ans. (3)—It makes no difference, it may be either silk or cotton covered wire.

* * *

F. J. C., Yonkers, N. Y., writes:

Ques.—(1) An article in a recent magazine states that for long distance reception, the aerial need not be more than 20 or 30 feet above the earth, providing it is 200 or 300 feet long. If this statement is correct, what is the idea of raising an aerial 50 feet long to 100 feet in height for receiving?

Ans.—(1 The statement is only approximately correct. It is a fact that for ship to shore communication neither of the aerials need be as high as those used for overland work, but the statement in question, however, has not been definitely proved. Better results have generally been obtained with the aerials of the greater height. It is a noticeable fact that the longer the wave-length, the nearer to the earth the receiving aerial may be placed, but this is no argument for the lower aerial because if it was raised to the greater height, undoubtedly stronger signals would be received.

Ques.—(2) I have an aerial consisting of one strand of No. 14 wire 500 feet in length, 30 feet above the earth, situated on the highest hill in town. Using the following instruments, Brandes Superior Head Telephones, a large loose-coupler, a 4,000-meter loading coil, fixed condenser and galena detector, I cannot receive further than Cape Cod. Do you think the height of my aerial is the cause? I can do good tuning even though I am shy variable condensers.

Ans.—(2) Undoubtedly you would secure better results if your aerial was placed at a greater height. After careful inspection of your apparatus we could give more definite advice. Possibly your circuits are out of resonance. For the shorter wave-lengths, such as 600 meters, you would require a series condenser in the antenna circuit. We suggest that you erect a 2-wire aerial, if possible, at a greater height.

Ques.—(3) The wireless station at Sayville uses a sharply tuned transmitter, but I can hear their signals from 800 meters all the way up to 3,200 meters. The signals are very loud on about 2,800 meters. My station is about 45 miles distant. This work is being done with the above aerial and instruments. Is it the fault of my instruments?

Ans.—(3) This is undoubtedly due to bad design of your entire receiving equipment. Apparently the circuits of your receiving tuner are of high resistance, rapidly damping out the oscillations, or perhaps you are using a very tight coupling and of course cannot expect to do much tuning. You should have a variable condenser in shunt with the secondary of your receiving transformer and then reduce the value of coupling. You will find under such conditions that Sayville will tune very sharp. The primary of your receiving transformer should be wound with No. 24 wire and the secondary with, say, No. 32. Furthermore, it may be that your receiving transformer is so designed that there are a great number of unused turns. If so, the coil may have a natural period to make it respond to one of the harmonics emitted by the Sayville station.

* * *

B. S. Wilmington, N. C., writes:

Ques.—(1) What places do the letters and groups of letters stand for when Arlington sends the weather for the Great Lakes, as V 94381, CH 000041 ?

Ans.—(1) V relates to the weather at Cleveland, O., and CH, Chicago, Ill. This query was fully covered in this department in the August issue. A circular issued by the United States Department of Agriculture, dated May 25th, fully explains these abbreviations.

Ques.—(2) Are abbreviations used in commercial work other than those beginning with Q and PR B ? If so, where can I obtain a list of them?

Ans.—(3) No other abbreviations are used with the exception of the message prefixes adopted by the London convention. A list follows. P, ordinary paid message for delivery; X, ordinary paid message for re-transmission; S, government message for delivery; XS, government message for re-transmission; MSG, master's service message for delivery; XMSG, master's service message for re-transmission; PDH, frank message for delivery; XDH, frank message for re-transmission; Presse, press message for delivery; XPresse, press message for re-transmission; A, telegraphic service message for delivery; XA, telegraphic service message for re-transmission; OL, ocean letter for posting.

This OL should not be confounded with the expression "OL collect," used in the United States ship services, which means "other line tolls collect," the other line in this case being the Western Union or the Postal Telegraph-Cable Company.

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AUTHORS