THE ROYAL ENGINEERS JOURNAL.

Vol. I. No. 2. FEBRUARY, 1905.

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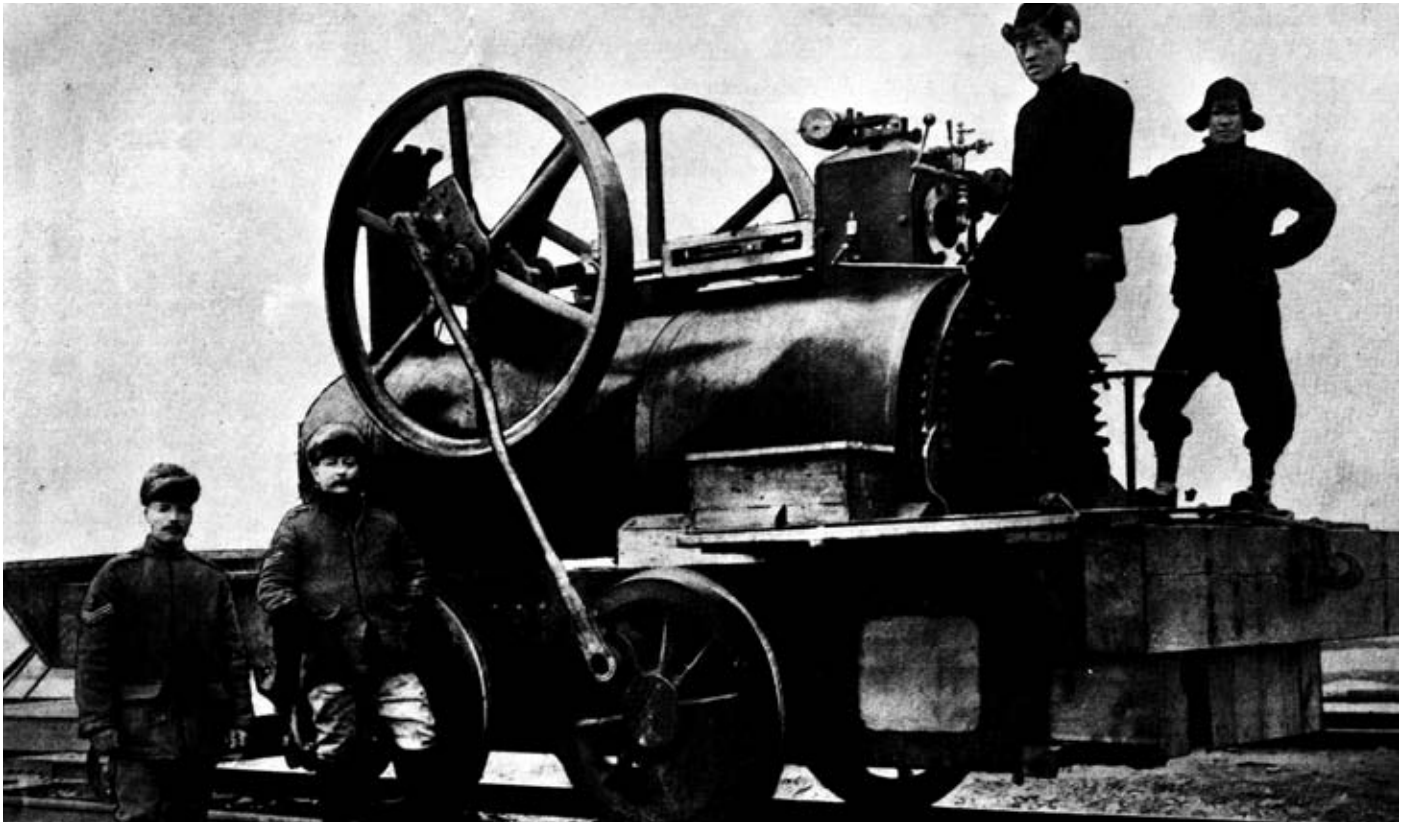


THE GRASSHOPPER
An improvised Locomotive in the China Expedition, 1900

"THE GRASSHOPPER."

AN IMPROVISED LOCOMOTIVE IN THE CHINA EXPEDITION, 1900.

THE frontispiece of this number of the *R.E. Journal* shows a locomotive which was improvised during the operations about Pekin in December, 1900. It was constructed by No. 4 Company of the Bengal Sappers and Miners (Capt. H. R. Stockley, R.E.), under the supervision of Sergeant (now Q.M. Sergeant) A. Tinkham, R.E., of that famous Corps.

The frame and wheels were taken from the remains of locomotives destroyed by Boxers at Fangtai Junction. No lifting gear was available; and in order to suit the frame to the superstructure, a length of 6 feet had to be cut off with chisels and a large "Jim Crow," and a wooden buffer plank put on.

The engine was an old stationary single-cylinder one, originally used for driving a dynamo at the Imperial Palace near Pekin. It was mounted on the shortened frame and secured by bolts, while coupling rods were attached to the flywheels on each side. These rods were made from long truss bars, taken out of damaged bogie carriages at Fangtai and "bushed-up" with copper piping for the bearings; they lasted very well. In the absence of reversing gear, the crank of the eccentric coupling had to be shifted with a spanner whenever the engine went backwards. No steam gauge was available.

Notwithstanding these drawbacks the respectable speed of 12 miles an hour was attained with a load of three 20-ton cars. At first the motion was found to be very shaky, but steadiness was obtained by fixing counter-balances on the flywheels. Owing to its ungainly appearance the engine was christened "The Grasshopper."

This novel locomotive worked successfully for 3 months on the sidings at Pekin; after which the engine was taken off its frame and sent to Tientsin, where it did useful work in pumping water.

THE BATTLE OF THE YALU.

FROM 22ND APRIL, 1904, TO 1ST MAY, 1904.

By BT.-COLONEL J. D. FULLERTON, R.E.

I. DESCRIPTION OF THE BATTLEFIELD.

Extent.—The battlefield extends along both sides of the R. Yalu, from Antung, the right flank of the Russian position, to the village of Su-ku-chin, which marked the Russian left flank.

Rivers.—R. Yalu.—The main feature is the R. Yalu, the passage of which was the Japanese object. The river itself is broad, shallow, and full of muddy, sandy flats or islands, the position and size of which vary considerably according to the time of year and the height of the tide, which at ordinary times has a rise and fall of some 8 ft. at the town of Wiju. At Su-ku-chin the stream (a single one) is about 250 yards wide; at the point where it is joined by the River Ai the breadth increases to about 2½ miles, while a little below Wiju it is about 3½ miles. The principal islands are Chiu-li-tao lying between Won-hwa-tong on the Korean side and Husan Hill; Chin-ting-tao, opposite Wiju, and stretching some miles down the river, and Chang-chaing-tai, an island about 4 miles long, also opposite Wiju, running some mile and a half up the River Ai. All these islands are more or less cultivated and have many small villages and huts on them.

The depth of the river is very variable; at Wiju the centre of the three streams into which it is divided requires bridging, but the other two can be forded, the depths being about 3 ft. At Antung the depth is about 10 ft., but bridges were found necessary at Su-ku-chin, between Chiu-li-tao and Husan, and between Chin-ting-tao and Chang-chaing-tai Islands. The water in the river was low, and generally favourable for the passage of troops.

R. Ai.—The R. Ai runs into the Yalu, a little above Wiju, and is very similar in character to the latter. It has a soft bottom, with a

depth of from 3 ft. to 5 ft. according to the time of the year, but the depth varies greatly, and careful reconnaissance is necessary, to find out the best crossing places.

Hills.—The country generally is hilly, the right or Manchurian bank of the river as a rule commanding the Korean side. Between the R. Ai and Yalu the country is very rough, the hills having steep slopes, unsuitable for any artillery but mountain batteries. From Antung to Chiu-lien-cheng, and along the right bank of the R. Ai, the hills vary in height from 100 to 200 ft., while further back, N.W. of Chiu-lien-cheng, a height of 300 ft. is attained. Husan at its highest point, about 7 miles N. of Wiju, is about 1,000 ft. high, and commands the Makan and Yu-shu-kon range on the left bank of the Ai. The high ground N. of Li-tzu-yuan rises to a height of 300 ft. The S. bank of the R. Yalu is low lying, being seldom more than 150 ft. high (100 ft. at Wiju) within a couple of miles of the river bank.

Roads.—The roads in the area are few, the principal one being the main Mandarin road through Wiju, Chiu-lien-cheng, and Hohmatung to Feng-whang-chang and Liao-yang. The other routes are little more than paths leading from village to village, and like the Mandarin road, are very rough, and unsuitable for anything but light traffic.

Towns.—The principal towns and villages are Wiju (20,000); Antung, the right of the Russian position, and Chiu-lien-cheng, its centre. There are small villages at Su-ku-chin, Li-tzu-yuan, Husan, and on the islands.

Weather.—The weather for a week before the battle was fine, and suitable for military operations. A heavy mist on the morning of the 30th April prevented the Japanese Artillery opening fire till 10 a.m.

II. THE OPPOSING FORCES AND THEIR DISPOSITIONS.

A. THE RUSSIAN FORCE.

The Russian troops were on 22nd April holding the line of the R. Yalu on the N. side from Antung to Su-ku-chin, disposed as follows :—

In command—General Sassoulitch, Commanding II. Siberian A.C.

Right Wing	... Antung and neighbourhood.	...	9th E. Sib. Rifle Regt. 10th E. Sib. R. Regt. 24th E. Sib. R. Regt. (1 battalion). No. 1 Battery, III. E. Sib. Art.

Centre	Chiu-lien-cheng with detachments about Husan. ...	12th E. Sib. R. Regt. No. 1 Battery, VI. E. Sib. Art. No. 1 M.G. Company
Left Wing ...	W. of R. Ai	22nd E. Sib. R. Regt.
	Makau	No. 2 Battery, VI. E. Sib. Art.
	Yu-shu-ku	No. 3 Battery, VI. E. Sib. Art.
Reserve ...	Hohmatung	11th E. Sib. R. Regt. No. 3 Battery, III. E. Sib. Art.
Cavalry ...	Guarding both flanks ...	Cossack Cavalry Brigade (3 regts.), Major-Gen. Mistchenko.

Total Strength: 17 battalions, 5 batteries, 1 M.G. Company and 3 regiments cavalry. About 14,000 men, 40 guns, and 8 M.G.

General Sassoulitch's Headquarters were at Antung; Major-General Kashtalinsky commanded the centre and left wing.

Very little was done in the way of entrenching the position, the earthworks constructed being, especially on the left flank, of a very simple character.

The object of General Kouropatkin, the C.-in-C. of the Russian Army, in holding the R. Yalu position was to gain time for the concentration of his troops at Liao-yang. His orders to General Sassoulitch were to check the advance of the Japanese, watch their movements, hold them for a time, but not to seriously engage a superior force.

General Sassoulitch's plan of operations was to hold the line of the R. Yalu as a defensive position and prevent the enemy crossing. He appears to have thought that the Japanese would attack his centre and right flank, partly because the country on the left of his position was not very suitable for manœuvring large bodies of troops, and partly owing to false information obtained by him which led him to believe that the Japanese were concentrating at Wiju, and preparing to cross some distance below the town.

B. THE JAPANESE FORCES.

On 22nd April, 1904, the Japanese Forces were holding the S. bank of the R. Yalu from Yongampho (12 miles S.W. of Wiju) to Suku-chin, and were disposed as follows:—

(*a*). *Military Forces.*

In command—General Kuroki, Commanding the I. Imperial Japanese Army.

Right Wing ...	Won-hwa-tong to Su-ku-chin.	...	XII. Division (Lt.-Gen. Inoue).
			12th Brigade { 14th Regt. 47th Regt.
			23rd Brigade { 24th Regt. 48th Regt.
Centre	About Wiju		Imperial Guard Division (Lt.-Gen. Hasegawa).
			1st Brigade { 1st Regt. 2nd Regt.
			2nd Brigade { 3rd Regt. 4th Regt.
Left Wing ...	S. of Wiju		II. Division (Lt.-General Nishi).
			3rd Brigade { 4th Regt. 29th Regt.
			15th Brigade { 16th Regt. 30th Regt.

Each Division had 6 batteries of artillery, and there was a special artillery force of 20 heavy (probably 5-inch) guns.

The Cavalry Brigade consisted of 3 regiments.

The total strength was: 48 battalions, 108 field guns, 20 heavy guns, and 1,800 cavalry, or about 45,000 men with 128 guns.

(*b*). *Naval Forces.*

In command—Commander Nakagawa, I.J. Navy.

Left	Between Yongampho and Antung.	... Gunboat *Uji*. Gunboat *Maya*. T.B.'s—two. Armed launches—three.

The Japanese positions all along the river were very carefully entrenched; all the routes along which troops were to move were concealed by artificial hedges, screens, etc., and it was extremely difficult not only for the Russians to see the positions from their side of the river, but also for spies, etc., examining the ground to ascertain the real strength and dispositions of the troops.

General Kuroki's object was to force the passage of the R. Yalu, and he attached considerable importance to this action, not only on account of the results to be obtained by a successful crossing, but

also because this first encounter between Japanese and European troops would, if successful, considerably increase the confidence of his men in their powers of meeting the Russian forces in the future. The plan of operations was very simple. The whole line of the river was to be strongly held, and numerous demonstrations made to mislead the enemy; then when all was ready, a direct attack was to be carried on the centre by two divisions, combined with an attack on the enemy's left flank by the other Division.

III.—NARRATIVE OF OPERATIONS.

22nd April.—The Japanese completed the concentration of their troops about Wiju, and commenced carefully reconnoitring the enemy's position. At the same time arrangements for concealing their own positions, by erecting screens, to cover guns, lines of advance of troops, etc., were undertaken.

The Russians also carried out reconnoitring expeditions. On this date their information regarding the enemy was that a concentration was in progress about Wiju and that smaller bodies were moving up stream. It was evident to the Russians that an attempt would be made to cross at Wiju with the main force, while a flank attack either below or above Wiju would also probably be attempted at the same time.

23rd April.—Reconnoitring and general preparations were continued by both forces.

24th April.—The result of the Japanese reconnaissances showed that the Russians held the whole length of the W. bank of the R. Yalu, from Su-ku-chin to Antung, with small parties concealed near the riverside. The naval flotilla, after exploring the lower reaches of the river, reported that small boats could get up to the neighbourhood of Antung.

25th April.—The Russian reconnaissances had not up to this date been very successful; no patrols had succeeded in reaching the E. bank of the R. Yalu. The opinion of the Russian Commander was that an attempt would be made to cross below Wiju, and all his preparations were based upon this idea.

26th April.—In the early morning the Japanese flotilla proceeded up stream, and had an engagement with some Russian cavalry near Antung, while later on, about 5 p.m., there was some further skirmishing in this neighbourhood. At about 4 a.m. a detachment of the Imperial Guard, 250 strong, attacked the enemy on Chiu-li-tao Island, some 150 strong. After a hot fight the Russians retired in some disorder to the right bank of the R. Yalu, setting fire to the village before retreating. The firing of the village was a signal for a heavy fire from the batteries N. of Chiu-lien-cheng, but the Japanese pushed on and occupied the place, with a loss of 9 killed and

32 wounded. The Russian losses amounted to 1 officer and about 30 men. While the above action was in progress a detachment from the II. Japanese Division occupied Chin-ting-tao Island without loss.

About 12 noon the Russian batteries N. of Chiu-lien-cheng opened fire on Wiju and the village Soho-tong to the W. of the town, but the Japanese did not reply, the fire being ineffective.

During the day the Japanese succeeded in bridging the E. branch of the R. Yalu (the first channel) about 3 miles below Wiju, but further bridging operations could not be carried out owing to the heavy fire from the batteries N.E. of Chiu-lien-cheng.

27th April.—The Russians commenced entrenching their positions along the W. bank of the R. Ai, the operations being plainly visible to the Japanese.

During the day the Russian batteries N.E. of Chiu-lien-cheng kept up a heavy fire in order to persuade the Japanese guns to answer and disclose their positions, but the Japanese batteries did not reply.

The Guards and II. Division sent further detachments to reinforce the troops which had obtained possession of Chiu-li-tao and Chin-ting-tao Islands. A detachment of the II. Division occupied Chang-chaing-tai Island.

A company of the Japanese guards moved across to Husan in the early morning, but after a skirmish with a small Russian detachment about Li-tzu-yuan, had to retire on Chiu-li-tao Island with a loss of 10 men, as the Russians were reinforced by a battalion with 3 guns.

28th April.—Two Companies of the Japanese Imperial Guard, 4th Regiment, occupied Husan, and reconnoitred towards Li-tzu-yuan, driving out a small Russian detachment some 30 strong, which retired across the R. Ai with a loss of 5 killed. Later in the day 2 battalions of 4th Regiment, with some mountain guns, occupied Li-tzu-yuan, and held it during the night of 28th—29th. The Russians again opened a desultory fire against the Japanese in the islands and about Wiju, but this was not replied to. The general orders for the final attack of the Russian positions were issued this day, as follows :—

XII. Division to march to Su-ku-chin (on the R. Yalu, about 8 miles N. of Wiju), cross the river on the 29th April and by midnight on 30th April to be on the hills E. of the R. Ai, on the line Li-tzu-yuan—Tchingou (opposite to). Objective in the final attack, the extreme N. Russian defences, and to prevent retreat of Russians from Chiu-lien-cheng.

Guards Division to cross to Husan, and by midnight on 30th to hold the line Li-tzu-yuan—Husan. Objective in the final attack, the Makau Hill and pursuit of enemy.

II. Division to cross to Chang-chaing-tai Island, and by midnight 30th April to be ready to cross the R. Ai. Objective in the final attack, the hill N.E. of Chiu-lien-cheng ; then to move down stream towards Antung.

Artillery distributed as follows :—

XII. Division...	With the Division.
Imperial Guard Division	E. of Wiju and on Chiu-li-tao, heavy artillery ; field batteries on N. Chin-ting-tao.
II. Division	S. Chin-ting-tao.
Reserves...	Wiju ; to advance along the Wiju—Chiu-lien-cheng road as the action developed.

Artillery bombardment to commence at 5.30 a.m. on 1st May, 1904 ; the infantry attack by all Divisions to commence at 7.30 a.m. Divisional Engineers to construct the necessary bridges.

29th April.—In the early morning a Russian detachment under Lieut.-Colonel Linde attacked the Japanese forces at Li-tzu-yuan and compelled them to withdraw, some to Chiu-li-tao and some to the N.

A detachment of XII. Japanese Division (2 battalions and 2 batteries) crossed at Su-ku-chin, driving back a weak Russian detachment under Lieut.-Colonel Gouser. A bridge was commenced at that place 2 p.m.

The Russian batteries continued their bombardment of Wiju and the islands.

The Imperial Guard and II. Divisions continued bridge making and moving guns on to the islands.

The Japanese Naval Flotilla moved up stream from its base at Yongampho, and had small engagements with the Russian scouts during the day.

30th April.—From 10 a.m. to 6 p.m. the Japanese kept up a heavy bombardment of the Russian position with all the available heavy and field guns, to cover the movements of their troops.

The Imperial Guards crossed to Husan, and by the evening had driven the Russian detachment holding Li-tzu-yuan across the R. Ai.

The II. Division completed its crossing to the islands, and took up a position which was only separated rom the right bank of the R. Yalu by a narrow stream.

The XII. Division continued its crossing at Su-ku-chin, and by night time had occupied the Tchingou (opposite to)—Li-tzu-yuan position, outflanking the Russian left. Some of the Japanese troops on the extreme right crossed the R. Ai during the night, and were by early morning in rear of the Russian left.

Major-General Kashtalinsky, who commanded the Russian left wing, viz., from Chiu-lien-cheng to Tchingou, reported to General Sassoulitch, commanding the Russian forces, about 5 p.m. that an attack on the left flank seemed probable ; but he received a direct order to accept battle on the positions he then held.

The Japanese Naval Flotilla again proceeded up stream to reconnoitre, and had a brisk engagement with about 400 Russian cavalry a little S. of Antung.

By midnight, 30th April, the whole of the Japanese troops were in their allotted positions.

May 1st.—5.30 *a.m.*—*The Artillery Bombardment.*—At sunrise the Japanese Artillery opened a very heavy fire on the Russian positions all along the line.

7 *a.m.*—By 7 a.m. the whole of the Russian guns had been silenced and the Russian infantry outposts driven from the river bank. The objectives of the artillery fire were: II. Division and Imperial Guard, the hills N. of Chin-lien-cheng and Makan Hill; XII. Division, Yu-shu-kou and Li-tzu-kou.

7.30 *a.m.*—*The Infantry Advance till* 12 *noon.*—At 7.30 a.m. the infantry attack commenced. The objectives were: XII. Division, Yu-shu-kou and left flank of Russian position; Imperial Guards Division, Makou and hills to the S.; II. Division, Chiu-lien-cheng and hills to the N. The infantry attack formation was successive lines of skirmishers, the distance from man to man being about 6 paces. The losses were not great considering the strong positions attacked, the greatest losses being suffered when the men had to close in to cross the fords.

About 9 a.m. the Japanese succeeded in occupying the whole position from Chiu-lien-cheng to Tchingou. The Russians held out gallantly for a considerable time, but owing to the fact that the reserves were at such a long distance in rear (about 3 miles) a retirement became absolutely necessary. The troops commenced to retreat in good order towards a position about 1½ miles E. of Hohmatung, across the Chin-lien-cheng—Hohmatung road.

After capturing the heights the Japanese advanced as follows:—XII. Division, towards Tai-tou-fung and Hohmatung; Imperial Guard Division, on Hohmatung direct; II. Division, by hills to W. of Chin-lien-cheng, on Hohmatung. Reserves along the Chin-lien-cheng—Hohmatung road.

1 *p.m.*—*Arrival of Russian Reserves.*—About 1 p.m. two battalions of the 11th Regiment and a battery, which the Russians had up till now held in reserve, came up with instructions sent by General Sassoulitch to hold out till the 9th and 10th Regiments from Antung (which had not hitherto been engaged) could come to the assistance of the left wing. The 11th Regiment and the battery were ordered by Major-General Kashtalinsky to take up the position above alluded to and cover the retirement of the rest of his troops. The Russians made many charges, and fairly well maintained their position till about 2 p.m.

2 *p.m.*—*Final Retirement and Surrender of Russian Troops at Hohmatung.*—About this time the Russians at Hohmatung were in a

desperate position. Three advanced companies of the Japanese 23rd Brigade, XII. Division, had got well round their left rear, and although these had lost nearly half their strength, they managed to prevent the retreat of the Russian Hohmatung troops. Other Japanese troops began to close in, and soon the Russians were enveloped on three sides. They made desperate but unsuccessful charges, and finally, after having suffered considerable loss, they surrendered at 6 p.m.

6 *p.m.*—The remains of the Russian force retreated along the Feng-whang-chang road.

After the battle was over the Japanese occupied the line Antung—Hohmatung—Tai-tou-fung—the R. Ai. While the action was in progress the Japanese Naval Flotilla assisted by engaging the enemy in the neighbourhood of Antung. It suffered no losses.

The Japanese losses were 5 officers and 218 rank and file killed, 33 officers and 783 rank and file wounded.

The Russian losses were, according to General Kouropatkin's report, 7th May, 1904, 26 officers and 564 rank and file killed, 40 officers and 1,082 rank and file wounded, 7 officers and 670 rank and file missing; but the Japanese state that they buried 1,363 of all ranks after the battle and took 613 prisoners.

The Russians also lost 21 3-inch Q.F. guns and 8 machine guns.

IV. COMMENTS.

1. *The Russian Plan of Operations.*—The orders issued by General Kouropatkin were suitable for the occasion. His great object was to gain time to collect his troops at Liao-yang, and consequently a course of action on the R. Yalu, which allowed of checking the enemy temporarily without incurring serious loss, was exactly what was required. General Sassoulitch does not appear to have quite realized this, and seems to have thought that the defeat of the Japanese on the R. Yalu was the principal object of the operations. As regards his actual plan for the defence of the position, it cannot be said to be a very satisfactory one. The troops were almost all extended along the banks of the river, the only reserve being some three miles in rear of the centre of the position, with very rough and broken country to cross if it became necessary to reinforce the flanks. The calculation also that the right flank would be attacked was unfortunate, as many indications showed that the Japanese intended to operate against the left flank.

It is only fair to say, however, that the position was not such a strong one as it might at first sight appear. There was no good secondary position in rear of the main one; Husan Hill and the high ground to the N.W. commanded all the country within artillery range, and the Rivers Ai and Yalu, though formidable obstacles,

could, as far as their W. streams were concerned, be forded fairly easily.

There is, however, little doubt that the well-established principle of holding the river bank lightly, keeping the bulk of the force in hand at some convenient position and either falling on the enemy while in the act of crossing or promptly retiring, leaving strong rear guards to inflict as much loss as possible without becoming seriously engaged, would have given better results.

As regards Major-General Kashtalinsky's defence of the left wing of the position, it should be noted that he was directly ordered to maintain his position, and no blame can therefore be attached to him for his share in the defence.

2. *The Japanese Plan of Operations.*—The general plan was remarkably good, and extremely well carried out. Two objections have been made to it, first that the outflanking movement on the Russian left flank was not carried far enough, and second that the II. Japanese Army, the greater part of which was in transports off the mouth of the R. Yalu, should have been employed to make an attack on the Russian line of communications with Liao-yang, from the W.

As regards the first objection, it should be noted that the XII. Division crossed the R. Ai on a front of about 4 miles, and that considering it was attacking locally strong positions, viz., the hills about Yu-shu-kou and to the N. of that place, this extension was as much as could be safely made. In the actual advance after the hills were taken the 23rd Brigade did march on Hohmatung, and the capture of the Russian guns and defeat of a large number of infantry ensued. But it is doubtful whether an advance to the W. of the Tchingou—Hohmatung road would have been safe, and the very difficult nature of the country, quite unsuited for cavalry action, would probably have rendered such an extended advance abortive. Next as regards the employment of the II. Japanese Army. General Kuroki had some 45,000 men, and he no doubt felt that he had quite sufficient troops to deal with the Russian Forces, and as his superiority in strength was about three to one, the employment of the II. Army hardly seemed necessary. Again, the Japanese were naturally enough particularly anxious to isolate Port Arthur, and intended to use the II. Army for that purpose. Had the troops been landed at the mouth of the R. Yalu and moved as suggested, considerable delay in acting against Port Arthur would have ensued, and it is also possible that the Russians might have withdrawn from the line of the R. Yalu altogether, a result certainly not desired by the Japanese, who were particularly anxious to give their troops an opportunity of encountering their enemy.

Taking it as a whole the general plan of attack was skilfully arranged, and reflects great credit on the Japanese Commander.

3. *Intelligence and Reconnaissance Duties.*—The Russian Intelligence Service does not appear to have been very well carried out, chiefly, no doubt, on account of the difficulty always experienced in obtaining information in a country the population of which is hostile to the army operating in it. The Russian Commander ought by the morning of the 29th April to have known that a movement in force against his left flank was in progress, but he does not seem to have received any really reliable information on this subject till the afternoon of that day, when he received Major-General Kashtalinsky's report. In the same way the precarious state of the left wing positions on 1st May was not known apparently to General Sassoulitch at Antung till about 10 a.m., and consequently both the Reserves and the troops of the right wing arrived too late to be of much assistance to Major-General Kashtalinsky.

The Japanese Intelligence Department was most carefully organized and skilfully worked. Very complete information as to the strength of the enemy, the best points for crossing the river, etc., was obtained, and the work done by this branch of the service was most satisfactory.

4. *Artillery.*—Owing to the great preponderance of the Japanese artillery (128 guns to 40) it is difficult to estimate the values of the respective artillery services. But there is no doubt that the Japanese artillery was splendidly served in every way, and that its fire, especially on the 1st May, was most effective. The Russian guns had of course little or no chance against such a large force, but they were well fought as far as circumstances permitted.

5. *Engineers.*—The Japanese engineering operations were most skilfully carried out, especially the bridging of the rivers, and the concealment of the gun positions and routes of approach to the river bank. It must however be recollected that there was ample time to construct these works, which might not always be the case in attacks of this description. The Russian entrenchments were as a rule of a very slight character. With the time at General Sassoulitch's disposal (at least three weeks) much better works should have been constructed, but he probably was so confident of holding his position that he considered a better class of defence unnecessary.

As regards the telegraph service, that of the Japanese appears to have been remarkably complete. All the Headquarters of Divisions, brigades and even of smaller units were connected with Army Headquarters by a telephone service, and the Commander of the Army was thus able to keep in complete touch with his subordinates, and knew exactly what was going on all over the area of the battlefield.

The Russians do not appear to have had a telegraph detachment with them. It was noticed by the Japanese that messages were constantly sent by mounted officers and orderlies, and it is probably

due to this that so much delay ensued in bringing up the reserves on 1st May.

6. *Infantry.*—The Japanese infantry attack, although carried out in much closer order than our S. African experience would consider suitable, was effected with remarkably little loss, the whole of the casualties being only about 1,000 out of some 45,000 men, 350 of which occurred among the 3 companies which checked the Russian retirement at Hohmatung. This result was no doubt partly due to the artillery fire, but the turning movement on the Russian left flank appears to have been the real cause of the very effective assault.

The Russian infantry was so outnumbered that it is difficult to estimate its proper value, but there can be no doubt that the officers and men showed great courage under very trying circumstances, and that in the final charges everything that brave men could do was done.

NOTE.—The plan is reproduced from the *Voennyi Sboenik* by the kind permission of the Imperial Russian Authorities. As most of the places have different names in Russian, Chinese, and Japanese, the names which appear to be most commonly used in the different accounts of the battle have been inserted in the plan.

LANGUAGES IN INDIA.

By COLONEL J. E. BROADBENT, C.B., LATE R.E.

IN the last Census it was found impracticable to take any language census in the greater part of Baluchistan, British Afghanistan, Swat, Kohistan, Chitral, Hunza-Nagar, etc., and in certain wild hill-tracks in Burma. But without these no less than 147 distinct languages were recorded as vernacular in the Indian Empire; of these 147 the Indo-Chinese family accounts for 92, found in the Himalayas, Burma and North-East India.

The languages of India proper belong to two great families, denominated in the census report The Drāvido-Mūnda Family and the Indo-European Family, Aryan Sub-family.

The *Drāvido-Mūnda family* of languages are those of the ancient inhabitants of India. They have no affinity in construction or vocabulary with Sanskrit. They belong to the "agglutinating" type (Cases, etc., formed by the addition of suffixes). They are divided into the Mūnda sub-family and the Drāvidian sub-family. The former includes Santāli, Kol, and other languages spoken by about 3,180,000 people in the north-east of the central plateau of India—the hills of the Santal *pergannahs*, Chota Nagpur, Orissa, Chattisgarh, and North-East Madras; they have no written character of their own.—The latter comprises Tamil, Malayālam Kanarese, Telugu (each of which has its own distinctive though allied written character), and a number of others of less importance, among which may be mentioned Gond and (strange to say) Brahui; these languages are spoken by more than 56½ millions, being the speech, broadly speaking, of the south of the Indian Peninsula. Tamil is the best known and most cultivated; Telugu is the most wide-spread and the most euphonious, and has been called the Italian of the East.

The *Aryan sub-family* has two branches, the Eranian and the Indo-Aryan. The former includes Baluch and Pashtu (the latter written in an adapted Arab-Persian character), which are spoken by about 1,380,000 people. The latter includes;—(*a*) several languages spoken in the mountainous region north and west of Kashmir—Gilgit, Chitral, Kafiristan—which, though clearly Indo-Aryan, appear to have been developed independently of Sanskrit; and (*b*) the Sanskritic Indo-Aryan languages—Hindi, Bengāli, Bihāri, Oriya, Panjābi, Gujerāti, Marāthi, Kashmiri, Sindhi (each with a different written

character, but most of them akin to Deva-nagari) and others,—spoken by nearly 220,000,000 people.

The original home of the Indo-European populations (now spread over Europe and parts of Western and Southern Asia) was perhaps in the Steppe-country of Southern Russia. One division of this people wandered westwards and became the parents of the Greek, Latin, Keltic and Teutonic races. Another wandered to the east, and from their language descended the speech-families which we call Aryan, Armenian, etc., (four others). The first only of these concerns India.

The Aryans, at first a people of one language, again subdivided; after the separation the once common Aryan speech developed on two different lines, becoming the parent on the one hand of the Eranian (often spelt Iranian) and on the other of the Indo-Aryan family of languages.

At the earliest period for which there is documentary evidence Eranian was divided into two not very different languages, Persic and Medic. The oldest form of Persic is found in one of the versions of the inscription of Darius I. (B.C. 522—486) at Behistun; from this through Middle Persian, or Pāhlavi, was developed modern Persian. The one literary monument which remains of ancient Medic is the *Avesta;* there is no mediæval Medic; but the modern Eranian languages of India, viz.:—Pushtu, Baluch, etc., were developed from it.

The earliest specimens of actual Indo-Aryan vernaculars are to be found in the hymns of the *Rig Veda*. They were composed at widely different periods and in far-apart localities; most of them were originally in the actual spoken language of their authors. They were edited by the Brāhmans, who compiled them into one collection so as to obscure dialectical peculiarities; but they nevertheless furnish invaluable evidence as to the house-language of the earliest inhabitants of India.

The term *Prākrit, prākrita,* has for centuries been used to denote the vernacular language,—the natural, unartificial language, as opposed to Sanskrit, *samskrita,* the polished artificial language. The vernacular dialects of the Vedic hymns were, in this sense, essentially Prākrit, and may be called the Primary Prākrit of India. Existing inscriptions and writings show that, by the 3rd century B.C., an Aryan speech in several dialects, which had developed from the ancient vernaculars, was in use in Northern India; parallel with this, the so-called classical Sanskrit had developed from one of those dialects, and under the influence of the Brahmans had achieved a position similar to that of Latin in the middle ages. The edicts of Asoka were written in the former of these, and, further, it was used by the Buddhists for their sacred scriptures; as thus crystallized and fixed it is known as the Pāli language. But as a vernacular it continued to develop, and in its

later stages, in various dialects, it is what the term Prākrit is commonly used to denote. These dialects in turn were used for poetic, religious and dramatic works, so becoming fixed; and finally they also became a dead language (about 1000 A.D., as a very approximate date). The true vernaculars still continued to develop and eventually gave us the languages of the present day.

Classical *Sanskrit*, derived from one of the primary Prākrit dialects, was early fixed by the labours of grammarians, culminating in the grammar of Pānini about 300 B.C. It borrowed freely from the secondary Prākrits, and they from it. Regarded as a sacred language, and as such jealously preserved by the Brahmans in their schools, it had all the prestige which religion and learning could give it. It is usually written in the Deva-nagari character. For many hundred years classical Sanskrit has been exercising, and still exercises, a potent influence on the vocabularies of the modern vernaculars; but *only* on the vocabularies, for their grammars show no trace of it. Literary Bengali and Hindi are filled with Sanskrit words; it has been proved by actual count that in a modern Bengali work 88 per cent. of the words were pure Sanskrit, every one of which was unnecessary.

There is not space to discuss the modern languages in detail; but a few words may be said about *Hindustani*. As a vernacular it is classed in the Census Report as a dialect of Western Hindi. But it is better known as the literary language of Hindustan and the *lingua franca* current over nearly the whole of India; to Europeans it is the polite speech of India generally. As a *lingua franca* it grew up in the bazar attached to the Delhi Court, and was carried everywhere by the lieutenants of the Moghal Empire. It has several recognized varieties, Urdu, Rekhta, Dakhini and Hindi (that is the Hindi of the *Prem Sagar*).

Urdu is that form of Hindustani which is written in the Persian character; it makes a free use of Persian (including Arabic) in its vocabulary. Rekhta is the form it takes when used in poetry. Dakhini is the form of Hindustani used by Musalmans in the Deccan; it is written in the Persian character like Urdu, but is not so Persianized.

The *Hindi* variety of Hindustani is the prose literary language of those Hindus who do not employ Urdu. It was introduced at the commencement of last century, when Lallu Ram, under the inspiration of Dr. Gilchrist, wrote the *Prem Sagar;* the prose parts of this work are practically written in Urdu, but with Indo-Aryan words used wherever a writer of Urdu would have used Persian words. This language fulfilled a want by giving the Hindus a *lingua franca* free from the (to them) unclean words of the Musalmans, and it has held its place to the present day. It is written in Deva-nagari character.

External Languages.—In addition the following languages may be noted:—(1) *Persian;* this is spoken by all the upper class Muhammadans and is in Western Asia what French is in Europe, the language of culture and diplomacy; it has an extensive and interesting literature; and it is worth learning on both accounts, though it is nowhere a vernacular in India. (2) *Arabic*, the most common of Eastern languages, and knowledge of which facilitates the learning of others. (3) *Turkī*, the language of Turkestan, which may be found more useful than Russian in a possible theatre of war.

ELECTRIC DEVELOPMENT AT NIAGARA FALLS.

By LIEUT. E. D. CARR-HARRIS, R.E.

WHILE on leave in Canada during last summer I paid a visit to Niagara Falls and went over some of the new electrical works which are in course of construction on the Canadian side of the river.

Some very large electrical developments are in progress, of which the following notes may prove of general interest.

Three separate Companies, entirely independent of each other, are now at work. These are the Ontario Power Company, the Toronto and Niagara Power Company, and the Canadian Niagara Power Company.

THE ONTARIO COMPANY.

The first of these, which began its work nearly two years ago, hopes to have its generating station in use within the course of the next four or five months.

This generating station is built on a rocky plateau or shelf at the foot of the Falls and only a few feet above the level of the water. It will develop 50,000 H.P. when completed.

The intake is some distance above the Falls. Two long steel flumes, circular in section, 18 feet in diameter, and 6,600 feet long, lead the water from the point of intake near Dufferin Island. They follow very nearly the surface of the ground along the river's bank until they reach a point beyond the crest of the Falls and vertically above the generating station; here the water is led into a vertical stand pipe, at the bottom of which are placed large turbine wheels. The water passes down the vertical stand pipes and out through the turbine wheels, which, by means of shafting, transmit the power to the dynamos; it is then discharged back into the river again, but below the Falls.

THE TORONTO AND NIAGARA COMPANY.

The method followed by this Company is the reverse of that adopted by the Ontario Company in that the generating station is at the intake end.

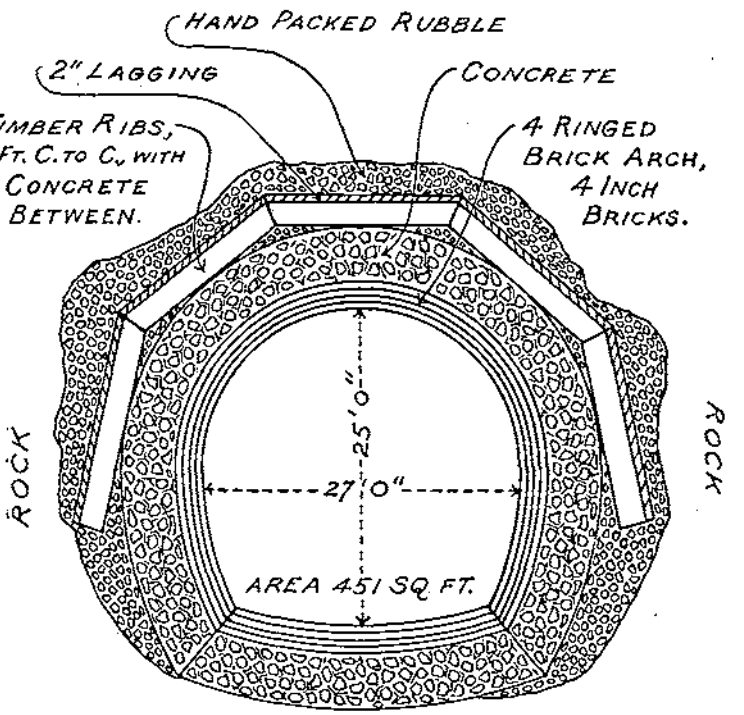
Turbines are placed at the bottom of a wheel pit, which is being sunk at Tempest Point, about half a mile above the Horse-shoe Fall. This pit is to be 40 feet by 200 feet in cross section and deep enough to give 164 feet head of water to the turbines. After passing through the turbine wheels the water will enter a tunnel, which leads away under the bed of the river, and ultimately discharge at the foot of the Falls.

When I visited the site, in company with one of the engineers, work was in progress at both ends of the tunnel, and the pit was being sunk at the upstream end, within 100 yards of the river's edge; when the latter is completed a passage will be opened out in order to admit the water.

As the whole of the work is in rock, heavy blasting is necessary and a large number of compressed air drills are in use. When excavating for the wheel pit a water seam was crossed. This was only stopped, after various experiments had been tried, by running in cement grouting under 50 feet head of pressure.

Eleven turbine wheels are to be placed in line at the bottom of the wheel pit, each turbine capable of developing 10,000 H.P.

The power house will be built over the mouth of the pit and will contain the dynamos and electric appliances.



CROSS SECTION OF TUNNEL

(Not to Scale)

The tunnel was begun from the down stream end. At a point on the river bank in line with the Horse-shoe Fall a workmen's shaft was first sunk, from the bottom of which a gallery was run out, at

right angles to the course of the river, to a point about mid stream; from here the main tunnel was begun at a level only a few feet above that of the water under the Falls. To save labour in getting rid of the rock excavated from the main tunnel, an opening has been broken out through the face of the fall, and all the débris is now discharged through this into the river. When I visited the work the tunnel had been cut for a distance of about 1,000 feet upstream from the point of discharge. Its cross sectional area will be 451 square feet and its dimensions roughly 27 feet by 25 feet; the total length will be 2,700 feet. From the above particulars some idea of the boldness of the scheme may be obtained.

The labour employed is principally Italian. Compressed air drills have been found most useful, and are entirely used on account of the confined area in which the men have to work. Mules were lowered through the workmen's shaft and are now used in the tunnel. Work is carried on by relief shifts through the 24 hours of the day, so that the drills are never idle.

It is proposed to utilize most of the power generated in the City of Toronto, some 90 miles distant.

THE CANADIAN NIAGARA COMPANY.

I did not have an opportunity of visiting the works of this Company, but the general scheme is similar to that last described. The power house is built immediately over the wheel pit, and the water, after passing through the turbines at the bottom, is discharged into the river again through a tunnel.

For the following details of the plant to be installed I am indebted to *The Canadian Engineer*.

"The wheel pit is now excavated, and a considerable part of it lined. It is 165 feet deep, 18 feet wide inside of the brick lining, and 570 feet long.

Of the eleven mouths for as many turbines nine will be placed in position now, and six of these are having wheel pits cut and bricked up ready to attach the machinery on delivery. The turbines, each of a capacity of 12,500 H.P., were designed by Escher Wyss & Co., of Zurich, Switzerland; and are of the twin Francis vertical type, inward discharge, two draft tubes to each unit, discharging into the open tailrace below. Three of these units are being manufactured and installed by this firm, and two units on the same design by J. P. Morris & Co., Philadelphia.

The generators, each of 10,000 H.P., are of the internal revolving field type; and will generate alternating 3-phase current, 25 cycles, at 12,000 volts. Five of these are being installed by the General Electric Company. The generator and turbine are direct connected by a vertical shaft, and will revolve at 250 R.P.M.

The transformer station, equipped with water cooled transformers, has a present capacity of 25,000 H.P.

There will also be a stand pipe, 116 feet high and 30 feet in diameter, carrying one day's supply of water to be drawn upon in case of any accident to the (cooling) pumping system."

As regards the relative costs of the two methods adopted, the schemes of the two last-mentioned Companies, in spite of the fact that the excavations for the tunnels were through the solid limestone of the Niagara plateau, would appear to be much less expensive than that in which steel flumes were used.

GORDON AND GLADSTONE.

By Colonel D. Corrie Walker, late R.E.

If the two men whose names head this had ever met, ever had familiar speech with one another, ever become something approaching to intimate, and each learnt to appreciate what was great in the other—what might such intercourse have brought forth? Or *could* they ever have got to know one another in this mortal existence, in which souls are so strangely handicapped and limited, that every man, as Oliver Wendell Holmes said, is really *three* men in one:—

The man as he imagines himself.

The man as others see him.

The man as God knows him?

These questionings are rather raised than laid by the perusal of the "Soudan" episode in the third volume of Morley's *Life of Gladstone*.

In the fateful year 1884 the lives of these two men touched one another. The thirty pages of the book that relate what came of this contact give us a very interesting study of Gordon from the Gladstone-Morley point of view. We get the impression at the outset that to the statesman the Soudan was simply an encumbrance and a bore, an unhappy region over which our protected vassal, Egypt, lorded it with cruel and oppressive hand. His openly expressed sympathy was with the oppressed and plundered people.

The force under Hicks ("a capable and dauntless man") had been overwhelmed on November 5th, 1883. The London Cabinet then decided against employing a British or Indian force in the Soudan; and so evacuation was decided on. "Those who knew the Soudan best approved the course," and among them Gordon himself. Besides which the reforms which have since made Egypt what it is would have been impossible if its Government had been burdened with the re-conquest and administration of the Soudan. Mr. Gladstone, we learn, had stood alone in objecting to the Suakim expedition, and he is held to have been justified by the event. "The operations had no effect upon the roll of the fierce Mahdi wave over the Soudan."

At this point the responsibility for action is largely shifted from the Premier to "Ministers," who had twice enquired of Baring "whether General Gordon might not be of use." "Unhappily a third application from London at last prevailed; and Sir E. Baring, supported by Nubar, by Sir Evelyn Wood, by Colonel Watson, who had served with Gordon and knew him well, all agreed that Gordon

would be the best man if he would pledge himself to carry out the policy of withdrawing from the Soudan as quickly as possible." Lord Granville submitted the matter to his Chief who returned a truly oracular answer, an answer which might have applied well to a military Gladstone, but scarcely to a Gordon! The General is to report what should be done, not to be the judge of who should do it, nor even to "commit us on that point by advice officially given" (*sic!*). Imagine Gordon stopping short, say at Wadi Halfa, to write reports and receive answers!

On January 18th four Ministers met in the War Office at Pall Mall, Lord Wolseley bringing Gordon, who left that same evening for Calais. He is represented "according to a very authentic account" arguing with a somewhat light sense of the danger of his enterprise. "Thus in that conclave of sober statesmen a tragedy began."

The estimate of Gordon is too long to quote. It ends as follows:— "All this was material enough to make a popular ideal, and this is what Gordon in an ever-increasing degree became, to the immense inconvenience of the statesmen, otherwise so sensible and wary, who had now improvidently let the genie forth from the jar." And now comes a very important crisis. At Cairo, Baring and Nubar, after discussion with Gordon, altered the mission from one of advice and report to an executive mission. Still evacuation was the fixed policy. To this policy of "evacuation and abandonment" Gordon was to adhere; and the British Government was to leave him a free hand.

Neither party according to our author kept this compact, an important admission. Some detached extracts will give a good idea of the rapid development of Gordon's policy according to Mr. Morley. "Gordon's policies were many and mutable . . . frightful embarrassments enveloped him . . . he had undertaken his mission without any serious and measured forecast . . . once at Khartoum, at first he thought himself welcome as a deliverer, and then . . . flung the policy of his mission overboard . . . when March came he flung himself with ardour into the policy of smashing up the Mahdi . . . . he (finally) declared that to leave outlying garrisons to their fate would be an indelible disgrace." This last was the crucial point: and here we get a valuable side-light. Lord Hartington said "the Government were under no moral obligation to use the military resources of this empire for the relief of those garrisons." "I do not admit," said the Minister very sensibly, "that General Gordon is on this point a better authority than anyone else." "Mr. Gladstone at first, when Gordon set all instructions at defiance, was for recalling him." And now comes the very important Zobeir episode.

Almost immediately on his arrival at Khartoum Gordon demanded that Zobeir Pasha should succeed him as Governor-General on his retirement. Baring, Nubar and Stewart, after consideration, backed

this proposal. "Mr. Gladstone had become a strong convert to the plan of sending Zobeir." Thus this all-important step wavered in the balance until internal changes of side within the Cabinet decided against it—and against Gordon. The Queen had also agreed. The blame is laid by the biographer upon the "Parliament and people of England."

The toils now closed rapidly around the noble quarry. Almost the moment that the leading chiefs became aware that they were to be left alone, they began to fall away to the Mahdi. By May 26th Gordon and Stewart were shut up in Khartoum. Then followed nearly three months of tedious consideration and delay; for which however the Premier is not blamed by his biographer, who speaks of ignorance of the country and the river, distracting counsels, etc., while he claims credit for the vigour with which the Nile Expedition was prepared for when a decision had once been arrived at, and gives full credit to the troops for splendid perseverance in face of almost preterhuman difficulties. But, as we know too well, all was "too late for Gordon and Khartoum." Several, at least, of those statesmen who guided affairs at home, are still great figures in the political world, but :—

> "Not here but somewhere in the far Soudan
> *He* lies—earth knew no simpler, nobler man."

The Premier, we learn, when the news came was staying at Holker. "The Queen sent an angry telegram . . . not in cypher as usual, but open." Mr. Gladstone to the last seems to have imputed blame to the man whom he nevertheless spoke of as a "hero of heroes"; blame for "turning upside down and inside out every idea and intention with which he left England, and for which he had obtained our approval," and for not coming away from Khartoum when he saw that the pacific mission was a hopeless failure and his military means inadequate.

In a note by Mr. Bright of March, 1885, just after the Vote of Censure had only been averted by a majority of 15, we find the Premier saying "The sending Gordon out a great mistake—a man totally unsuited for the work he undertook." Mr. Gladstone never saw Gordon. He was appointed by Ministers in town, and Gladstone concurred; but he had never seen him. Fortunately the veteran statesman has left us a happier last word to finish with :—"I do not doubt that a true and equitable judgment will eventually prevail."

TRANSLATIONS.

PROGRESS OF WIRELESS TELEGRAPHY.

Extracts from the KÖLNISCHE ZEITUNG *of 20th and 23rd November*, 1904.

Nearly two years have elapsed since Marconi claimed to have succeeded for the first time in transmitting a telegraphic message through the ether across the Atlantic Ocean by means of electrical spark waves.

The announcements of the Marconi Company, promising the installation, within the shortest possible time, of a cheap system of wireless trans-atlantic spark telegraphy between the two giant stations at Poldhu and Cape Breton, were received at the time with great jubilation; now they are already forgotten, which proves that the telegraph cables connecting the old and the new world, and running at the bottom of the sea free from disturbance, fully meet the present requirements. Once more has Nature given man an instructive lesson; elementary forces, such as the electricity of the atmosphere, cannot be mastered; and should Marconi's wireless trans-atlantic telegraphy ever become a reality, these forces will make their influence felt.

However, great progress has certainly been made during the last two years in the domain of wireless spark telegraphy. We possess to-day serviceable installations which permit of the safe transmission of messages up to a distance of 1,000 kilomètres—in round figures—across water and of 300 km. across land. On the other hand it has been impossible up till now to establish a practical system of wireless telephony.

The practical application of wireless spark-telegraphy is chiefly due to the German Company for Wireless Telegraphy, which has been able to unite the advantages of the Slaby-Arco and Braun-Siemens systems in a new one, called the Telefunken or Telespark, which is recognised, even abroad, as the best in the world.

The Telespark system at present employs for stations of medium carrying power (*i.e.*, for distances of from 200 to 300 km.) single senders having the form of the Hertz exciter; and for stations of greater carrying power, as well as for installations requiring to be specially guarded against disturbances caused by the working of other stations, coupled senders with Braun's oscillator circuit. In the single Hertz exciter the two poles of the spark-gap are each connected with one conductor; one is carried upwards and forms the transmitting wire; while the second takes the form of a horizontally outstretched wire-gauze and, as an insulated electrical counterpoise, equilibrates the aerial conductor. The

electrical energy, which, at the generating of the discharge-spark, produces the oscillations and thereby the carrying power, is stored, before the generating of the discharge-spark, in the aerial conductor or counterpoise.

A similar transmitter arrangement was also formerly used by Marconi except that he used a direct earth connection in place of the counterpoise. It is impossible with such a primitive arrangement to radiate into space larger quantities of electrical energy, the limit of efficiency of such installations being reached as a rule at a distance of 50 km. The insufficient effectiveness of the sender was the result of the spark-gap arrangement. If, for example, the distance between the pole-balls of the spark-inductor (*i.e.*, the length of the spark-gap) was increased to more than 5 cm., it became impossible, when using an aerial wire 60 mètres long, to obtain oscillating spark discharges; in their place the discharge became a continuous one in the form of a luminous arc. Nothing but oscillating spark-discharges will produce electrical carrying-power. It is true that lately it has been possible, by the use of spark-inductors tuned to resonance, to increase the spark-gap to 30 cm. with an aerial conductor 60 mètres long, and thus to obtain also an increase in the discharge tension and a considerable augmentation of the electrical energy radiated into space; but it was soon seen that the increase of carrying power in no way kept pace with the lengthening of the spark-gap. The reason for this is found in the great loss resulting from spark-gaps with great sparking distance, a large part of the electric energy being converted into heat and thus lost for radiation.

To remedy this evil Prof. Braun replaced the ordinary long spark-gap by a number of small ones, the technical construction of which was carried out by the engineer Hagar Rendahl; they are now in general use under the name of the Braun-Rendahl series spark-gap. Instead therefore of a single spark-gap of great length, a discharge spark-gap is used which consists of several small partial sparks mounted in series. In order that the desired effect of the separate heat losses may be obtained, tension dividers (in the form of small condensators of very small capacity) are mounted in this series spark-gap, parallel to each small spark-gap. These new senders of the Telespark system work with such high efficiency that, even with 90 watts of primary inductor energy (=0·12 horse-power) and with an aerial wire of only 32 mètres in height, a distance of 250 km. can be spanned.

The arrangement of the coupled senders of the Telespark system corresponds in general to the connections of the old Braun-Siemens system. There are two distinct couplings, the electric and the galvanic; by the former is understood the connection of the Braun closed Leyden-jar circuit with the aerial conductor by means of inductive transference; by the latter the direct metallic connection of the aerial conductor to a point of the closed oscillator-circuit.

A considerable improvement has been brought about in the Braun-Siemens sender by the addition of the Braun energy-connection and the above-mentioned series spark-gaps. The Braun energy-connections render possible an increased carrying-power by increasing the capacity

(*i.e.*, the electrical susceptibility) of the exciter-circuit relatively to the spark-waves, without thereby impairing the electrical or galvanic coupling as has occurred hitherto with all spark-telegraph senders. Prof. Braun no longer employs for the sender a single exciter-circuit or oscillator-circuit, but several such circuits, each of which is tuned to the same number of oscillations as the former single circuit. Each of these oscillator circuits receives from an electric high-tension generator the same amount of energy as the former single circuit; in this wise ten oscillator-circuits, for example, are able to transmit tenfold energy to the transmitting wire. It is, however, essential that the single circuits should have exactly similar oscillations, and that the electrical oscillation should arise simultaneously in each of the circuits. The coupled senders of the Telespark system, besides larger carrying-power relatively to the single sender, have the advantage that with a given aerial wire the radiated wave-length can be altered within fairly wide limits without weakening the intensity. This fact is of very high importance for military stations, which are thus enabled to make use quickly of a new and altered wave-length when disturbed by hostile installations. It is, for example, easy to change for such a purpose from a wave-length of 300 m. to one of 900 m.

For the receiver of the spark-waves the Telespark system employs a number of new connections, all of which are so chosen that one and the same maximum receiver intensity can be obtained with each. The receivers are either sharply tuned or non-sharply tuned. The method of connection for non-sharply tuned receivers is intended for stations which have to work in conjunction with others not tuned to a similar wave-length, without continually altering their regulating apparatus, as for example for the installations on transatlantic fast steamers. Sharply tuned connections, on the other hand, are of special importance for military stations, in order to exclude hostile disturbances even in the case of a slight difference in the wave-length. The sharpness of the tuning of a receiver connection is mainly determined by the degree of coupling of the oscillator circuit containing the coherer, or other wave-indicator, with the receiving aerial-conductor. Sharp tuning requires loose coupling, and non-sharp tuning fast coupling, of the receiving oscillator circuit with the aerial conductor.

The most notable practical success of which the Telespark Company can boast is the constructions and introduction of the electrolytic wave-indicator invented by the engineer Schlomilch. This receiving apparatus is the most sensitive and reliable of all wave-indicators hitherto invented; it answers even to the smallest energies of an alternating current, *i.e.*, to the weakest spark-wave. The construction of this indicator is based on the stronger activity of the polarisation cells when exposed to the rays of electric waves. An ordinary polarisation cell consists of a small closed glass vessel filled with diluted sulphuric acid, having soldered into its upper part two gold or platinum wires which dip into the liquid and serve as electrodes. If such a polarisation cell be connected with a current generator, the electromotive force of which is somewhat higher than the counter electromotive force of the cell, the electrolytic current

passing through the cell causes a minimum formation of vapour at the electrodes. As soon, however, as the spark waves pass to the cell over the aerial conductor the formation of gases becomes very active; it then becomes possible after some practice to read the wave impulses, and thereby the Morse signs of the transmitted message, direct from the cell. If an ordinary Morse receiver be connected with the cell, the signs will be registered on a strip of paper in the Morse alphabet; if a telephone be connected with it, the Morse signs can be heard as long or short clicks of the telephone diaphragm. The small dimensions of this instrument cause well-justified astonishment; the glass vessel is of the size of a hazel-nut, the electrodes are 0·001 mm. thick and 0·01 mm. long.

The new Telespark apparatus, and particularly the Schlomilch wave-indicator, have successfully undergone their crucial test in German South West Africa and in the Far East. According to the official reports of General von Trotha, messages have been sent through the air to distances of over 150 km. by means of the new portable Telespark stations. Although connection was broken during the prevalence of heavy tropical thunderstorms, this was of no importance; for, as soon as the atmospherical electricity was to some extent compensated, spark telegraphy became once more possible. During heavy thunderstorms it is also impossible to telegraph with the ordinary wire system. At the beginning of December, 1904, three further portable Telespark stations will be sent out for the colonial forces in South West Africa; these have a carrying-power of as much as 300 km. The expenditure will be covered in part by the saving in men and animals for the intelligence department, and the stations will ensure greater promptness and safety in the execution of military orders. Wireless installations cannot be destroyed by savages unless the whole station falls into their hands, in which case they will destroy the mysterious machines without being able to make use of them. Wire telegraphs and heliographs the savage is already acquainted with; opportunities for cutting the wires are quickly found, and from the flashes of the heliograph lamps he is soon able to draw conclusions. The safest means of communication for our colonies in unsettled times are therefore the wireless installations; and where no political disturbances are to be feared, they will form a welcome addition to the wire telegraphs. For the service of a wireless station, thoroughly trained telegraphists are, of course, essential. For the attainment of such skill many years of training are required, as well as constant practice. No wireless operator should be sent out who cannot correctly read by ear at least 20 words a minute in the Morse alphabet. If the Telegraph Troops have not a sufficient number of such trained operators the Imperial Telegraph Department will be able to supply them.

Equally favourable results with the Telespark system have been obtained by the Russians during the present war. They have succeeded in spanning Lake Baikal by spark-telegraphy; and nearly all large men-of-war have been fitted with Telespark apparatus, all the vessels of the Baltic Fleet being provided with them. In the naval battles before Port Arthur the wireless apparatus worked until smashed by shot; this of course teaches us that the apparatus must be better protected than

hitherto from shells. The Russian installation for wireless telegraphy at Chifu, which was for a long time the medium of communication between Port Arthur and the outer world, and which later on was closed in consequence of the Japanese protests and the diplomatic representations of China, was likewise provided with Telespark apparatus. The Russian army has also a large number of portable Telespark stations in use. The Japanese have of course made similar use of wireless telegraphy in their operations; they employ the old Braun-Siemens system, which Prof. Kimura has very cleverly imitated.

As the latest epoch-making invention in the domain of wireless telegraphy there still remains to be mentioned the high-frequency sender-arrangement of Prof. H. Th. Simon, of Gottingen, which is based on the employment of mercury vapour-lamps as spark-gaps. This invention may be destined to mark a new era in the development of wireless telegraphy. The present telegraphic spark-senders do not radiate the waves continuously but in separate wave-currents, which are divided by the pauses between the spark discharges. Such wave currents, interrupted by relatively long pauses, are unable to produce sharp radiation capable of resonance; they have therefore always been an impediment in the way of absolutely safe tuning of the stations to equal wave-lengths. Prof. Simon, in conjunction with Dr. Reich, has succeeded in reducing to a minimum the pauses between the separate discharges, and thus in sending out continuous and undamped electrical oscillations.

The great point of his invention is the generating of alternating currents of an extremely high frequency (*i.e.*, number of oscillations per second). In his trials he made use of an Aron Hewett mercury vapour-lamp, *i.e.*, a species of electric arc lamp in which the electrodes consist not of charcoal rods but of mercury. Such lamps are now being introduced for lighting purposes under the name of Cooper Hewett lamps. The mercury vapour-lamp represents a spark-gap in an airless space, *i.e.*, a vacuum spark-gap. The waves generated are, as regards their character, identical with those of the air spark-gaps hitherto used. With such vacuum spark-gaps, the discharge-tension can be considerably increased in the same way as with Braun's series spark-gap, and one is thus enabled to bring considerably more energy into the oscillations. Simon, with a continuous current generator of 5,000 volts, obtained a discharge-tension of 50,000 volts for the mercury spark-gap. He now asks engineers to undertake the construction of high-tension dynamos of the requisite resistance for continuous currents of a tension of from 10,000 to 20,000 volts. By means of such machines the discharge-tension of the mercury spark-gaps may be increased to such a degree that the pauses between the separate discharges disappear and continuous electrical waves are radiated.

Foreign countries have not made any notable inventions or progress during the last two years in the realm of wireless telegraphy. At the side of the Marconi system, there have been introduced into practice in a minor degree the Fessenden and the De Forest systems. The characteristic feature of the former is the barretter or liquid column wave-indicator; that of the latter is likewise an electrolytic wave-

indicator, called the responder. This apparatus consists of two metal electrodes, enclosed in a glass or ebonite tube, between which is fixed a paste made of filings, glycerine or vaseline, and oxide of lead with traces of water or alcohol. Under the influence of a small galvanic element, the filings, which are distributed throughout the whole paste, form a conducting bridge of comparatively small resistance from one electrode to the other. As soon as this bridge is irradiated by electric waves, it collapses into itself in consequence of a considerable increase in the resistance resulting from the depositing of great masses of minute hydrogen bubbles at one of the electrodes; after cessation of the electrical irradiation, it instantaneously returns to its original state. This advantage of rapidity is shared in common by the responder and the Schlomilch polarisation cell-indicator; but while the latter can be used for years without requiring any attention, the paste of the responder must be renewed every three days.

The *Haimun* despatch-boat, which *The Times* sent out to the scene of operations in the Far East, was fitted with a De Forest wireless installation. The vessel was able not only to maintain communication with the land station of the same system, erected at a distance of about 200 kilomètres, but also to catch most of the wireless telegrams of the Russians and Japanese, which of course were mostly in cipher. The correspondent of *The Times*, who was in charge of this wireless service, also reports however that the successes were obtained solely by the extraordinary skill of the operators in the reading of messages by ear.

As the distinguished English telegraph engineer, Nevil Maskelyne, has now joined Dr. De Forest, we shall not be wrong in stating that the De Forest system will enter as a new and no mean rival into the competition now going on between the Marconi and the Telespark systems. A healthy and fairly-conducted competition cannot but promote development.

In England private wireless telegraph installations, which had been independent, are now placed under the control of the Government, which is thus in a position to fix the conditions of concessions as it may think proper. The United States of America have put all private installations under the Department for Trade and Industry. There remains therefore only Italy which fully recognises the Marconi monopoly, and is not prepared to admit the free competition of all wireless telegraph systems provided they offer proper guarantees for a well-regulated telegraph service.

Till lately the Marconi stations controlled the Atlantic route. Now ships fitted with the Telespark system are able to communicate with the German North Sea stations at Cuxhaven, Heligoland, Sylt and Borkum. On the Dutch coast there has lately been thrown open to public traffic by the Dutch postal authorities the station at Sheveningen, fitted with the Telespark system; besides this there is open for public use at Amsterdam a station belonging to the Telespark Company under the control of the Dutch Government. France has established a large station on the Island of Quessant, open to all systems, the service being in the hands of the French Post Office. In America the station on the

Nantucket Light Ship is now also open to all systems, and is controlled by the U.S. Lightship Board; stations are also being erected at Haversink, Cape Cod and Montauk, which will be fitted with the Telespark system and thrown open to public use. For the South American service the Telespark system already possesses a number of coast stations, others are in course of erection, and various steamers of the Hamburg American Line are being fitted. On the Brazilian coast two Telespark stations are at work, one at Santa Cruz and the other on the Ilha Grande (Rio de Janeiro); they have on various occasions been in communication with Italian men-of-war, which of course are fitted with Marconi apparatus.

In the domain of wireless telephony no inventions or improvements of great importance are to be recorded apart from the above-mentioned invention by Simon of a continuous wave-transmitter; this furnishes the theoretical solution of the problem of wireless telephony by means of spark-waves. Even Simon's well-known electric-light telephony, in which the electric arc-light is used for the transmission of speech through the air, has not yet been practically developed. Still, a certain amount of progress can be reported; Prof. Simon, in his electric-light trials, was able to establish wireless telephonic communication up to a distance of 3 kilomètres; and the Berlin physicist E. Ruhmer, who has taken a leading part in the practical working-out of Simon's electric-light telephone system, finally succeeded, by means of specially sensitive selenium cells (constructed by himself) for the receiver station, in transmitting speech up to a distance of 15 kilomètres.

The idea naturally followed to make use of the electric spark-wave for wireless telephony in a similar way as for wireless telegraphy. Nothing practical has been done in this direction, but the trials made by Profs. Simon and Reich lead us to hope that the continuous electro-magnetic waves, generated by high-frequency alternating currents by means of the vacuum spark-gaps, can be made use of for wireless telephony—spark-telephony—for long distances. It will only be necessary to adapt the strength of the spark-waves to that of the speech-waves; this can be done either by altering the wave-length while making permanent the strength of the radiated waves, or by altering the strength while retaining the wave-lengths. Prof. Fessenden of America has described methods of connections for both cases, but cannot show any practical results. Dr. Mossler of Brunswick, the Danish engineer Waldemar Paulsen and others claim to have attained results; but it is still impossible to form a judgment on the practical utility of their trial installations.

REVIEWS.

GAME, SHORE AND WATER BIRDS OF INDIA.

(With Additional References to their Allied Species in other Parts of the World).

By Colonel A. Le Messurier, C.I.E., F.Z.S., F.G.S., late R.E. 4th Edition.—(London: Thacker & Co., 1904).

This important work, embodying the original notes and sketches of an ardent naturalist and sportsman in India, first appeared (minus the sketches) in 1874, for private circulation only. A second edition was issued to the public in 1878, and a third, to which the sketches and much additional matter were added, in 1887.

The present (fourth) edition made its appearance last year, and will doubtless prove as popular and as much in demand as its predecessors. Its general scheme is still that of the 1874 "Notes"; but the whole character of the details has been altered by the addition of a careful series of references to all known genera and species of Game, Shore, and Water Birds occurring in other parts of the world. This has, of course, necessitated an immense amount of work on the part of the Author, but he gives us an excellent reason for the innovation in his Preface, where he says: "These additions seem necessary, as, owing to the facilities of travel, Anglo-Indians are now engaged in most countries either on business or pleasure." Any sporting Anglo-Indian finding himself among strange birds in a, to him, new country, will certainly welcome these additional references contained in his familiar Indian *vade-mecum*, for they will prove of great and constant use to him. And though a keen ornithologist would doubtless prefer to take with him a reliable book on the avi-fauna of the particular country concerned, Colonel Le Messurier's work was written chiefly for sportsmen, and is very compact and portable, and sportsmen do not carry about with them in their kit more books than they can help. So we may safely predict a large circulation for this fourth edition among the ever-increasing numbers of sporting Anglo-Indians.

With the scope and arrangement of this work there is little fault to find from a sportsman's point of view; it is portable, useful, and up to date. But I may perhaps be allowed to suggest that the addition of a map, or maps, of the various regions of India, with brief notes on their peculiar avi-fauna, would be of very great assistance to the sportsman and collector; while it seems a pity that the numerous sketches could not have been reproduced a little more elaborately. Another useful improvement might

be effected by printing the characteristic features of a species, where such exist sufficiently marked to distinguish it at once from other allied and similar species, in italics or some other conspicuous type.

Up-to-date ornithologists may possibly find fault with the classification adopted, as being somewhat old-fashioned; and there are, as might be expected in a work of such extended scope, some errors and omissions more or less important. But on the whole there is an immense amount of valuable information, and that easily accessible, within the (roughly speaking) 300 pages of Colonel Le Messurier's book; and it is one that can heartily be recommended to all those who are fond of birds and of shooting, and who are likely to find themselves quartered in India at any future time.

SAVILE G. REID.

GENERAL SIR HENRY DRURY HARNESS, K.C.B., ROYAL ENGINEERS, 1804–83.

(R.E. Institute, Chatham. 3s. 6d.).

This book is a memoir collected and arranged by the late General Collinson, R.E., and edited by General Webber, C.B., R.E., London, 1903. It contains a series of papers written by various officers who came into intimate contact with him during his eventful life.

The memoir opens with an introduction giving a brief summary of General Harness's life. He was born in 1804, and died at Oxford, February 10th, 1883. He passed through the Royal Military Academy at Woolwich, leaving in 1824, and was delayed in obtaining a commission, as there were no vacancies at that time. He went to Mexico as superintendent of a silver mine and returned to England, obtaining his commission in 1827 as Second Lieutenant of the Royal Engineers. He was successively promoted to the various grades, becoming major-general in 1868 and colonel commandant in 1877, and in the same year he retired with the honorary rank of general.

The various distinguished services of this officer are set forth in the succeeding chapters of the book in the form of biography and correspondence, briefly described as follows:—

1. Mexico, 1825; Royal Military Academy, 1834 to 1844 and 1852, by General Collinson.

2. Report of the Irish Railway Commission, arbitrator between the Post Office and Railway Company, and work as Secretary to the Railway Commission of 1846, by General Hutchinson.

3. The Reform of the Royal Mint, 1850 to 1854, by General J. H. White.

4. Board of Public Works, Ireland, 1854 and 1855, by General Sir R. H. Sankey.

5. The War Office, 1855 and 1856, and Malta, 1856 and 1857, by General Collinson.

6. The Suppression of the Indian Mutiny, 1857 to 1860, by General Webber.

7. Education and Organization of the Engineer Service, 1860 to 1862, by General Collinson.

8. Royal Engineers' School, Chatham, 1860 to 1865, by General Collinson.

9. Retirement, 1865 to 1883, by General Collinson.

The book is very readable and instructive and portrays the versatile talents of General Harness. He possessed executive ability and a business discrimination to a remarkable degree. This, added to his capabilities

and training as a soldier and engineer, made him at once an important figure in the economic questions of the time far above his actual duties and position.

As General Collinson says in his preface, he possessed a powerful mind and a large heart, and underlying these was a deep religious feeling. The circumstances of his career and his inclination turned him to mathematical and physical problems, but he could readily apply his mind to any of the great questions of the day. His papers were valuable not only for the light they threw on the particular questions dealt with, but for the fine general principles they contained. His face was a tower of strength, and you could feel with him what true loyalty meant. These qualities made him what he himself wished to be—a true soldier. He had also another quality, and that was his deep-seated faith in the government of the world by a divine and beneficent Creator, which influenced his dealings with all men.

During his active life he devoted his whole energies to the uplifting of the army, and especially of the engineer service. While at Woolwich he assisted Capt. Denison in starting "The Professional Papers of the Royal Engineers." In 1840 he was instructor at the Royal Engineer School at Chatham; in 1855 he was appointed Deputy Inspector-General of Fortifications, and in 1860 Director of the Royal Engineer School at Chatham.

After his retirement he lived for nearly seventeen years at Warting, near Basingstoke, but he was several times called to active service on important missions, viz.:—In 1866 on the cattle plague; 1868, Royal Commission on Water Supply of London; 1869, Council of Military Education; and 1876, President of a joint Board of Artillery and Engineer Officers upon Siege Operations. He also devoted considerable time to the theological discussions of the Church at that time. His intimate friend to the last was Reverend G. R. Gleig, Chaplain-General of the army. His career reflected new glory on the Corps of Royal Engineers, of which he was an honoured member.—*Journal of the Military Service Institution, U.S.A.*

NOTICES OF MAGAZINES.

NATURE.

PATAGONIA.—Colonel Sir Thomas Holdich, R.E., was chosen as the head of a commission to arbitrate between Chili and Argentina with regard to the boundary line of their Patagonian possessions. He had already served his country as boundary commissioner in the wild inaccessible lands that lie to the north-west of India, and he has now by his tact and skill traced a frontier more than 800 miles in length in such a manner as to accomplish the almost unprecedented feat of satisfying both parties. In his new book *The Countries of the King's Award* he gives us his impressions of the progressive republics of Chili and the Argentine and a most interesting account of the little-known country of Patagonia, with its mountains, valleys, forests and glaciers; a land of striking illustrations of long-established principles and of problems that will require many years of search to solve, of the story of its making of which Darwin wrote the first chapter.

CHANGES UPON THE MOON'S SURFACE.—Until within the last few years there has been a very general opinion that the moon was a cold, dead world, a burned-out cinder, upon which nothing ever happened. Prof. Pickering as the result of his lunar observations in Peru, Jamaica and California has come to the conclusion that physical changes do occur upon the moon, due (*a*) to volcanic action, (*b*) to frost, and (*c*) to vegetation. In the first class (*a*) the crater Leimè was, 60 years ago, 5 miles in diameter, whereas at present it is only three-quarters of a mile. The floor of Plato, 61 miles in diameter, was surveyed in 1870 by a committee of the British Association, next by Mr. Williams and others in 1881; then by Mr. Pickering at Arequipa in 1892, and again in this past summer in California. In each survey about 40 craterlets have been mapped, and each time some new ones have been discovered, while at the same time a few of those previously observed had ceased to be visible. The original trigonometrical survey of 1870 was based upon four craterlets near the centre of the floor, and selected as primary stations. The easternmost of these was last seen as a crater in 1888, a trace of it only was glimpsed in 1892, but a search for it in 1892 with a 16-inch telescope under excellent climatic conditions failed to reveal any trace of it. Turning now to the second class of physical changes, those due to the formation and disappearance of hoar frost, one of the clearest evidences is found in connection with the pair of small craters known as Messier and Messier A. When the sun rises upon them they are both of the same brilliancy as the

mare upon which they are situated, but three days later they both suddenly turn white, and remain so until the end of the lunation. When first seen the white areas are large, but gradually diminish in size under the sun's rays. In the crater Eratosthenes (37 miles in diameter) there is a brilliant white area on the summit of the central mountain range, 5 miles long and 2 miles broad. It soon, however, begins to dwindle, and two and a-half days later all is gone save two little spots each about a mile in diameter, reaching a minimum of half a mile in diameter five days after sunrise. They then begin to increase, the northern one attaining a length of 5 miles shortly before sunset.

The third class of physical changes may be due to vegetation. There can be no liquid water on the moon's surface, because as we reduce the atmospheric pressure the boiling point of water is gradually lowered, until when we reach a pressure of only 4·6 millimètres, the boiling and freezing points coincide. Below this pressure ice changes at once into the gaseous form without passing through the liquid state. There is nothing however to prevent water from occurring beneath the surface of the ground, retained by the capillary action of the soil. This action is so strong that it is capable of extracting water from a membrane against a calculated osmotic pressure of 36 atmospheres. Since on the earth plants can live on moisture which they have extracted from such a soil, there seems to be no difficulty in understanding how they could live on the moon in a soil which could thus retain considerable moisture in spite of the low atmospheric pressure. The presence of vegetation explains how when the sun first rises on the crater of Eratosthenes the floor is found to be of a light grey tint, which gradually darkens as the sun shines upon it and later fades out again. The reason why the earth has oceans is that it is large enough and massive enough to retain the water expelled from the rocky materials of its crust with which it was previously united by the forces of crystallisation. The moon, on the other hand, is too small to do so, and the water therefore appears scattered over its surface in the form of hoar frost before being dissipated into outer space. Mr. Romanes (and other writers) deny this volcanic action and think that there never had been sufficient heat developed in the interior of the moon by gravitational compression to account for volcanic action on its surface, and that the lunar markings could be accounted for by the impact of meteoric masses. He assumes that the moon has grown to its present form and size by the gradual agglomeration of what was a ring of satellites, broadly similar to what we know to exist in the case of Saturn. Also in the absence of an atmosphere meteoric masses would impinge upon the surface with high enough velocities to render the immediate vicinity liquid. A mass of lead into which small bullets had been fired reproduced the leading characteristics of the lunar "craters," even to the small hill in the middle of the main depression.

THE LEBAUDY II. AIRSHIP made its thirtieth experiment in aerial direction at Moisson on the 22nd December, the last of the autumn campaign. The airship has been taken out in rain and in wind blowing at 5 or 6 kilomètres; it has risen to the height of 500 mètres, returning each time to its shed, after having gone away to distances so great as

10 miles. The volume has been brought up to 2,063 cubic mètres, its length to 64 mètres, and its regular crew consists of three persons. Several times it has taken as many as six passengers. The speed attained by its own propulsion has been 40 kilomètres per hour. In its last trial the Lebaudy II. remained inflated for 64 days.

W. E. WARRAND.

REVUE D'HISTOIRE.

December, 1904.

THE CAMPAIGNS OF MARSHAL SAXE.—Carried down to the eve of the battle of Fontenoy. The problem that Saxe had to deal with, how to cover the siege of Tournay against a relieving army of 50,000 men, is fully examined, and it is shewn how his difficulties were increased by the noisy "bear-garden" of high nobility which surrounded him.

THE WAR OF 1870–1871.—*18th August in Lorraine.*—This completes the account of the battle of St.-Privat (Gravelotte). The principal subject of this section is the advance of the Second German Corps to storm the Point du Jour position, made by order of the King against the wish of Moltke. The details are drawn chiefly from Hoenig, Kunz and Verdy du Vernois, who have fully described (in Hoenig's case perhaps exaggerated) the confusion and panic which followed upon this mistaken attempt, carried out after nightfall. French records give hardly any corroboration to the statements of the German writers about French counter-attacks, and they must have been at any rate on a very small scale. Broadly, Frossard's corps confined itself everywhere to a passive defence. It was the vivacity of the French fire which made such an impression on the enemy.

E. M. LLOYD.

CORRESPONDENCE.

RACE AND CASTE IN INDIA.

To the Editor of THE ROYAL ENGINEERS JOURNAL.

DEAR SIR,—Colonel J. E. Broadbent, in his interesting compilation, which appeared in the *R.E. Journal* of November, mars the merit of his labours by employing two contentious words in describing the method of baptism and the status of the Portuguese converts.

These two words are "forcibly" and "nominally," and they are as unnecessary as they are misleading.

Putting historical records apart, had Colonel Broadbent lived, as I have done, amongst the descendants of these Portuguese-baptised Christians, and observed their undeviating piety, especially in places where there are no "influential persons" and where piety is not a commercial asset, he would have admitted that such real Christianity could not possibly have owed its birth to force or been continued by force, and that the word "nominal" is the very antithesis of the word which truly describes their Christianity.

Yours truly,

G. P. CAMPBELL,

6. 12. 1904. *Capt., R.E.*

The above letter refers to the last paragraph under the subhead "Race" of the article referred to. Colonel Broadbent wrote:—

> *Eurasians* are of mixed European and Indian parentage; and claim to belong to the English race, as they are Christians in religion and speak English. Probably, however, the majority have no English blood, but are descended from Portuguese, Dutch and French. Some perhaps have no European blood at all, but are descendants of Hindus who were forcibly baptized by the Portuguese and so lost caste and became nominally Christians.

The letter is published as a matter of fairness, and also because it appears to impugn the accuracy of a contributor to these pages. But the *R.E. Journal* is not intended for discussion on matters connected with religion, and no further correspondence on the question under reference will be printed.

Obviously there was no intention on Colonel Broadbent's part to reflect on the Christian character of the Portuguese Roman Catholics, or to introduce controversial matter. He merely gave a possible explanation of the origin of a section of the population who call themselves Eurasians, but have no European blood in them. The converts of missionaries like St. Xavier and their descendants never claimed to be Eurasians; they were organized into congregations of *Indian* Christians belonging to the Roman Catholic Church.—EDR.

RECENT PUBLICATIONS.

Field Service Regulations. Part I.: Combined Training.

The Unveiling of Lhassa, by E. Candler. ($9\frac{1}{4} \times 6$. E. Arnold).

To Lhassa at Last, by Powell Millington. ($7\frac{3}{4} \times 5\frac{1}{4}$. 3s. 6d. Smith Elder).

A Secret Agent in Port Arthur, by W. Greener. ($8\frac{1}{2} \times 5\frac{1}{2}$. 6s. A. Constable).

Under the Care of the Japanese War Office, by Ethel McCaul. (6s. Cassell & Co.).

The Transvaal Burgher Camps, South Africa, by Lieut.-Colonel S. J. Thomson. ($8\frac{1}{2} \times 5\frac{1}{2}$. 2s. 6d. Rees).

The Moscow Expedition, from Vol. XIV. of Thier's *Histoire du Consulat et de l'Empire*. Edited by H. B. George. (6×5. 5s. Clarendon Press).

Napoleonic Studies, by J. H. Rose. (7s. 6d. Bell & Sons).

History of Andrew Jackson, by A. C. Buell. 2 vols. (4 dollars. C. Scribner's Sons, New York).

Feeding of Fighting Armies: Franco-German War, 1870–71, by Lieut.-Colonel T. A. Le Mesurier, late A.S.C. (10s. Harrison & Sons).

Fortification Applied to Schemes, by Major L. J. Shadwell and Major W. Ewbank. (9s. Thacker, Spink & Co., Calcutta).

Dictionary of Battles, by T. B. Harbottle. (7s. 6d. Swan, Sonnenschein & Co.).

The Architects' and Builders' Pocket Book, a Handbook for Architects, Structural Engineers, Builders, and Draughtsmen, by F. E. Kidder, C.E. (Chapman & Hall).

The Principles of Planning, by P. L. Marks. 2nd edition. (8s. 6d. Batsford).

The Design of Plate Girders, by W. E. Lilley. ($9 \times 5\frac{1}{2}$. 7s. 6d. Chapman & Hall).

Ornament and its Application, by L. F. Day. (Batsford).

Simple Methods of Testing Sewage Effluents, by G. Thudichun. ($6\frac{1}{2} \times 4\frac{1}{4}$. 2s. 6d. Sanitary Publishing Co.).

The Sewage Problem (Review of Evidence collected by Royal Commission on Sewage Disposal), by A. J. Martin. ($7\frac{1}{2} \times 5\frac{1}{2}$. 8s. 6d. Sanitary Publishing Co.).

Pioneer Irrigation, by E. O. Mawson, P.W.D., Bombay, and *Light Railways*, by E. R. Calthrop. (Crosby, Lockwood & Son).

The Modern Reflecting Telescope and the Making and Testing of Optical Mirrors, by G. W. Ritchey. (Smithsonian Institution, Washington).

Elements of Mechanism, by P. Schwamb and A. L. Merrill. (12s. 6d. Chapman and Hall).

Der Bau der Dampfturbinen, by A. Musil. (8 marks. B. G. Teubner, Leipzig).

Damfturbinen, by W. Gentsch. (16s. Helwing, Hanover).

Petrol Motors and Motor Cars, by T. Hyler White. (8 × 5. 4s. 6d. Longmans).

Electric Lighting. Vol. I. "Generating Plant," by F. B. Crocker. (9½ × 6. 12s. 6d. Spon).

Heat. Vol. III. of *Text Book of Physics*, by J. H. Poynting and J. J. Thomson. (9 × 6. 15s. Griffin).

Quadratic Partitions, by Lieut.-Colonel Allan J. C. Cunningham, late R.E. (9 × 6. Francis Hodgson, 89, Farringdon Street).

Dictionary of English History. Edited by Sydney J. Low and F. S. Pulling. (9 × 6. 7s. 6d. Cassell).

Napoleon and England, 1803—1813, by P. Coquelle. (9 × 5. 5s. Bell).

Oliver Cromwell, by John Morley. (8 × 5. 4s. Macmillan).

Japan in the Beginning of the 20th Century. (9½ × 6½. 25s. Murray).

The Silken East: A Record of Life and Travel in Burma, by V. C. S. O'Connor. 2 vols. (42s. Hutchinson).

Through Town and Jungle, by W. H. and F. B. Workman. (21s. Fisher Unwin).

In Unknown Africa, by Major P. H. G. Powell-Cotton. (21s. Hurst & Blackett).

The Principal Navigations, Voyages and Discoveries of the English Nation, by Richard Hakluyt. Vols. IX., X., and XI. (MacLehose & Sons, Glasgow).

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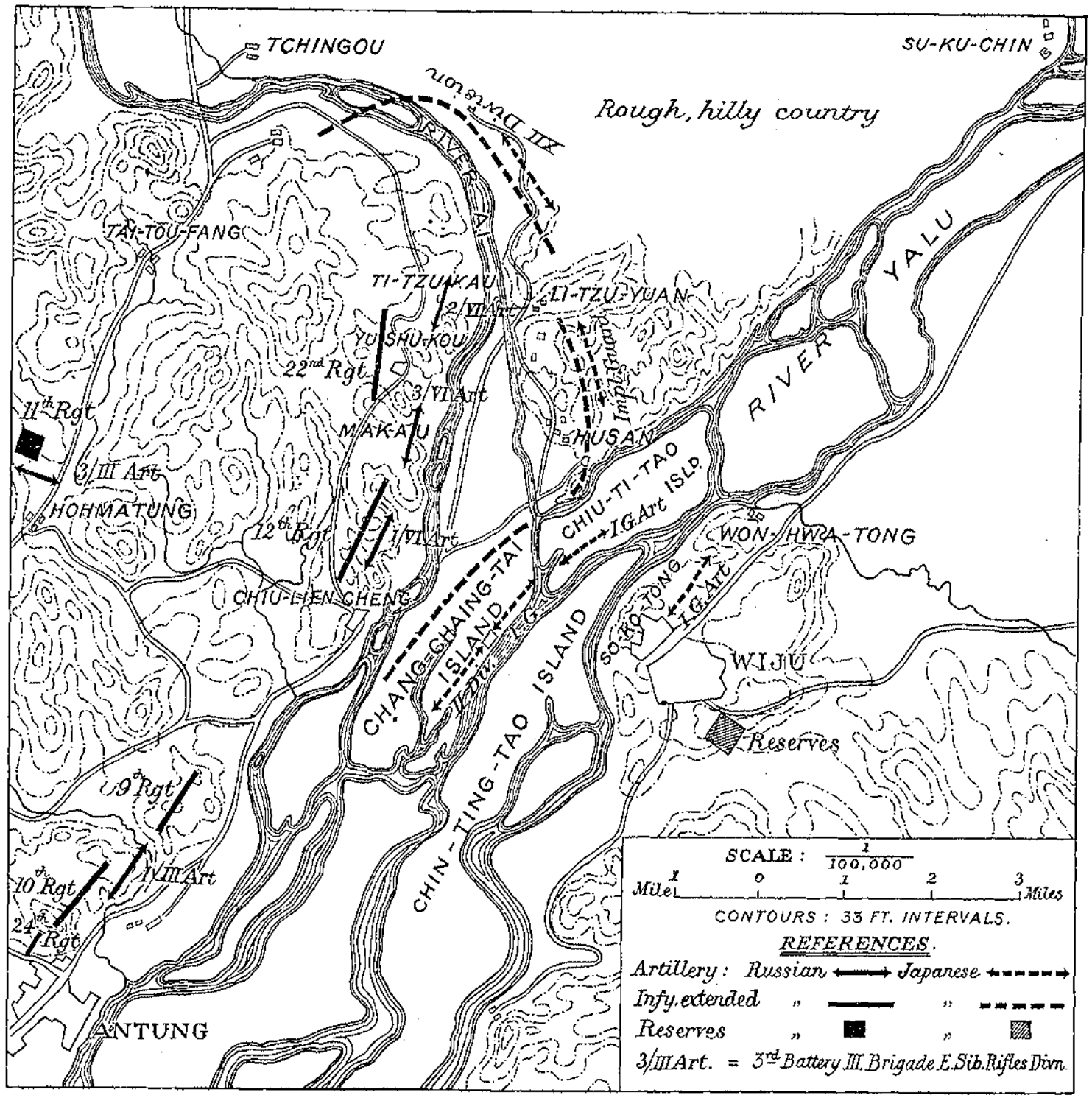

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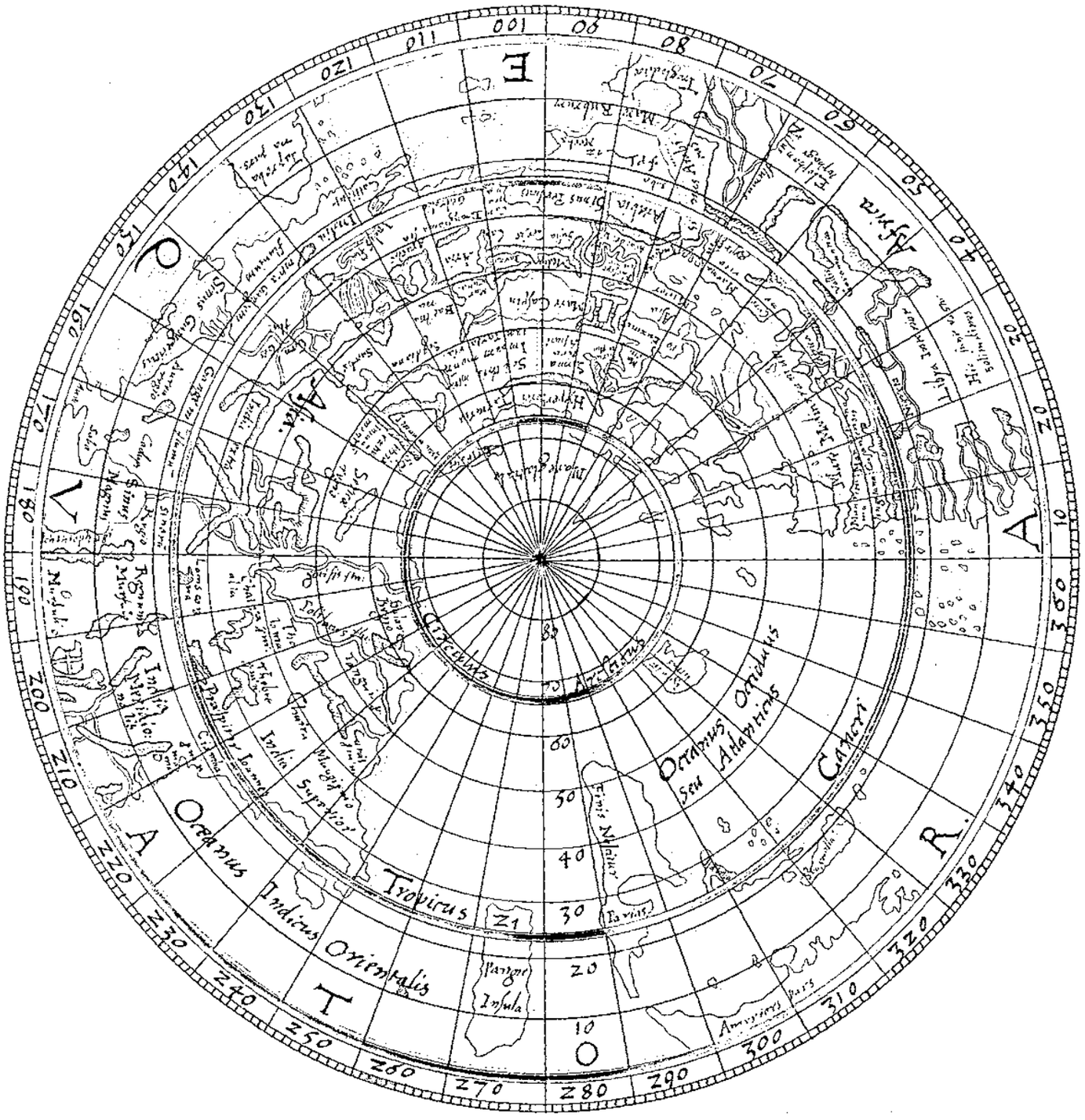

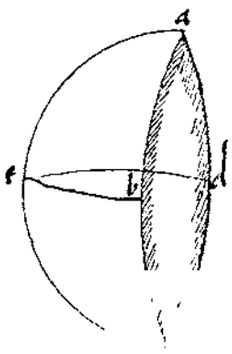

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