



Vol. I.—No. 9.

December, 1918

Price Ninepence

POST-WAR PROBLEMS

November, 1918, was perhaps the most surprising month in the world's history, and the change in the economic and domestic outlook has come about so suddenly and so quickly that few of us are, as yet, prepared for the new conditions.

We were almost as unprepared for peace as we were for war; but now that we have at last attained the goal for which we have striven during four and a half years of carnage and suffering, let us examine these new conditions and decide how best to profit by them.

During the general epidemic of public holidays and peace celebrations, the chaos of hastily-reconstructed business policies, and the haphazard discussion of post-war problems, many have temporarily lost their bearings.

"After the War," has been a catchphrase for so many years that now that this period has actually been reached, few of us realise that this is what we have been fighting and working for.

Quite recently we have heard it said that now that the war is over, nobody will have much use for flying machines and wireless men. Indeed there appears to be some speculation as to the ultimate employment of our aviators and wireless men after demobilisation.

While the war has undoubtedly given a tremendous impetus to these branches of science it would be absurd to suggest that their sphere of usefulness is restricted to the bombing of cities or to the transmission of messages recording the strength and disposition of enemy forces. Their adoption for war purposes has done much to strengthen these new weapons; simultaneously it has impressed upon the layman the enormous possibilities to be realised by their fuller development in time of peace.

The progress already made has been achieved in the face of many handicaps and restrictions, most of which will shortly disappear. Perhaps the most stubborn obstacle to the adoption of aviation for commercial and sporting purposes has been the fear of instability and the danger of falling from the air. Yet almost every day brings us word of some additional stabilising factor in aircraft construction, while aviators claim, in all seriousness, that they feel safer in the air than on *terra firma*. In the air one travels direct from one point of the compass to another, and is not compelled to thread his way through a maze of vehicular and pedestrian traffic.

As for danger—a man walking about in his own garden has been known to

slip and break a leg. The risk of accidents in the air is no greater than the daily risk we incur in crossing a busy thoroughfare, probably even less. Much of this squeamishness is probably due to newspaper reports of aviators colliding in mid-air, and crashing to earth, and of others being shot down in flames, but in peace-time our airmen will abandon "stunting," "looping," "nose-diving," and similar spectacular evolutions which form part of the daily routine in the battle areas. A maximum speed will probably be laid down by the Australian Air Board, when we get one, and pilots of commercial aircraft will proceed along given routes in machines which are no more liable to overturning than a railway train is of leaving the rails.

Aviation projects now under contemplation both in Australia and New Zealand will provide employment for many of our returning airmen, who will doubtless elect to follow the newly adopted profession in which they have so brilliantly distinguished themselves, in preference to their pre-war occupations.

As with the returned flying man, so with the returned wireless man.

That a chain of wireless stations will eventually encircle the Commonwealth is practically assured, although no definite announcement to that effect has yet been made. Former military operators will then be afforded every opportunity of exercising that skill and initiative which has raised our Wireless Squadrons to their present standard of efficiency.

On the purely mechanical side radio-telegraphy has advanced in two very large

strides during the last two months. First came the perfection of the receiving apparatus, enabling a small experimental station in New South Wales to receive perfectly audible messages from England, and later, as detailed in another section of this journal, the solution by Mr. Roy A. Weagant, of the atmospheric problem, with the result that interruptions hitherto caused by disturbances in the æther have now been eliminated.

The possibilities open to the development of Aviation and Radio-telegraphy are too numerous to be dealt with or even indicated in the scope of this article. It will be our task in the future to outline from month to month, what is being achieved or contemplated in these directions under the new order of things, and we predict without the slightest hesitation that the coming year will almost completely revolutionise our previous systems of communication.

The time is now ripe for some definite plan of action in the construction of Australian aircraft. The eyes of English and American aircraft builders are already focussed upon our raw materials, and a "wait-and-see" policy on the part of Australian engineers will probably lead to the early establishment in this country of aircraft factories erected by nations more enterprising than our own. Further, these factories will be branches of the more important concerns already in operation overseas, and the profits derived by their exploitation of the Australian market will probably not be expended or invested in Australia.

Peace on Earth

Goodwill towards men.

THE PROPRIETORS, PUBLISHERS, EDITOR AND
STAFF OF *SEA, LAND AND AIR* BEG TO WISH
ITS READERS A HAPPY CHRISTMAS, WITH PEACE
AND PROSPERITY THROUGHOUT THE ENSUING YEAR.

DESTROYERS: THE FLEETEST OF THE FLEET

Epecially Written for "Sea, Land and Air" By E. J. HILL

(All Rights Reserved.)

"She raced away down the sunset track,
Beyond the mines and the boom;
The spray flashed white on her turtle back
To the whirr of the engine-room.
Her funnels spouted their smoke-plumes black—
She looked the spirit of doom."

—Will Lawson.

It was an ideal day for destroyer work. Sea, land and sky were merged into one opaque shroud, and through it all descended a soft and steady rain. Under these circumstances the open steel deck of the long, low craft was hardly a place to picnic on, and the "Number One" suggested that "civvies" were not exactly the rig for such weather, especially if I intended to visit the bridge and the engine room. He fitted me out with a one-piece suit of dark brown overalls, and after having divested myself of collar and the suit I had come aboard in and donned this more serviceable article, topped by oilskins and sou-wester, I prepared to enjoy myself.

Though it was early in the morning, the rules of hospitality on board this ship of His Majesty's Navy were as the rules on board all others, whether flagship, battle cruiser, light cruiser or other destroyers. The rule never varies. Your host leads the way to the ward room, offers you the most comfortable chair, pushes the cigarettes over, presses a button, and when the steward appears, turns to you and asks "What's yours?" These mystic rites having been satisfactorily performed one felt more fit to face the unpleasant conditions reigning outside the cosiness of the ward room, with its miniature sideboard, sofa,

dining table, arm rack, radiator and book shelf. The steward was removing the glasses when the slightest sense of movement made one understand that we were off—stern first. A glance through the nearest porthole confirmed the fact, for shadows passed us through the white mist—shadows which one recognised as landmarks that in clearer weather would be giant sheerlegs, buildings, and sheds, but in the mist appeared blurred and distorted as figures in a nightmare. With the syren wailing out a long warning note, we slung round and crept down the harbour "dead slow"—at about 15 knots, until we swung out through the entrance. Here the skipper let her go a bit as we met the long roll lazily working its way shorewards, but what struck me most was the absence of vibration. I knew that down below somewhere there was 13,000 horse-power locked up and working steadily, but on deck there was a total lack of the regular vibration one gets accustomed to on even the biggest liners, and the steadiness of the little craft—she was only 700 tons—was remarkable.

"It's my trick on the bridge; come up with me for awhile," said "Number One." "The 'chief' will tear himself away from his beloved engines later on and then I'll introduce you to him, and you can let him show you his pets." So we mounted to the bridge. "Number One" explained the *multum in parvo*

while the wind whistled past, twanging the stays and halyards into one blended note. Hardly had we settled on the bridge with pipes going freely than a breeze came away from the east, sweeping the mists off the face of the waters, leaving them stretching zinc-grey to the horizon.

"We'll whack her up a bit," said "Number One," and almost imperceptibly one felt the pace increasing. Once up to 25 knots her forefoot lifted out of the water, flinging on either side great bow waves whose foam showed against the greyness of the surrounding seas as fine old lace on rich velvet, whilst the stern squatted down in the water till, lying flat on the plates, one could have

dabbled one's hand in the sea. With the increase of pace a great wall of water rose up behind, following steadily in our wake a towering mass of creams and emeralds whose centre was iridescent as the heart of black opals. (See illustration.)

I had left the bridge and was watching this following wall of water, fascinated by its beauty, when the Chief came along. He said he'd heard I'd like to see his engines, and being very proud of them he was only too pleased to do the honours. Of course, we were running under forced-draught, and so had to pass singly through the air-lock before gaining the steel trap-door that gave entrance below. The outer steel door had to be closed before the trap could be opened, as if the



H.M.A.S. "Yarra" at 25 Knots.

The Dark Outlines are Bow-Waves Thrown Up by the Destroyer.



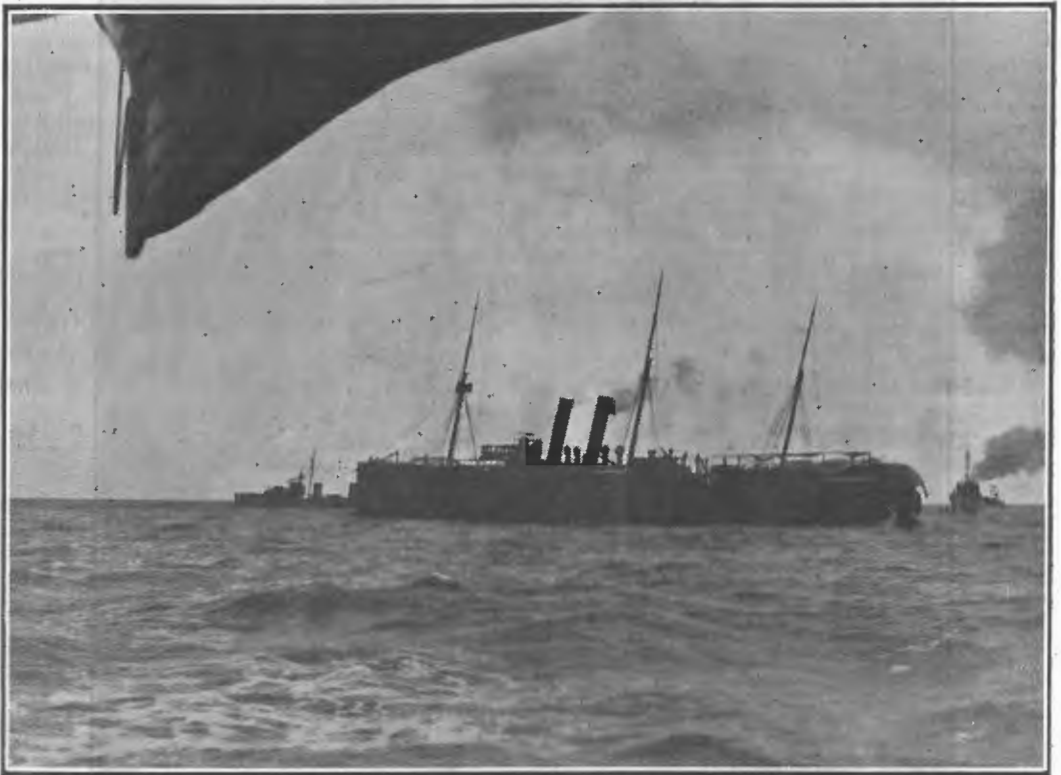
"Whacking Her Up!" H.M.A.S. "Yarra."
The star-shaped object seen on the reader's left is the wireless "spreader."

trap-door were opened before the outer one was closed the draught would have been sucked up from the furnaces and the fires and motive power correspondingly reduced. Once the trap-door was closed behind one it felt as if pencils were being forced into the drum of one's ears, but the sensation wore off in a few seconds, and one realised that one was securely clamped in in a steel-walled chamber from which, were there an accident, it would be awkward to escape in a hurry. In the engine-room the roar of the turbines made conversation an impossibility. Their work is unseen—it is not spectacular like the work of the huge engines in some palatial liner, neither is the work of the stoker so spectacular. One stoker attends to each furnace on an oil-driven destroyer, but the job takes all his attention. His hand rarely leaves the sprayer valve which regulates the supply of oil, unless to open the furnace door

and take a peep into its white hot heart through a piece of smoked glass.

When a destroyer is running well south the line life is not too uncomfortable, though on the bridge, when she is bearing along at over 30 knots, or in the engine-room with a temperature of 100 degrees or more, comfort is a matter of degree. When, however, a T.B.D. is running along the Line or close to it, north or south, the workers down below have an unenviable time what with the heat and the oil, but in the North Sea, where so many destroyers have been operating since the Mad Dog of Europe managed to get off the chain, life on one of these boats, whether one be an officer or a lower deck hand, is something that no man—save for love of country and a fine sense of duty—would accept for choice.

Everyone is at the highest tension. The guns are always kept loaded and so are the torpedo tubes, each ready to fire at a



Australian Destroyers Speeding to the Rescue of a Torpedoed Italian Transport, the "Orione." The Photograph, which shows the *Warrego*, *Parramatta* and *Huon*, was taken from the deck of the *Yarra*, one of whose lifeboats is shown slung ready for lowering.

moment's notice, a "ready" supply of ammunition is at hand, and every one of the crew is employed on the look-out for the slightest sign of enemy craft. During war-time a watch does not mean one-half of the ship's company, as it would on a peace footing. The crew is turned out *en masse*, but having arranged its toilet for the day, it proceeds to breakfast. Having "stoked" the order to clean ship is given, and then the men not actually on watch parade at a hasty "divisions," after which the captain, if not doing duty on the bridge, reads prayers. After a sprint round the deck—and it is a real obstacle race on a destroyer's deck—to keep a waist, the watch not on duty is piped below.

To ensure that the watch on deck is alert the gun crews are frequently relieved, because, should the watches be made too long and tedious, men would be likely to sleep towards the end of such a watch and at the crucial moment the vessel might be caught napping, with fatal results. When darkness falls, bringing the increased chance of a surprise attack, the look-outs are doubled, and those men not on watch pick out sleeping billets in close proximity to their guns, torpedo tubes or searchlights. When the weather is calm and fine sleeping on the deck of a destroyer is not half bad, but once heavy

seas are running with cold and sleet as accompanists, the deck is hardly the place to seek the gentle arms of Morpheus.

One is not told these things straight off. One gathers a remark here and another there, for in the Silent Service one is left to read mostly between the lines. The Chief and his satellites may talk shop, the Lower Deck, when no outsider is present, discusses its own particular officers and the Lords of the Admiralty in a hair-raising fashion, the ward-room discourses racing or golf, cricket or football, but shop is taboo if visitors are aboard. "Number One" (as we were proceeding homeward) and I had just answered "What's yours?" again, introduced me to his Warrant Officer. He had previously told me that this man had been present in the Falkland Island scrap, and I tried to get a first-hand story out of him, but the W.O. was too wily for me. "Yes," he said, "I was there, but there's nothing to describe. We had an account to settle with Von Spee. We settled it. That's all!"

And there, to my mind, you have the whole maxim of the Navy. There are other accounts to be settled, and they will be settled in due course, and until they are paid in full the Navy will keep its tongue between its teeth but its weather eye uncommonly wide open.



Corfu Town,

Showing part of the French Fleet. The white building in the background is the ex-Kaiser's Palace, now utilised by the Allies as a Military Hospital.

WIRELESS OPERATORS ON ACTIVE SERVICE

EXTRACTS FROM THE DIARY OF PRIVATE GEORGE V. SHAW,

Wireless Operator, Attached to the Australian Flying Corps.

Contributed to "Sea, Land and Air" by the courtesy of Mr. A. V. Shaw, of Sydney.

At 3 o'clock on Sunday, October 28, Chris. Wride and myself, attached to 301st Brigade Royal Field Artillery, set out from Tel-el-Tarar. Everyone knew that the long-looked for attack was close at hand. Troops and material had been coming up the line for days past, and it was quite evident that we were in for the biggest affair ever attempted in this country. Owing to the great strain put upon the Transport services we were unable to obtain riding camels, so began the trek on foot. About two hours' tramping through clouds of dust brought us to the **Wadi* Guzzeh, where we outspanned until 11 p.m. After following the course of the *wadi* for another couple of hours we arrived at a part known as Essani shortly after 2 a.m., and pitched our bivouac for the first time. Our "bivvy" is a splendid tent-shaped little home 6 feet square. After a couple



Field Wireless Station Beneath the Scyamores of Dier-el-Belah.

had all our belongings on a baggage camel and had considerable trouble in keeping him up with the column. Shortly after midnight we began to hear the crack of the outposts' rifles. At 2 a.m. we came to a halt, with stray bullets whizzing around everywhere. "Snow" and I erected our station behind a small ridge known as Observation Post Ridge, and then got down for a couple of hours' sleep before daylight. Quite a number of men around us were hit by stray bullets before the attack began.

The dawn of October 31 broke with glorious weather—slightly cloudy, fairly hot, and not a breath of wind. There was intermittent rifle fire until 8.15 a.m., and then parachute flares were sent up from Observation Post Ridge to signal the opening of the attack. The artillery began a heavy and incessant barrage, and the infantry moved forward. The barrage lasted fifteen minutes, and then the wounded and the prisoners commenced to come back. About an hour later we learned that we had gained all our objectives in the first phase of the action—the chief being Hill 1070. There was desultory firing on both sides until 12.10 p.m., when more flares were sent up and the second phase of operations commenced. This time our main objective was the approaches to Beersheeba, which were practically evacuated by the



The Author on Active Service. In his Bivouac at Essani, Palestine.

of hours' sleep we erected our station so as to get the afternoon press news, and rested the remainder of the day. On Tuesday we dismantled our station and left Essani at 7.30 p.m. It was a beautiful moonlight night, but fairly cold. Strict silence had to be maintained, and no smoking was allowed on the march. We

* Dried-up river-bed.

Turks, and so gained without much difficulty. It had been a scorching hot day and everyone was feeling the want of water. Our small supply of two water bottles ran out early in the morning, and we were unable to replenish it until late in the day. About 3 p.m. we dismantled our station and rejoined our waggon-line. We were both dog tired, and it was not very long before we were underneath our "bivvy" and asleep.

The following day—November 1—we were expecting a move forward and only

erected our station for the press news, and then dismantled again. Leaving the vicinity of Observation Post Ridge at 7.30 a.m. on the 2nd, we reached Hill 1070 an hour later, and pitched camp for the day. The Turks evidently thought Hill 1070 and the adjoining positions impregnable, as material of all descriptions was lying about in hopeless confusion, indicating a hurried and unexpected withdrawal. Our barrage on the previous Wednesday had played havoc with their trenches, and they were lined with enemy dead. We moved



The Author in Peace Time. Formerly Wireless Operator on s.s. "Suffolk."

on again early the following morning, and had a couple of hours' very dusty tramping against a head-on wind before outspanning two miles east of Beersheeba, where we remained until 4 o'clock. Just as we were getting on the move again an enemy aeroplane descended very low and dropped four bombs on the infantry, as well as machine-gunning them. We skirted the town and halted a mile north of it, at about 7 p.m. Beersheeba appears only slightly larger than El Arish, but is, of course, of more importance on account of the railway which runs into the town.

At about 2.30 p.m., on Sunday the 4th, we moved on again in a northerly direction, and were tramping along until 5 p.m. Just as we were arriving at our destination two of †Johnny's *pip-squeaks* (10 lb. shells) burst dangerously near the column, and it was quite obvious that we were under observation. A couple of minutes later we had topped a small crest and come to a halt in a small *wadi* behind a hill;



Private G. V. Shaw at Mustabig, Palestine.

† The Turk was christened "Johnny" during the Dardanelles campaign.—Ed.



Field Wireless Station near Gaza.

and then a third and fourth shot sailed over. The last one landed right in amongst our horses and men. Our Colonel and his Sergeant were hit in the legs, and the man alongside me in the groin. Six or seven horses were also hit, which was splendid work with so small a shell. As there was no action in progress we turned in for a good night's sleep. Monday, November 5, was a fairly miserable day for us all. We had been without a wash for six days, and were beginning to feel the pinch. Our water issue had been reduced to a quart a man per day; food—such as it was ("bully" and biscuits) was not too plentiful, and there was nothing doing to keep us occupied. We managed to exchange a bottle of water for five cigarettes, and this cheered us up somewhat. The chap we made the bargain with took the water in preference to ten *piastres* (2s. 6d.). We went to sleep soon after sundown, and were up and on the move again at midnight. We had a couple of hours' fairly comfortable marching, and then the guns went into position again in readiness for an attack at dawn. A fairly intense artillery bombardment opened up about 5 a.m., and at 11 o'clock we heard the infantry had made progress and captured the Rushdi System of trenches. The guns went forward, but we and the rest of Brigade Headquarters remained in the same position and our camels went back for water—the first for six days instead of three. About 11 a.m. we witnessed a splendid aerial duel overhead, in which 11 machines participated, but none were brought down. Later in the day Suffolk Ridge had fallen into our hands and the infantry were beyond it. At 5 p.m. we went ahead about five miles and rejoined Headquarters just behind Suffolk Ridge. After a bit of tea we got down to sleep, but were aroused at midnight, and had to pack up. After

standing-to for half an hour we unpacked and got down to sleep again. Heard later we were to have gone over to our right to assist another division. About 9 p.m. a series of terrific explosions occurred on our immediate front, and it was thought Johnnie had blown up an ammunition dump—this later proved to be correct. At dawn on Wednesday, the 7th, we went back a quarter of a mile, as the guns were going into action just where we halted the night before. Headquarters took up a position alongside a six-inch battery, who throughout the morning were firing continuously on Sheria. About 10 a.m. we moved forward again to our position of the previous night and halted for a couple of hours, giving Wride and myself a good opportunity to look over Suffolk Ridge and a Turkish six-gun position behind it. This position had been spotted by our Heavy Artillery and Johnnie had to quit it in a hurry, leaving behind two guns and thousands of rounds of ammunition. At noon we left Suffolk Ridge and could see Sheria a couple of miles ahead of us. We made direct for it across open country, and had a couple of shells at us *en route*. Two hundred yards beyond the railway station we came to the *Wadi Sheria* and Tel-el-Sheria (Lebel—hill of) and found the railway bridge across the *wadi* had been blown up. Crossing the *wadi*, we came to a halt under cover of the hill, and a minute later Johnnie started to shell. He sent battery-fire after battery-fire over, but fortunately they were field guns so the hill afforded us ample shelter, and the shells fell on the far sides of the *wadi*, and on the flat country beyond it where a couple of batteries were in action. The guns were limbered up and rushed forward under cover of the hill, and there were guns, camels, teams and men all jumbled up together. After about half an hours' shelling he left us



Wireless Operators attached to No. 1 Squadron, Australian Flying Corps.

alone for the rest of the afternoon and evening. Had he been using Howitzers instead of field guns he could have slaughtered us like rats in a trap. Earlier in the day he caught another brigade in this same position, and within fifty yards of where we slept that night there were the bodies of seven men and twenty-four animals. As the weather was fairly hot the stench next morning was almost unbearable. On Thursday, November 8, we were up at 3.30 a.m. and standing-to ready for a move. The cavalry had been out the previous night, and now had the enemy on the run. At 7.30 a.m. we were on the move once more, and struck north from the never-to-be-forgotton Tel-el-Sheria. We were moving at a good rate all day, but Johnnie was still on the run, and we did not get within range of him. At 7.30 p.m. we came to halt two miles west of Huj, where the Warwick Yeomanry (Cavalry) had earlier in the day made their glorious charge against the guns, and so avenged themselves for Katia Woods. The following morning, the 9th, we managed to get a very muddy wash and a shave—the first for nine days—and then went over the scene of yesterday's charge. There were eleven guns captured including two 5.9 inch. They were turned in all directions as if they had been completely surrounded. The cavalry sabred the gunners whilst they were firing at them at point-blank range. It was no doubt a marvellous achievement, and on the equal of Balaclava itself. On Saturday at 9. a.m. Headquarters moved off from Huj, but as the camels were away for water we remained behind. We were issued with ten cigarettes each, which had been captured from the Turks, and they were more than acceptable. The camels did not arrive back until 7.30 p.m. after doing 20 miles for water, so we decided not to set out until the following morning.



Cleaning Telephones at El Arish.



Field Wireless Station at Wadi Jemmami.

Leaving Huj early on Sunday morning we had a very trying ten miles' tramp through clouds of dust. We passed dozens of dead bodies on the way and the stench was something awful. We were both short of water, and it was a welcome relief when we rejoined our Headquarters in *Wadi Jemmami* about 1 p.m. After erecting the station we found no press news were sent out. There were three wells within half a mile of this position, but it was a very hard job to get water over and above the issue for drinking purposes—the wells were guarded by Military Police. We had a fairly easy time for the next three days. No trekking and we managed to get a bath and some Bedouin tobacco in the native village of Jemmami. On Thursday, after attending a ceremonial parade, at which General Shay decorated our Colonel and another officer with D.S.O's., we took the road for a couple of hours, and arrived at *Wadi Hessi* about 1 p.m. In the afternoon we paid a visit to a Sergeant-Major of the Camel Transport Corps, and were glad to accept his offer of a dinner, which turned out to be better than we had been in the habit of having. We expected to stay at Hesse for a few days as the other Army Corps were engaging the enemy and this Division was out of action, but we were to suffer a disappointment. The next morning, Friday, found us on the move once more, with ten miles of flat and fairly comfortable marching, to two miles north-east of Tel-el-Sheria. On the way we passed through an enormous ammunition dump which had been abandoned by the Turks. There were stacks and stacks of small arms, ammunition and thousands of shells. Saturday and Sunday we spent without a move, and managed to visit our Camel Transport Corps friends, who were always camped somewhere near us. At 7 a.m. on Monday, the 19th, we moved off

again in the direction of Gaza, and after a few miles we came into touch with the line Johnnie held in front of Gaza for eight months, and we marched parallel to it to two miles north-east of the town. We no sooner had our bivouac erected than down came the rain in torrents. The first real shower since last February. Tuesday, the 20th, found us on the move again. Our camels were away at water, so we did not go ahead with the rest of the column. At 3.30 p.m., just as we had finished loading the camels and began to move off, down came the rain in sheets. We attached our camels to the long string on the road and went along with our Camel Transport Corps friends. The ground was wet and slippery and the going very slow. We halted at 8 o'clock and waited for a guide. As he did not turn up after half an hour, we made a cup of cocoa and sat waiting on the wet ground. The wood had run out so all we could do was to sit and wait. Midnight came and still no guide, and at 1 a.m. the officer in charge of the column decided to move on. At 4.30 a.m., after a very tiring journey, we arrived at Mejdal, and at daybreak found our Headquarters just as they were taking their horses to water. Spreading our waterproof sheets on the ground and rolling up in our blankets, we snatched an hour's sleep before having a cup of hot tea and loading the camels up again. Shortly after 7 a.m. the brigade was on the move again. We passed through Julis and several other villages, arriving near El Kustine at 3 p.m. Most of that day's march was across ploughed fields of some of the finest chocolate soil I have ever seen. But, owing to the rain, it was wet and sticky, and pounds of it were clinging to our boots when we reached our destination. Walking had long since become a mere mechanical movement of the



Christmas Dinner in the Holy Land. Wireless. Men Enjoying Their "Bully" and Biscuits.

legs and body. We managed to erect our "bivvy," and kicking off our boots, crawled inside exhausted. We had covered about 26 miles in under 24 hours, including six hours' halt. We were both dead to the world, and neither of us woke until breakfast-time the next morning. At 8 a.m. that day—November 22—we were in column of route again and on a fairly decent road for four hours. We passed the villages of Sofia and Mohammed, and came to a halt at noon, after covering about seven miles. On the morning of Friday, the 23rd, we set out again on the main road and, passing through Junction Station or *Wadi es Surur*, we arrived at Latron (Amwas) about noon and outspanned a mile north of the village. Latron is the junction of the Gaza and Jaffa road to Jerusalem. We remained there for three days and had a good rest, and managed to visit our Camel Transport Corps friends several times. Plenty of beautiful oranges could be bought from the Bedouins and there was ample water. At 1 p.m. on Tuesday, the 27th, we packed up and started up the long winding road through the hills. On each side of the road the stony hills rose to a height of several hundred feet, reminding one of the Grand Canyon at Blackheath, New South Wales. It is marvellous how the infantry forced the enemy back from the outskirts of the hills. We arrived at Kuryet-el-Enab about 5 o'clock, and branched off the main road on to the Roman road. As Johnnie was shelling this road we had to wait for an hour or so until it was properly dark before continuing our uphill journey to El Kubeibeh. The road was little better than a stony track, and we were halting every few minutes. We reached our destination just as the bells of the Latin Hospice were chiming ten. How strange it seemed to hear these notes of civilisation pealing forth in the pitch-black night! Upon waking the following morning we found ourselves right alongside the Hospice—an imposing building of stone, which was good to see after the Bedouin mud huts. Later the nuns and monks of the Hospice nursed a few of our wounded. We moved back along the Roman road to a part known as Hairpin Bend, and took up a position near Biddu. This was the first time our batteries had been in action since November 8. Wride and I erected our



Two Views of our Wireless Dugout Before Gaza.

The Upper Snap Shot Shows Wireless Set in Operation.

The Second Photograph Shows Entrance to Dugout.

station and stood by for a co-operation "shoot" which did not eventuate. (Written at Ain Karim, 19th and 17th December, 1917.)

* * * *

On November 29 we were both very glad to see some mail come along—the first for over a month. I received 23 letters and six parcels. The parcels were particularly welcome, as we had been on bully and biscuits for more than five weeks. On November 29, 30 and December 1 we had machines out to co-operate with our howitzers, but on each occasion the shoot was not a success. One target was out of our range and the other two had to be abandoned, owing to the plane having engine trouble. On December 3, to celebrate the anniversary of my landing in Egypt, Johnnie sent over a few 5.9 inch shells—one of which sent our Artificer-Sergeant into hospital with shell shock. From the



A Glimpse of Modern Jerusalem.

hills in front of our position one could see the spires of Jerusalem in the distance. On December 5 our Headquarters moved back along the Roman road, as we were being relieved by another division to enable us to go into another portion of the line. Wride and I stayed behind with one of the batteries, and moved off at 6.30 the following evening. Passing through Enab we went along the main Jerusalem road and rejoined our Headquarters at Kuba. We had just time to erect our bivouac when the rain began falling very heavily. It rained all day Friday, December 7, but this did not stop the concentration of troops, and it was evident an attack on Jerusalem was close at hand. At midnight the Colonel and a couple of signallers went on ahead and the remainder of Headquarters moved on at 11 a.m., on December 8.

We moved forward a few miles and halted until 4 p.m., whilst the infantry were fighting their way ahead, and then passed through Kulonich, and went into position about 10 p.m., half a mile from the outskirts of Jerusalem. The Turks had put up a good defence and our infantry had considerable trouble in driving him from the trenches he occupied on the summits of the hills, and which look inaccessible from the front. There was little firing during the night, and we managed to snatch a few hours' sleep. Early the following morning, Sunday, December 9, the O.C. of our howitzer battery went out from the observation post to choose a new position forward, and he was met by a large portion of the population of the town, who were cheering and waving flags. They handed the town over to him, and shortly afterwards numbers of the inhabitants of Kulonuh were making back to their homes from Jerusalem, where they had been taken by the Turks. It was a strange scene—they patted us on the back and cheered

us, and many were the exclamations of "Bravo Ingleese!" and so on. These were the first people wearing European clothes that we had met this side of the Canal. Shortly after noon we started off for the town, and everyone was in high spirits. By 2 p.m. Wride and I were fairly in the town and with a crowd of people around us. "Snowy" has a fair smattering of Arabic, and I found a large percentage of the people could speak French and quite a few English. One of their chief English sentences was "Come to my house and have a glass of Cognac." Needless to say the offer was generally accepted with alacrity. The streets of the town soon became congested with columns of troops all eager for their first glimpse of the Holy City. About dusk it began to drizzle rain and some French people invited us inside their house and provided us with some supper—brown bread with a mixture of what seemed to be molasses and currants. They told us about the privations the town had been through, and the shortage of food, especially sugar. Were I to write about these things here I am afraid this little account would spin out over many more pages. At 7.30 p.m. our brigade began moving into the town, and the streets became a little less congested. We passed on through the New City, and about 10 p.m. halted two miles west of it. It had rained all the way and we were all pretty well soaked through and spent a sleepless night. Early the next morning the batteries went into action where we outspanned the night before. The Turks were holding on to the hills in various points and sniping on the roads leading from the town. There were two Royal Flying Corps fellows attached to our howitzer battery and we tossed up to see which one from each station should go on French leave into Jerusalem. I lost.



Mosque of Omar, Jerusalem.

After a couple of hours, "Snowy" came back just as we were moving forward. He had had his hair cut, and his pockets were full of cigarettes and bread. The latter we ate dry straight away. It is, I think, what is known as unleavened bread, and was very welcome at five *piastres* (1s.) per loaf. At 5 o'clock we moved forward about a mile along the Nablus road and, passing the native village of Shafat, went into position behind Tel-el-Ful. Johnnie had the road well taped, and pasted anyone moving along it in daylight. He shelled us fairly heavily the following two days, but the hill gave us good shelter, although our Colonel got a slight scratch on the leg. We were very close up to our infantry at this time, and on the 12th could see our howitzer shells bursting a thousand yards away on a Turkish machine gun crew. There was considerable talk of the brigade going into billets in Jerusalem for a rest and before daylight on the 14th we were moving back towards the town. To our disappointment we passed through it and four and a half miles beyond to the village of Ain Karim. On the way we passed an ammunition waggon of Johnnies which had been caught by our shell fire, and 23 dead horses had to be dragged off the road. Ain Karim is one of the prettiest little villages I have ever seen. Nestled in the hills and with a long winding road down to it, it presents a pleasing picture to the eye. We were billeted in empty houses in the Russian quarter, and were very comfortable. We had eight days in billets and during that time I washed all my clothes and did sundry other jobs, incidently writing the first part of this history. I paid four visits to Jerusalem, chiefly for the purpose of buying eatables, the main things procurable being oranges, figs, vegetables, poultry, eggs and bread. The sale of the latter was prohibited by the Military Governor, but that is not to say it was not procurable. It rained almost every day whilst we were out in rest and we were glad of dry blankets and a roof over our heads. On Sunday, December 23, we left our comfortable billets shortly after noon and, passing through Jerusalem, went along the Nablus road to our old position at Tel-el-Ful, left our brigade Headquarters and became attached to our howitzer battery. The two Royal Flying Corps operators were left behind with one of the batteries



Armoured Tanks at Belah.

when we went out to rest, and we were greatly grieved to hear that in our absence Muir had been accidentally killed. He was a fine chap and a good soldier, who had been in the field right from the beginning of the war. He was killed by an enemy fuse which exploded whilst a Sergeant was tampering with it. An officer and the Sergeant went down the Long Trail with Sandy on account of this one fuse. It rained fairly heavily during the night of the 23rd, but cleared up for long enough the next morning to enable us to make some improvements to our bivouac. The rain came down in torrents that afternoon and by midnight nearly everyone but us was about washed out of their bivouacs but this did not prevent the boys from singing carols. Christmas Day dawned wet and miserable with the rain still pouring down. Up to the present "Snowy" and I with our belongings were fairly dry, but nearly everyone else was soaked to the skin. Our rations for the day consisted of half-tins of bully between us, two cups of tea, five dates, and a pint of small biscuits each. Fortunately we were not short of tobacco and cigarettes. At five o'clock we had to pack up and withdraw a thousand yards. It rained very heavily on the way back, the night was pitch dark, and we were just about fed up when we put our bivvy up and crawled inside. None of the gunners bothered about putting bivvies up as they could not possibly get any wetter than they already were. Up till midnight we could hear them singing as they walked backward and forward on the road, but then the rained proved too much for even their spirits, the singing ceased and all we could hear was the tramp-squelch-tramp, as they marched up and down in their endeavours to get warm. By midnight we ourselves were wet through, although we had ten or

a dozen thicknesses of canvas underneath us. We dug a trench between our "water-proofs" and did our best to drain the water out, but with little or no avail. I don't think I have ever before or since seen such heavy rain as fell around Jerusalem on Christmas night, 1917. Needless to say, we did not get a wink of sleep all night, and were mighty glad when dawn came and it showed signs of clearing up. But what a scene of desolation! mud everywhere, and dozens of horses dead on the lines. "Snow" was walking a chap up and down the road. He had cramps in the stomach, and later went into hospital, making the fourteenth man from the battery to be evacuated that day from exhaustion and exposure. The rain kept off all day and for variety Johnnie shelled our observation post, killing the officer, wounding a signaller and sending the remaining signaller into hospital as a bad shell shock case. Half an hour before he was a fine up-standing young fellow, but in a flash was changed into a shivering and whimpering physical wreck. He managed to hold out until he got back to the battery and reported, and then collapsed, lying down in the mud and crying like a little child. A couple of us carried him back to a Casualty Clearing Station, and it was a pitiful sight to see this strapping young fellow with his nerves smashed to atoms. (Written at *Wadi Auja*, Valley of the Jordan, March 22-24, 1918.)

* * * *

On Thursday, December 27, we were awakened about 1.30 a.m. by the noise of our guns pouring hundreds of rounds into the Turks, who were endeavouring to advance along the Nablus Road. After some time the attack was beaten off, only to be followed by two more unsuccessful attacks at noon and 4.30 p.m. the same day. It transpired later that the enemy was endeavouring to fulfil his promise to retake Jerusalem by the New Year. Simultaneously, attacks were made on both our flanks without success. In the vicinity of Tel-el-Ful, two and a half miles from Jerusalem, the enemy attacked in considerable force, and our artillery, which was massed on the Nablus Road, inflicted heavy casualties. In the afternoon I took a trip into town and found it was improving wonderfully—shops and restaurants were being opened everywhere and a hot meal of sorts was obtainable. The next day Snow went in



Good-bye-e-e! Men of the Royal Flying Corps Leaving Mejdal (Palestine) for the Western Front.

and returned about 9 p.m., just as we were about to move forward. Our infantry supported by artillery had been hard at it all day and forced Johnnie back. We moved along the road about $3\frac{1}{2}$ miles to Er Rain. The next morning, Saturday, the division Norm Moss was attached to was moving up the Nablus Road and Norm's battery took up our position. We were sitting together yarning when a land mine fifty or sixty yards away went up, blowing a young chap to pieces. Upon examination it would found that a field alongside the road was thickly sown with other mines. Leaving Norm and his battery behind, we moved on about 4 p.m., and covered a few miles before going into action. During the day our infantry, after severe fighting had occupied Beireh and Rain Allah, and on Sunday morning our battery moved up close to the former. It rained very heavily that night and all the following day. New Year's Day dawned wet and miserable with mud everywhere. Rations were short and things were exceedingly unpleasant. Johnnie had retired some distance beyond Beireh, and not a shot was heard all day. On January 4 we handed our position over to another battery and moved back to Er Rain and the following day to our previous position at Tel-el-Ful, but, instead of firing along the Nablus Road, our guns were turned towards the Valley of the Jordan. We did very little firing in this position, and did not have another move before Wride and I were relieved on January 20. During those fifteen days it rained more than half the time, and one night we had a slight fall of snow. It was bitterly cold all the time, but there were several caves near the guns and we all managed to keep comparatively dry. "Snow" and I paid four visits to



A Christmas Mail from Australia.



In Abraham's Vineyard.

Jerusalem, and on each occasion managed to get a good meal. Rations were exceedingly short, and we were very glad when a large mail turned up for me, including a dozen parcels of groceries. Our delight knew no bounds when at about noon on January 20 our Wireless Officer arrived with a relief for us. Ten minutes later we were packed up and speeding along towards Jerusalem in one of the squadron's tenders. There were eight of us being relieved and †Norm Moss was amongst the party. We dumped our gear at an Artillery Headquarters in Abraham's Vineyard, where we slept that night. We spent the remainder of the afternoon having a final look around the Holy City, and in the

† This boy was a cadet at Wireless House, Sydney.

evening Norm, Hec. Johnson and I visited Dr. Halaby—an Assyrian who deserted from the Turkish army on December 9, after serving as a conscript for over three years. He has been right through the campaign in Sinai and Palestine, and told us some wonderfully interesting things. We left Jerusalem shortly after nine o'clock on Monday, the 21st, passed through Kulonieh, Enab and Latron, and on to the squadron at Mejdal. The motor ride covered about 50 miles and was very interesting and enjoyable. After a quiet ten days at the 'drome we set off on the twenty-four hour's train journey to Cairo and had a great six days there, forgetting all about the worries and hardships of the previous three months. (Written at Tel Azur, Palestine, April 19-20, 1918.)

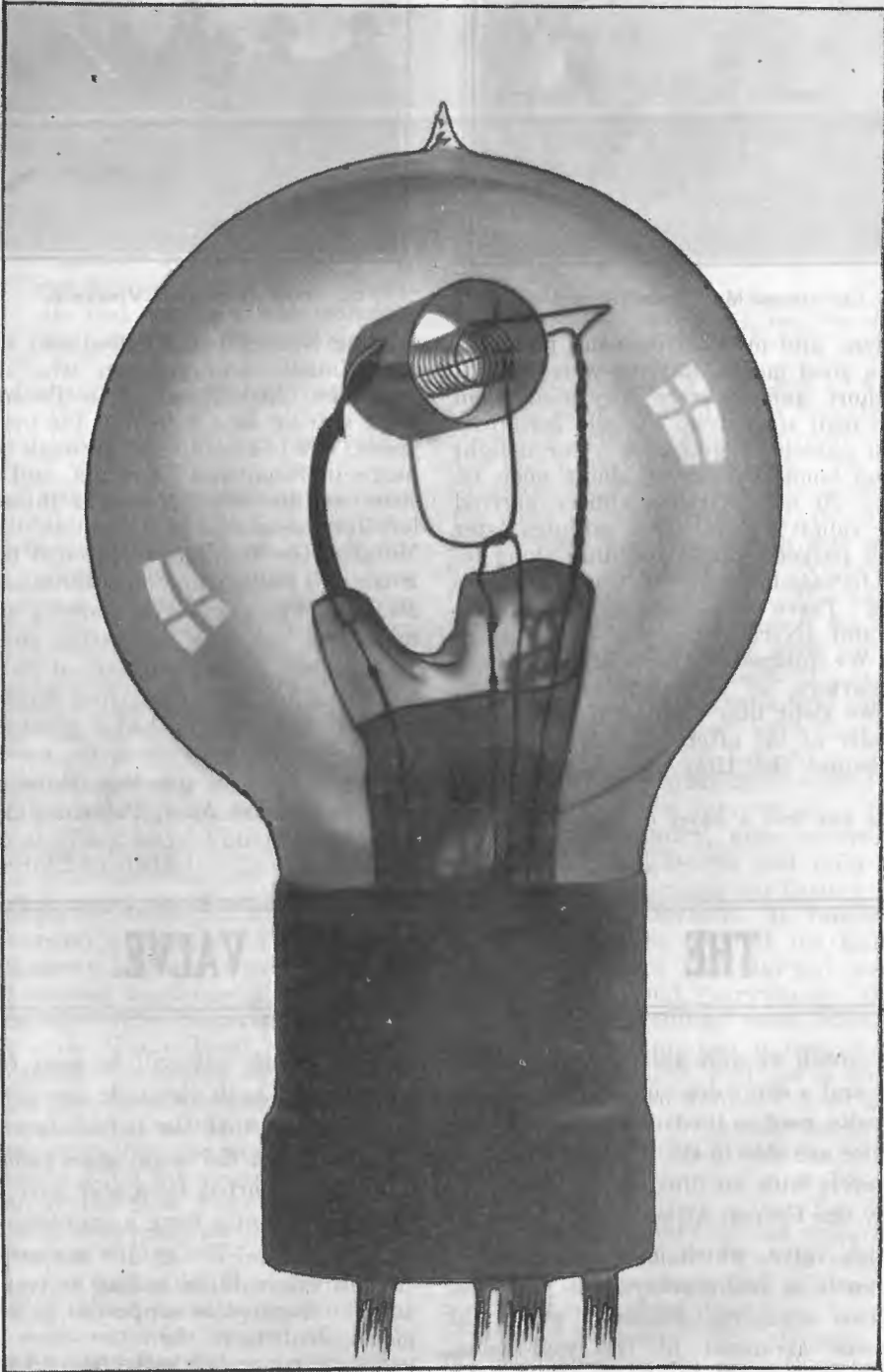
THE FRENCH TYPE OF VALVE.

Last month we were able to give an illustration and a short description of a magnifying valve used in the German Army. This month we are able to still further entertain our readers with an illustration of a valve used by our French Allies. (See page 538.)

In this valve, which, although used by the French, is manufactured in England, the three elements—filament, grid and plate—are arranged in the well-known form of straight filament, surrounded by cylindrical grid and cylindrical plate, although, instead of being mounted in a tubular bulb, which is usual with that arrangement, the elements are mounted in a

spherical bulb. It will be seen from the picture that each electrode has a separate support, and that the three supports protrude through the usual glass pillar. The plate is supported by a stiff wire column, which apparently form a connection to the terminal wire. The grid is supported by a twisted wire column, ending in two prongs, and the filament is supported by a wire U piece. In both of the latter cases the supports are connected with the lead wires.

The bulb terminates in a metal base, the lower portion of which has four plugs, which form the terminals from the electrodes and which are arranged to fit into a suitable socket.



Type of Magnifying Valve Receiver Used by French Wireless Squadrons.
(For description see preceding page.)

TWO LANDINGS

Written for "Sea, Land & Air" by "PROP BOSS"* (Australian Flying Corps)

(All Rights Reserved)

Some time in 1916, and somewhere on the north-west coast of the Old Country, I had been testing a new machine, and it was a good one at that. It would be superfluous to add that I had had a good time, because all the inhabitants had been most awfully good to me, and I regretted the thought of my departure very much.

At the end of my fortnight's stay "the powers that be" were beginning to ask questions as to why my Observer and myself had stayed so long, and we managed to concoct an answer which satisfied them, but at the same time it showed us that we ought to be moving. Consequently, we had a farewell dinner, and Vickers, my Observer, prepared for our last night. We collected a bunch of the boys around us, and did ourselves well, one of them sleeping in my room all night on the floor, hardly being in a fit state to go home.

I had left instructions with the hall porter that I was to be called about 8, and consequently was on the aerodrome about 9.30. It was a gorgeous day, a slight wind blowing, which was directly behind us and which would help us on our journey, and not a cloud to be seen. As the mechanics were getting the machine out the usual crowd of inquisitive busy-bodies appeared, and one old lady, carrying an umbrella, persisted in an answer to her rather silly question:

"What happens when the engine stops?"

Vickers got on board and strapped himself in; I shook hands with a few of my old pals, got on board, and also strapped myself in. The mechanics started the engine, and from the feel of it I could tell

she was running quite correctly. A slight interruption was caused by Dudley Codrington, who, by the way, is the champion amateur yachtsman of the North of England, who presented me with an imitation of the Iron Cross. This relic I still have and value very much.

At length we were off. Climbing rapidly to about 3,000 feet I pointed the nose of the old bus due south and left the sea behind me.

Just a word on the type of machine. She was a small two-seater, carrying an engine of just over 100 h.p., and capable of flying at a speed in the region of some 90 miles an hour. Providing the wind held I hoped to make our destination, some 300 miles south and near London, in a very little over 3¼ hours. Meantime I was endeavouring to trace our course over the network of railways over which we were flying, and eventually gave it up as a bad job, relying on my compass entirely for the direction, and trusting to be able to pick up a landmark I knew when we reached further south.

After some 40 minutes I saw a large hill, and on consulting my map found that it was the Wrekin, which is, as you all probably know, a large bump in the middle of flat country. From here the ground was very bad, being almost entirely over a very hilly and rugged watercourse, which obviously made any accidental landing very dangerous. I did not worry, however, as the engine was going beautifully. Vickers continually turned round—he was sitting in front—and every now and then passed me some chocolates or made idiotic remarks down our telephone, because when flying the roar of the engine and the whistling of the wind make it almost impossible to hear one speaking, even when they shout in your ear.

So far all had gone well, but our trouble was only just beginning. First, the wind changed and started to blow. Secondly, a large black cloud appeared straight in

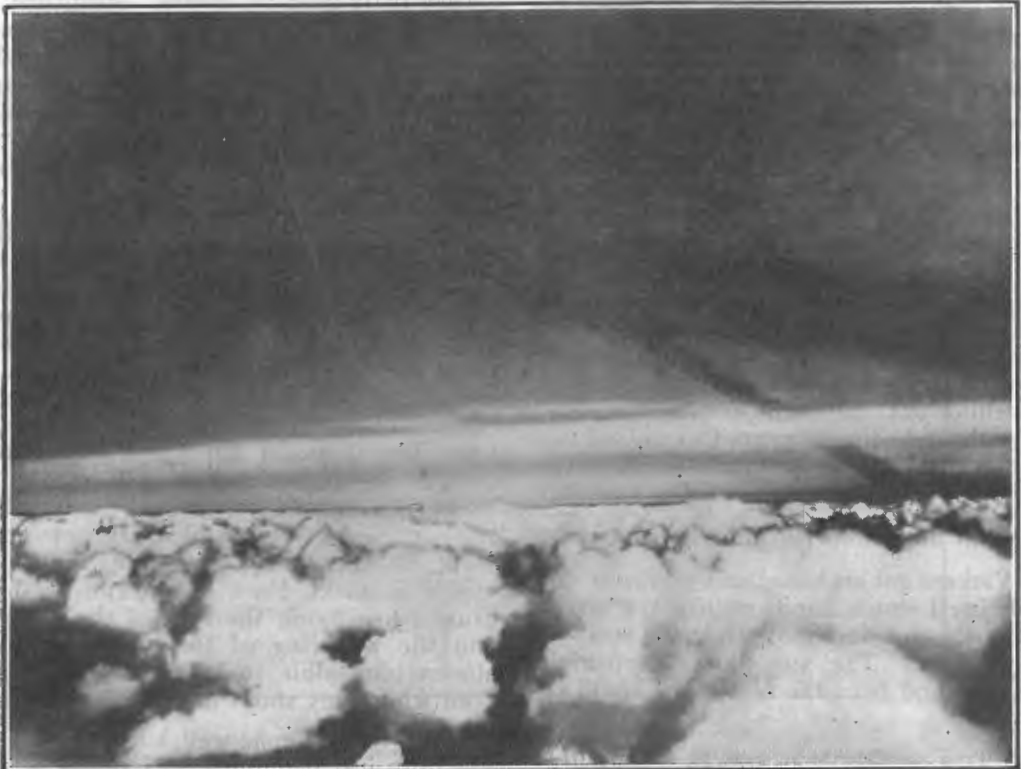
* "Prop Boss" is the *nom-de-plume* adopted by a returned A.F.C. airman, who still retains his high military rank and whose identity for that reason must remain anonymous.—Ed.

front of us, and I knew we were in for a rough passage. To keep under this cloud it meant dropping to less than 1,000 feet, and as the wind increased the trip became exceedingly rough. On several occasions, owing to still lower clouds flowing beneath us, I lost sight of the ground altogether. On coming out from above one of these clouds I discovered that we were over the centre of a large town, which on consulting my map I found to be Kidderminster. Vickers asked where we were, and I told him. He made some remark to the effect that we ought to land and buy a carpet.

The next phase of the trip was the arrival of the rain, and added to the rain was hail. The speed that we were going through this made it very painful when beating on our faces, and Vickers, being the passenger, was able to get underneath the wind-screen and so be in comparative comfort; my lot, however, was rather more unfortunate, as it was obviously

necessary for me to see where we were going. The driving rain and hail made it almost impossible to see the ground; the wind made it extremely rough, and with the kind assistance of the two I lost my way. I shouted to Vickers through the 'phone and asked him if he knew where we were, but as he had been coiled up inside the observer's cockpit he was unable to tell me or locate our position on the map. There was no alternative but to land.

The next thing to do was to find a suitable field. It required a field without many trees and a good 250 to 300 yards in length to effect a decent landing. At last I saw one which I thought would do. Four times I came down and skimmed the ground, but each time I was travelling too fast to stop, and I knew that if I attempted to land I should run into the hedge at the far end. After carefully considering the matter in my mind, and still being in the air without the slightest idea



Above the Clouds.

where we were, I decided to fly south again and have another try at picking up a piece of country that I knew.

By this time the rain had stopped, and feeling more hopeful we once more pushed off. Alas for our hopes! Before we had been going more than 10 minutes we struck another storm, but I had just caught sight of a large meadow, the surface of which looked good. Down we came, skimming the hedge at one end, and with the engine shut right off we touched the ground, pulling up undamaged among some trees at the further end.

Vickers got out looking very sheepish and swearing somewhat. He was very cold, and his first remark was "I wonder where the nearest pub is." Although I did not say it aloud, my sentiments were somewhat similar. We crouched under the wings of the machine for shelter from the rain, and were discussing what we should do next when a farmer arrived with a small cart to render what assistance he could. He seemed extremely surprised to find two able-bodied men in the best of health to greet him, instead of, as he thought, two mangled remains. Such is the rustic mind! We ascertained from him that there was a station where we could telephone from some two miles by the road, and adjoining it (thank Heaven!) was a pub. He very kindly drove us there, and having despatched some official messages from the station to Headquarters to the effect that we had landed and were quite O.K., we journeyed

into the pub. There we cheered both our body and soul with a good drink and a very excellent country lunch of bread, cheese and pickles. The pub-owner discoursed at length on the war, enumerated several methods by which it could be brought to a speedy finish, and also asked us if we knew his son, who was a private in the Connaught Rangers. We replied that we were sorry we had not had the pleasure of meeting him yet, but hoped to some day.

About 4 the weather cleared and brightened, and Vickers and I decided to have another go and get through to our journey's end. We had considerable difficulty in starting the machine, but after Vickers had expended much energy, much perspiration and still more uncharitable thoughts concerning the makers of the said engine, she started with a roar and a bang. Quickly clambering into his seat I "taxied" across the field and opened the engine full out. Very shortly we passed over Droitwich, and after picking up my course on the map again we went "hell for leather" for home.

Beyond Oxford the weather brightened considerably, and some two hours after leaving Droitwich I shut off the engine at about 6,000 feet above our destination. Round and round in a spiral we came, the ground getting nearer and nearer, until at length with a jerk she straightened out and we came to rest in the centre of the aerodrome. Thus finished the second of two landings.



Australian Tank in Action at Gaudecourt.

SHIPS THAT HAVE PASSED

Especially Written for "Sea, Land and Air".

BY CAPTAIN J. H. WATSON, J.P., F.R.A.H.S.

(All Rights Reserved)

THE "DUNBAR," "CATHERINE ADAMSON" AND "JAMES CHESTON"

Many notable ships have visited Australia, and their names will long live in shipping history. Prominent among them is the ship *Dunbar*. Visitors to the South Head of Port Jackson almost invariably look for the spot where she terminated her career, but few know any particulars of her short life.

The *Dunbar*, a ship of 1,321 tons, was built at Sunderland by James Laing, an eminent shipbuilder, and launched November 30th, 1853; a wood ship of the class known in those days as a frigate-built clipper. The London papers of the day said she was by 300 tons the largest ship ever built at Sunderland; the same papers also said this of the *La Hogue* when she was launched 18 months later. The fact that they were sister ships prob-

ably justified this joint claim. In alluding to this ship in the last issue of *Sea, Land and Air*, a paragraph begins: "She commenced her career in the unusual way of being launched stern on," now this is the usual way, and the *La Hogue* entered the water stem (bow) on.

The *Dunbar* was built with a British oak frame, planked and decked with East India teak, the masts also being built of that timber, and was said to be the finest merchant ship of her day afloat. On her way to London to go on the berth for Sydney she came into collision with the barque *Twenty-ninth of May*, and lost her starboard cathead and bulwarks.

Shortly after her arrival in the Thames war was declared against Russia, and with many other ships the *Dunbar* was



The Ill-Fated "Dunbar"; Wrecked at South Head, New South Wales, at Midnight, August 20, 1857.

chartered as a transport, and carried troops to Varna. She then embarked the 79th Regiment (now 1st Battalion Queen's Own Cameron Highlanders) for the Crimea, where it took part in the battle of the Alma, forming a portion of the First Division, having two killed and seven wounded.

On the conclusion of the war in April, 1856, and the evacuation of the Crimea, the *Dunbar* was put into her legitimate trade, and arrived in Sydney, under the command of Captain James Green (his brother, Captain Malcolm Green, R.N.R., who commanded several of the *Dunbar* line, died at Waverley, N.S.W., in January, 1904), who previously had the *Waterloo*, a 900-ton ship, belonging to the same owner. She left London June 26th, and Plymouth July 1st, arriving at Sydney September 27th, with 55 passengers and a large general cargo. Her time on the voyage was 88 days. Taking the average passage of 18 regular traders in 1850, which, in the pre-clipper days, was 114 days, it can be seen that the new ships were a great improvement on the old, as the average of the first 18 ships of the new type which arrived in 1856 was 91 days.

Her time home was 79 days, arriving at London March 16th, 1857.

In writing of Captain Green's command, previous to the *Dunbar*, of the ship *Waterloo*, it is interesting to note that although he made his last voyage in her 65 years ago, there is at least one of her passengers still living in Sydney and, in his peaceful home on Bellevue Hill, enjoying the quiet repose of a long life in the service of his country. Sir Henry Stephen, when he retired from the Bench, was Acting Chief Justice of New South Wales. Born in Tasmania, he was the eldest son of the late Sir Alfred Stephen, for many years Chief Justice of this State prior to Federation. Sir Henry came from the island colony when a boy, and after completing his education here was called to the Bar.

When about 23 years of age he sailed for England in what at the time was a somewhat celebrated ship, the *Phoenician*, a vessel of 521 tons, built by Walter Hood in 1847, and the first full-rigged ship of the clipper type built in Aberdeen, also the first to arrive in Sydney, coming here

under George Thompson's house flag, and commanded by Captain H. Sproat, arriving July 21, 1849. She was a regular trader for many years to this port, and on her return voyage to London, January 9th, 1851, Mr. M. H. Stephen was a passenger. In England he followed up his legal studies, and returned in the ship *Waterloo*, at that time commanded by Captain James Green, and reached Sydney January 2nd, 1853.

The *Dunbar* sailed on the second voyage to Sydney with Captain Green still in command, leaving Plymouth June 2nd, 1857. All went well, and a pleasant run was made up to August 20th, the ship being then 81 days out. At 8 o'clock p.m. she was off Botany, and then stood off on the starboard tack, with double-reefed fore and main topsails. It being a very dirty, dark and rainy night, two men were at the wheel, and Captain Green had not been off the deck since the coast was sighted some days previously. At 11.30 the yards were squared, and the ship ran under close-reefed fore and main topsails and foresail. As she ran in the foresail was clewed up, and the second officer was sent for'ard to look out for the light. The night being very dark, he was told by the Captain to "keep a good lookout for the North Head." The Captain called out, "Can you see the Head?" The reply came back, "No, Sir, solid darkness," followed almost immediately by the loud, startling cry, "Breakers ahead! Hard a starboard!" for it was blowing strongly, and the ship was on a dead lee shore.

It was midnight, the passengers were all in bed, having retired in the joyful anticipation of a happy re-union with friends, who awaited them with equally happy feelings; but the ship would not come round, and a tremendous sea seizing her, she was lifted on its crest and dropped on to the rocks, almost directly below the signal station, and smashed to pieces.

. . . . "And then all was hushed,
Save the wild wind and the remorseless
dash
Of billows; but at intervals there gushed,
Accompanied with a convulsive splash,
A solitary shriek, the bubbling cry
Of some strong swimmer in his agony."

Thus Byron describes "The Shipwreck" in Don Juan, but who is to tell what the last few moments were to the 120 passengers and crew who were engulfed by the sudden catastrophe? Captain Green evidently mistook the northern cliff of the Gap for the North Head and a lee shore, and ordered the helm starboard to clear it, and run into the harbour.

One man only was saved, James Johnson by name, a seaman on the ship, who was washed on to a ledge of rock, and from there crawled up to a higher place, where he was secure from the waves, and from which he was rescued on Saturday, August 22nd, having been there 36 hours when brought up by a young Icelander, Antonio Wollier, who was let down the cliff by a rope.

The officers of the ship with Captain Green were Chief Officer Struthers, Second Officer Spence, Third Officer Pascoe, Midshipman Duverde, Dr. Bain, and an apprentice named Hordern.

The wreckage and the bodies of those who were drowned were scattered over a large area, some being found as high up Middle Harbour as the Spit.

The remains of many of those who were lost and recovered were accorded a public funeral. An immense procession, composed of about 200 carriages, officers and men of the navy and mercantile marine, officers and men of the Royal Artillery, mounted police, and hundreds of citizens taking part. The cemetery at Church Street, Newtown, was not reached until 7 p.m., and the impressiveness of the ceremony was rendered more solemn by the last office taking place by moonlight.

A tablet on the walls of St. James' Church is placed there to the memory of Captain James Green, whilst monuments and tombstones in the cemetery bear the names of others of the unfortunate drowned, one being erected to Captain Steane, R.N.

THE "CATHERINE ADAMSON."

The people of Sydney had hardly recovered from the shock caused by the wreck of the *Duabar* when another passenger ship was announced as being wrecked at the Heads. This vessel proved to be the *Catherine Adamson*, an Aber-

deen-built ship, commanded by Captain George Stewart, who later had the *Jason* and *Strathnaver*, all owned by Henry Adamson, of Aberdeen. Aberdeen ships at this time were generally spoken of as being "Aberdeen liners," although five firms sailed ships to Australia from the granite city. These were George Thompson, Jnr., Donaldson, Rose & Co., W. Duthie, Alexander Nicol & Co., and Henry Adamson, all owning splendid ships, built by such noted builders as Walter Hood, A. Hall & Co., and W. Duthie & Co.

The *Catherine Adamson* made her first voyage to Sydney, where she arrived on January 31st, 1856, in 82 days, despite the loss of her foretopmast and her fore and maintopgallant masts, which went over the side with all sails attached, when off Scilly Islands, and new masts and yards had to be made from the rough timber she carried. On her second voyage she made the port in 79 days, and on her homeward run landed her mail in 68 days; she entered the Heads on her third voyage on October 23rd, 1857, less than seven months from the day she left for the homeward voyage, and 85 days on the voyage out; thus justifying the name given her of the Queen Ship, as up to this time she had established the record.

The night she entered the Heads, at 9 o'clock, October 23rd, was her last night afloat, and by daylight on the 24th not a vestige of her remained but broken timbers, floating cargo, and the dead bodies of passengers and crew who had lost their lives when the vessel was pounded to pieces on the North Head.

When off the Heads, the pilot, Captain Hawkes, boarded her, and she stood in under double-reefed topsails, courses, jib and spanker. She made several tacks when off the reef, and after putting about on the port tack was struck with a heavy S.W. squall, hauled up the mainsail and foresail, and stood towards the North Harbour; the weather moderating, and to get more way on, the foresail was again set, when the fore sheet carried away, and from the force of the breeze the mainsail could not be set. As the ship had no steerage way and was drifting bodily to leeward both anchors were let go. Thus the Captain describes what led up to the disaster.

After midnight, the Hunter River steamer *Williams*, coming in under command of Captain Henry Creer, immediately went to the assistance of the ship, but in spite of all efforts the result was as stated. Twenty-one lives were lost, including Pilot Hawkes and the second officer. Among the passengers who were drowned was Mr. Leathes, a brother to the then Secretary of the London and Liverpool Fire and Life Insurance Company, Rev. Jacob Jones, a Congregational minister, who was under engagement to the Home Missionary Society, and Mr. Ramsay, a Darling Downs pastoralist.

Whilst the *Catherine Adamson* was at the Circular Quay on her second voyage there was lying at Towns' Wharf, at the foot of Kent Street, a ship of 1,073 tons register which had gone through an experience as romantic as the oft-quoted *Marie Celeste* story.

THE "JAMES CHESTON."

As the Newcastle-on-Tyne owned ship *Marathon* was crossing the North Atlantic on February 28th, 1855, she descried a ship which, from her appearance, was evidently in distress. As she failed to respond when hailed, a boat's crew, with the chief mate of the *Marathon* in charge, put off and boarded her, when she was found abandoned. On an inspection of the ship being made, the cabin was found in a state of great disorder, the ship's papers were missing, the compasses had been removed, and every movable article of any value had been carried away, the general appearance being that the ship had been plundered. Continuing the examination and sounding the pumps, it was found there was 10 feet of water in her hold, with two feet on her 'tween decks.

Throwing over some of the cargo so lightened the ship as to get rid of the water 'tween decks, and exposed a hole bored in her side. This was plugged, and the ship pumped out, exposing other holes as she rose in the water, and clearly showing that an attempt had been made to scuttle her. The vessel proved to be the *James Cheston*, of London, with a cargo of wool, foodstuffs, oilcake, etc. She was quite a new ship, and well found in all respects. Mr. John B. Thomas, the mate of the *Marathon*, and nine men, were put on board, and took her to Liverpool, where she duly arrived. To what extent

those who saved the *James Cheston* benefited by it history does not say, nor has any light been thrown on the matter of how she became a derelict. On this voyage to Sydney she was 116 days out when she arrived, under command of Captain Bryan. If fiction were being written, the orthodox romantic ending would have been to have the mate of the *Marathon* in command.

This vessel's next voyage also had an element of excitement in it, for on her way to Adelaide from Liverpool, whilst in the South Atlantic, she picked up two boats, which contained the crew and passengers of the brig *Prince* (which vessel, whilst on a voyage from London to Algoa Bay, took fire); these she brought on to Adelaide.

Mr. Henry Adamson, the owner of the *Catherine Adamson* did not visit the sins of Captain Stewart on his head, for in January, 1859, we find him in command of the fine new ship *Jason*, on her first voyage, in Sydney Harbour, where she arrived after 96 days on the voyage from the Downs, on the 14th. A curious incident occurred while the vessel was in the Bay of Biscay. At midnight on October 19th, Captain Stewart heard a voice, apparently close alongside, calling for a rope, and at the time thought it came from one of the crew who had fallen overboard. Captain Stewart immediately threw a lifebuoy, but a very heavy sea was running, and the wind, which had been blowing a gale, was flying all round the compass. The ship was thrown aback at once, and one of Clifford's lifeboats lowered with the chief officer, Mr. Duthie, and four hands, but she could not get clear of the ship and filled alongside, the crew being with great difficulty saved from drowning. On mustering the ship's company there was no one missing, so that the unfortunate man must have fallen from some other ship. In 1865, when Duthie built the *Strathnaver* for Mr. Adamson, he gave the command of her to Captain Stewart, and she arrived in Sydney on January 30th, 1866, making the port in 84 days. It was announced at the time that this was Captain Stewart's last voyage, as he intended to retire from the sea on his return home, so when the *Strathnaver* arrived, on her second voyage, on October 12th, it was found that Captain Fowler was in command.

AUSTRALIA'S PRICELESS HERITAGE—IRON

ITS CONVERSION INTO STEEL

(All Rights Reserved.)

PART II.

(Continued from November issue.)

In the manufacture of steel two furnaces are required. The functions of the blast furnace, as explained in our last issue, are to reduce the raw material (iron-ore, limestone and coke) to molten iron. The finished product of the first furnace now becomes the raw material of the second, or Open-Hearth Steel Furnace, which in turn converts the molten iron into molten steel.

From the blast furnace the iron is conveyed first to the mixer, then to the steel furnace, from which it is tapped into 80-ton ladles and poured into moulds. The contents of these moulds, when cooled, become ingots or slabs. The former are rolled into rails and other forms of structural steel, the latter into plates three-eighths of an inch thick, for the outer plating of our new ships.

This article will detail the progress of the molten iron from blast furnace to mixer, describing how the metal is maintained in a molten state until required by the steel furnace, the methods of heating and charging the open-hearth furnaces, the tapping and drawing off of the molten steel into moulds, and, finally, the treatment of the slabs and ingots in the rolling mills.

From the blast furnace the iron is tapped into 40-ton ladles and disposed of in three sections. One goes to the Pig Mill, is cast into "pigs" and stacked until further required. A second batch is taken to the Direct Metal Foundry, so-called because the metal is handled direct from the furnace, and is here utilised for casting the moulds into which the liquid iron and steel are subsequently received.

The third batch is conveyed to the Mixer.

The Mixer.

This was installed as the one practical solution to certain difficulties arising under the old system of handling the molten iron. The blast furnace yields some seventy tons of iron every four hours;

the steel furnace a similar quantity every eight or ten hours. Thus there remains a surplus of iron. If allowed to remain in the ladles it would cool, and become useless; on the other hand, if taken to the Pig Mill and cast into "cold pig" it may be required in one of the steel furnaces soon after having been chilled. In the latter case the "pig" must either go back to the blast furnace to be re-smelted or go into the steel furnace cold.

Iron fed into the steel furnace in a molten state is ready for tapping in from eight to ten hours; cold metal would require twice as long. Hence the adoption of the mixer.

This is housed in the mixer building, and the economy which the operation of this department has effected fully justifies the initial expense of establishing it. Here the ladles on arrival from the blast furnace are manipulated by overhead cranes, and their contents poured into the mixer through a doorway in its roof. The mixer is heated by gas, generated in the gas producer building, and serves the dual purpose of storing the molten metal and maintaining it at an even temperature. In appearance it is a huge cylinder mounted on roller bearings to permit of its being tilted, and with a colossal spout protruding from the discharging end. The cylinder is 35 feet in height, 25 feet in diameter, and has a storage capacity of some 1300 tons. The interior is heavily lined with fire-brick.

A telephone message is received from the steel furnace building: "twenty tons number six." "Now you'll see how she works," explains our guide; "they want twenty tons of metal in No. 6 furnace." The process of replenishing the steel furnaces is known as "giving the furnace a drink," and is performed in the following manner:

On the discharging side of the mixer is an automatic weighbridge, upon which rests a 40-ton ladle. The position of the ladle is immediately beneath the mixer spout, or runner. On a platform, some 40

feet above floor level, a system of electrical levers controls the tilting of the cylinder. Thus, immediately on receipt of the telephone order one of these levers is brought into play; the mixer then tilts slowly forward, and in a manner strangely suggestive of a huge coffee pot, the mixer spout now emits a stream of molten iron into the 40-ton breakfast cup, while on the platform above the exact flow is recorded and regulated until the indicator points to 20 tons. By reversing a lever the supply is at once cut off, and the cylinder restored to its original position.

Let us now trace the movements of the breakfast cup, and the method by which the still furnace receives its 20-ton "drink."

Situated a few feet distant from the Mixer Building is the Steel Furnace

House. To reach this one passes the Gas Producer Building, wherein is generated the gas which supplies heat not only for the mixer, but for the steel furnaces.

The Gas Producer Building is 80 feet in height and 600 feet in length.

Here the coal—which has been brought by grab and locomotive from the coal yards—is gasified in Morgan Gas Producers, and all impurities eliminated therefrom. In the Steel Furnace House are seven furnaces, each of which is supplied by four gas producers, the gas being conveyed by pipes, eight feet in diameter, into checker chambers, which are built below and behind each furnace. The gas thus supplied is of a variety known as "44 per cent. combustible."

To obtain in the furnaces a flame temperature of some 1800deg. centigrade, or



The Open Hearth Steel Furnace House,
Showing Raw Materials at Furnace Mouth, also the Electrical Charging Car.

3272deg. Fahrenheit—which is equivalent to one-quarter of the estimated heat of the sun—it is necessary to pre-heat both the air and the gas.

The checker chambers are built in pairs, one for air and one for gas. Through one pair of these checkers the gas passes first into the furnace, and here attains the desired temperature. For a period of twenty minutes the combined gas and air enter the furnace at one end and traverse it, in a continuous stream. A reversing valve is then thrown over, causing the gases to travel in a direction opposite to that previously followed. At the conclusion of its work in the furnace the outgoing gas gets away from the hearth at a very high temperature, and is led down to slag pockets at either end of the furnace. The gases next travel through a second pair of checkers at the other end, and in their progress heat up the checkers to about 1200deg. centigrade. In this manner the

gases are robbed of their heat prior to flowing out at the stack.

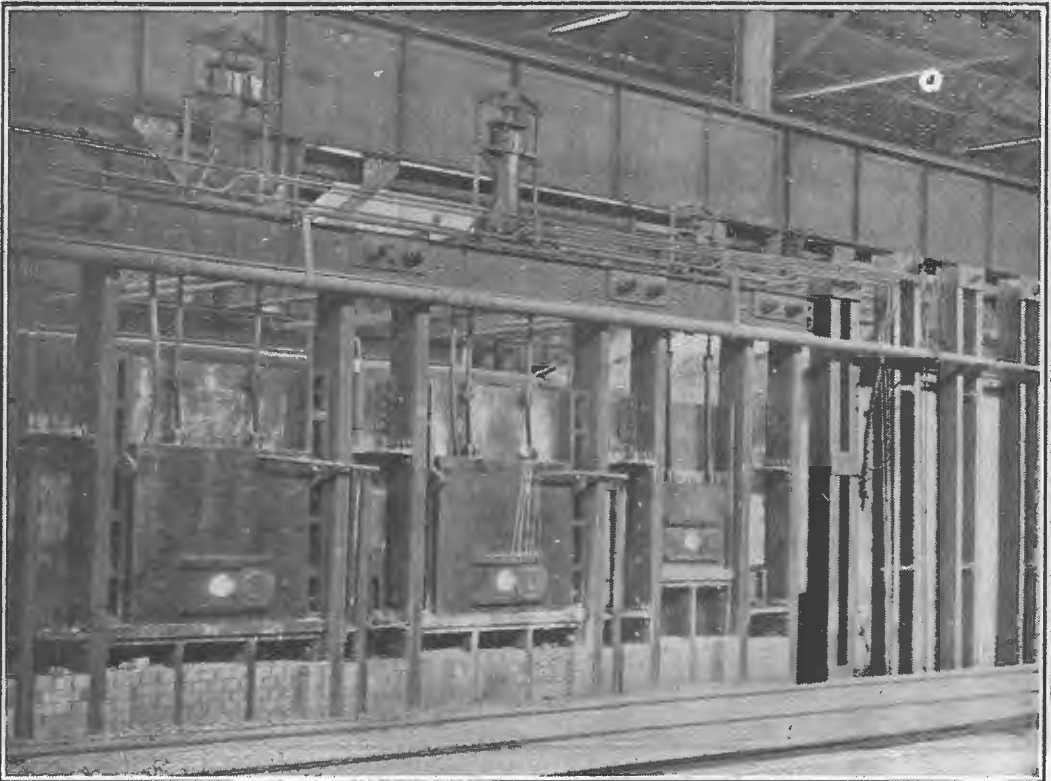
By alternating the flow of gas and incoming air, first in one direction for twenty minutes and then in an opposite direction for a similar period, each pair of checkers is heated and used for conserving heat and pre-heating the incoming gas and air.

The Open Hearth Steel Furnaces.

On entering the Steel Furnace House the visitor is at once impressed by two facts. First the vastness of the building, and secondly the complete absence of the rush, bustle and noise which one would almost instinctively associate with the work carried on therein.

The explanation is that each man is thoroughly familiar with his own particular job, and sets about it without waiting for verbal orders.

The white glare of the furnaces is too strong for the naked eye, and the men are supplied with blue goggles, which



A Section of One of the Seven Open Hearth Steel Furnaces. Each Furnace has Five Doors.

they wear upon their caps in the manner adopted by motorists and airmen.

The Furnace House is 80 feet high, nearly 1,000 feet in length, and divided into two sections, i.e., the "floor," or charging end, and the "pit," or discharging end.

The narrow-gauge railway system which covers the entire area occupied by the Steel Works, ascends an incline and conveys the raw materials to the floor of the furnace house, where, by means of an electrical charging machine, or ram, the "cold" charge is fed into the furnace mouth.

The hot metal, including our 20-ton "drink," is conveyed either direct from the blast furnace immediately after tapping, or from the mixer, as ordered, and is fed from the ladles into the steel furnaces by means of overhead cranes.

The dimensions of each furnace are as under:

- Width 18 feet.
- Length 36 feet.
- Depth of bath 3 feet.

These dimensions are clear of "ports," or port-holes, through which the gas and air from the checker-chambers descend.

As stated earlier in this article, each open hearth furnace yields from 70 to 75 tons of molten steel, and is tapped at intervals of from eight to ten hours.

The raw materials comprising a single charge, and the order in which they are fed into the furnace, are as follow:

- First, limestone: 8 tons.
- Second, iron-ore: 4 to 5 tons.
- Third, scrap steel: 20 to 25 tons.
- Fourth, pig iron, (hot or cold, whichever be available): 40 to 50 tons; in ratio of two tons of pig iron to one ton of scrap steel.

The cold raw materials arrive on the "floor" in trucks, or charging-boxes, which are mounted on flat-topped carriages, or buggies, and drawn by locomotive from the store-yards.

The charging of the steel furnaces is conducted in the following manner:

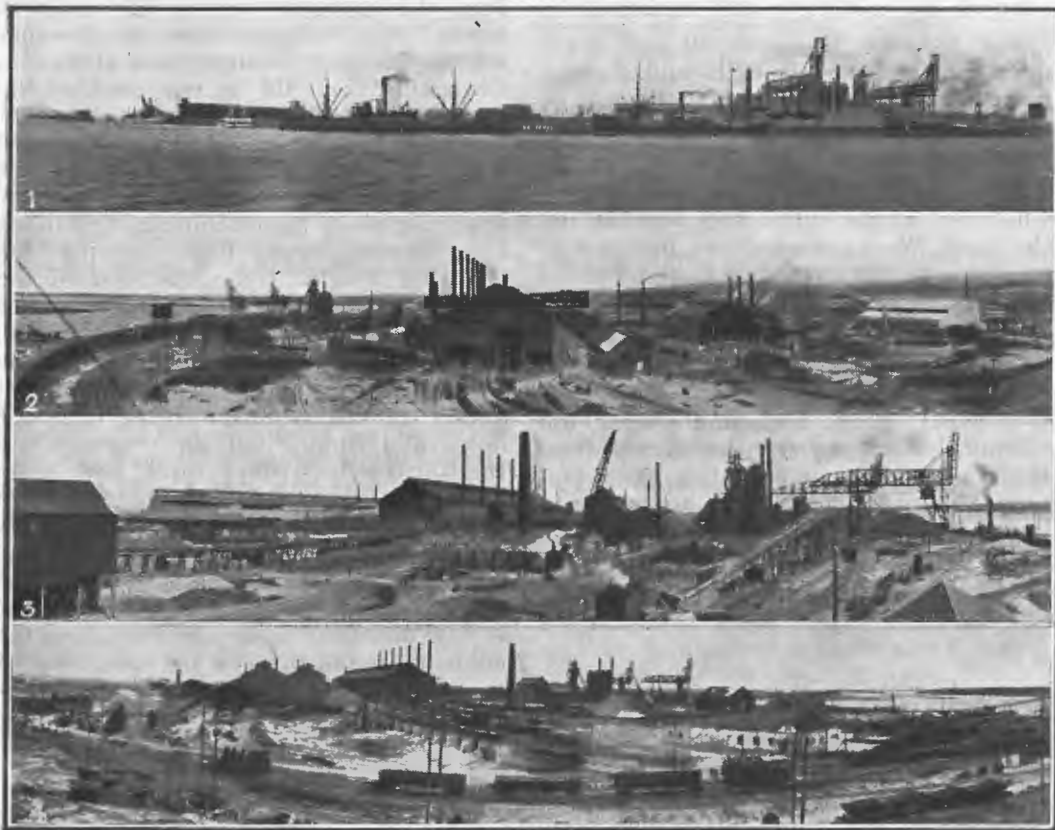
On the opposite side of the floor, and corresponding with each furnace door, is a lever, controlled by hydraulic pressure,

and manipulated by a boy. At a touch from the lever the door is automatically raised. The electrical ram or charging machine is now brought into operation. Projecting from the extreme end of the car is a ram head, which fits into a socket at the rear of each charging box. On the platform of the charging car are four levers manipulated by one man. Number one lever pilots the machine up and down the furnace house floor, hauling the charging trucks from one end of the building to the other as required. Number two raises the charge box from the buggy. Number three pushes the box into the heart of the furnace. Number four reverses the charge box, turning it upside down and tipping out the contents into the furnace. Number three now withdraws the empty box and places it upon the buggy. The empty charge box weighs seventeen cwt., the nett contents from 1½ to 2½ tons, according to the density of the charge. The furnace door is now closed by hydraulic lever, and the contents of the furnace are soon reduced to a river of seething, bubbling incandescence. Our guide explained to the writer that this process is called "making steel soup."

Tapping The Open Hearth Furnace.

The tapping of the steel furnaces is performed under the supervision of a man known as the "melter." When in his opinion the contents of the furnace are ready to be run off, a tapping-bar, about 30 feet in length, is inserted in an aperture at the floor side of the furnace and pushed through the bath to a corresponding aperture on the pit side. Another man at the pit side having simultaneously cleared the passage, the molten metal now flows through an enormous spout or runner into an 80-ton ladle set in the pit immediately below the spout. The ladle fills in five or six minutes. The slag being light floats to the top and runs over.

When filled an overhead travelling crane of 100-ton lifting capacity engages the ladle and removes it to one of the three pouring platforms. Standing in readiness against this platform is a set of moulds. These moulds vary in shape according to the purpose for which the metal is required, and are those previous-



Four General Views of the Steel Works.

- (1) The Water Front. (2) The View from the Coke Plant. (3) From the Boiler House.
(4) From the Coal Crane.

ly described in the portion of this article which relates to the Direct Metal Foundry.

In the base of the ladle is an aperture $2\frac{1}{4}$ inches in diameter, and plugged with a stopper, this being operated by a lever attachment clamped to the exterior of the ladle.

On arrival at the platform the pourer directs the suspension of the ladle in such a manner that the aperture corresponds with the mouth of the mould, and by manipulating the stopper lever, controls the flow of the molten steel into the upright moulds, each of which has a capacity of about three tons. These are mounted in pairs on a table, the mould-table is set upon a wheeled carriage, the whole resting on narrow-gauge rails.

The moulds when filled are conveyed by a locomotive to the soaking pit. Here an overhead stripper-crane whips off the

mould from the metal which remains standing on the mould carriage.

When cold the slabs, or ingots, which are now known as "blooms," are raised by tongs crane and lowered into the soaking pit.

The process of soaking by gas-heat prevents the outer crust of the "bloom" from chilling, and ensures an even temperature throughout the mass of metal. After a few minutes' treatment in the soaking pit the "bloom" is withdrawn by a pair of giant pincers, called the "bloom" crane, the grip of which is maintained by compressed air. The "bloom" is then lowered, and deposited on a travelling table which consists of revolving rollers, the pincers are relaxed and the "bloom" rumbles along this table towards the rolling mill, its progress being controlled by

levers on an overhead platform which regulate its movements to the minutest fraction of an inch.

Immediately in front of the rolls is a pair of giant manipulators which work backwards and forwards from left to right, and gripping the "bloom," steer it into whatever position may be desired

before passing it between the rolls. From a horizontal pipe, a miniature cascade descends continuously upon the rolls, preventing them from becoming overheated.

The rolling, finishing and testing of the steel plate will be described in our next issue.

THE MORNING WATCH

Lo, bright shine the stars in the vault overhead.

(Oh, purple and deep is the tropical sky!)

No glint of a hint in their beams have I read

That, down 'neath the skyline, fair Morn-
ing is nigh,

'Till, low in the east, comes a sign from afar,

Like a token of Peace shines the bright
Morning Star.

'Tis Venus, new-sprung from her couch
'neath the wave,

As though from the arms of her lover
she flew:

Paler she beams, though she's soaring so
brave,

From the Sun, climbing fast o'er the
water's deep blue.

The rose-tinted clouds fond adieux seem
to say

To the stars, as they herald the Lord of
the Day.

Each wave seems to flash, as though it too
would please,

When gently caress'd by the fresh morn-
ing breeze:

Whilst, her snowy wings spread, the broad
ocean adorning,

My ship bows her head to the Birth of the
morning.

Ah! Sweet is the kiss, soft and tender as
lawn,

That Nature imparts to the watcher at
dawn.

—STANLEY O. BATT.

T.S.S. *Moeraki*, 1918.

JAPANESE BANK TO FINANCE SHIPBUILDING

In connection with the recent establishment of a ship mortgage bank at Hamburg, and the plans for similar institutions in Berlin and other German towns, it is interesting to learn that this method of facilitating the building of new tonnage is about to be adopted in Japan. Captain Fevrells, the Secretary of the Swedish Legation at Tokio, states in a report to the Foreign Department at Stockholm that with a view to encouraging the Japanese shipbuilding industry, which is now working at its fullest capacity, it has been decided to establish a loan bank for advancing money on the security of ships under construction or to be built. The nominal capital of the bank is to be 20,000,000 yen, but the bank will be able to enter into engagements up to ten times the amount of the capital, and efforts are to be made to obtain a State guarantee. The maximum annual dividend has been fixed at 5 per cent. for the first ten years after the foundation of the bank. Captain Fevrells further states that in all departments of the Japanese shipping trade the war has been productive of great expansion. In particular the steamship lines to Australia, the United States, and Europe have undergone considerable development. "In Eastern waters," his report continues, "the Japanese are now almost supreme, and where Japan has once firmly established herself it is little good to try to drive her out again by competition. There is hardly any doubt that Japan's future lies on the water, and the Government and the authorities, as well as shipping and shipbuilding circles and a large section of the people, have their eyes open to the advantages of the present situation."

ON A FRENCH DESTROYER

CONVOYING TRANSPORTS

BY LAURENCE JERROLD

Looking for a convoy of transports in a thick fog off the French Atlantic coast is a great experience for a landlubber on a French destroyer. This for the French destroyer, is only the daily drudgery which has been done during three and a half years of war. I merely saw one day's normal work. The elderly skipper, gallantly joining from the Reserve, as so many of our own retired officers have done, apologised for the tameness of the day. "I ask pardon; it is just the ordinary run; unfortunately, we have nothing sensational to show you. If we had had we would have done so, but everything at sea is just luck."

The mere working day of the little destroyer, now old, but still very fit, was interesting enough to the landsman. It was glad indeed to be just in the boat, and with the officers and men in their ordinary drudgery, and nothing faked in what I saw. Just everyday work that has been carried on quietly each day since the war from Dunkirk to Bayonne. This particular little elderly destroyer of 400 tons was at Dunkirk, and has run between Dunkirk and Bordeaux countless times, convoying merchantmen.

We set out before daybreak on our destroyer's daily job of meeting merchantmen and looking out for submarines. There are a good many submarines round here, but I must say they must have a bad time of it. Our boat and a thousand other boats are incessantly darting hither and thither over their heads, and they can scarcely put their noses above the water for a moment. One does not envy the life of the German submarine sailor. We pick our way by chart and compass through an opaque white fog, and cannot see 200 yards ahead. The coast is a deadly one, strewn with rocks and islands. The skipper gropes his way from buoy to buoy and lighthouse to lighthouse, each barely seen before one is upon it.

Looking for Victims.

"Splendid weather for submarines," said the skipper: "How? Good for the submarines?" "No, good for us. This is

the best sort of weather in which to see a submarine, and, of course, hit it when you see it. It comes up, peers through its periscope, and cannot see anything, and you suddenly come upon it." We did not come upon one, but we suddenly heard guns. Our five little guns were ready, with a man at each, and our torpedo-tubes. We were very keen to fire, but we had nothing to fire upon in the mist. The explanation came later from a wireless message: "Submarine thirty miles off." Another and a luckier destroyer had been in that spot thirty miles away, had fired and torpedoed and dropped depth charges, and come back, triumphantly, sure it had done for the submarine.

The admiral's staff remained a little sceptical. "They often say they have done for the submarine," said the admiral's aide-de-camp. But it is the staff's job to be healthily sceptical. That wireless about the submarine thirty miles away came to us, and came to every warship. These wireless messages come very often, more often, probably, than the German submarines imagine. There are methods of direction by wireless which are now much improved and very accurate.

We were still groping our way through the thick fog. We were still peering for buoys and lighthouses, also looking for the convoy coming from England, to find which seemed to the landsman worse than finding a needle in a bottle of hay. Having reached the worst danger zone, we dashed up and down from east to west. "Can't miss the convoy now," said the skipper. Around us were darting those marvellous little U-boat chasers built in America, and peaceful fishing-boats were unconcernedly fishing. After we had rushed up and down for a little while, sure enough parts of the convoy appeared from out of the fog. We signalled, the U-boat chasers repelled, and we and the tiny chasers began our stunts.

Convoy Picked Up.

The convoy came slowly and placidly on. The skipper was too busy to say anything about what he was doing, but I just

watched him do it. Having picked up the convoy, now clearly seen, the fog having risen in the sunshine, we danced round the convoy. We waltzed round it; we followed a good old camouflaged 5,000-ton steamer at her own peaceful speed, and, suddenly, with an order from the skipper into the speaking tube, dashed on, turned round just ahead of the steamer, raced back past the stern of her, and raced on again. Then we did zigzags in front of the steamer and other steamers; then we zigzagged on either side of the convoy. It was like a fly buzzing round a plodding ox, but our 400 tons were not teasing, they were saving the 5,000-ton cargo boats.

The skipper was quite pleased. "You see how she picked up?" Our little eleven-year-old destroyer did indeed pick up. She could crawl beside the steamer, and in a few moments get up to eighteen or twenty knots, swerve round down astern of the steamer, then up again and leading once more, after which she zigzagged like an acrobat on a bicycle. "Good little boat," said the skipper. "Speed and zigzagging are our only real methods against submarines." After a few more stunts the danger zone was passed. We just signalled imperiously to the convoy: "Follow us!" and made straight for the anchorage.

There we inspected a convoy painted all over curiously, and looking exactly like

so many Cubist pictures planted in the green sea. We passed also a flotilla of those discreet, heroic mine-sweepers going out once more, as they do day by day, to the Atlantic. But the greatest sight of all which we saw on getting at the anchorage was a fleet of ships starting for England under an escort of countless torpedo-boats and little chasers. This is the largest fleet that has even sailed in any time. The escorting boats started waltzing round the great sailing fleet, and I imagine are still doing their vigilant tricks around it even now as a I write.

"Our men don't look much," said the skipper in my eleven-year-old torpedo-boat; "they don't look much, but they are the best chaps in the world. They are all Bretons, and they are faithful unto death. They have been doing this same old job all round the Atlantic coast since the war began." Incidentally, the second officer said that nobody bothers about danger on board. "A torpedo amidships, and we should all go down in a minute or two. Then why bother?" These French sailors have, in the Atlantic, been in their own more modest way doing the same great silent work that our own do elsewhere. And the little destroyer I sailed in "wears" the French Military Cross on her quarterdeck, won at Dunkirk.



Australian Tank in Sunken Road, Gaudecourt.

RECORD OF THE DEVELOPMENT OF WIRELESS TELEGRAPHY AND TELEPHONY AND INTERESTING ITEMS IN RELATION THERETO

The record below is intended to constitute, arranged in chronological order, a résumé of the outstanding events in wireless telegraphy from year to year. [ALL RIGHTS RESERVED.]

(Continued from September Issue.)

1914 (Continued).

On August 24 the Germans blew up the giant station at Kamina, Togoland, to prevent its falling into the hands of the British.

On August 24 the United States Government notified the owners of the German Transatlantic station at Tuckerton, New Jersey, that its experimental license had expired, and it must therefore close down. Arrangements were afterwards made for restricted working.

On August 29 the German wireless station at Samoa was captured by an Australasian Naval Force.

The German station at Nauru, Marshall Islands, was captured shortly after this.

On September 12 an Australian Naval Reserve Force captured the German wireless station at Herbertshohe on the island of Neu Pommern.

The powerful German station at Duala, Cameroons, was seized on September 27.

On November 9 a Japanese force occupied Kiauchau and its wireless station.

On November 13 the Marconi Wireless Telegraph Company of America obtained a preliminary injunction against the De Forest Radio Telephone and Telegraph Company and the Standard Oil Company in a suit for infringement of patent.

On November 28 the following notice, under the Defence of the Realm (Consolidation) Regulations 1914, was issued: "No person shall, without the written permission of the Postmaster-General, buy, sell, or have in his possession or under his control any apparatus for the sending or receiving of messages by wireless telegraphy, or any apparatus intended to be used as a component part of such apparatus."

During the year high-power trans-oceanic stations were completed at Carnarvon (Wales), Belmar, New Jersey (U.S.A.), Honolulu (Hawaiian Islands), and San Francisco (Cal.). The Honolulu and San Francisco stations were formally opened to public service on September 24.

1915.

In January Senatore Marconi took his seat in the Italian Senate.

On February 20 the Panama-Pacific Exhibition at San Francisco was officially opened, by President Wilson at Washington, through the medium of wireless telegraphy.

A wireless telegraph service between Spain and Italy was inaugurated on May 1.

On May 12 the German high-power wireless station at Windhoek was captured by a South African force.

On May 12, in Battery Park, New York, the Mayor of New York unveiled the monument in

* The first direct wireless messages to Australia were transmitted by this station.

memory of wireless operators who had lost their lives at the post of duty.

On July 8, as a result of investigations into alleged breaches of neutrality, the United States Government decided to take over the control of the Telefunken wireless station at Sayville, Long Island.

At the end of August the submarine cable between Oban and south-east Mull broke, and until its repair wireless telegraphy formed the only means of communication between the outlying islands and the mainland.

At the annual meeting of Marconi's Wireless Telegraph Company, on July 26, Mr. Godfrey Isaacs announced the complete destruction of the German wireless chain, upon which our enemy had expended so much money, and on which they based their high hopes of a commercial world-domination.

On July 27 wireless communication between the United States and Japan was effected. The two terminal stations were situated at San Francisco and Funabashi, near Tokio, and the messages were relayed through Honolulu.

At the British Association meeting, held in September, three papers on wireless telegraphy were read, the first, by Dr. W. H. Eccles and Mr. A. J. Makower, was entitled "Electric Oscillations in Coupled Circuits—A Class of Particular Cases." The second paper, by Professor G. W. O. Howe, dealt with "The Capacity of Aerials of the Umbrella Type." The final paper was entitled "A Note on Earth Resistance," and came from Professor E. W. Marchant.

On September 28 the American Telephone and Telegraph Company, working in conjunction with the Western Electric Company, succeeded in telephoning by wireless across the American Continent from Arlington to Hawaii, a distance of nearly 5,000 miles.

In September a commercial wireless service was inaugurated between Japan and foreign countries, via Ochushi and Petropavlovsk, in Siberia.

On October 26 the wireless telephone experiments were continued, communication being effected across the Atlantic from Arlington to the Eiffel Tower, Paris.

In November Mr. Daniels, United States Secretary of the Navy, successfully transmitted from Washington a wireless telephonic naval order to Rear-Admiral Usher at Brooklyn Naval Yard.

1916.

In January, by an Order in Council, His Britannic Majesty prohibited to all destinations the export of material for wireless telegraphs and telephones.

In February the Pope, restoring an ancient custom of the Church, announced his intention

of officially blessing wireless telegraphy in recognition of its services to mankind.

During the course of a severe blizzard in the United States during February wireless telegraphy was extensively used for train despatching, as the telegraph wires had been destroyed.

In the early part of the year wireless enthusiasts in Holland formed a wireless association, "The Nederlandsche Vereeniging voor Radio-Telegraphie," with headquarters at The Hague.

During the Irish rebellion at Easter in this year wireless telegraphy played an important part, as the insurgents entirely isolated Ireland by cutting the cable to England.

Among the subjects discussed at the Pan-American Conference, held at Buenos Aires in April last was the control of wireless telegraphy. This forms a big step forward on the part of the South American Republics, clearly proving their appreciation of the necessity of a reliable wireless telegraphic service.

The determination of the difference in longitude between Paris and Washington with the aid of wireless telegraphy, which has been in progress since October, 1913, was completed in May, the result, expressed in terms of time, being 5 hours 17 minutes 35.67 seconds, and has a probable accuracy to the order of .01 second.

On July 28 the *London Gazette* printed the text of a new official regulation requiring the owner of every vessel of 3,000 tons or over, registered at a British port in the United Kingdom to take out a license for a wireless installation before August 21, 1916, irrespective of whether his ship carried passengers or not.

On September 20, Judge Mayer, of the U.S.A. District court, delivered an important decision regarding the suit tried before him, affecting the patents involved in the Fleming-Valve controversy, between the American Company and the De Forest Radio Telegraph and Telephone Company. He gave his decision in favour of the former, and his judgment has been pronounced to constitute one of the finest and most technically correct opinions ever delivered from the American Bench.

On November 12 Senatore Marconi delivered an important lecture at the Lincei Academy, Rome, before H.R.H. the Duke of Genoa, and a most distinguished audience. He took as his subject those problems of Radio-telegraphy to which scientists are likely to direct their attention in the immediate future.

The initiation of the newly-established Trans-Pacific Wireless Service between the U.S. and Japan was celebrated on Wednesday, November 5, by an interchange of messages between the Mikado and President Wilson. Whilst the world's greatest war has been raging with unabated fury in Europe this new enterprise, carried out by the Marconi Company, demonstrates the progress of wireless communication in zones wherein men are unobsessed by pre-occupation in mutual destruction.

1917.

"*Coming of Age.*"—In June of this year wireless telegraphy "came of age"—i.e., 21 years had elapsed since the registration of patent 12,039, on June 2, 1896. This constitutes the basic patent of the Marconi system, from which all the other so-called systems have radiated. Eminent radio-telegraphists like Dr. J. A. Fleming

and Professor E. W. Marchant paid a tribute to the occasion by reviewing the past and forecasting the future. Mr. F. S. Stacey, the first British wireless operator to make a transatlantic voyage, contributed an illustrated article to the *Wireless World*, detailing his experiences on that initial crossing, together with a description of his apparatus.

Wireless and Aircraft.—During this the fourth year of war considerable developments have taken place in regard to wireless as utilised for military and naval purposes. Into the greater number thereof it is not possible to enter into detail, but one outstanding feature has come into sufficient prominence for its presence to be irrepressible by Press censorship. We refer to the connection between aircraft and wireless, which has become so pronounced as to justify the title which is sometimes given them of the "Gemini of modern war."

The great expansion of aeronautics has necessitated a most insistent call for instruction in wireless telegraphy. This appeal formed part of the important message to the wireless men of America, issued by Senatore Marconi on the occasion of his visit to the U.S.A. The close connection between aircraft and wireless constituted a prominent feature in the great pan-American aeronautic expansion, held in the course of 1917, under the auspices of the Aero Club of America, at the Grand Central Palace, New York. A significant item in this connection occurred amongst the details of the new four-engined German Gothas, which was allowed to be published in the British Press. According to this account the captaincy of these huge aeroplanes is vested in the wireless man.

Compulsory Wireless.—The year 1917 saw a further development in the direction of compulsory wireless for sea-going vessels. As recorded in our notes for 1916, on July 28 of that year the British Government made it *de rigueur* for every British-owned vessel of 3,000 tons or over to take out a license for a wireless installation. These measures are regulated by Orders in Council, issued under the Defence of the Realm Act. Regulation No. 37 under that Act, together with those numbered 37A, 37B, and 37C, all refer to these various new measures; of these 37B, the one mentioned above, refers specifically to radiotelegraphy. A further amendment was introduced in the course of 1917, bringing the tonnage limit down to 1,600 tons gross. This new clause enacted that every British sea-going ship of such tonnage or upwards, in respect of which a license to instal wireless telegraph apparatus has been granted by the Postmaster-General, shall be so equipped and provided with two certified operators, who must be suitably accommodated.

(To be Continued.)

EDWARD WATERS & SONS

(Established 1859)

Patent and Trade Mark Attorneys

905 CULWULLA CHAMBERS,

67 CASTLEREAGH ST., SYDNEY

Tel. City 1187

(And at Melbourne)

Mention *Sea, Land and Air* when communicating with Advertisers.

THE PHENOMENA OF HEAT

Especially Written for "Sea, Land and Air"

BY MRS. SELWYN LEWIS, B.Sc.,

(All Rights Reserved)

(Concluded from previous Issue)

The Unimaginable Temperature That Must Exist at the Sun's Core.

Astronomers and physicists find it very hard to imagine what the state of matter must be in the centre of so huge and so hot a body as the sun, where a tremendous temperature is making for expansion and a tremendous pressure is making for compression, both such temperature and pressure being far beyond anything which we can experimentally produce and study on this earth.

We know the temperature of the sun is very high, and can scarcely believe, what is nevertheless a fact, that Newton seriously discussed the possibility that the sun may be inhabited. Nothing that we can conceive as life could exist at the lowest of the many estimated temperatures of the sun.

Violent local phenomena change the temperature of the sun in various places from time to time, but the figures of from 9,000° centigrade to 30,000° that have been estimated show how hot the sun must be.

The Sun Too Hot to Burn.

The temperature of the sun must be so high that not only can the complicated compounds necessary for the development of living matter exist in it, but even the simplest compounds such as water, carbonic acid, or sodium chloride (common salt) cannot exist there. At such a temperature even they would be broken up into their elements. All the elements comprising these compounds exist in the sun, but they exist uncombined. The amount of heat given out by the sun is quite a distinct measurement from the sun's temperature. As compounds cannot exist there then the process of combustion which produces heat in our furnaces on the earth cannot occur in the sun, for combustion is the formation of compounds between oxygen and other elements such as hydrogen and carbon. Water and carbonic acid. the respective

products of such combustion, could not be formed at the temperature of the sun.

We know, therefore, that the sun is not burning, and the source of the amazing output of electrical energy which we call radiant heat and light, is not combustion, whatever it may be.

Helmholtz holds a theory, however, that the whole of the sun's incessant output of light and heat is due to its gravitational shrinkage. So it seems that gravitation, Newton's famous discovery, is the force which provides us with the light and heat whereby we live; it not only holds us to the sun but it makes the sun worth holding to for us.

All the World on Fire.

Do you know that this earth that we walk about on now was at one time a hot molten mass, a seething sea of boiling lavas, pounded into huge waves by tempests of heavy metallic vapours? There was no moon at that time to move it, but the sun would drag and churn it, and the atmosphere, which then must have exerted a pressure of 5,000 pounds to the square inch—instead of 16 pounds as now—would plough and furrow it. There would be no currents between the poles and the equator, for the cooler metals at the poles would sink, and warmer molten metal from the equator would flow in.

Over this weird, wild sea, unbroken night would reign, for the sun would be hidden by the heavy metallic vapours, and the only lights would be the flashes of the shooting stars and the glow of the fiery waves. There must have been a perfect pandemonium with the thud of those ponderous waves, the splutter of the molten hail, and the sizzle of the falling stars. Such a Hades heat can make. But every hot body cools, whether it be a hot potato or a glowing world.

Age after age heat radiated into space, and as it radiated away the earth began to simmer. Cool currents fell, hot currents rose, and just as rough ice forms on a freezing lake on a windy day, so a

wind-roughened crust began to form on the surface of the molten sea. At this time all the water now in the sea would be in the atmosphere. This shell of water, quite two miles high, would be spread through the air, and would exercise a tremendous pressure on the surface of the globe. Pressure assists the consolidation of molten masses, so the crust would begin to solidify, but the cooling would proceed very slowly. As the crust cooled it would contract, and the contraction again would cause strain; under it the hot liquid tides would surge and heave till finally there would be an earthquake and a volcanic eruption. So again and again the crust formed and cracked, but by degrees it grew stronger.

That the earth has now a solid and stable crust is quite evident. Sometimes it yawns and swallows an island; sometimes it shudders and shakes down a city, but as a rule it is *terra firma* and now it is debatable whether the central mass of the earth is molten or solid.

As we penetrate deeper down in the earth we find that the temperature of the crust rises. Men have never bored very far; the deepest hole has been bored in Upper Silesia, measuring 2,190 yards. It sounds a deep hole, but it is really only a pin-prick, for it is nearly 4,000 miles from the surface to the centre of the earth.

Between our feet and hot rock there is only a comparatively thin film of cool crust. Peel only two miles of rock off the surface of the world—a layer less in proportion to the mass of the world than its skin to the mass of an apple—and we should all be grilled.

The earth is so intensely hot in its interior that at 50 miles deep it fuses the most refractory rocks. As rock and air are both bad conductors the rate of cooling is comparatively slow, and Professor Everett estimates that the amount of heat leaking away from the earth every year would melt a shell of ice an inch thick over the whole surface of the globe.

As consolidation of the earth's crust probably took place at a temperature of about 2,000°, Lord Kelvin estimated the time that must have elapsed since then to be from 20 to 40 million years, more likely 20 than 40.

Radium suggests a new source of heat for both sun and earth, allowing us to

suggest a longer past and a much hotter future; it also shows that there must be a smouldering fire in the heart of the world that will eventually consume it. So if radio activity exceeds a certain point the earth will become a furnace, and if it fails then the earth will become ice-cold, with liquid air lying on the frozen seas.

The Heat and Cold Felt on the Moon.

The earth's atmosphere and the clouds it contains form a kind of enveloping blanket, thereby enabling the earth's surface to retain by night some of the heat it has received by day.

The moon has no sufficient medium to retain the heat, and during her two weeks' night, her surface must descend to a temperature very nearly as low as that of the outer spaces, a coldness impossible to imagine. The absence of an atmospheric blanket must allow the sun's rays to fall on the desolate rocks there with a fierceness unknown to this earth; but the heat can radiate away again at once, so on the whole experiments have shown that the temperature of the moon's surface remains very low even with the sun's rays pouring vertically upon it, probably never rising to the degree at which ice melts, and if that is the case, any water on the moon will be in the form of ice.

Dewdrops Just Lowly Cloud Drops.

As moisture gathers on the dust floating over Mount Kosciusko, so also does it gather on the flowers in the early morning freshness of the garden.

For centuries dew was a mystery. It was noticed to be most plentiful on clear, calm, starry nights, hence the ancients had the idea that dew came from the stars; and when it was noticed that there was most dew on cold nights, then cold was supposed to come from the stars too. But afterwards it was found that dew sometimes formed on the under-surface of leaves and stones, and that the formation of dew depended very much on the bedewed object. Dew is simply moisture condensed on cold bodies, just as the human breath condenses on a cold mirror. The reason why clear, calm, starry nights are dewy nights is that on such nights the heat from the surface of the earth radiates away more freely, and cooled objects

therefore become better condensers. On cloudy nights the clouds act as a blanket and keep the surface of the earth warm, so the warmer surface fails to condense moisture and to form dew.

The Change of a Plant Into Heat by Burning.

Different plants, like different factories, turn out different products.

The nut is largely composed of fats and oils, which also consist of the element of carbon. The energy that a Brazil nut can store up can be seen by changing the oil into heat. If you cut a part of the kernel into a pyramidal shape with a pointed beak, and put a match to it, you will find that it will burn for a little while almost as clearly as a candle. The heat produced

is a form of the oil's energy which springs from the energy of the sun working on the elements of which this world is composed.

The coal we burn is giving back in the energy of heat the same energy by which the sun, leaves, roots and stems got out of minerals and invisible gases this hard form of carbon called coal, on which man depends so much. Plants also supply a furnace, not in the indirect way of coal, but by their direct activity.

The inside of the bell of a snowdrop is often two degrees warmer than the air outside it, and in some tropical places parts of the plant are raised 17 degrees or more above that of the surrounding air, and what can be a more telling evidence of energy than emergence of heat?



Destroyed Tank on the Somme.



Australian Tanks on the Way Back for Repairs.

LETTERS FROM AN AUSTRALIAN AIRMAN

[The following letters are from an Australian airman at the front, who desires to remain anonymous. The first is to his brother in Sydney, the second to his father in Adelaide. The letter of September 4 is of especial interest, for, according to recent cable advices, the writer was taken prisoner by the Germans on the afternoon of that day.—Ed.]

I.

France, August 3, 1918.

Dear B.,—I have been here three weeks now and am settled down. I have got five Huns in the three weeks, which is some going. I have skittled seven altogether now. I have had two buses shot to pieces in fights and one burnt to a cinder, so you can see I'm not dying of boredom.

The only news I have these days is about flying, so I will give you some. I'll give you the dinkum oil of an air fight or two, but *please don't let this letter get into "Sea, Land and Air."* (Objection overruled, Ed.)

The other day, after much cajoling on the part of an orderly, I arose at the ungodly hour of 3 o'clock with a sticky taste in my mouth, having gone to bed at 1. Like the pilot of fiction I sprang alertly from my couch, and donning my flying kit mounted my impatient machine and dashed forth into the glorious air of Heaven, *I don't think!* In reality I reluctantly dragged on my sheepskin boots, and doing without a wash, because it was too cold, went to the cook-house, where the guard gave me a cup of hot cocoa. Somewhat refreshed I walked down to the hangars and was greeted by the *ack-emma's* (air mechanics); who had trotted my bus out and were stamping about to get warm. By the same token they are fine boys, and are awfully bucked when their particular pilot gets a Hun. Joyfully they will patch bullet-holes and mend rents and tears when they know the author thereof is *na-poo*. To continue. The Sergeant asked if I would take

bombs, and I said yes. I put on the rest of my gear, and getting into the old bus made myself comfortable. Contact! The propellor was swung and the engine going. Running her slowly for a while to get her warm, I then opened her out to see she was doing her revs. O.K. Waved the chocks away and taxied across the drome, and turned into the wind. One look to see all was clear—full throttle—bump, bump, bump, bump, then the wires start to scream, the engine roars, a floating sensation, and I was flying. It was still pitch dark, and I turned towards the faint glow in the East. Climbing and climbing I presently saw a certain canal (which stands out plainly as water does in the dark), and knew I was about to cross the lines. I now throttled down a bit and flew steadily over towards Hurland. As I passed along I could see the Fritzes dousing their lights, but I was looking for a good target to lay my eggs. About ten miles over I espied a train steaming along, so shut off and dived down on to it. When a few hundred feet above I let the old pills go, but missed, so tore into it with my machine-guns. Gee! you should have seen that train move. It was getting light by now and I was pretty low, and the Hun started at me with machine-guns, flaming onions and Archie and other weird frightfulnesses that he dishes out to us; so I climbed west.

As I was coming along I saw a kite balloon just rising to begin its day's work, so strafed it, but it obstinately refused to catch fire, and all I got was another issue of Archie, etc. It was pretty light by now, and the darkness was

no longer a safety to me, so I got over the lines. After cruising round along the line for about ten minutes I spotted an old Hun two-seater, accompanied by another, coming along, also five scouts above them. Too much! so I went west over our lines and watched. Presently the five scouts buzzed off and left the two big buses by themselves; I went after them. I started firing at pretty long range to put the wind up them, and one dived off east, but the other one stayed to fight. We tore round each other for a while, and his observer did some good shooting on me, putting about ten holes through me, cutting a spar and hitting my engine. The engine kept going, and I got under his tail (where his observer couldn't fire without shooting his own tail away), and put a burst into him. That fixed him up. Down he went and crashed most ungracefully, strewing various parts of himself around the scenery.

I had now been out about two hours, so thought I would go home. The boys' eyes stuck out of their heads when they saw the old jigger. I went in, woke the Major to put in my combat report, and got a cigarette off him, then went back to bed.

That's just a typical morning flight.

A few days later I went with five others on an escort job. When well over Hunland 19 Hun scouts appeared and ten hopped into us. We had an awful fight and I got one, and while getting him a Fokker paid his respects to me and shot one of my flying wires away. Anyhow, when we had finished there were only three Huns left, the rest were either driven down or shot down. The troops then returned home and had a drink.

A few days later I led a patrol (six) over the lines. After admiring the Hunland scenery for a while I saw eight homeless Huns flying along like little gentlemen. The rough Australians spat on their hands and hopped in. I got two

and shot up another, and would have got him too only my ammunition ran out. Bad luck! Again, a few days later, early in the morning, I found a Hun seeing too much of our side of the line, so went for him. Got underneath him and fired about 200 rounds at him, but the son of a — was armour-plated. The only vulnerable spot in him was covered by his observer's gun, but I took a chance. He was a jolly good shot, I can tell you. Got him on fire anyhow, but I've had to get a new bus to replace the one I had, as it was absolutely shot to pieces. Well B, old boy, I think I'll go to bed as it's about midnight.

I'll have a few yarns to spin when I get home, which I hope won't be long, as I'm getting fed up with the war.

Cheerio for now.

Yours, etc.,

LEN.

II.

"France, September 4, 1918.

"Dear Dad,—

"The summer is just about ended now; we get spasms of nice weather, but mostly it is very windy and rainy. I still do plenty of flying, and love the game. I got my thirteenth Hun yesterday. I have been sick for about a fortnight, and only started flying about four or five days ago. I had ten Huns before I got sick, and I've got three in the last two days. The day before I went out in the early morning to see what was doing. About eight miles over Hunland I saw a kite balloon observing for the Hun Artillery, and as I've had experience of being on the ground and seeing these "sossidges" staring at me, I thought the best place he could be was out of action. These balloons are filled with hydrogen, and we carry special ammunition which is incendiary and destroys them. Anyhow, to get on. I feigned not to see this sausage, and sneaked up on him and then dived. Immediately the

Hun saw the game he started shooting at me like a madman with flaming onions, machine guns, Archie and all the rest of his frightfulness that he uses on us. I think he must have had a bad night the night before, because he didn't get me; so when I was about 100 yards off the old sausage I let both guns go full lick, and you should have seen the two streams of flame into him. I torpedoed him amidships, as they say in the Navy, and he burst into flames (a really wonderful sight in the early morning). The two observers jumped out on parachutes. Then I turned by attention to the flaming onions. I saw one guy shoot, and dived on him and dropped my two bombs on him, and he shut up like a book; then with my machine-gun I strafed all the others I could see. The old Hun was getting rather annoyed by this time, so I beat it. I suppose you wonder what flaming onions are? They are balls of phosphorus which the Hun fires out of a sort of pom-pom gun, about twenty at a time. If one hits you, you cook.

"The same evening it was very dud with a terrific wind blowing over to Hunland a nasty thing, as it carries an inexperienced pilot over the lines before he realises it.

"I was sent out on a patrol with two others just to see that the line was clear. I stayed on the line for about an hour and didn't see a thing, and was just coming home when I saw a Hun two-seater sneaking along, taking advantage of the dud weather to get his observation done without opposition. I stalked him for about half an hour before I could get within diving distance, and then went down on him like a ton of bricks. I dived out of the sun and he didn't see me till I was about 300 yards off, then he got a horrible wind up, and his observer started shooting at me. I didn't fire till I was so close I couldn't miss, then opened up the old barrage on him. I wounded the pilot and he put the bus into a spiral to get away, but my old scout soon showed him I could get on the inside of his blooming

spiral, and I then gave him another dose of hot lead, and that shut up the observer and finished off the pilot, and he went into a spinning nose-dive and hit the deck with a horrible thud.

"Next day I went out in the evening and saw a sausage doing his bit. I tootled over his way and then dived. I repeated the well-known formula of balloon strafing and whizzed over the top of him. I looked back, and to my annoyance he was not in flames, and they were pulling him down like mad, and the old Huns, on their parachutes, were on the way down. I turned round to dive again and got a bullet in my tank. I said 'Good-night, Nurse,' expecting to go in flames, so I thought I would take the sausage with me, so down I went on him again and let him have it. As my tank didn't burn I tried the other, and my engine picked up, though it was a bit wonky. I was then down a few hundred feet, and bullets were hitting chips off the old bus all roads, so I did another dive at the sausage, which was now on the ground, and, joy of joys! she started to burn. I left for home at 150 miles an hour and had to run the gauntlet of Archie, machine-guns, flaming onions, etc., for nine miles.

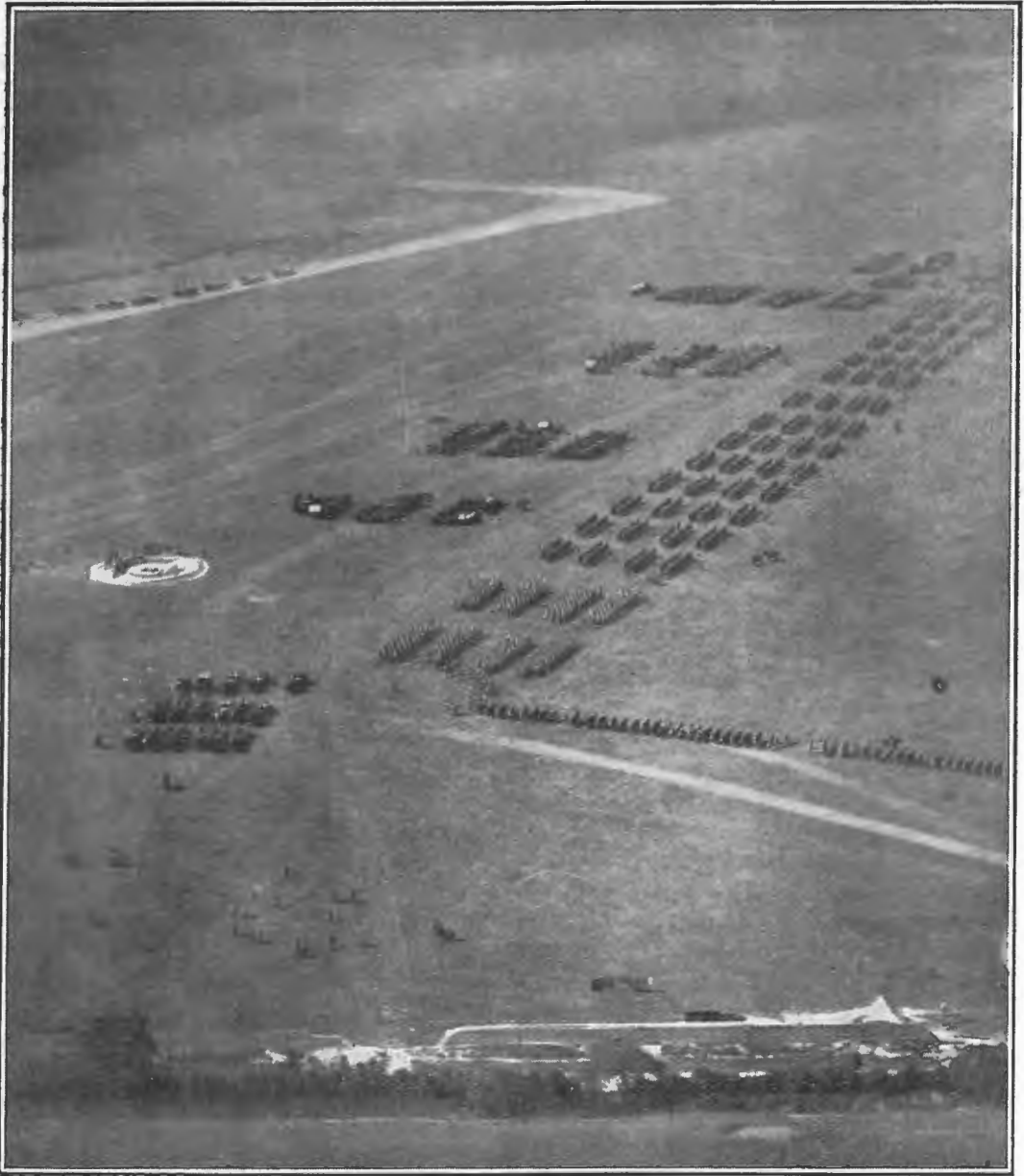
"Here I am writing this, so all's well, but you ought to see my poor old bus. They took the bullet out of my tank this morning, and it was still burning, which says something for the Hun incendiary ammunition, doesn't it?

"What saved me was the fact that the bullet entered the tank on an angle, and fell in the bottom in some petrol that didn't escape; this smothered it. If any air had got to the bullet in the petrol the whole outfit would have exploded. Not a nice job flying over Hunland and getting strafed every inch, with a blessed mine underneath you that might go up any minute.

"This letter will give you an idea of the life of a scout pilot, father.

"Honestly, it's a great game. The best in the world. I am afraid you will think I am pretty bloodthirsty, but it's not much good being easy at this game.

"I am going out over the lines now with one of the chaps, so I think I will close. Remember me to all at home."



Unique Photograph by Australian Airman, Showing Field-Marshal Sir Douglas Haig
Reviewing the Third Australian Division in France.
Troops Marching Past the Saluting Base.

Copyright, Sea, Land and Air.

FROM RECRUIT TO WIRELESS OPERATOR

Epecially Written for "Sea, Land and Air"
 BY SERGEANT F. B. COOKE (F.R.A.S.), A.I.F.
 (All Rights Reserved)

The following article was contributed by Sergeant Cooke before the breaking up of Liverpool Camp, and although no longer topical we believe that many readers will be interested in an account of the training of our wireless operators for active service.—[Ed.]

When a recruit first comes into camp he finds himself in a totally different environment to any elsewhere experienced. He was first of all divested of his civilian clothes, and in their place receives a suit of dungarees. He is then a raw recruit, exactly similar to hundreds of others. He seems to feel all eyes on him, and innumerable corporals and sergeants flying round with no other object than to issue contrary orders. Officers seem to come before his imagination as from the clouds, and may never be approached but held secretly in holy terror. The bugle sounds, and our recruit's head whirls round as he witnesses men tearing past him from all directions, converging towards a common point. He is suddenly brought to earth by someone bawling in his ear: "Why don't you fall in on parade?" The author of the command vanishes, and the recruit manages to find the parade ground, and on arrival is reproved for being late. After standing perfectly still for five minutes, listening abstractedly to the officer talking about something entirely foreign, he hears the command "Dismiss!" He breathes a sigh of relief as he finds himself free for a few hours.

Everybody rushes to his tent. The recruit mechanically follows. The men very quickly change into their service dress and make for the gate. Our friend finds he has no other dress than his dungarees, so donning his great coat and service hat, saunters to the gate. On the way he learns from some brother sapper that he requires a pass. He has never heard of a pass, so his friend pilots him to the orderly room and leaves him to ponder. He gets out into the street, and much to his amazement finds no one paying particular attention to him, although he is

sure everyone must be talking of him. At 10 p.m. he returns to camp, and after a sleepless night on hard boards arises at *réveillé* to start another day wondering what on earth he has to do.

He is soon put easy on this score, as he finds his name is already on a roll book, and is with a squad of men with someone to tell him what to do. Very quickly our recruit falls into the why and wherefore, and finds himself quite an old soldier in a very short time.

During the first month the recruit is inoculated, vaccinated and has his teeth seen to, goes through a course of musketry, and does innumerable fatigues. He also does guard duty. This month he is doing the same work as he would do in any camp, whether wireless or infantry. He soon finds that it depends entirely on himself as to whether camp is enjoyable or the reverse.

The fellows in the wireless school were mostly postal telegraphists or wireless operators, consequently there is a common bond of good fellowship between them. Of course, when first in camp, a recruit is liable to make many blunders, some of which are very amusing. There is a yarn which is said to have originated in this camp, although disputed by many others. A sentry is taught to turn out the guard to "present arms" to their colonel once per day. The sergeant of the guard told the recruit sentry to keep a look out for the colonel and tell him (the sergeant) directly he saw his commanding officer. The colonel finally made his appearance, and was right up to the sentry before the latter recognised him. Directly he did so, he went up to the colonel and said: "If you are the colonel, you had better

get for your life, as the sergeant is looking for you."

After the first month the sapper (as he is now) is sent to an equitation school for a month to learn to handle horses. This is, of course, very important, as on active service the Signal Branch is mounted.

On returning from equitation the men are drafted into two sections. In the Signal Squadron they have to learn all the methods of visual signalling. There is Morse flag, semaphore, heliograph and cable telegraph, and telephone operating.

The second section is the Wireless Squadron. On entering this squadron they are first placed into the theory class, which takes six weeks to complete. In this class they are taught the elementary principles of electricity and the application of the theory to the practical working of the $\frac{1}{2}$ K. W. Marconi Pack Set. This training is fairly thorough and is sufficient to enable the students to fully understand the underlying principles on which wireless is based. They ought to be able to work their stations with a comprehensive aptitude and find and rectify most of the faults as they arise on active service. In addition to the theory they learn to handle a station to the best advantage.

The erection of the masts and aerial is thoroughly grasped, the men being trained to erect a station in the shortest possible time and with maximum efficiency. Soon the men are all able to pack the whole station on four horses, in such a manner as to be secure whilst offering the least hindrance to the horses. They then have to unload the horses and erect station. The average time of erecting station and sending V's from the order to halt the horses, is about six minutes, and in $4\frac{1}{2}$ minutes the station is dismantled and packed on the horses ready to move off.

Further in their course they have to learn how to run and maintain the internal combustion engine. In the sets in use here a $2\frac{3}{4}$ h.p. twin opposed Douglas engine is employed, and each man is required to be able to detect and rectify common faults and run the engine with maximum efficiency and minimum wear and tear.

After qualifying in the theory class the men go on bivouac. One can't speak too highly of the bivouac training, as it develops all the instincts necessary for a successful soldier. The training on bivouac is as thorough as possible, and is conducted on lines as nearly similar to active service conditions as possible. It would be very difficult to exactly describe how the bivouacs are conducted, as each one is different, inasmuch as the conditions vary in each case. Initiative is encouraged in the individual man. To outline the general idea of a bivouac the writer will give a few brief extracts from his log book, taken on one of these bivouacs:—

Tuesday morning: 4.30 *réveillé*; 4.50, fall in; orders to get all kits ready for the bivouac; 5.30, orders to load the cart, gear all checked; kits and blankets all carefully seen to; 6.30, breakfast; 7.30, final inspection by O.C.; final orders given to sergeant in charge; 8, quick march.

Weather not at all promising, steady rain falling consistently, little of interest on road, men very cheerful in spite of rain, marching well; 12 noon, arrive at Sans Souci (and a very good name for it). Everybody soaked but cheerful. Cooks appointed to get a hot dinner ready as soon as possible; wireless party detailed to get into communication with H.Q.; everyone working well; 2 p.m. dinner, hot and very acceptable, although uncomfortable to eat in rain; however, no complaints. Sapper Patrell amuses us with Charlie Chaplin impersonations. After lunch wireless operators kept busy, station working well. Rest of party set to work to improvise a kitchen and shelter shed with waterproof sheets and bushes. Completed by 5.30. Rain now very heavy, but shelter shed and big fire look very cheerful. All retire early except picquet for horses and station.

Wednesday, 6.30 a.m.: *Réveillé*. Still wet and cheerless, although men quite ready for next move. The cooks detailed prepared breakfast, while the remainder dismantled the wireless station and loaded the cart. 8 a.m.: We moved off *en route* to Cronulla. Roads very bad owing to rain. 9 a.m.: The brake of the cart snapped, so we had to halt until repairs were

effected. Rain now started to get steadily worse. Arrived at Cronulla about 12 noon. By 2 p.m., under very severe difficulties, everything was in readiness to work. On depressing the key a heartrending sound was heard. Water had found its way into the transformer and condensers. The men showed great initiative in the construction of an oven to dry these articles. Rain continued to pour down in torrents. At 4 p.m. the set was once more tried, and after a little trouble we got into communication with headquarters. Permission was now given to most of the men to set about making a shelter for themselves for the night. Much amusement was caused at the various attempts to make dug-outs in the sand hills. A resident of Cronulla kindly invited the whole station to a hot tea at her house, which was gladly accepted. One of the men had spent a lot of time and trouble in making a cosy little dug-out with the aid of branches and waterproof sheets, and at 10 p.m. turned in. At 6 a.m. the following morning this man was absent from roll call. No one seemed to know where he was. He was finally found fast asleep and buried up to his neck in sand. It appears that the rain had loosened the sand round his dug-out, and during the night the whole thing had collapsed. He presented a very amusing spectacle with only his head showing, the rain beating on his face, and he, blissfully ignorant, snoring his head off. His reply to the question as to what sort of a night he had was: "Jolly fine, only woke up once when the dug-out fell in, but that didn't worry me!" As a matter of fact, this appears to be the prevailing motto of all the boys, nothing seems to worry them.

This brief extract from the log-book will serve to show some of the conditions under which the men are trained, and it is perfectly amazing how fit and strong they keep. Their excellent spirits probably account for their fitness, as there is no doubt that a healthy mind must surely demand a healthy body. Very little trouble is experienced, and such as there is arises from their utter disregard of hardships in times when all are required to be serious.

In addition to the daily routine of work

there is, of course, always a fair amount of signalling by night. The wireless station is kept manned continuously night and day, as at any time a message might come through to immediately move on to new country. In order to maintain a resemblance to active service conditions, it is necessary to occasionally have night alarms, and it is then that the men show their knowledge of the work, and put into practice the theory they have learned in the depôt. One might truthfully say that the men can handle their station, both erecting and dismantling, just as easily in the pitch dark as on the brightest day. Further, the weather conditions do not prevent good work being done. As an example, another extract from the same bivouac log might be quoted:

"At 12.20 a.m. the hurricane reached its climax. The men had constructed a lean-to, and for the first time were sleeping in dry blankets, when the operating tent began to totter. The alarm was given, and all hands were called out. This night proved to be the worst storm witnessed in these parts for many years. Trees were uprooted and coats were torn off men's backs; yet, in spite of all, we kept the wireless going. The aerial snapped three times, but each time we effected repairs. The masts were anchored to huge logs, which were sunk six feet deep. The instrument tent finally went, carrying half the set with it, but we managed to improvise protection for the instruments by lashing waterproof sheets and sinking anchor logs all round them. The engine was bodily lifted out of its bed, and blown five or six yards away, breaking the right-hand exhaust valve and tappett, and smashing the oil feed pipe. However, we had spares, and soon had it working again, taking extra precautions to lash it firmly to anchor logs."

The writer would like to add, in conclusion, that wireless has played, and is playing, one of the most important parts in this war. A passage from a despatch sent by one of our Generals says: "If the wireless were suddenly taken from us we should have to totally reconstruct our whole scheme of operations."

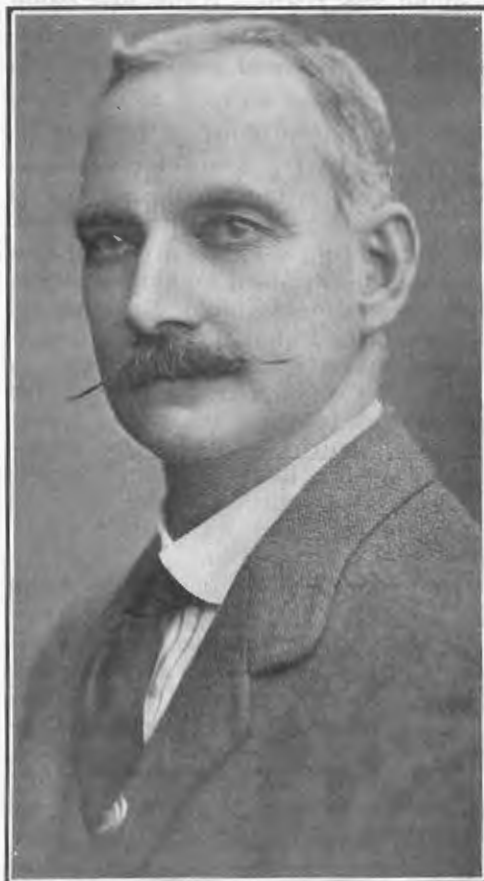
THE SUPERINTENDENT OF MERCANTILE MARINE

(From Our Own Correspondent.)

Though we are a nautical race, the average individual in Australia's seaports, if asked to describe the important duties carried out by the Superintendent of Mercantile Marine would find considerable difficulty in intelligently explaining them. Yet the important nature of the multiple duties he has to fulfil in connection with our coastal and oversea shipping make the office he holds one in an especial degree first class.

The designation of this officer is Superintendent of Mercantile Marine, but he is also known as the Shipping Master, while in the ports of the Oriental dependencies of the Empire he is styled Master Attendant. The Superintendent of Mercantile Marine is the title which is beneficently bestowed by the Board of Trade upon the officer who acts in the rôle of arbitrator and adjustor in the many phases of mercantile marine disputes, and in safeguarding the interests of masters and seamen in British ships. The seaman has a right of appeal in ventilation of his claims, real or otherwise, to this official. Happy indeed is the position of the Shipping Master when he is able to earn the confidence of both parties in the adjustment of their respective disputes. In foreign ports the British Consul undertakes similar duties.

The Imperial Merchant Shipping Act, 1894, with amendments of 1906, is practically the basis of all the Shipping Acts of the world, and is administered in uniformity by the British Board of Trade, through its officers, in all parts of the world. Seamen who are wrecked, injured, or become ill while on ship board, and thus come under the designation "distressed seamen," are looked after under the Act, which is so complete and far-reaching in its operations that until the seaman dies, or is cured, or returned to his home port, all expenses attendant thereon are defrayed by the ship. In



Mr. E. W. Crossley, Victorian Superintendent of the Mercantile Marine.

one instance expenses are still being defrayed on account of a seaman who, owing to injury sustained in 1906, could not be safely sent to his home port overseas.

The Workmens' Compensation Act of the United Kingdom and the Seamens' Compensation Act of Australia further make provision for pensions during a period of inability to work after arrival home, or the granting of a lump sum to dependents in case of death by injury.

Seamens' Savings Banks are found in the chief ports of the United Kingdom,

and facilities are provided by Marine Superintendents abroad for the transmission of seamen's wages to these banks, or direct to the relatives of the seamen if they so desire.

Seamen have shown great loyalty to the Empire, and this has been so strongly in evidence on the Australian coast that in the earlier years of the struggle instances occurred in which almost every member of the crews of some ships obtained their discharges for the purpose of enlistment. Enlistment among seamen has been steady and continuous. Many will never return to take up their old work, and herein a difficulty which may arise in the future suggests itself, and in the solution of which the Superintendent of Mercantile Marine will be called upon to play a not unimportant part.

In Melbourne the Superintendent of Mercantile Marine is Mr. E. W. Crossley. He is a brother of Madame Ada Crossley, the Australian *prima donna*. His eldest son has recently returned from France, where he was wounded.

THE LATE CAPTAIN R. F. DOUTON

Cable advice has been received that the death occurred at sea on October 19 of Captain R. F. Douton, who had been for over 20 years in the service of the Howard



The Late Captain R. F. Douton.

W. E. Smith's Australian Scribbling Diaries

—Are Indispensable
to the Business Man

May we suggest that you thwart disappointment by ordering early! The large demand for these Diaries is sufficient evidence of their popularity. Write for Catalogue giving Particulars and Price.

W. E. SMITH, LTD.

Commercial Stationers and Printers,
BRIDGE STREET, SYDNEY
Also at Newcastle and Brisbane.

Smith line. Captain Douton at various times was in command of the *Bombala*, *Peregrine* and *Cooma*. He also commanded the *Canberra* when she made her maiden inter-State voyage from Melbourne to Sydney and Queensland ports in 1913. Captain Douton was well known and very popular in shipping circles. Early in his career he was marine superintendent for Howard Smith, Ltd., in Brisbane, and he occupied the same position at the company's office in Melbourne. Many hundreds of pounds were raised for patriotic purposes by the concerts organised by him aboard ship. He was 60 years of age, and leaves a widow and one daughter.

THE LAST FENCE

A few days ago the press cables reported briefly that an invention produced by Mr. Roy A. Weagant, chief engineer, Marconi Wireless Telegraph Company of America, has succeeded in overcoming the difficulty of "static," or, as it was printed, "takes the static out of wireless."

Readers who have an understanding of wireless work will realise what is meant by that rather vague phraseology. Other readers, however, will not understand unless they read the explanatory notes published at the same time by the *Sydney Sun*. In those notes a clear explanation was given by a prominent wireless man, who is a regular contributor to this journal. The invention was referred to by the expert as being practically the last fence in the achievement of universal wireless communications.

The actual nature of the invention has been held secretly for the use of the Allies in the war. Therefore we cannot give a technical description nor hint at the manner in which the result is achieved. All this will probably be made known through the Patents Office after Peace is definitely arranged.

In the meantime, we can explain the great importance of Mr. Weagant's invention and forecast some of the benefits which will be derived therefrom.

The great advance which has been made in the extension of the range of wireless communication as a result of the new re-

ceiving apparatus has proved that direct communication can be established and maintained between any two points on the earth's surface. In the tropics at all times and in the temperate zones at certain periods of the year the reception of wireless



Mr. Roy A. Weagant.

messages from great distances has been difficult, because of the disturbances created in the receiving apparatus by local atmospheric electrical discharges. At tropical stations these disturbances are almost continuous, although they vary in intensity

Shipowners Shipmasters and Chief Engineers



Your shipboard Electrical Plant must be maintained in good condition.

Have your repairs and installations carried out by those who specialise in Marine work.

We have a staff specially trained and employed in shipping work for several years, also fully equipped workshops for repairs, testing, calibrating and manufacturing.

Our Clients include :—

P. & O. COMPANY

ORIENT LINE

UNION S.S. CO. OF NEW ZEALAND

HUDDART, PARKER, LTD.

and

COMMONWEALTH GOVERNMENT LINE

The Australlectric Company

Telegrams: "Expanse," Sydney.

97 Clarence Street, Sydney, N.S.W.

(Conducted by Amalgamated Wireless (Australasia), Ltd.)

at different daily and yearly periods. They do not usually prevent all communication, but they limit the range of communication according to their intensity. At sub-tropical and temperate zone stations they are troublesome during summer, and their intensity increases with the wave-length to which the receiving apparatus is tuned. In spite of these difficulties, wireless messages can be received in Australia direct from England, but when they are removed the communication will be perfect to all intents and purposes.

If Mr. Weagant's invention acts successfully it should find a wide application in Australasia for all forms of wireless communication. It will be particularly useful in opening communication with places inland, in establishing direct communication between Australia and other countries, and in communicating between the ground and the large number of aircraft which are certain to be used in Australia in the near future.

Mr. Weagant is a Canadian, born in Ontario 37 years ago. He was educated at Stastead College, in Quebec, and studied electrical engineering at the celebrated McGill University in Montreal. At the university Mr. Weagant studied Physics under Sir Ernest Brotherton, from whom his interest in wireless was first gained.

Mr. Weagant is a prominent figure in the Institute of Radio-Engineers, being a Fellow of the Institute, a member of the Board of Directors and of the Standardisation Committee. He has read a number of interesting papers before the Institute, reprints of which have been issued with the "Proceedings."

INTERESTING SALVAGE AWARD

To earn salvage on a stranded ship and cargo does not necessarily require that the salvaged craft be brought into a place of absolute safety, but rather that she be saved from the position of extreme peril in which she is first found. Such is the decision of a British Admiralty court, Justice Holl rendering the decree, in a case which has attracted a great deal of attention; partly by reason of the award of £5,500 for less than 15 hours' work on the part of a Norwegian crew. The plain-

tiffs were a firm of Norwegian shipowners and the defendants the Compagnie Generale Transatlantique and others. Briefly put, the circumstances were that the owners, master and crew of the Norwegian steamship *Heim* claimed remuneration for salvage services rendered to the French steamship *Fournel*, her cargo and freight, in the Mediterranean on January 15 and 16, 1916. The defendants denied that salvage was earned, alleging that the *Heim* left the *Fournel* in a position of danger, that the *Heim* improperly attempted to enter Port Mahon, to which she towed the *Fournel*, without the assistance of a pilot, and also without shortening the scope of the hawser, and that it was in consequence of this that the *Fournel* stranded in a dangerous position and had to take other assistance. It was, however, admitted that the *Fournel* was left by the *Heim* in a position of greater comparative safety than that in which she was found and that therefore salvage was really earned. It was contended, however, that the fact that the *Fournel* had to take further assistance was an element that must be taken into consideration in arriving at the amount of the award.

The *Heim*, 1,669 tons gross, was in ballast, on a voyage from Genoa to Huelva. The *Fournel*, 2,047 tons gross, was on a voyage with a cargo of wine in casks from Algiers to Cette. The values of the salvaged property as proved in the affidavit of values were: Ship, 850,000 francs; cargo, 900,000 francs, and freight at risk, 22,458 francs. That makes a total of 1,772,458 francs, which had been taken for the purpose of the case at the exchange of 27 francs at £65,646. The time occupied over the salvage was not more than 24 hours and for about nine hours of that period the *Heim* was trying to get the *Fournel* off the strand, so that it did not come to very much more than 15 hours. The distance towed was not very great, nearer 30 miles than 60 miles. The boat of the *Heim* became worthless by reason of the damage done to it, and a new boat had to be supplied at a cost of £150.

Taking all these matters into consideration, the judge arrived at the conclusion that a proper award would be £5,500, of which to the owners of the *Heim* he would give £4,000; to the master, £600, and to the crew, £900; the mate and four men who did the boat service to have treble shares.

The Broken Hill Proprietary Co.

LIMITED

MELBOURNE (Victoria), AUSTRALIA

Mine Owners and Iron and Steel Masters

**Manufacturers of Pig Iron, Billets, Blooms, Steel Rails,
Structural Steel, Plates, Sulphate of Ammonia, &c.**

AUTHORISED CAPITAL	£600,000 in 1,500,000 Shares of 8/- each fully paid up.
PAID-UP CAPITAL	£600,000 in 1,500,000 Shares of 8/- each fully paid up.
Authorised Debenture Issue	£1,000,000
Less Redeemed	£151,300
	£848,700

DIRECTORS:

BOWES KELLY, Chairman.	R. O. BLACKWOOD.
Hon. D. E. McBRYDE, M.L.C., Vice-Chairman.	H. V. McKAY, C.B.E.
D. W. HARVEY PATTERSON.	H. G. DARLING.
WILLIAM JAMIESON.	

LONDON BOARD:

FRED. DUTTON, Chairman	Sir JOHN COCKBURN, K.C.M.G.
W. DOUGLAS REID.	G. D. DELPRAT, C.B.E., General Manager.

BRANCH OFFICES:

LONDON —3 GREAT WINCHESTER STREET, E.C.	
NEW SOUTH WALES:	SOUTH AUSTRALIA:
SYDNEY.	ADELAIDE.
BROKEN HILL.	PORT PIRIE.
NEWCASTLE.	IRON KNOB.

TASMANIA—DEVONPORT.

BANKERS:

BANK OF AUSTRALASIA. COMMONWEALTH BANK OF AUSTRALIA.
NATIONAL PROVINCIAL AND UNION BANK OF ENGLAND (LIMITED).

Head Office : Equitable Building, Melbourne

F. M. DICKENSON, Secretary.
J. CAMPBELL, Assistant Secretary. P. H. ROBERTS, Accountant.

MELBOURNE ELECTRIC TRAIN TEST PROVES MOST SUCCESSFUL

(From Our Own Correspondent, Melbourne.)

Sunday, November 10, was a red-letter day in the railway history of Victoria, for a completely-equipped electric train, such as will be employed in due course on all the suburban lines, was tested under actual service conditions with brilliantly successful results, over the main line between Essendon and Newmarket. Owing to the International situation the event did not attract a tithe of the attention it would otherwise have done, and even the press notices were brief. People had no time for anything save war news, for peace was in the air, and everyone was keyed up to a high degree of excitement and expectancy, waiting eagerly for the announcement that Germany had accepted Marshal Foch's terms. Even on the following evening, that is the early part, when a run was made from Essendon to Flinders Street Station and back with the newly-equipped train, the masses of people pouring into the city to partake in the peace demonstrations regarded the electric train as the most ordinary thing in the world, and contented themselves by simply noticing that the train in question was there.

But to return to the test. There was not a large attendance, but among the more prominent were Mr. Barnes (Minister for Railways), Messrs. C. E. Norman and E. B. Jones (Railway Commissioners), Mr. W. F. Shannon (Chief Mechanical Engineer), Mr. A. E. Smith (Assistant Chief Mechanical Engineer), and Mr. W. Stone (Chief Electrical Engineer). Mr. E. P. Grove was present on behalf of Messrs. Merz and McLellan, while Mr. F. B. Clapp represented the General Electrical Company, which has supplied a large amount of the electrical equipment necessary. The train, which was made up of three coaches, the end cars being fitted with electric motors capable of generating almost 2,000 horse-power, was in charge of Messrs. J. Finn and R. Balmer, two old and trusted locomotive drivers.

It was shortly past 11 a.m. when the start was made from Newmarket platform, Miss Gladys Smith getting it under way by moving the "dead man's hand" to the position requisite for the current to be supplied to the motors. The start was characterised by great smoothness, and before the end of the platform was reached a speed of 20 miles an hour had been attained, which a few seconds later was increased to 40 miles. The time occupied in the run from Newmarket to Essendon was 6 minutes 54 seconds, showing a saving of 2 minutes 6 seconds for the schedule time under old conditions. The return was a non-stop run, and here a speed of 50 miles was attained.

One of the most pleasing and noticeable features about the trial was the remarkable steadiness of the train, a vast improvement on that experienced by locomotive-engine drawn trains.

The officials expressed every satisfaction with the test. It is not easy to say when the system will be in full working order, but now that the war has come to an end there is a chance that it will be sooner than would otherwise have been the case.

SALVING THE "LUSITANIA"

The salving of this vessel, which lies in about 300 feet of water off the Old Head of Kinsale, is again under discussion, the method suggested being by beaching on the Irish Coast. It is at any rate expected that the treasure from the strong room may be saved. By the use of modern appliances it is also hoped to salve many other steamers around the British coast.

H. E. TAPLIN & CO.
ELECTRICAL ENGINEERS,
Buyers and Sellers of New
& Second-hand Machinery
Telephone
City 6247
CHALLIS HOUSE,
SYDNEY

A. GONINAN & CO.

LIMITED

**ENGINEERS and
IRONFOUNDERS**



NEWCASTLE

NEW SOUTH WALES

**have just completed machining two 40-ton
Steel Castings, the biggest job of its kind
ever attempted in the Southern Hemisphere.**

**Specialists in Mining and Heavy Machinery of all kinds.
Railway Waggon Builders. Contractors to N.S.W. Govern-
ment and all important Coal Mines.**

ENGLAND TO AUSTRALIA IN FOURTEEN DAYS

OLD SCHEME MAY NOW BE TRIED

By our own Correspondent.

Now that the victory of the Allied Powers over Germany's world-subduing efforts may be regarded as complete it may not be without interest to recall a scheme advanced in London some seven years ago whereby the time between England and Australia should be reduced to 14 days. This also seems all the more timely in view of the fascinating proposals of Mr. Reginald Lloyd, so fully set out in the last issue of this magazine by which an aerial mail service would reduce the time between the metropolis of the Empire and the chief commercial and shipping centre of Australia to six days four hours.

"The fortnight scheme" met with considerable support, but the railway route proposed to be adopted came in for considerable criticism.

Almost within living memory, the time occupied in transit between the United Kingdom and Australia has been reduced to a tremendous extent. It is not easy to grasp the fact, that during the past century the time between the two parts of the Empire was reduced from 20 weeks to 23 days 23 hours to Fremantle, and 26 days 6½ hours to Adelaide. The scheme propounded proposed to utilise the trans-Australian railway, then not built, but now happily completed. Asia, or a section of it, would be traversed. It was to run through Persia and Beloochistan, forming a link with the Russian trans-Caucasian system at Tiflis, and connecting with the Indian system at Quetta, Naski, or New Charnan. Passengers would then have to be conveyed to Bombay, and thence to Madras, at which port 25-knot mail and passenger steamers would make Fremantle in six to eight days.

That was briefly the scheme, and the objections advanced may now be stated, though, having regard to the war and the consequence resultant, they will of course be subjected to a degree of alteration which at this stage is impossible to indicate or even estimate. It is necessary to

bear this in view, for many of the objections of seven years ago may have not the slightest existence when the "world is remade," as we are told it will be, and militarism in every form and degree abolished. First, the objection to railways in or through certain Indian frontier countries; second, the shorter route, assuring a line through Afghanistan between the Indian railhead at New Charnan and the Russian railhead at Herat, less than 400 miles, had been overlooked; third, passengers from Quetta to Bombay would have to follow the present circuitous route, unless a line were built from Rohri across Rajaputana to Dessa; fourth, the Bombay-Colombo route supplied by the Indo-Ceylon Railway, whereby a saving of two days would be effected; fifth, that vessels of 25-knot speed could reach Fremantle from Colombo in four days fifteen hours, whereas from Madras to Fremantle the minimum time by such steamers would be six days.

However, an alternative route was proposed, and in this considerable daring or inventiveness were manifest. The small distance, filled with great engineering difficulties, between the Indian and Burman railway systems, was to be joined, and also the long and practically wild section of country dividing the southern terminus of the Burmah railways and Sungkla, the northernmost point of the Malay Peninsula system, with, of course, the bridging of the small gap between Merbau and Wellesley. Singapore would be reached in due course and then the sea journey to Port Darwin, supposing the north-south railway were built; or to Fremantle, if it were not, would be an easy matter. This route was practically "laughed to scorn." Many years are still likely to elapse before the Burmah and Indian railways are connected. Lord Curzon, when Viceroy of India, opposed this junction, mainly on the ground of expense. From Chittagong to Alon on the Burmah railways is 240 miles, and the route is literally crowded with the great-

est engineering problems; from Alon to Rangoon is close on 400 miles. Again, the Burmah railway is on the metre gauge, whereas the Indian and Ceylon gauge is 5ft. 6in., and the Russian 5ft. 3in. Rangoon is distant from Singapore, roughly, 1,400 miles, and over a great extent of this a railway would have to be built through a country largely unexplored and in a wild state. From Singapore to Port Darwin is between 1,800 and 2,000 miles, and the navigation between the two places presents conditions vastly different from those which prevail between Colombo and Fremantle, where typhoons are unknown and islands in multitudinous form do not exist.

That Australia, as represented by Fremantle, can be brought within 14 days of London by rail and steam is unquestioned, and the route would be via Ceylon, India, Persia, Russia and Germany. The Persian-Indian rail connection would

be at Bandar Abbas, the eastern opening of the Persian Gulf. The route in sections may be briefly reviewed. It has been observed that vessels maintaining a speed of 25 knots would accomplish the Fremantle-Colombo journey in 4 days 15 hours, which would leave 9 days 9 hours for covering the remainder of the distance. Persian railway enthusiasts maintained, and still maintain, that by their scheme Bombay will be less than a seven days' journey from London. Accepting this, the balance does not seem too short to permit of the run between Colombo and Bombay being accomplished in the remaining time. Though the world may be said to be in a state of topsy-turveyism at present, it may settle down to work again with incredible speed. Should this happily be so the phrase "London to Australia in a Fortnight" will, if carefully looked into, be found to contain a far greater measure of probability than perhaps appears at first sight.

The Australian Mutual Provident Society

:: :: **Declares a Bonus Every Year** :: ::

Insure early for as large an amount as you can afford, and increase your Assurances as often as you are able.

"It is better to have a life policy and not need it, than need a life policy and not have it."

NOTE PARTICULARLY:—

Insurances completed before the end of this year participate in the annual bonus.

Rate Tables and all other information cheerfully furnished on request.

A. M. LOEWENTHAL, A.M.P. Society's Representative,

Perpetual Trustee Building (2nd Floor),

Telephone, City 1591.

33-39 Hunter Street, Sydney.



"Big Bertha," Captured by Australian Troops in August last, on its way to Paris.



"Big Bertha" in Paris. Enthusiastic Parisians Inspecting the Long-Range German Gun Recently Captured By Australian Troops.

Big Bertha.

The above photographs of the German long-range gun, which bombarded the French capital in March, are the first to reach Australia. They were forwarded to this journal by our French correspondent, who is a resident of Paris.

AVIATION AS A CIVILISING FORCE

Especially Written for "Sea, Land and Air" by FRANCIS JOHN

(All Rights Reserved.)

Many years ago J. Theodore Bent declared that each little war and each little journey contributed to the discovery of new parts of the earth and the rediscovery of others. Here is furnished something more than an axiom. If this was true in 1896 what must be said of the enlarged form it is applicable to to-day with the greatest war the world has ever known happily drawing to a close?

When the full history of this war comes to be written most people will be amazed at the number of things which will then be revealed. Take the part played by aviation and wireless telegraphy! Everybody is, of course, perfectly aware, that both have been greatly employed, but how many are aware of the nature and improvements which have been made in each branch? Main attention has naturally been directed to the western front, but the battle area has been so far-flung and covered so many sections of the earth's surface that surprise must not be expected at people not displaying a closely connected knowledge of the events in each campaign. It is in some of the minor campaigns connected with the war, or indirectly arising therefrom, in which will be found many of the most striking illustrations of the usefulness of aviation and wireless telegraphy. It is now permissible to raise the curtain a little on what has been transpiring on the north-west frontier of India. Some may object that this has nothing whatsoever to do with Australia, a deduction wholly inaccurate. If the scheme of Imperial defence is studied it will be realised what an important strategic area India supplies, a fact the Germans were perfectly well aware of, as was indicated at the time when they hoped to be able to initiate a drive with India as its first objective, and Australia as its second. Now it was at this period that we were having considerable trouble on the north-west frontier. Many of the tribes were hostile

and committing the usual acts of murder, depredation and rapine, incited thereto by Germans and Turkish emissaries. The field was a promising one for enemy activity, for across our north-west frontier policy, up to the present, must be written the word *Failure*. In due course the world will be supplied with particulars relative to what has occurred since August, 1914, on the frontier and in what precise localities. Until such time it is sufficient to say that there has been considerable trouble and not a little hard fighting in one of the wildest and most difficult countries to carry on military operations it is possible to conceive. That the work was successfully accomplished is a matter for congratulation, but that success was mainly attributable to the work of our airmen, as a recent order issued by the Officer Commanding makes abundantly plain.

It is hard to fully estimate the results aviation is likely to play on the civilising of the north-west frontier tribes. The Waziris, Afridis, Orakzais and all the other Pathan tribes have now learned that the British Raj has at its command a power against which all the fastnesses of their mountains, and the number and strength of their *nullahs* are of no avail, and it may be that this knowledge will lead them, with the fatalism characteristic of all Oriental peoples, to mend their ways. "The picturesque, dirty, lawless savages," as the late Sir Lepel Griffin once described the frontier tribesmen, present as unfavourable a picture as can be drawn in any country adjoining the territory of the British Empire. For this they are not altogether to blame. In the guarding of India it has been a part of our policy to keep a sort of buffer state of savagery between us and Russia. We have paid dearly for it in blood and money, but the war has changed that policy, root and branch. When Russia emerges from her orgy of

blood and anarchy a new Russia will arise, and a perfect understanding be arrived at with the British Empire. Then the policy wherein this "Switzerland of Asia" is kept denuded of roads and railways will disappear. The flying machine renders such a policy useless in a military sense, and that is the sense which has guided our actions heretofore. From all this the future will see many changes. Railways will join India and Europe; the Indian and Russian systems are now less than 150 miles apart. Once these channels of through communication are opened the influences of civilisation will begin to expand. All of this has been made alone possible by aviation, and future generations will look back to these days and comprehend, as it is not possible for us to-day, what an enormous debt civilisation owes to aviation and the men who laboured in its cause.

Reference might, of course, be made to

New Guinea, largely a *terra incognita*, but which will come mostly under the administration of the Commonwealth. Aviation will there shed its penetrating rays into quarters of which we only know their impenetrable darkness to-day; but it is to the north-west frontier of India that the greatest immediate triumph must be placed.

The beautiful verse of Auberon Herbert has to-day a significant and peculiar application, not alone when applied to the question with which we have been chiefly concerned, but to each and every question associated with the body politic:—

"Forward we look, and we gild it all,
 Rich is the picture and tender and fair,
 Backward we look and the blue mists fall,
 Veiling the troubles that once were there."

"Sea, Land and Air"

will be sent, Post Free,
 for 9/- per Annum.

Subscriptions should be sent to _____
THE WIRELESS PRESS, 97 CLARENCE STREET, SYDNEY

WORLD-WIDE WIRELESS

INTERESTING STATEMENTS MADE IN LONDON

In an address to shareholders at the Twenty-first Ordinary General Meeting of Marconi's Wireless Telegraph Co., Ltd., held in London on August 1, the Managing Director remarked:—

“Mr. Marconi extremely regrets that he is unable to be here to-day. Important duties detain him in Italy at the present moment. . . .

“Our inventions and patents continue to be used on an immense and ever-increasing scale by the Admiralty, the War Office and the Royal Air Force. Their incalculable help to the Allied cause is unquestionable. . . .

United States.

“In the United States of America a new company has been formed—with the approval of the United States Government—by the Marconi Wireless Telegraph Company of America, with the title of the Pan-American Telegraph & Telephone Company. The object of that company is to erect stations for the purpose of creating a commercial service of wireless telegraphy between North, Central and South America. . . .

Australasia.

“The Australian company, Amalgamated Wireless (Australasia), Limited, is making excellent progress under the managing direction of Mr. E. T. Fisk and a re-constituted board. I am confident that that company will substantially and successfully develop its business under able management. . . .

France.

“. . . The whole of the tangible assets of the French Universal Wireless Telegraph & Telephone Company have been sold to a new Company entitled the Cie Générale de Télégraphie Sans Fil (General Wireless Telegraph Company), with a capital of 12,500,000 francs, the whole of which has been subscribed in cash by about 20 shareholders, amongst whom are the French Cable Company (with the approval of the

French Government)—I should say that the French Government is interested in the French Cable Company and it has approved of the French Cable Company taking a substantial part in this new wireless company—the Banque de Paris et des Pays Bas, Banque Française pour le Commerce et l'Industrie, Banque Transatlantique, Crédit Mobilier Française, Messrs. Jacques Gunsburg et Cie, Société Central des Banques de Provence and, again with the approval of the French Government, Marconi's Wireless Telegraph Company, Limited. . . .

“We have many important negotiations in many parts of the world and I think one may contemplate that the business of wireless telegraphy will be no less important when peace comes than it has been during the war. In speaking with a very eminent officer of the United States Navy Department a day or so ago he told me that, although before the war he was of a very different opinion, he has now come to the conclusion that no new long-distance cables will ever again be laid; that, in his view, wireless telegraphy is thoroughly efficient for telegraphic purposes. It would not be, perhaps, altogether advisable for me to express such views, but I think you will be glad to hear those of a practical man holding such an important position in so great and progressive a country as the United States of America. . . .

Installation at Australia House, London.

“The Relay Automatic Telephone Company, Limited, in which we have a very large interest, has had its sphere of action very considerably restricted in consequence of the war. It has, however, been able to do some business, notably that of installing its system at *Australia House*, London, amongst other large establishments, where it is working to perfection. This company, when war closes, in my opinion, has a great future in front of it; unquestionably automatic telephones will be the order of the day when circumstances change, and there is, I believe, no automatic system so excellent as that of the Relay Company.”



Osram
DRAWN WIRE
Lamps

OSRAM LAMPS for Life, — Strength and Efficiency.

**Osram Lamps mean more
light at less cost :: ::**

Osram Lamps are manufactured at the Osram-
Robertson Lamp Works, Hammersmith, LONDON.

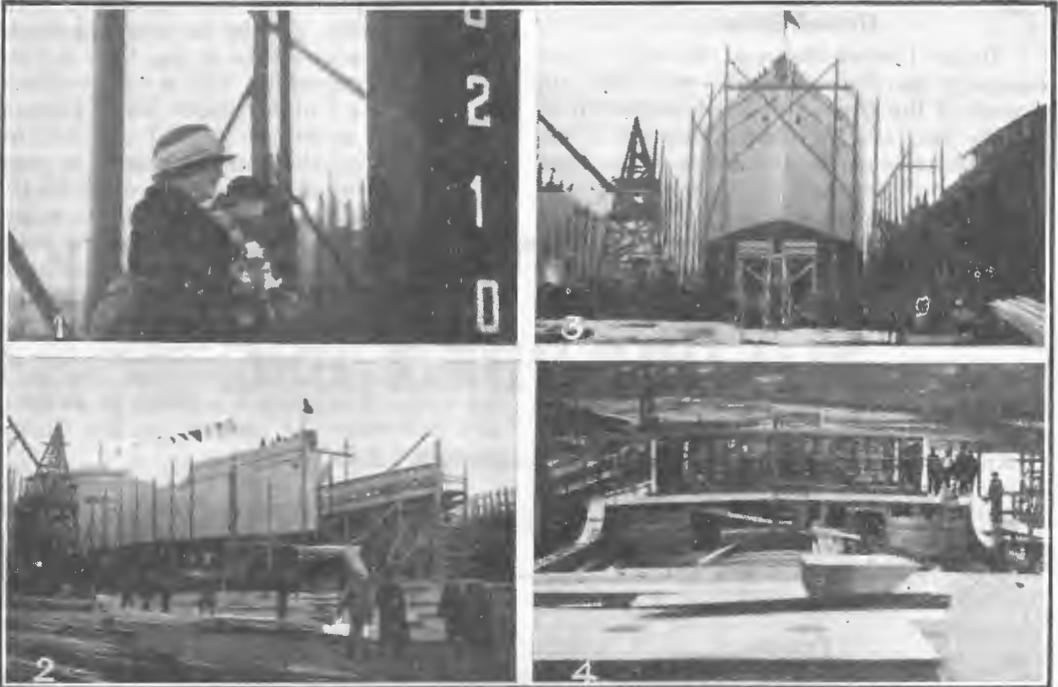
The British General Electric Co. LIMITED.

BRISBANE:
N. Bell & Co., 83 Eagle
St. (Sole Agents).

WELLINGTON:
8 Willeston St.

MELBOURNE:
590 Bourke St.

ADELAIDE:
Harris, Scarfe & Co.
(Sole Agents).



Launching the "Culburra."

- (1) Miss Lister, daughter of the State Governor of Washington, christens Australia's new motor-schooner.
- (2) and (3) On the slips at Olympia, Washington.
- (4) Loading her first cargo for Australia.

The *Culburra* (2,341 tons) is the second of our new fleet of American-built wooden motor-schooners. She arrived in Sydney last month on her maiden voyage.

MARCONI SCHOOL SUCCESSES

After a singularly successful existence of little more than three months, the Melbourne branch of the Marconi School of Wireless held, on October 28th, its first examination of school students.

Of these, four obtained their first-class certificates, the names of the successful candidates being: Messrs. W. S. Harvey, A. Lucas, C. Lawry, and E. H. C. Olney.

The last named has been appointed as Wireless Operator to s.s. *Kauri*, of the Union Steamship Company of New Zealand, and has now sailed in that capacity.

It is expected that the remaining candidates will be appointed to vessels of the Australasian Mercantile Marine within the next few days.

The Superintendent of the Marconi School at Melbourne is Mr. Horace J. Firth, who joined the Marconi Company in England in 1910, and was transferred to Australia two years later.

Leaving Sydney on August 6th, 1914, Mr. Firth sailed on board H.M.A.S. *Melbourne*, with a wireless party for Rabaul, where he assisted in the fitting of several ships, also of the Rabaul shore station.

He returned to Sydney on the German yacht *Komet* (subsequently renamed *Una*, and put into commission as a gunboat).

In October, 1914, Mr. Firth joined the A.I.F., as a Sapper, in the 2nd Light Horse Signal Troop and, prior to sailing for Egypt with the First Contingent, was promoted to the rank of Lance-Corporal.

The following month he won his second and third stripes. He took part in the landing at Gallipoli on April 25th, 1915, was ashore at 8.30 a.m., and within half an hour had the Wireless Pack Station erected.

Promoted to 2nd Lieutenant for work at Gallipoli, he now took charge of the 4th Brigade, and was the last to leave Gallipoli at the evacuation.

Returning to Lemnos Island as 1st Lieutenant he next proceeded to Egypt, where his Brigade occupied part of the line at Serapeum.

On June 1st, 1916, he arrived in France, and was wounded on August 7th of that year, at Pozières. Officially reported killed, he nonetheless arrived in Australia on the 14th April, 1917, where he was appointed Home Service Instructor at the Wireless Training School, Moore Park, Sydney, and later to command of the School, which he relinquished in June of this year to take charge of the Marconi School of Wireless in Melbourne.

YOUR OPPORTUNITY NOW!

I.C.S. SALARY-RAISING EDUCATION
Study for Better Pay in Spare Time

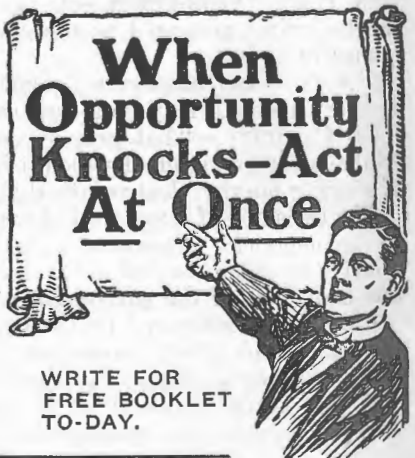
INTERNATIONAL CORRESPONDENCE SCHOOLS
183 Pitt Street, SYDNEY—79 Swanston Street, MELBOURNE

Electrical Engineering
Marine Engineering
Mechanical Engineering
Structural Engineering
Gas-Electric Engineering
Steam-Electric Engineering
Civil Engineering
Draughtsmanship

Better English
Arithmetic
Bookkeeping
Advertising
Shorthand
Illustrating
Ticket Writing
Salesmanship

Name.....
Address.....

*The First
Commandment
of Success is-*



WRITE FOR
FREE BOOKLET
TO-DAY.

DEFINITIONS OF TERMS USED IN WIRELESS

Compiled from the Report of the Committee of Standardisation of the Institute of Radio Engineers and from other sources,

BY DR. J. ERSKINE MURRAY, D.Sc., F.R.S.E., M.I.E.E.

(All Rights Reserved.)

::

(Continued from August Issue.)

39. **BEAT.**—When two oscillations of slightly different frequencies are impressed on an electrical circuit they periodically help and oppose each other. The result is an oscillation whose successive half periods gradually increase and decrease in amplitude with a frequency equal to the difference between the two impressed frequencies.

40. **BRUSH DISCHARGE.**—“A discharge having a feathery form, and consisting of an intermittent partial discharge which takes place from a conductor when the potential difference exceeds a certain limit, but is not high enough to cause the formation of a true spark or arc. It is always accompanied by a hissing or cracking sound” (I.E.C.). When such a discharge is being given off by a conductor the latter is said to be “Brushing.”

41. **BRUSH OR CORONAL LOSSES.**—Those due to leakage convection electric currents through a gaseous medium.

42. **BUZZER.**—A small mechanism (usually electromagnetic) used for rapidly making and breaking an electric circuit. When connected in series with part of a circuit in which oscillations are possible it continually impulses the circuit, thereby producing oscillations which are convenient for testing purposes.

43. **CAGE CONDUCTOR.**—A group of parallel wires arranged as the elements of a long cylinder.

Note.—Any conducting element of an antenna may be a cage conductor.

44. **CAPACITY.**—That property of a material system by virtue of which it is capable of storing energy electrostatically.

The capacity of a system is dependent on its geometrical dimensions, its position relative to other conductors, and the dielectric constants of the surrounding media.

Capacity is measured by the ratio of the quantity of electricity stored to the potential difference at which it is stored.

A distinctive property of a capacity is that it permits the passage of electrical

energy through it only in the form of displacement currents.

45. **CAPACITY, EFFECTIVE OF AN ANTENNA.**—The effective capacity and effective inductance of an antenna at any oscillation frequency are the equivalent capacity and inductance values determined from the following fundamental equations:

$$\omega = \sqrt{\frac{1}{LC}} \quad \dots \dots \dots (1)$$

where L = the total antenna inductance,
 C = the total antenna capacity,
 ω = the angular velocity of the free alternating currents in the antenna.

$$d = \pi R \sqrt{\frac{C}{L}} \quad \dots \dots \dots (2)$$

$$\text{or} \quad d' = \pi R' \sqrt{\frac{C}{L}} \quad \dots \dots (2A)$$

where R' = series resistance inserted at the base of the antenna and
 d' = increased decrement resulting therefrom.

Solving (1) and (2A) for L and C , we have

$$L = \frac{\pi R'}{\omega d'} = \frac{R'}{6 \times 10^8 \times d'} \cdot \lambda \quad (\lambda \text{ in meters})$$

$$C = \frac{d'}{R'} = \frac{d'}{6 \pi^2 \times 10^8 \times R'} \cdot \lambda \quad (\lambda \text{ in meters})$$

Having the antenna inductance and capacity, the resistance R of the

antenna can be determined from equation (2). This value of R satisfies the fundamental equation:

$RI^2 =$ power absorbed by the antenna,
where $I =$ current measured at the base of the antenna.

Note.—The equation.

$$I = \omega CE \frac{\pi R'}{d'}$$

(and also $E = \frac{\pi R'}{d'} I$)

defines an effective voltage E , which is the voltage approximately given by the equation. Energy per spark $= \frac{1}{2}CE^2$.

46. CATHODE.—See Kathode.

47. CENTRE OF CAPACITY OF AN ANTENNA.—See Form Factor, Note 2.

48. CHANGER, FREQUENCY.—A device delivering alternating currents at a frequency which is some multiple of frequency of the supply current.

49. CHANGER, WAVE.—A transmitting device for rapidly and positively changing the wave length.

50. CHARACTERISTIC CURVE.—A curve showing the variation of a property of a material or a piece of apparatus when submitted to a changing influence which produces that variation.

The characteristic curve of an arc or crystal shows the relation between the current produced and potential required to produce the current.

51. CHARACTERISTIC, DYNAMIC, OF A CONDUCTOR (for a given frequency and between given extremes of impressed E.M.F. and resultant current through the conductor).—This is the relation given by the curve obtained when the impressed E.M.F.'s are plotted as ordinates against the resultant currents as abscissas, both E.M.F.'s and currents varying at the given frequency and between the given extremes.

52. CHARACTERISTIC, STATIC, OF A CONDUCTOR.—This is the relation given by the curve plotted between the impressed electro-motive force as ordinates and the resultant current through the conductor as abscissas, for substantially stationary conditions.

53. CHOKING COIL.—“A coil with so great a self-induction that its impedance depends chiefly on the self-induction rather than upon the resistance” (I.E.C.). Generally called a Reactance Coil in U.S.A.

54. CIRCUIT, CLOSED OSCILLATING.—A circuit in which the capacity and inductance in series are localized substantially in different places, and which has very small power of radiating electromagnetic waves.

55. COEFFICIENT, ATTENUATION, RADIO.—See Attenuation.

56. COEFFICIENT OF AMPLIFICATION.—See Amplification.

57. COEFFICIENT OF COUPLING, INDUCTIVE.—The ratio of the effective mutual inductance of two circuits to the square root of the product of the effective self-inductances of each of these circuits.

58. CODE.—A system of conventional characters designed to represent letters by dots and dashes. The International Morse Code is official.

59. COHERER.—A form of detector (*q.v.*).—An imperfect contact or collection of such contacts so arranged that when under the influence of an alternating potential it coheres and allows current from a local battery to pass and make some kind of signal. A device sensitive to radio frequency energy, and characterised by (1) a normally high resistance to currents at low voltages, (2) a reduction in resistance on the application of an increasing electro-motive force, this reduction persisting until eliminated by the application of a restoring or disturbing mechanical force, and (3) the substantial absence of thermo-electric or rectifying action.

60. COMMUNICATION, RADIO.—The transmission of signals by means of electromagnetic waves originating in a constructed circuit.

61. COMPASS, RADIO.—A radio receiving device for determining the direction (or the direction and its opposite) in which maximum energy is received; or

A radio transmitting device for determining the direction (or the direction and its opposite) of maximum radiation.

62. CONDENSER.—A material system possessing electrostatic capacity. Two conducting surfaces separated by a dielectric.

63. CONDENSER, AIR.—A condenser having air as its dielectric.

64. CONDENSER, COMPRESSED GAS.—A condenser having compressed gas as its dielectric.

65. CONDUCTOR, CAGE.—See Cage Conductor.

66. CONDUCTION CURRENT.—A transfer of electrical energy guided by a conducting medium.

(To be Continued.)

Established 1882.

HUGHES & CO.

Fashionable Tailors <small>1/2</small> 'Phone: City 77	UNIFORMS: Naval and Mercantile Marine A SPECIALITY
-------------------------------------------------------------------------	------------------------------------------------------------------------------

70-72 ERSKINE ST., SYDNEY.

ERNEST MILLS & SON
 DESIGNERS AND MAKERS
 OF HIGH GRADE FURNITURE
100 HARRINGTON ST., SYDNEY
 For 10 Years Factory Manager and Designer for Farmer & Co., Sydney

THE Telephone: 1180 City
RAPID FREIGHT DESPATCH CO.
 Licensed Customs Agents,
 Shippers and Forwarders.
98 CLARENCE STREET, SYDNEY
 (Opposite Hotel Grand Central).

If your Newsagent cannot supply
 "SEA, LAND AND AIR"
 order it direct from
THE WIRELESS PRESS,
 97 Clarence St., Sydney.

—

Single Copies, 9d.
 Annual Subscriptions, 9/-. Post Free

ROYAL TYPEWRITERS
 The Latest Development in Modern Type-
 writer Manufacture. "Compare the Work."
 Australasian Agents:
SYDNEY PINCOMBE, LTD.,
 5 Hamilton St. and 46 Hunter St., Sydney

JOHN BROOMFIELD, LTD.
 Ship Chandlers and Hardware Merchants
152-154 SUSSEX ST., SYDNEY
 Large Stocks of Ship Chandlery, Motor
 Launch and Yacht Fittings always on hand.
 Inspection Invited. 'Phone 9780 (6 lines)

Do these figures mean anything to you——?

There are 23,000 Manufacturers (large and small) in Australasia.
 £122,000,000 was spent on Raw Materials by these Manufacturers last year.
 £202,000,000 represents the total value of their land, building, plant, and machinery.
 £136,500,000 was the total amount SPENT by each of these Manufacturers last year.
 Power-plant, aggregating 800,000 h.p., is in use in the Manufacturing Industries of Australasia.

The Australasian Manufacturer

Is the only medium which reaches the Manufacturers throughout the Commonwealth and New Zealand. If you have anything to sell to the largest buying class in Australasia—the Manufacturers—you can reach them through this paper—surely, effectively, and economically.

Write or Telephone the nearest Office for Advertising Rates and Full Particulars.

16 Bond Street,
SYDNEY.
 ('Phone: City, 6818.)

34 Queen Street,
MELBOURNE.
 ('Phone: Central, 160.)