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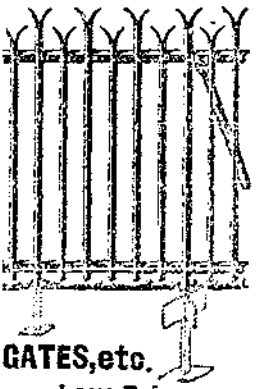

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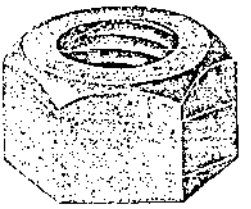

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COAST EROSION AND ITS PREVENTION.

By COLONEL W. PITT, LATE R.E.

THERE is no branch of civil engineering, however remote apparently from the ordinary duties of the Corps, that a Royal Engineer may not find himself suddenly obliged to undertake the study of. Frequently indeed he may find himself carrying out works before he has had time to gain even a rudimentary knowledge of the principles according to which they are, or should be, constructed.

Few people have any idea of the great extent of sea and river shore, for the protection of which the War Office is responsible, using the word "protection" in the sense of guarding that shore from the incursions of the sea or river, as the case may be, and not from invasion of another kind. Only those officers who may happen to have been stationed in the districts concerned, and the officials at the War Office, are aware that the Royal Engineers are responsible for warding off the attacks of the sea at certain places where these attacks are most persistent and dangerous, and where a failure to maintain the defence would result in the flooding of many thousands of acres of valuable land and enormous pecuniary damage.

The coast of England from the Wash to Portsmouth is generally considered to be that portion of our shores which is most exposed to attack by an invading enemy, and it is an unfortunate coincidence that it is also more subject here than elsewhere to the inroads of the sea, excepting, perhaps, part of the coast of Yorkshire. Really this is not a coincidence, because the conditions which favour the first kind of attack involve liability to the second also. The War Office has assumed most of its responsibility for foreshore protection and maintenance since 1805, when Napoleon filled the country with alarms by his elaborate preparations for invasion. As a protective measure many forts and over a hundred martello towers were constructed at intervals along the exposed extent of coast line. These were generally near, and sometimes close, to high-water mark as it then was. Of course, land for the defence works had to be acquired; each martello tower stood in an isolated plot varying from two to ten acres in area, and the forts required more land according to their size. Most of the martello towers were built between Eastbourne and Folkestone, with the object of preventing landings from boats on the open beaches; frequently the intervals between these towers are half a mile or less. Many were also erected on the coasts of Essex and Suffolk.

Ever since these defence works were constructed a ceaseless warfare has raged round most of them between the Royal Engineer officer in charge and the tireless sea. On the whole victory so far has been mainly with the attack; of many of the towers no trace now remains. Others are below the present high-water mark, and their days are numbered. Of the forts some have disappeared; of two at least the gorges alone remain intact, and any storm may complete their destruction. The defence however has been but half-hearted, at any rate where there was only a question of the salvation of the works themselves. Long since regarded as obsolete, they have been dismantled, and many of the towers are now peacefully occupied either by fishermen or "week-enders." Amongst the latter they are strangely popular, and where not dangerously near high-water mark are let on lease for quite substantial rents. Others again have been sold. Under the circumstances described it would have been a waste of money to go to a great expense in constructing protective works for the towers, more especially as the War Office could not compel the owners of the intervening lengths of foreshore to do anything.

Apart however from the sites of the obsolete defence works, there are many places where it was imperative that the foreshore should be protected from the erosion of the sea, for example, from Dymchurch Redoubt eastwards to Hythe, and at Felixstowe. In the first-named locality there is constant encroachment, a source of great danger, because behind the beach lies Romney Marsh, many feet below high-water level, every acre of which would be drowned out were a serious breach to be made, as well as the rifle ranges of the School of Musketry at Hythe. At Felixstowe the butts in the rifle ranges near Landguard Fort have recently been imperilled, and if nothing were done, the fort itself would in time be cut off from the main land. There are many other danger spots which it is not necessary to specify here. It will suffice to say that they are not confined to the east and south coasts, much trouble having quite recently been caused in Milford Haven.

So far reference has only been made to protection from encroachments by the sea. There are however many miles of river embankments on the Thames, Medway, and other rivers forming the frontage to War Department property, often lying well below high-water mark. For the maintenance of these banks Royal Engineer officers are responsible. Failure might in some cases mean an almost national disaster. In 1707 the bank of the Thames at Dagenham, in Essex, was breached, and it was 14 years before the damage was finally repaired by Perry.*

Before dealing with the causes of erosion and the remedies it will perhaps be as well here to make some remarks as to the liabilities of

* *Lives of the Engineers, Vermuyden, Myddleton, Perry, James Brindley*, by Samuel Smiles, p. 138.

landowners for the maintenance of the foreshore, as it is in this capacity that the War Office is affected. In a new country there would in all probability be a general law on the subject and a uniform practice. In our islands there is nothing of the sort; with every few miles we find varying conditions, and the local Royal Engineer officer has to make himself acquainted with them. As a general rule, and where it has not been alienated, the "foreshore," *i.e.*, the shore between high and low-water marks, is the property of the Crown. In many places it is vested in the lord of the manor, and often is in the hands of private owners or public bodies. This ownership however carries with it no responsibility for keeping high and low-water marks in the same place. They may, and in places do, change constantly. As the foreshore moves landwards through erosion or seawards through recession, so the ownership moves with it. Primarily the ground landlord is liable for the prevention of encroachment on his frontage to high-water mark. If the sea recedes, he gets the benefit. There are vast areas of accretion formed in this way, usually however covered with shingle, and of little, if any, value; examples may be seen at Dungeness and the "Crumbles," east of Eastbourne. Where the land behind the foreshore has at some time been reclaimed, and is protected by sea walls from being flooded, these walls, and the marsh land generally, are supervised by commissioners, often adorned with ancient and sonorous titles, whose duty it is to keep all safe. The cost of maintenance is recovered by a rate levied on the land interested, sometimes called a "scot"—hence the term "scot-free." In such a case the liability of the landlord is limited to the payment of the rate. This system is in force on Pevensey and Romney Marshes, but in the case of the latter does not extend so far as Hythe. In some places the landowners have to keep the sea walls or groynes in repair themselves, and can be compelled to do so if their neighbour's property is in danger. Again, as for instance on the coast of Essex, there is no obligation of any sort. Here unfortunately there are large tracts of reclaimed land, which have within recent years reverted to marsh, the cost of maintenance of the sea walls exceeding the rents received. The embankments to tidal rivers are, as a rule, supervised by local commissioners, who either carry out maintenance works themselves or direct the owners of river frontages to execute them. As an example of the latter system, it may be mentioned that two or three years ago the War Office was called upon by the Thames Conservancy to raise the embankments on the shore of the War Department property at Tilbury, which were insufficiently high. The Board of Trade exercises a supervision over all foreshores as regards impediments to navigation.

At the present moment a Royal Commission is enquiring into all matters connected with coast erosion, its causes, the best methods of

protection, and the question of the incidence of cost. As regards the last named, representations have been made by interested parties chiefly, that it is a national duty to keep the sea out. It is however questionable whether individual landowners can legitimately claim to have their property protected and increased in value at the expense of the State. When the report of this Commission is published, it will no doubt contain a great deal of valuable information. Whether any Royal Engineer officer will ever see it is, however, a matter of some doubt. In any case it is hoped that in the meantime the remarks made in this Paper may prove useful to any officers who may, without previous experience, suddenly find themselves called upon to deal with the very difficult subject of foreshore protection.

CAUSES OF EROSION.

The sea coast has throughout all ages been subject to the attacks of the waves, the currents, and the weather, no matter whether the shore is mud, sandy dunes, chalk, or seemingly everlasting granite cliffs. If left unprotected, and the land is not raised from below, erosion is certain to occur; it is a mere question of time.

Apart from the material of which it is composed, a coast will generally be of one of the three following natures, viz.:—

A. Cliffs, high or low.
B. A more or less level plain, slightly above sea level at high water.
C. Marsh land, probably reclaimed, below high-water mark, protected from flooding by artificial embankments or a natural beach of greater height than the general marsh level.

The forces acting on the coast line are:—

(*a*). Rain, frost, and wind, degrading the face of cliffs where they exist, and causing the rock or earth of which they are composed to fall on the beach, whence the *débris* is washed away by the sea.
(*b*). Direct action of the waves, eating away the base of the cliffs or the embankments.
(*c*). Littoral drift of sand or shingle forming the beach, due to oblique action of the waves or to tidal currents parallel to the shore.

The material of which cliffs are composed may be either the hardest rock, as in Cornwall and Pembrokeshire; chalk, as in Kent; sand, as in Hampshire; or clay, as in Essex.

The erosion of rock is so slow that we cannot measure it; certainly it has occurred on a vast scale, but the human mind is incapable of appreciating the number of years the process must have been going on.

The degradation of chalk is comparatively rapid, and may amount to a setting back of the coast line by a mile in a thousand years. It is probably due rather to frost and rain bringing down the face of the cliff than to direct action of the sea. Waves have really little effect on hard chalk *in situ*. There is a plot of W.D. land on the top of a cliff at Broadstairs. Under this plot is a cave worn out by the sea, and someone cut his name and the date (1847) in the chalk at the side of the cave. The inscription, now 60 years old, is still perfectly legible; it is, of course, protected by its position from the rain and frost.

The resisting powers of sand, loam, and clay, forming cliffs are of the slightest. These materials not only yield to the weather, but are also undercut by the waves with great facility, and unless protected artificially, their degradation proceeds with extraordinary rapidity. Cliffs of earth or clay suffer much more from the effects of land drainage and rain than from the action of the sea. The face is constantly being washed down on to the beach, and is carried away by the sea. This is well illustrated on both sides of Scarborough.

A coast line coming under the heading B, as described above, is not liable to be affected by weather; its only enemy is the sea. Moreover, the waves in their attack frequently provide a defence against themselves by piling up a high crest line of shingle or sand, aided, as regards the latter material, by the wind. There are hundreds of miles of sea shore in England and other parts of the world where the coast is fringed by sand dunes, forming an effective barrier to encroachment. These dunes frequently block the outlets to the drainage from the land, and cause shallow and sometimes brackish lakes to be formed behind them.

A shore coming under Class C must of necessity have been made artificially. It is found either where a tidal river running through marshes has been embanked, or some estuary has been reclaimed by the construction of a sea wall. Some of the reclamation embankments still existing in England are very ancient. It is an ascertained fact that part at any rate of Romney Marsh was reclaimed as early as the Roman occupation, Roman remains having been found in many places. Sometimes the sea itself acts as the agent by piling up a bank of shingle to a higher level than the land, thus actually excluding itself. Such a bank is known technically as a "full."

Now if we consider the forces in action, those classified under the heads (*a*) and (*b*) above are sufficiently obvious, and need no further explanation here. When, however, we come to (*c*), the conditions are more complex, and subject to local considerations such as set of tides and prevailing winds. It is only possible within the limits of a

short Paper to indicate generally and very briefly what may and does take place, with a few characteristic illustrations.

Along the coast of Sussex and the south coast of Kent we find very strong tidal currents, running generally parallel to the shore, due to the tides running up and down the English Channel, which rapidly narrows towards its eastern end. There are also strong parallel currents along parts of the east coast of England, caused partly by the flow into and out of estuaries, and partly by the main tidal flow being directed along the shore by the numerous banks and shoals some little way out to sea. The tendency of every flowing tide is to carry along with it the sand or shingle on the beach and lying some little distance below low-water mark. Similarly every ebb tide seeks to bring the beach material back again. If there were no winds, and if the ebb and flow currents were of equal strength, which is not always the case, the beach would not be permanently altered; each ebb would restore to it that which the flow had taken away. Such an equitable arrangement is however upset when there is a prevailing wind blowing either parallel to, or at an acute angle with, the shore. Then wind and tide, acting in the same direction, move a great deal more of the beach covering than would be the case were the tide alone at work, and carry it along with them. When the tide turns it has wind and waves against it, and is consequently prevented from bringing back all that was removed. It is obvious then that a wind blowing constantly in one direction must cause a permanent transfer of beach material along the shore, the travel being in the direction of such a wind. This is what we find actually going on along the south and east coasts of England. The prevailing wind blows from the south-west in the one case and from the north-east in the other, and there is, except in places affected by local conditions, a constant movement of sand and shingle along the shore in easterly and southerly directions respectively. Groynes on the beach will be seen to have the material piled up against their western or northern sides, as the case may be. An easterly or southerly gale may temporarily reverse the state of affairs for a short time, but directly it ceases things go on as before. The shingle travels by rolling along the beach, and is worn smaller and smaller as it goes. Sand is mostly carried in suspension, and deposited when the current slackens.

The action described may be studied to great advantage at Dungeness and along the shore in that neighbourhood. On looking at the map (*Plate* II.) it will be observed that to the west of the Ness the coast line runs a little north of west, and east of the point its direction is at first due north, nearly as far as Littlestone, where it begins to trend off to the east. Now when the tide is flowing there is a very strong current all along the shore from beyond Hastings, and the prevailing south-west wind strikes nearly at right angles against the beach between Rye Harbour and Dungeness. The combined action of

wind and tide causes a marked travel of the small shingle, of which the beach is composed, towards the extreme point of Dungeness. The tide then makes in a north-east direction for Dover, cutting across the bay on the east side of Dungeness, and the shingle getting into deep water comes to a halt. When the tide is flowing there is an eddy in the east bay, and the current sets from the direction of Dymchurch back towards the Point of Dungeness. We then get the curious fact that the beach is working from both sides towards the Point, and causing it to push its way out to sea a few yards every year. The beach is very steep at the apex, and there is deep water close in shore. This process has evidently been going on for a long period. All the way inland from Dungeness to Lydd there is nothing but a wilderness of shingle, stones, once forming part of some distant rocky or chalk cliff, fallen into the sea, and rolled for miles along the beach, to come to rest here. Back from the Point the eye can plainly trace a series of concentric curved ridges of shingle, each marking the crest of an old beach, as the rings in a tree indicate its growth. The same phenomenon may be observed on that dreary waste of shingle on the west side of Pevensey Bay known as the Crumbles, behind Langney Point.

Between the life history of Dungeness and that of Langney however there is a striking difference. Within historic times the former has steadily moved seawards and towards the east; the latter on the other hand has had alternations of accretion and recession. Pevensey was once a port, long since closed up by shingle moving eastwards from the Crumbles, whilst Langney Point itself has lost no less than half a mile in the last 170 years. East of the Point the present coast line, which is separated by half a mile of shingle from the old shore, is being eaten away rapidly, losing sometimes 50 yards in a year. Langney Fort, just east of the Point, has lost its gun emplacements within the last four or five years, and a heavy gale may any day destroy the remainder. It is difficult to find a reason for these changes in the action of the sea. In this particular locality there does not appear to have been within recent times any change in the level of the land, or, at any rate, none sufficient to explain what has been happening. Space does not admit of a discussion of this interesting problem within the limits of this Paper.

The travel of shingle along the shore materially affects the drainage of the land by closing or altering the position of the outlets of the streams and rivers. There are numerous instances of this round the coast of England. One of the most characteristic is to be seen near Aldeburgh, in Suffolk. Here the drift is from north to south. The River Alde approaches the shore at right angles, and formerly had its outlet just south of Aldeburgh. It still reaches a point within 80 yards of high-water mark, but the mouth of the river has been gradually deflected further and further south, so that we now see the

Alde running at the back of the beach, and parallel to it, for no less than nine miles. The present mouth is south of Orfordness, and is no doubt continuing its southerly movement. The rapid accumulation of shingle is well illustrated by some old cottages on the beach at Aldeburgh, the ground floor rooms of which are now buried. The roofs are still on the houses.

A beach which is exposed to rough seas or strong currents, or both, is liable to great changes in its appearance within a very short time. A heavy gale in the direction of the normal movement of the beach material will accumulate in a day or two great quantities of shingle or sand. Should the gale be in the opposite direction, the beach may be entirely denuded of its covering, and the replacement of it may take months.

Some few years ago a severe storm washed all the beach out of Babbacombe Bay, near Torquay, leaving a floor of bare and rugged rock. This was an unfortunate occurrence for the local boatmen, as it was no longer possible for them to land out of or launch their boats except in perfectly calm weather. It is believed that the beach has since restored itself.

Rough weather will alter the slope of a beach. Where the material is sand the angle of inclination is generally practically uniform throughout. The section of a shingle beach frequently takes the form of a semi-parabola, with its apex about high-water mark. The action of the waves works the shingle up to the top, where it accumulates. Sand does not adopt this section, partly because it will not stand at so steep an angle as shingle, and partly because when collected above high-water mark it is liable to be blown away.

It is impossible here to give more than a very brief account of what is known as "littoral drift." Officers who have to deal with problems of coast protection, and others who take a special interest in the subject, are referred to *The Sea Coast*, by W. H. Wheeler, *The Scenery of England*, by Lord Avebury, and other standard works.

For further information regarding that most interesting and much discussed locality, Romney Marsh, the following books should be consulted in addition to those just mentioned, viz. :—*Ancient Britain and the Invasion of Julius Cæsar*, by Rice Holmes, and *Lives of the Engineers*, by Samuel Smiles.

PREVENTION OF EROSION.

There is no subject on which the opinions of engineering experts differ more than that of the means of protecting the land from the sea, no matter whether it is a question of the particular section for the face of a sea wall, its method of construction, or the form of groynes.* In the year 1904 the leading authorities in England joined

* *Minutes of Proceedings of the Institution of Civil Engineers*, Vol. CLIX.

in a discussion at the Institution of Civil Engineers. Many of them had been engaged in coast protection their whole lives; all had different methods, and each was convinced that his was the right way, and all the others were wrong. The result of reading this discussion is that it leaves one's mind in a hopeless fog. The question however should be treated in a scientific way. From the evidence brought forward in this discussion by each engineer, we should try and discover not what he did so much as why he did it. Possibly then it may be judged which particular system is likely to be suitable for adoption, having regard to the local conditions of the part of the coast we may have to deal with. People are very apt to attach an undue importance to their experience. The saying *experientia docet* may be very true, but it has its limitations. It does not follow that because a man has been doing a certain thing all his life he has been doing it the right way. Even though he may not have had failures, it is conceivable that by going outside his trusted experience he might have attained better results. It is unfortunately but too true that the history of the construction of sea walls in England is a record of failures rather than of successes, although in many cases the most talented engineers in the country have been engaged to design them. This is no reflection on the professional ability of these gentlemen, but indicates either that the impossible has been attempted, or that the problem has not yet been solved. Very large sums of money, found by ratepayers, have been expended on protection works, every penny of which has at some unfortunate places been literally cast into the sea. At many watering places the maintenance of the esplanade is really a matter of life or death to the town. Its destruction does not mean merely the loss of the main attraction to visitors, but exposure of the town itself to the danger of being washed away by the sea. Hardly a winter passes without a tale of extensive damage to some esplanade or sea wall, built at great expense. Where a wall is constructed to serve the double purpose of keeping the sea back and of affording a promenade, it may be its own undoing. In order to gain space it is often built some little way down the beach instead of at or above high-water mark, with this result, that instead of causing the beach material to accumulate against its face, the sand or shingle may disappear, leaving bare clay, when the undermining of the foundations of the wall rapidly follows.

It has been said of Acts of Parliament that none was ever passed which effected all that was expected of it, or which did not have some entirely unforeseen result. This remark applies very aptly to schemes for coast protection works, the unexpected being usually of a painful nature. The Corporation of Scarborough has had an unpleasant experience of the kind described, having spent £150,000 on a "Marine Drive" round the Castle Hill, connecting the north and south bays. The work was supposed to be completed in October,

1904. Owing to damages caused by the sea, the drive is closed to traffic at the present moment.*

Earlier in this Paper the different descriptions of coast which may have to be protected have been classified under three heads:—(A), Cliffs; (B), Low Shores; (C), Embankments, or natural beaches protecting marshes below high-water level. The attacking forces were classified as (*a*), Weathering; (*b*), Direct Action of Waves; (*c*), Littoral Drift. Having now considered the nature of our fortress and what our enemy is like, it behoves us to scheme our defence, bearing in mind that military tactics must not be followed too closely, and that salvation lies rather in "passive resistance" than in the "offensive-defensive." We are not considering reclamations, which of course are offensive operations.

Now there are two methods of staving off encroachments, which may be employed either separately or in conjunction. These are the direct and the indirect. By the former we mean the construction of continuous walls, more or less massive according to the violence of the waves which has to be resisted. The indirect method is that of employing the waves and currents themselves as an active agent in building up defence works in the shape of accumulations of shingle or sand as a bar to encroachment. This is effected by the construction of groynes on the foreshore, usually at right angles to the coast line. Groynes are frequently erected in front of sea walls, and we then have the combined system.

At first sight it may seem a vain thing to place lines of obstacles in the direction of the attack and not at right angles to it, and were there no tides or currents it would be so. Our object is, however, to hold up and retain the material, sand or shingle, brought up by the sea and moving along the shore under the influence of the littoral drift.

The aim of the engineer is to get his beach well covered, with no bare bones exposed to view, but as great a depth of sand or shingle as possible. The Walrus and the Carpenter, though experts in oysters, were not appreciative of this desirability:

> They wept like anything to see
> Such quantities of sand:
> "If this were only cleared away,"
> They said, "it would be grand!"

The carpenter at any rate should have known better. Perhaps though he was out of a job, and wanted to be employed making groynes to bring the sand back again.

Sea walls are very costly to construct and to keep in repair. They are usually adopted where it is desired to form promenades, as at

* Since these lines were written the "Drive" has been thrown open to the public.

most watering places, to protect the foot of cliffs from being undercut, and to carry railways round the coast, as on the Holyhead line, the Great Western Railway between Dawlish and Teignmouth, and elsewhere; also on certain parts of the coast where the action of the sea is particularly violent, or a breach would be peculiarly disastrous, as at Dymchurch in Romney Marsh. The term sea wall as used above is intended to mean a solid wall of masonry or concrete, but earthen or clay embankments faced with stone or chalk are popularly called sea walls also. There are many miles of banks of this description on the shores of Essex, in the Thames and Medway, and in numerous other places.

It is hardly likely that an English military engineer would be called upon to design or construct any extensive masonry sea wall. Unfortunately, those who rule over us do not see fit to employ Royal Engineer officers of civil works of public utility, as is the custom in the United States, the government of which has recently placed the completion of the Panama Canal in the hands of military engineers. It is not proposed, therefore, in this Paper to go into details of construction, or to discuss the much debated question of the type of cross section. All these matters will be found fully set forth in Wheeler's *Sea Coast*, already referred to, and elsewhere.

There are, however, numerous existing walls which Royal Engineer officers have to maintain, some of them giving much trouble, *e.g.*, one at Hythe, also a long stretch at Harwich; the latter fortunately giving cause for little anxiety. There are certain dangers to which sea walls are liable. The toe is subject to insidious attacks, not so much from the direct beating of the waves when the tide reaches it, as from the backwash caused by the water running back off the face of the wall and scooping out the sand. This danger is usually combated by the construction of a stone apron some way down the beach, which often forms a continuous curve with the face of the wall. These aprons require very careful watching and examination after every gale. There are always a certain number of open joints through which the backwash finds its way and carries off the sand, leaving hollows beneath the masonry, and into these the stone falls. It is not unusual to see stacks of stone and timber piles at intervals along the top of a wall. These are kept in readiness to carry out instant repairs when necessary. The piles are required for driving into the sand at the foot of the apron, to prevent it from sliding down the beach. Another danger is that due to waves in heavy storms washing over the top of the wall and carrying away the backing. If this occurs a breach is certain to follow quickly. The surface of the ground behind the wall should, therefore, be covered with concrete, asphalte, or some other material strong enough to resist the breaking waves falling on it, and impervious to water.

Flanks of walls are a weak point. They should never be "in the air" if it can possibly be avoided. It will almost always be found that the face of a wall is in advance of the line of the natural top of the beach, and therefore where the wall comes to an end a corner is formed. In such places the action of the waves is peculiarly deadly in its effect on the beach, and constant care is required to prevent the flank of the wall from being turned by the sea getting behind it. There is one such danger point at Dymchurch Redoubt, at the eastern extremity of the Dymchurch sea wall.* The jurisdiction of the commissioners who supervise Romney Marsh ends, on the eastern side, where the wall does. For 200 or 300 hundred yards to the east the frontage to the sea belongs to a private owner, and then that of the War Department begins, and extends to Hythe. This short length in private hands contains, perhaps, the weakest point on the shore of the marsh, and in order to save its own property from damage the War Office has been forced to undertake its protection by constructing groynes. In spite of these precautions the sea made a breach about four years ago and flooded a large area. We have here a striking instance of the unsatisfactory state of the law, or rather absence of law, dealing with the maintenance of foreshores. The private owner referred to could not be compelled to provide groynes in front of his property, so the War Department had to do the work.

Further along towards the east we come to another length of wall, extending from Hythe to Sandgate. At its western end it is on W.D. land, and formerly terminated at a fort, which has been almost entirely washed away. The destruction of the fort has left the end of the sea wall exposed, and its flank has been turned by the sea, owing to the natural "full" being now some distance behind the line of the face of the wall.

Sea walls must of necessity come to an end somewhere, but care should be taken not to leave the termination abrupt. The wall should be sloped back gradually to high-water mark on the beach, so that there is no corner.

Besides walls of masonry or concrete, others of flimsier construction may often be seen, such as camp sheeting and piles, or even brushwood and hurdles. The former will be found, for instance, along the top of the beach at the well-known Felixstowe Golf Links. There is a good example of brushwood work just south of Littlestone, near New Romney. Here the 1-inch Ordnance Survey maps show a deep indentation in the crest of the beach half a mile wide, and of the same depth, behind the general line of high-water mark. Quite recently the gap has been closed by means of banks of sand, protected by lines of brushwood planted in the beach in front. Up to the present time the new works appear to be holding their own.

* *Vide Plate* II. The wall extends from the village of Dymchurch to the Redoubt.

So far we have considered the method of direct defence against erosion and encroachment. We now come to the indirect method, *i.e.*, the employment of groynes. In considering this subject we find ourselves at once confronted with the great divergencies of opinion on the part of the experts. These are fully set forth in the discussion at the Institution of Civil Engineers previously referred to.* The points in dispute are whether groynes should be of masonry or timber, high or low, long or short, straight or curved, at right angles to the shore or at some other angle, and how far apart they should be spaced. At the risk of seeming tedious it is proposed to go into this contentious subject somewhat fully, and as no definite conclusions were arrived at in the course of the discussion referred to, which is therefore not of much practical value to the novice in groyne construction, but rather bewildering, I intend to set forth my own views. These may be right or wrong, but they are not nebulous, and in justification of what may be considered presumption on my part I may say that they are founded not only on the study of a great deal of literature on the subject, but also on personal observation and knowledge of the coast of England and Wales throughout nearly its whole extent from Yarmouth to Fleetwood. I have referred to no locality by way of example which I have not visited. With these remarks, I leave it to officers who may have to design groynes to adopt my recommendations or not, as they may think fit.

An explanation has already been given of the action of waves, tides, and currents in causing what is known as "littoral drift." The supply of the shingle and sand travelling along the coast is derived from disintegration of cliffs, from the bottom of the sea beyond low-water mark, and from old storage grounds such as the "Crumbles," "Dungeness," or the "Denes" at Yarmouth. In most localities the direction of the drift, though subject to temporary changes, is practically always in one direction. But for the obstructions to the flow of shingle, etc., either natural or artificial, we should find vast accumulations at the meeting points of tides.

Sharp headlands, deep bays, estuaries, and river mouths are natural obstacles tending to hold up the stream of shingle.

Breakwaters, piers, and groynes are artificial obstructions. Now take the case of a breakwater or solid pier running straight out to sea into deep water. It is plain that it must bring the shingle moving along the foreshore to a halt, and consequently we find an accumulation on the windward side, a much higher beach, also high and low-water marks farther out. The lee side is dependent for its beach covering on what is brought up from deep water, or collected by gales from a direction opposite to that of the littoral drift. It is not till we get some distance beyond the pier that we find a normal

* *Minutes of Proceedings of the Institution of Civil Engineers*, Vol. CLIX.

beach section again. Incidentally it may be mentioned that breakwaters, harbours, and solid piers have a prejudicial effect on the shore, owing to their cutting off the supply of shingle in the manner described.

Groynes are, or should be, intended to intercept enough shingle to keep the beach at a suitable section and let the rest go on. They are familiar objects of the seashore, execrated by boatmen, a nuisance to visitors, as they turn a beach into a sort of steeplechase course, and popular only with those seeking shady places, screened from view. In their older form they are massive timber structures, frequently strutted on the leeward side with huge tree trunks, and with a difference of level between their two sides of sometimes 15 feet, or even more. The corporations of some seaside towns have constructed large masonry groynes resembling breakwaters, which are a still greater obstruction to the beach. High timber groynes, and those of masonry or concrete, may be unhesitatingly condemned. They are expensive to construct and maintain, and pernicious in their action. At Eastbourne some flagrant examples of high timber structures may be seen in front of the parade. Doubtless they were designed to arrest shingle and cause it to cover the foot of the parade wall, and act as a protection to it from the waves at high water. Owing, however, to their great height, the shingle is piled up into the angles between the face of the wall and the groynes on the windward side, and there is a deep drop down on to the beach on the other side. The covering to the foot of the wall should be of a uniform depth; as matters are, there is a great deal too much in some places and too little in others. Moreover high groynes cause a nasty sea, and the waves tumbling over, tend to undermine them, and scour away shingle where there is already an insufficiency.

High groynes are immoral in principle. There is only a limited and fairly constant supply of shingle travelling along the shore, and if an undue quantity is arrested in one locality, the beach beyond must suffer from a deficiency. That this is so is demonstrated on a large scale at Dungeness, though in that case the stoppage is due to natural causes. There the shingle comes from the west, and on that side of the Ness which acts as a natural groyne there is plenty of it. On the east side of the Ness there is hardly any; the beach is almost entirely sand, and the shingle only begins again in any quantity some miles to the east. Corporate bodies have proverbially no consciences; their only care is to bolster up their esplanades, and if this is done at the expense of their neighbours, they reck not.

On a properly regulated beach the contours should be parallel to the shore line. This ideal condition is only attained when the levels on both sides of the groynes are the same, and obviously, therefore, they should, at any rate when first constructed, be low, so that the arresting and accumulating of the shingle may be gradual, and be

distributed over the whole length of beach which it is desired to improve or protect. A series of parallel high groynes will collect all the shingle at the windward end, and little or none at the other. When a beach has, by the construction of groynes, been brought up to a proper cross section, very little of them should stand up above the shingle or sand; any portion that does so project is not only useless, but remains a nuisance; it is moreover likely to cause eddies and scour.

The first thing to do then in designing a groyne or series of groynes, is to take a cross section of the beach, showing its existing level. Above this should be drawn the section line which it is desired to obtain. The height of the posts or piles to which the boards are to be fixed should be arranged so that their heads are slightly above the ideal section.

In constructing the groyne the boards should be put in so that only two or three of them stand above the existing beach level. As the material collects more boards should be put in by degrees until the groyne reaches its final height. This method of gradual construction, besides ensuring an accretion of material along the whole length being dealt with, also disposes of the risk of destruction should a gale spring up before the new work has acquired any protecting covering. It must be borne in mind that adding to the shingle on a beach may have the effect of moving both high and low-water marks seawards, and that it may be desirable to extend the groyne so as to keep its lower end always at low-water mark.

It may be objected that this piecemeal construction is difficult to carry out under a system of annual allotments of funds. The difficulty may be got over by driving all the piles and purchasing all the boards in one financial year; the cost of putting the latter into position when required later on is practically *nil*.

Having now, it is hoped satisfactorily, disposed of high timber and masonry groynes, I propose to consider the question of length. It may be laid down as a general rule that each groyne should extend from high-water mark, ordinary spring tides, to low-water mark. Failing this, shingle and sand, which might with advantage be intercepted, will pass by and be lost. This rule has not been generally observed. Nearly everywhere that the coast is protected by groynes, especially where they are old, short lengths are to be seen. Sometimes they extend for a short distance down the beach from high-water mark, at others up the beach from low-water mark. This mode of construction is only justifiable where there are longitudinal hollows or depressions which it is desired to fill up. Such depressions are not infrequently found on sandy beaches, and may be seen forming pools when the tide has left them. Short groynes are often interspaced between long ones. It is difficult to understand the principle leading to the adoption of this arrangement; probably it

was due to some notion of economy. A much better result would usually have been obtained by constructing the groynes at wider intervals and making them all long. Possibly it may have been discovered that the long groynes were spaced in the first instance too far apart, and the short lengths were interpolated subsequently. If this were so, the new groynes should have been the same length as the others.

It has been stated above that groynes should be carried down to low-water mark, spring tides. Where there is much scour on a beach, it is advantageous to carry them out farther still. Sand in suspension being carried along by the current beyond low-water mark will then be captured. Shingle, unless very small, is drifted by the striking action of waves, and its movement is mostly on the foreshore, *i.e.*, above low-water mark. Recent investigations have however shown that the effect of waves is felt at a much greater depth below the surface than was formerly supposed, and is capable of causing the lateral movement of shingle considerably beyond low-water mark. Some engineers have even recommended that heavy chains should be secured to the tail ends of groynes and carried straight out to sea. It seems doubtful whether the result would justify the cost of this arrangement.

The next point for consideration is whether groynes should be straight or curved. The idea that they should be curved is probably a survival of the exploded notion that a bellying sail holds the wind better than a flat one, and it may be relegated to the same limbo. Curved groynes would be a much greater nuisance on a beach than straight ones. Boats coming ashore require a straight run up, which they can find between straight groynes without difficulty.

As regards the question whether groynes should be at right-angles to the beach or oblique, there is great difference of opinion, usually expressed with force. Many capable and experienced engineers say that they should be more or less at right-angles to the set of the waves on the shore. Suppose a shore line runs east and west, that the set of current is parallel to the shore, and that a south-westerly wind is blowing. The resultant of these two forces will give the direction of the drift of the shingle, and it is argued that groynes should be at right-angles to it. This sounds plausible, but I am not at all sure that there is much in it. Oblique groynes get in the way of beaching boats nearly as much as curved ones. On the whole, I should say, unless there is some strong local reason to the contrary, make them at right-angles.

Distance apart must be dependent on local considerations, no hard-and-fast rule can be laid down. It is fairly obvious that unnecessary expense is incurred, and no good done by erecting groynes too close together. Only in exceptional circumstances should the distance apart be less than the length, or the horizontal distance between

high and low-water marks. As has been observed earlier in this Paper, it is not possible to forecast with great accuracy what actual result will be obtained by protection works. If there are no other groynes existing in the neighbourhood under similar conditions which can be inspected, a tolerably safe rule will be to space new groynes at distances apart equal to twice their length. If subsequently found necessary, intermediate groynes can be interpolated without being too close together.

When once erected groynes should receive the most careful attention. They should be inspected frequently, and always after heavy gales. Damages should be repaired at once. Breaches left unattended to are almost certain to cause a mischievous scour.

Another important duty is that of keeping record plans and cross sections, on which the state of the shore is noted periodically. It is no use spending money on protective works unless an accurate record of the results obtained is kept. Royal Engineer officers and subordinates are not like those in civil employment, who may remain in the same job for years and carry its history in their heads; it is, therefore, all the more necessary that accurate plans of the shore should be kept up to date.

Having so far dealt mainly with principles, it is proposed now to give some details of construction. Nothing will be said about the massive timber structures forming high groynes. As regards low groynes, the use of which has been advocated above, it does not matter much how they are made so long as they comply with the condition that in the first instance they are not more than one or two feet above the beach, and that as the material is accumulated more boards can be added. The simplest plan is to drive piles in pairs with a space between them equal to the thickness of the boards, and at distances apart from centre to centre equal to the length of the boards. It is better to step the groyne up the beach, and not set the boards at a slope. The piles must be left high enough above the beach to leave space for the addition of boards as may be necessary to attain the desired section. About three years ago the Royal Engineers erected some groynes near Hythe. Instead of piles, piers of masonry in cement were employed, chases being formed in their sides, into which the boards were slipped. I do not recommend this system; it is expensive, the piers are terrible obstructions on the beach, and they are subject to scour. Also, they are liable to get out of upright, and it is then impossible to put any more boards in.

*In 1896 a patent was taken out by the late Mr. E. Case, then engineer of the Romney Sea Defences, for his system of groyning. He advocated the principle of making them low in the first instance,

* *The Sea Coast*, Wheeler, p. 124.

and raising by degrees. The patent really only applied to the manner of fixing the uprights. Instead of driving piles, Mr. Case fixed his uprights in blocks of concrete sunk in the beach. Subsequently the claim was upset by the Court of Appeal.

As regards the scantlings of timber used, where there is likely to be a heavy sea the piles may be 9 inches square and the boards 3 inches thick; elsewhere 6-inch piles and 2-inch boards will be sufficiently strong. The piles should be driven at intervals of from 7 ft. 6 ins. to 15 feet, and should if possible go down into the clay, especially when driven through shingle which is always on the move.

The Case system of setting the uprights in blocks of concrete is more suitable for a sandy beach than for one of shingle. *Fig.* 1, *Plate* III., shows a section of a beach and a groyne. The beach as drawn is unusually steep; a flatter slope would have necessitated an unwieldy plan being printed, and would not have illustrated the principles laid down quite so clearly. It should be noted that the boards indicated by dotted lines are to be placed in position one at a time as the beach fills up. Details on a larger scale are shown in *Fig.* 2.

Cost of construction must necessarily vary according to local conditions. It will depend on the distance apart of the uprights, length of piles driven, scantlings of timber used, and very much on the accessibility of the place of erection. Sometimes groynes have to be constructed in very out-of-the-way places to which there is no road, and the cost of haulage then becomes a serious item. Wheeler quotes 16s. 9½d. per yard run for low groynes with piles, and 19s 2½d. for "Case" groynes.* Mr. E. R. Matthews estimated the cost of low timber groynes proposed to be constructed near Bridlington at 13s. 6d. per foot or 40s. 6d. per yard,† the piles being 7 ft. 6 ins. from centre to centre. The only reliable way, however, of forming an estimate of the cost of a new groyne is to take out the quantities, and to provide for the full height which it will eventually reach. On *Plate* III. is given a cross section of a beach showing existing surface, the desired surface, and a groyne.

As has been already mentioned supervision of all foreshores is exercised by the Board of Trade. Before therefore proceeding with any protection scheme it is necessary to obtain approval of the Board through the War Office, submitting with the application plans of the proposed works. This fact is not generally known to Royal Engineer officers, and neglect to procure the sanction required may lead to serious trouble afterwards.

In an early part of this Paper allusion has been made to Romney Marsh and the growth of Dungeness. I am indebted to the C.R.E.,

* *The Sea Coast*, p. 124.

† *Proceedings of the Institution of Civil Engineers*, Vol. CLIX., p. 74.

Dover, for the map reproduced (*Plate* I.), which illustrates admirably the remarkable changes which have taken place in the topography of this most interesting neighbourhood within historic times. *Plate* II., reproduced from the most recent Ordnance Survey map, is given for the sake of a comparison. The old surveys from which the map reproduced in *Plate* I. was traced were not altogether accurate; it will, however, serve the purpose.* The first part of Romney Marsh to be enclosed was that lying to the east of the road from New Romney to Snargate. This road runs along what is known as the Rhee Wall. When and by whom this wall was made is not known. As Roman remains have been found to the east of it, certainly it is not later than the Roman occupation; it may be much earlier. Prior to the reclamation there was probably a bank of shingle extending from Littlestone past Dymchurch and reaching to Hythe, which place was a port till the shingle closed the entrance, in comparatively recent times. It is claimed by some authorities that Lympne was also a port in Roman times, and was, in fact, "Portus Limanis"; there is, however, good reason to believe that this assumption is erroneous.† However that may be, there is no question about Appledore having been accessible by water. The Danes landed there in 893,‡ and the map given in *Plate* I. clearly shows the sea reaching it. Rye is still reached by small craft, but has lost much of its importance. The original site of Winchelsea is said to be under the sea, the town having been overwhelmed by a storm in the year 1250.§ The present town was built to take its place, and stands on a rock. On the map given in *Plate* II. will be seen Camber Castle south of Rye, built in the reign of Henry VIII. It is similar in design to Walmer Castle, and is now in ruins.

On the map in *Plate* I. the growth of Dungeness is clearly shown. This map however shows the Ness as having once been considerably more to the west, and with its axis running nearly north and south. It is difficult to accept this as a correct representation, and I think it may safely be rejected.

In conclusion, I venture to express a hope that this Paper may prove useful to those of my brother officers who may be called upon to carry out the construction or maintenance of works for the protection of the coast from erosion. I would recommend them also to provide themselves with the book to which I have several times referred, viz., *The Sea Coast*, by W. H. Wheeler, published by Messrs. Longmans, Green & Co. in 1902; price, 10s. 6d.

* It will be observed that Dymchurch is shown below the line of high-water mark, 1736.

† *Ancient Britain and the Invasion of Julius Cæsar*, Rice Holmes, p. 543.

‡ *The Scenery of England*, p. 159.

§ *The Scenery of England*, p. 159.

THE RELATION OF COAST DEFENCE TO HOME DEFENCE AS A WHOLE.

By COLONEL S. A. E. HICKSON, D.S.O., R.E., *p.s.c.*

MAJOR MOLONY tempts me to write again, and the desire to be clearly understood on the questions recently raised in the *R.E. Journal* must be my apology for again appearing on this subject. I am especially anxious to correct the impression that I have at all advocated "Forts," "Chains of Forts," or permanent works of any kind. But we have got a chain of naval bases to defend, and, in my own words, "my proposals are the natural result of the development of artillery in accuracy, range, and rapidity of fire; and the question raised is nothing 'revolutionary,' but merely whether under the new conditions the best line of defence against land attacks may not be on the flanks of our naval bases, instead of round them." My endeavour was mainly to invite especial attention to the immense advantage now afforded to guns by a coastal, as compared with an inland artillery position, in point of this rapidity, accuracy, and range, besides field of view and fire, and immunity from any serious reply on the part of an enemy on the sea, intent on effecting a landing. In the latest edition of his book on fortification Sir G. S. Clarke indicates that "the 6-inch gun with an auto-sight will far surpass, in speed and accuracy of fire, the possibilities on board ship. The latest war experience plainly shows that frequency of hitting is now, as always, supremely important, and it is from this point of view that the 6-inch gun, which is doubtless capable of further development, must be regarded as well suited for coast defence." The result and development foreseen are now in process of being achieved, even beyond expectation; and as regards this *special combination of accuracy and rapidity*, even up to considerable ranges, the destructive power of small and medium guns, field and fixed, especially the 6-inch, is now immensely superior in an elevated coast position, as compared not only with similar guns on ships, *but inland*. This superiority is so great that it may well be called, at the present time, the distinguishing feature of Coast Defence. The high fixed vertical base obtainable by guns on cliffs, such as prevail on our south coast, firing over a clear fixed horizontal plane — the sea — with the latest developments of sights and range-finding apparatus, are mainly responsible for this result. On ships, though rapidity is possible, there is not sufficient vertical base for accuracy. Inland the vertical

base varies with every target, and, as hostile fire precludes the use of direct fire with advantage, concealment becomes essential. Speaking broadly, direct fire and a vertical base are as essential to coast artillery as concealment and indirect fire are to inland guns. Neither indirect fire,* which is practically useless against a rapidly moving target, nor concealment play a conspicuous part in coast defence, where a sufficient base is procurable. The modern accurate sighting system is there all-important, considerably more hits than misses being secured by the 6-inch gun at very great ranges with astonishing rapidity. Thus it is hardly too much to say that one such fixed gun, with its detachment well placed on the coast, has five to ten times the destructive power of a similar gun placed inland. In other words, *two hundred artillerymen behind guns well placed on the coast on the flank of a defended harbour are equivalent to something like an inland garrison of from* 1,000 *to* 2,000 *men manning guns on its land fronts.* The moral is that to go forward on those flanks, where favourable places exist, is politic and economical. This is not only an R.E. opinion, and not only my own inference. It is a line of argument which must be well grasped in discussing coast defence at the present time, and seems generally admitted by those experienced in latest results.

In applying it, I have hitherto confined myself to my own *metier,* which is harbour defence, attempting to utilize this coastal advantage more particularly on the south coast, which is so suitable, and where we have, as said, already a "chain of naval bases." Reliance on the naval defence of such excellent landing places as Torbay and Folkestone, so threatening to the harbours they adjoin, seems indeed an expensive and questionable policy, seeing that not only is free offensive action claimed for the Navy, but we are deficient in small craft, whilst, as Sir G. Clarke states, "The lessons of war prove that coast defences, so called, almost invariably fall as the result of a land attack, and that even when they are technically contemptible they serve their purpose." Doubtless if such places were defended on our south coast, we should have an almost continuous line of coast defence, but I have not myself advocated such a system as of universal application. On the east coast, for example, we have no naval bases north of London, and I have not dealt with this case.

It is clear, however, that some officers, considering that, as Major Molony says, "even our best fortresses have large gaps in their defensive circuit," realize that the field army or a part of it must move forward towards the coast line when those naval bases are threatened. One thing is certain, that we cannot "concentrate" our

* Whether firing direct or indirect, the 18-pr. field gun, firing shrapnel, may be more rapid than the 6-inch or other guns, when once the range is found; but the advantage of direct as compared with indirect fire still remains.

naval bases. We cannot pick them and their garrisons up, and put them all under one hat and sit upon it, or stand in front of it, or surround it with our little untrained force. To some extent we are committed to being "strong everywhere" by having to defend our naval bases, arsenals, and ports. Platitudes will not help us. Napoleon did not perpetually spout them. But he was a master of art, and he applied principles with common sense, being very careful always to have something worth "concentrating." This, too, should be our endeavour. If, moreover, there is to be co-operation, then clearly harbour defence is inseparable from coast defence, and coast defence inseparable from home defence; and as both Major Molony and Capt. Walker indicate, the only question is one of relative value and proportion—What is the correct relation between harbour defence and coast defence with regard to home defence as a whole?

We are thus, once again, brought face to face with our old friends the canons of all art—unity, proportion, and relative value—which so inevitably save us from riding wild hobbies, or from running amuck amongst desperate extremes. As already said, my own aim has hitherto been to keep strictly to the province of harbour defence, and I am fortunate so far in having, on the whole, the able support of Major Molony and Capt. Walker. But they, and perhaps, others, going further, seek to solve this relationship between coast defence (including harbour defence) and home defence. Putting aside the Blue Water School, and all extreme views, or such contentions as those of Sir George Clarke that a force of 40,000 men and 4,000 horses would "require at least 136,000 tons of shipping or 27 vessels averaging 5,000 tons,"* their desire appears to be to devise a general scheme of home defence, founded on what is *possible* in the way of invasion, rather than on what merely seems probable, since, as we have recently been told on high authority, "the bolt of war has often fallen from a clear sky." If, then, the proposal is now to propound a system of defence suitable against surprises and great emergencies, bearing in mind such notable events as Aegispotami, the crossing of the Alps by Hannibal, Constantine, and Napoleon, Ulm, the Norman Conquest, and our own temporary loss of the sea and of America, then I concur with Major Molony and Capt. Walker, and I think that here Major Harrison, and even "Forts," will be in agreement too, that the first point to settle is strength and distribution. Our aim should be to get the help of as many as possible of our inhabitants, not only inland, but on the coast; and to establish, for mutual co-operation, as has been so soundly suggested by several officers, the correct relation between coast defence and the field

* One wonders what tonnage Henry V. allowed when he landed at Harfleur with 30,000 men, cut himself off from his base, fought Agincourt, and eventually conquered France. Great men take great risks. The defences of Harfleur were weak.

army as factors of home defence on land, remembering that the first function of the Navy is offensive action at sea. Coast defence thus becomes merged in the larger subject of home defence on land; and, to secure unity and efficient co-operation we must, as a first step, fix the proportionate distribution of our forces as a whole with regard to the several parts, *i.e.*:—

1. The Coast.
2. The Supports.
3. The Reserve or Field Army.

Obviously the first question that arises thence is—should the line of coast be our line of resistance, the field army furnishing supports and reserves to move up to the threatened point; or, should the line of coast be regarded merely as a line of observation, to give warning to the field army, so that it may take up the most strategically and tactically advantageous position in rear of the threatened point? We have to bear in mind that our Territorial Army is not to begin to train seriously till war is declared, and that an attack may come like a bolt from the blue.

The schools of thought seem to divide themselves into two on this defensive question, as Major Molony has so clearly shown, *i.e.*:—

(1). Those who, accepting the orthodox view, propose to face the enemy when he marches inland, after landing unmolested at one of our "undefended" ports, such as Torquay or Folkestone, whose inhabitants have hitherto raised no objections to this visit of the invader to their homes.

(2). Those who—(i.) desirous of taking full advantage of the great power of modern weapons on the coast, (ii.) doubtful of the power of semi-trained troops to manœuvre, and (iii.) conscious of the need for sending, possibly, the whole regular army abroad on emergency—propose to endeavour to prevent a landing by defending the coast line, invoking the assistance of the inhabitants there, so easily capable of artillery training, in plugging the enemy with shell, instead of stuffing him with food.

Doubtless much may be said for the former alternative, though the advocates of the orthodox school do not seem to have enunciated the advantages they claim, and the once famous scheme for the defence of London is defunct. Major Molony has, however, skilfully propounded the advantages of the later idea, the arguments in favour of which may be summarized as follows:—

(1). That the coast affords an unmistakable and definite line of defence, requiring little knowledge of strategy and tactics.

(2). That that position, above all others, is, therefore, especially suitable to semi-trained troops, little experienced in manœuvre in the field.

(3). That in that position the conditions most favourable to defence are attainable, more especially the maximum destructive power of artillery, bearing in mind that Sir G. S. Clarke tells us that the essence of a good defensive position is "that the weapons of the defender shall obtain the utmost possible scope of action, and that those of the attacker shall have the minimum chances of effecting injury."

(4). That we must defend our naval bases and dockyards, which *are* on the coast, and the land fronts of which are most vulnerable to attack by landings effected on their flanks.

(5). That mobilization tables are easily worked out and practised in time of peace for concentrations on any sea front in time of war, with the aid of railways, motors motor buses, and steam trolleys.

(6). That there is available on our coasts a magnificent body of men in the sailors and fishermen living there—men accustomed to danger and hardened to weather, who would as joyfully man a gun to beat off an enemy as they would man a lifeboat to rescue a friend.

(7). Men are more easily trained as coast (fixed) artillery* and infantry than to manœuvre.

(8). That political agitation along our coasts, unless visibly defended, is notoriously apt to dangerously affect our naval policy, and we are weak in small naval craft.

These heads, I think, include all the advantages claimed by Major Molony. As regards distribution, I understand that he recommends (taking the Territorial Force as his basis)—

(1). One-third of the infantry to be entrenched within rifle shot of the beach.

(2). One-third to form mounted brigades in support, conveyed in motors, bicycles, buses, etc.

(3). One-third to be put at the railway junctions behind the coast.

What proportion and nature of artillery he recommends, except in Kent and Essex, I cannot find, but he recommends much more coast defence artillery than we have, in which I concur, though he states: "I should not propose to put troops on the coast till an invasion is

* Herein lies the difference between fixed coast artillery and field artillery, which latter arm, as Lord Roberts has just pointed out, requires very special training to be efficient.

actually threatened." As regards such a scheme generally, we labour at present under a two-fold difficulty, first, in not knowing what force may be available; secondly, as Major Harrison has pointed out, in not having any standard enemy. We might do as the Navy do, and adopt a one, two, or three-power standard. But even so we could not possibly fathom the strength of enemy likely to be brought over on an unexpected development; so that our scheme must be very general and calculated as far as possible to face the worst contingencies—the bolt from the blue. Here I concur also with Major Harrison, whose view I take to be that, on principle, we ought to have an expansive system, on a self-supporting basis, capable of including on emergency our whole able-bodied manhood for national defence, so that as many men as needful in any threatened part may be called up. Those who study history are aware that this actually was at one time our national system. "The maritime counties, even under Edward I., were liable for the charges of defending the coast."* More interesting still is it, as many may have noticed, that a large proportion of Militia battalions are said to have records dating from 1539. In that year we were threatened with invasion by Germany, and the French Ambassador of the time writes: "I found *every English subject* in arms who was capable of serving. Boys of 17 or 18 have been called out, without exemption of place or person."† 15,000 men of London in three brigades marched past Henry VIII., all in white uniform, headed by the Mayor and Aldermen "in white armour, with light coats of black velvet. Massive gold chains hung on their breasts. Their caps were of velvet, with plumes; and steel battle-axes were slung at their side."

Major Molony's scheme is doubtless on sound lines as far as data are available at present, but I suggest considering—

(1). Fixing first the number of coast brigades necessary to sufficiently retard any surprise landing, according to the facilities afforded by each portion of the coast for coast defence weapons.

(2). Fixing then the number of mounted brigades required in support between some such line as Taunton, Salisbury, Aldershot, Yarmouth, and the sea.

(3). Finally distributing the remainder as field army centrally at mobilization stations behind each front, such that any front could be easily supported in rear by sufficient strength, the total strength of the force being determined accordingly.

* Stubbs' *Cons. History of England.*
† Froude's *History of England.*

Artillery should, I think, be the paramount arm of the coast brigades, and the strength of this arm required will not be found excessive, having regard to the high efficiency of coast artillery, and the facts already stated as to its destructive power. I concur with Major Molony that 9·2 guns are not required everywhere, though in some cases essential. Medium and small guns (fixed and mobile), machine guns, and rifles are the mainstays of coast defence. As regards, however, guns mounted on trucks on railway lines, the aim should be to secure direct fire for the reasons already given. Indirect fire might occasionally be suitable against anchored transports, and on very flat coasts, but the general artillery view, I understand to be, that to use it on the coast is to sacrifice the main advantages of coastal positions, and with this view I concur. The use of motors and motor buses was dealt with in a lecture by Colonel the Right Hon. Sir J. H. A. Macdonald, K.C.B., Honorary Colonel of the Motor Reserve—published in the *R.U.S.I. Journal* for April, 1907. Starting with the assumption that our aim must be to prevent an enemy from landing, and that "for this purpose the thing to be desired is that we shall be able to concentrate rapidly a fire force at the place where a landing is to be attempted," he proceeds to show, amongst other little items, that 1,500 motor buses could convey 275,000 men from London to Dorking (26 miles) in 30 hours; but the question of roads, crossings, and collisions is avoided. Nevertheless, recent elections have shown what organization can effect by utilizing motors. It is also noteworthy that 20 buses (sometimes available in provincial towns) can convey a battalion any reasonable distance with great rapidity; and the suitability of these and steam trolleys for concentrations on the coast may yet be practised at future mobilizations of the Territorial Army, and would create great interest.

In conclusion, may I thank Major Molony, Major Harrison, and others for their valuable suggestions, as far as I am concerned, though they have doubtless been put forward by them as a labour of love. Certainly, we cannot too much consider either the relation of coast defence to home defence, or of home defence to imperial defence, or the relative value of land as compared with naval coast defence.

SOME NOTES ON AEROPLANES.

By Capt. R. P. T. Hawksley, R.E.

The science of flight, as relating to machines whose support is based on the dynamic reaction of the air, has proceeded so far that it is now founded on real facts, on natural laws (which are, however, as yet only partly understood), and on a long series of experiments. During recent years these experiments have increased in number and importance, owing to the enormous advance in the manufacture of the internal explosion engine, and of materials suitable for supporting surfaces and other parts.

Although it is somewhat difficult, if not impossible, to obtain information as to the most recent experiments and successes, yet Chanute, in his *Progress in Flying Machines*, gives information on a large number of experiments. Most of these are of extremely little use, the earlier ones being certainly the work of visionaries who had not studied even the elements of the science, if indeed they were then in a position to obtain any data to commence on. Needless to say a great many of these men broke their necks.

The later experiments detailed by Chanute are, on the other hand, of great use, for it is in these that theory begins to join hands with practice.

Among the authors of the latter may be mentioned :—

Phillips (1884), who invented and patented the "dipping edge," which will be touched upon later.

Maxim, who made a successful experiment in 1892.

Lilienthal (1892), who personally made a long series of gliding experiments on aeroplanes of various shapes. He unfortunately lost his life, in an accident, during one of these experiments.

Langley, Duchemin, and Joessel were mathematicians and theorists, who framed most important laws as to pressure and so forth.

Among the more recent mathematicians who have investigated the subject is Lanchester, whose *Aerodynamics* is an exhaustive review of the science (one volume is published and a second is promised). The only drawback to this work is that Prof. Lanchester begins where most people leave off.

Chatley's *Problem of Flight* gives a mass of information, but is not everywhere entirely convincing.

Navigating the Air, by the Aero Club of America, is a popularly-written work, and contains a proportion of useful information.

Among those who have of recent years made actual experiments, and gone up unto the air on aeroplanes, may be reckoned Santos-Dumont, the Wright brothers, and Farman, and the efforts and successes of these men have given the science an enormous impetus.

The following are some of the points which concern the design of an aeroplane:—

1. Lateral and longitudinal stability under all conditions of flight.
2. The shape of the machine and its parts.
3. The shape and area of the planes or supporting surfaces, in relation to the weight carried and the power generated.
4. Power, how generated and applied.
5. Starting and alighting.

The Wright brothers have made many flights of several miles, and have even made one flight of as great a length as 24 miles. On all these occasions the flights were made in perfect safety, and were only stopped by want of fuel, hot bearings, or some similar cause. Unfortunately, these flights have been kept so secret, and the machines have been kept so jealously from the public view, that very little is as yet known of the designs adopted.

Farman recently made a successful flight in Paris. In spite of his success, it is extremely doubtful if his machine has sufficient balancing power to render it even partly safe; and after all safety is the essential quality.

The fact however remains that successful flights have been made, and that all the conditions enumerated above—with the exception of the first—have been at least partially complied with. From this it is fair to assume that lateral and longitudinal stability is, at present, the main difficulty to be overcome in order to make the aeroplane of practical value. The remaining points, although partly solved, still require attention, and, perhaps, radical alteration.

Taking the points enumerated above in order:—

1. *Lateral Equilibrium.*—It is an established fact that a single plane of almost any shape, if provided with a following or guiding plane, will glide to the ground at a gentle angle, provided it remains laterally in a horizontal position. If however owing to a beam wind or to a deviation from the straight course, one side falls lower than the other, then nothing will prevent this motion continuing until the plane arrives at an angle where the resolved area is insufficient for support. It will then fall violently to the ground. This also applies if the plane is provided with power, and if there are tiers of planes in lieu of single planes.

If however instead of one single plane, or a tier of single planes, there are substituted two planes, or tiers of two planes, set at a dihedral angle, ridge downwards and fore and aft, then the conditions are altered. The tendency is for the planes to return to their normal positions when disturbed, unless they are taken aback owing to a sudden side wind or shift of helm. If this happens and there is insufficient "helm," the result must be disastrous, as the supporting surface, by being taken aback, is so reduced that resistance to gravity becomes impossible. From this we learn :—

Firstly, that the centre of pressure of the whole machine, when viewed laterally, must be abaft the centre of gravity. This will give the operator some control over his machine, in that he can, in such a case, put his helm down and luff.

Secondly, in order to avoid the possibility of being taken aback at all, some automatic arrangement should be provided which will cause the planes to return at once to the normal position, if moved by a sudden disturbance. This automatic provision has as yet not been devised, unless, by chance, the Wrights have hit upon the correct solution of this difficult question.

Longitudinal Stability.—This is equally important, and can only be satisfactorily provided for by automatic means. Joessel, Langley, and Rayleigh have established the law relating to the centre of pressure of a plane. This law states that in a square plane, normal to the pressure, the centre of pressure coincides with the geometric centre, or centre of gravity, but, as the plane is inclined to the horizontal, the centre of pressure moves toward the cutting edge. The same law applies in a greater or less extent to planes of any shape or of any section, if indeed the term "plane" may be applied to a curved surface.

This disturbance gives rise to plunging when the machine is proceeding at a small angle of elevation ; and it is this plunging which must be obviated by automatic means, it being apparently not possible to control the movement by means of the rudder alone. No such means have as yet been devised, but automatically-moved weights or planes seem to be required.

2. *The General Shape of the Machine.*—In almost every case, except that of Langley's model aerodrome, experimenters have attempted flights with machines of large width and comparatively very small length.

Some have been close imitations of birds, and have been composed of a short body on which a pair of dihedral planes are fixed, or a series of superposed dihedral planes.

A further and smaller plane has been placed in front or rear, either acting as a steering plane or as a balancing plane, or both. A rudder in front or rear, but more often in front, has been provided, and propellers have been placed either in front or in rear.

Owing to the extreme shortness of these machines, longitudinal stability must have been a matter of difficulty or of chance.

It is exceedingly doubtful if this type will survive, and all considerations seem to point to a much longer type being necessary, perhaps on the lines of Langley's machine. On the other hand, it must not be overlooked that in a machine such as Langley's, the efficiency of the planes and propellors in rear may be interfered with by those in front. It is necessary that the limits of this interference be determined by experiment.

The stream line theory must be considered in the design of suitable parts, such as the car, etc.

3. The shape of the supporting surfaces is a matter of considerable importance. In 1884, Phillips invented and patented planes with what is termed the "dipping cutting edge." This shape was also devised by Lilienthal and Lanchester in 1890 to 1894. These three authorities designed their planes somewhat thicker immediately behind the cutting edge than elsewhere. This shape, with modifications, seems to be adopted by all later authorities and experimenters.

It is curious to note the similarity between the curved plane and the "bellying" sail of a vessel. Phillips stated, in his specification, that in such planes the current of air struck the forward edge and was deflected upwards, thus causing a partial vacuum above the after surface of the plane. This theory, although it seems plausible, is said to have lately been discredited.

Joessel's law, as to the centre of pressure of a plane, points to the area of greatest pressure being always in front of the centre of gravity, hence the fore and aft length of the plane should be small, and the lateral width great, for any surface behind the centre of gravity must be more or less useless weight.

The proportion given in the later experiments is 1 to 5 or 1 to 6, but it is possible that even this proportion is too great. Phillips went so far as to propose a series of curved planes with dipping edges 1½ inches long fore and aft, and 22 feet wide laterally, the whole supporting surfaces somewhat resembling a Venetian blind. Holland, of submarine boat fame, suggested a similar arrangement. Such an arrangement of planes must be so designed that the after planes are not interfered with by the wake of those in front. It is obvious that the less the fore and aft length of a plane, the less will lateral currents of air be felt.

As regards the area of the supporting surfaces (in relation to the weight carried) the greater the velocity, the less area is necessary to support a given weight, but as this presupposes the machine to be in full flight, a minimum area must be determined upon for the purpose of starting a flight, whether from the ground or from a height.

This ratio can only be determined by experiment, and must

depend to a great extent on the materials used. No definite decision seems as yet to have been arrived at.

Maxim	allowed about	$\frac{1}{2}$	square foot	per lb.
Santos-Dumont	,,	2	,,	,,
Phillips	,,	$\frac{1}{3}$	,,	,,
Lilienthal	,,	$\frac{3}{4}$	,,	,,
Hargreave	,,	$\frac{1}{7}$	,,	,,

As regards the relation between the power, weight, and speed, we have the following records :—

Maxim	22 lbs.	per H.P. at	30	miles per hour.
Santos-Dumont	9 lbs.	,,	24	,,
Wright	62 lbs.	,,	30	,,
Do.	53 lbs.	,,	34	,,
Do.	46 lbs.	,,	38	,,

If Wright's observations are considered, it will be noticed that the weight per H.P. varies inversely as the speed, as it should do. When high speeds of say 100 to 150 miles per hour are attained, the proportion of weight to H.P. will be greatly decreased, owing to the resistance of the parts of the machine, such as the car, etc.

Chanute assumes that 100 lbs. per H.P. can be safely sustained.

4. The power is, and probably will be, provided by internal explosion engines, actuating one or more propellers, until wireless power solves the difficulty. The "Antoinette" motors are the latest in use, and are made now as light as 2·2 lbs. per H.P.

In the case of steamships, efficiency to the extent of some 75% of the I.H.P. is obtained, and, of the loss, some 10% is due to slip. Owing to the lack of viscosity of the air, the slip in an aeroplane is a great deal more than in the case of a steamship, and is undetermined at present.

5. *Starting and Alighting.*—Most aeroplanes have hitherto been provided with wheels, on which the machine runs along the ground, until it has attained sufficient speed to enable gravity to be overcome. This peculiarity has earned such machines the nickname of "Grasshoppers." In some cases specially prepared tracks have been provided for this method of starting.

Until the science has arrived at a stage where machines can with ease rise from the ground, it would seem to be more reasonable to provide stations at a height. Rising from rest is the most difficult evolution that an aeroplane can be asked to perform; it would seem to be more reasonable to expect a start to be made from somewhere in its own element. A steamship is not asked to pick up passengers at their front doors.

Perhaps the assistance of vertical helices will be required eventually

for the raising of the machine from rest on the ground. In such a case the vertical helices might be required to revolve into the horizontal position when sufficient height had been attained.

The pluck of the pioneers of this science is much to be admired, when it is considered that, in most cases, they have carried out their experiments over the hard ground. A more rational method would surely be to experiment over a warm and shallow sea, the machine being provided with a buoy and line, and the operator with a lifebelt, to ensure recovery of both in case of a fall.

Alighting is a point which has apparently been little considered. The "grasshoppers" alight on their wheels and run along the ground until momentum vanishes. The weight of the wheels and their gear must cause a certain amount of power to be wasted. Vertical helices may eventually solve the question.

If aerial stations are adopted, they would have to be so designed as to be able to catch the machine after a flight, as well as to start it on a flight. In the case of alighting, if the operator brings his machine up with too much weigh on, or misses the landing station, then he has plenty of room to get weigh on again and try a second time. Not so on the ground. In this case a bad shot means a broken machine and great danger to the operator.

It seems probable that bringing an aeroplane to its moorings will be an exceedingly difficult evolution. The machine will have clearly either to stop almost dead and drop down on to a cradle, or will have to hook on, below a horizontal arm, when travelling at its lowest speed. Neither of these operations appears to be easy of accomplishment.

A perfect type of aeroplane should be able, in case of an accident to the machinery or propellers, to glide gently to the ground without receiving damage. This quality is not yet in sight.

To sum up. If perfect automatic equilibrium, both lateral and longitudinal, as well as a fair percentage of efficiency in the propeller could be attained, there does not seem to be any reason why aeroplanes should not become a practical proposition, but as these points have as yet baffled human genius it may not be correct to be too sanguine.

Aeroplanes will probably never become commercially possible and will never compete with the present methods of transport, but for private, sporting, and similar purposes, they will naturally be in great request.

In warfare they will be invaluable for scouting, if, indeed, it will be possible to make accurate observations when travelling at high speeds. It seems exceedingly doubtful if the power of demolishing battleships by dropping explosives, which is given to aeroplanes by novelists and other visionaries, will be within the range of practical politics. It is at any rate not in sight at present.

THE FORTIFICATION SCHOOL AT THE S.M.E.

By Lieut.-Colonel B. R. Ward, R.E.

On October the 28th, 1812, Major Pasley issued his first order as "Director of the Royal Engineer Establishment." It runs as follows :—

"By virtue of His Royal Highness the Prince Regent's warrant issued in the name and on behalf of His Majesty, bearing date the 23rd April, 1812, whereby he was pleased to authorize an Establishment for the Instruction of the Corps of R.M. Artificers, or Sappers and Miners, and of the Junior Officers of the Corps of Royal Engineers, in Military Field Works, of which Major Pasley has been appointed Director, the N.C. Officers and Privates of the Detachment who are, or may hereafter, be employed in learning the practical part of the Field Duties, shall be classed as follows :—All N.C. Officers not qualified to act as Assistant Teachers, shall be put upon the First Class allowance immediately on joining this Establishment, but the Privates shall be put upon the Second Class until a sufficient period shall have elapsed to enable the Officers to judge of their merit, after which, those who are recommended as the most deserving men, shall be placed on the First Class. Drummers not grown up shall be placed on the Third Class, as shall be placed such Privates as are negligent or inattentive to their Field Duties, or who are guilty of unsoldierlike conduct and irregularities. . . . The allowance for the three Classes are as follows :—The 1st Class, 9d. per diem ; the 2nd Class, 6d. per diem ; and the 3rd Class, 3d. per diem.

"The temporary Field Works which will be constructed here merely serve for the Instruction of the men, so that after one set of men has been trained, the works erected by them will be pulled to pieces and the ground levelled, in order that new works may be constructed for the instruction of another Party. As these works will, therefore, not be of any permanent use or benefit to the Country, like the works which the men will be employed in constructing in Garrisons, the allowances granted to men employed in this Establishment must be considered very liberal on the part of the Government.

"It is intended that the whole Corps of R.M. Artificers, or Sappers and Miners, shall go through the same course of duty at present performed by the detachment here, receiving the above-mentioned allowances, until they have learned their Field Duties, and everyone knows that in all trades and professions, a learner or apprentice

cannot expect the same wages as he might claim when perfect in it. But at all other times when employed in work they will receive the regular working pay specified in His Majesty's warrant for the formation of the Corps with which the present warrant does not interfere, the Duties being perfectly distinct, etc., etc., etc.

"The men will parade for drill at 7.0 a.m., 10.30 a.m., and 2.0 p.m. The new detachment will commence Practical Geometry, Arithmetic, etc., to-morrow morning, and those who attend these duties shall be exempt from the morning drill. Those who are reported perfect in drill will commence Field Works on Monday morning."*

Thus was the School started, and the first company of trained sappers to be sent out to the Peninsula was despatched with a division of battering train ordnance from Portsmouth in the following July.

The fleet of transports arrived off San Sebastian on the 19th August, 1813,† and a company of sappers was landed on the following day. This company (the second of the 2nd Battalion) was the first company in the Corps to wear the scarlet uniform. They were nicknamed "Pasley's Cadets"‡ by their old-fashioned, blue-coated comrades.

Sir John Jones has testified to the fact that Pasley's cadets were "useful and intelligent"; and, although they had not much opportunity of distinguishing themselves during the short remaining period of the Peninsular War, it may fairly be claimed that the R.E. Establishment, as a Fortification School, had proved its value, even before the experience of the Waterloo Campaign had established its reputation beyond the possibility of cavil.

The original Royal Warrant of the 23rd April, 1812, authorizing the Establishment at Chatham, distinctly laid down that the sole object of that Establishment was the instruction of the Corps of Royal Sappers and Miners, and of the junior officers of the Corps of Royal Engineers, in military fieldworks.

The Fortification School is now only one of the branches of the S.M.E., but in 1812 the R.E. Establishment was a Fieldworks School and nothing more. At first the instruction of officers appears to have been entirely theoretical.§ The staff of the R.E. Establishment was no doubt at first kept down at too small a number to admit of officers being told off in instructional classes.

The following extract from p. 10 of the *Standing Orders* published in 1818, shows, however, that officers were, to some extent at least, expected to look after their own technical education :—

"Officers of the Royal Engineers are always to consider themselves

* Porter's *History of the Corps*, Vol. II., pp. 172 and 173.

† Jones' *Sieges in Spain*, 3rd edition, 1846, Vol. II., p. 51.

‡ Connolly's *History of the Royal Sappers and Miners*, 2nd edition, 1857, p. 202.

§ Pasley's *Standing Orders*, p. 217.

on duty. If they are not ordered for practical duties, they will be employed in drawing plans, writing useful memoirs, etc., and even if no positive task of this nature should be assigned to them by their Commanding Officer, they ought to feel so much the importance of their situation, and the character they have to support in the Army, that they ought voluntarily to occupy themselves in the study of their profession, and of military affairs in general."

The N.C.O.'s and men were, however, on a different footing. Every non-commissioned officer, private, and bugler, doing duty at the Establishment, had to attend the regimental schools every morning, either as a teacher or learner.

The chief object of the course of study in these regimental schools was—as laid down by Pasley on page 129 of his *Standing Orders* of 1818—"to qualify the non-commissioned officers and privates for the very important duty, which continually falls to their lot on service, of assisting their officers to lay out fieldworks, etc., and to superintend the execution of them, by giving such directions as may be necessary to working parties, furnished either by regiments of the line, or by peasants of the country which is the seat of war."

Many men of the Royal Sappers and Miners, however, could neither read nor write. These had to pass successively through the reading and writing schools before attending the School of Practical Geometry. This last school was conducted as laid down in the first volume of Pasley's *Course of Military Instruction*.

Having been taught the principles of plan drawing, they went on to the second volume of the *Course of Military Instruction*, which included Fortification and Military Mining. Arithmetic and mensuration were next taught, with special reference to fortification, the men being taught, for instance, how to calculate the number of cubic yards of excavation in a given length of parallel of a given profile. Meanwhile practical work in the field was being carried out concurrently with the work in the regimental schools. The men were also taken to some convenient part of the Lines, or to Fort Pitt, and the terms of permanent fortification as exemplified in the bastion trace were explained to them.

Pasley was very particular as regards correct nomenclature and pronunciation. At the various *vivâ voce* examinations, on which Pasley laid great stress, the officers and N.C.O.'s on duty were held responsible that the terms laid down in the printed *Course of Instruction*, and in the manuscript *Memoirs of the Establishment*, were invariably adhered to, "without any mixture of French or other foreign phrases";* and, as regards pronunciation, "the barbarous terms, *gabeen*, instead of *gabion*, *fasheen*, etc., borrowed from the old artificers," were to be checked by the officers.†

* *Standing Orders*, 1818, p. 158.
† " " " p. 135*n*.

The course of instruction for officers in Pasley's time is laid down in Section XV. of the *Standing Orders* of 1818. It consisted in drawing a couple of plans referring to the attack of a regular fortress, in writing a series of memoirs on brushwood, bridges, saps, mining, pontooning, etc., and in framing estimates of men, horses, and stores for completing an engineer brigade, a train of 20 pontoons, and a bridge equipage of casks.

As the officers under instruction were employed in superintending all the practical duties carried out at the R.E. Establishment, and were also entrusted with the monthly examination of the men of the companies to which they were attached, it was expected that they would be able to pick up sufficient information in field engineering subjects to enable them to tackle the foregoing plans, memoirs, and estimates. In addition to this, manuscript memoirs and other documents belonging to the R.E. Establishment were kept by the Clerk of Works, and were available for their assistance.

A progress return of the junior officers at the Establishment was forwarded every month to the Inspector-General of Fortifications. This return showed the number of plans and memoirs completed by each officer under instruction.

During the Directorship of Sir Frederic Smith—Pasley's successor in 1842—translations from the French official journals of sieges in the Peninsula were added to the officers' course. Some 50 volumes of these journals—the journal of each siege being bound up separately—are still in existence among the S.M.E. archives. In order to ensure continuous work, the original and translation had to be sent in until completed to the adjutant's office every Sunday morning at 9 o'clock.

This practice of translating Belmas' *Journaux des Sièges dans la Péninsule de 1807 à 1814* was continued during the Directorship of Sir Harry Jones, and appears to have been dropped soon after the Crimean War, during the Directorship of Colonel H. Sandham.

The course of instruction for the N.C.O.'s and men of the Royal Sappers and Miners is laid down in Section XIII. of the *Standing Orders* of 1818. Instruction in fieldworks, or, as it is called in the *Standing Orders*, in the "practical operations," was carried out throughout the year. Mining, for instance, was considered a suitable occupation for the winter months, pontooning being generally carried out in summer time.

A progress return for the companies of Royal Sappers and Miners, serving at the R.E. Establishment, was sent monthly to the Inspector-General of Fortifications, and in this return the N.C.O.'s and men were classified under the various branches of instruction as "Able," "Imperfect," or "Unpractised."

One company at the Establishment was looked upon as a depôt company. This company furnished N.C.O.'s to act as teachers in the regimental schools, and also furnished men for the duties of the

workshops, and for modelling when required. Transfers occasionally took place between the depôt company and others, so as to bring in new N.C.O.'s and men as instructors from time to time.

Since the establishment of the Fortification School at Chatham siege manœuvres on an extensive scale have been carried out on several occasions.

The earliest of these—so far as any record can now be traced—took place in 1833. A drawing made by Capt. J. Jebb, R.E.—afterwards Sir Joshua Jebb—was lithographed at the R.E. Establishment, and represents the trenches occupied by the garrison, and the explosion of a mine that took place on the 18th June, 1833. A copy of this lithographed drawing is now hanging in the Museum in the R.E. Institute. This picture is of considerable interest, as it represents perhaps the earliest manœuvres, properly so-called, that ever took place in this country. Field manœuvres were certainly not instituted until after the Crimean War, and were in any case very slightly developed until after the Franco-German War of 1870.

Siege manœuvres were however carried out at the R.E. Establishment in 1833, when Colonel Pasley was Director, and again in 1844, 1846, and 1848, under the Directorship of Colonel Sir Frederic Smith. Lithographed accounts of the operations in the forties are extant in the S.M.E. archives. The siege operations from 1833 to 1848 were directed against the left flank of the inner Chatham Defences, from Prince Frederic's Bastion to the Terrace Bastion. This front of attack included the old ravelin—still standing—between Prince Frederic's Bastion—now occupied by the S.M.E. workshops—and the Duke of Cumberland's Bastion. The right face of the latter bastion is still quite distinguishable, overlooking as it does the space between the officers' block and Block B of the new Naval Barracks. The salient of the bastion has been cut away to form the slope down to the Naval Barracks.

The bastioned fronts attacked—Prince Frederic's and the Duke of Cumberland's Bastions—are alluded to in the account of the operations lithographed in 1848 as "old fieldworks." They probably formed part of the early defences of Chatham before the permanent works known as the Great Lines were constructed. The latter were completed about 1807, having been commenced in 1758.

During the fifties no siege manœuvres appear to have been carried out. Doubtless the Siege of Sebastopol gave sufficient experience and practice in this class of work to render peace manœuvres a work of supererogation. A new edition of Pasley's *Instructions on Mining* was, however, got out by Capt. H. St. George Ord, Adjutant, Royal Sappers and Miners, in 1853, during the Directorship of Sir Harry Jones.

It was not until 1868—during the Directorship of Major-General Sir Lintorn Simmons—that the next siege manœuvres took place.

These manœuvres consisted entirely of mining operations, the attack being carried out against the salient of the right demi-bastion in front of St. Mary's Casemates.

It is interesting to note that the junior officer employed in the attack was H.R.H. Prince Arthur, who at that time held a commission in the R.E., prior to his transfer to the Rifle Brigade. Thirty-nine years later the same Royal Prince, as Inspector-General of the Forces, attended the siege operations that were carried out against two of the Chatham detached forts in August, 1907.

In 1871, when Colonel Thomas Gallwey was Commandant of the School of Military Engineering, siege manœuvres were carried out against the left of the Great Lines. An account of these operations is given in the *R.E. Journal* for November, 1871.

In 1873 siege operations took place against the same portion of Lines, mining operations being conducted against the New Ravelin, an earthwork which had been thrown up by convict labour in the previous year. An account of the operations is given in the *R.E. Journal* for July and August, 1873.

Again in 1877 mining operations were conducted against the New Ravelin. On 27th July, 1877, an assault, in which all the troops of the garrison took part, was carried out. An account of the operations, which were conducted under the eye of H.R.H. the Duke of Cambridge, is given in the *R.E. Journal* for August, 1877.

From 1877 to 1907—a period of 30 years—no real siege manœuvres appear to have been carried out at Chatham. Possibly the experience of the war of 1870 encouraged the view that fortresses could be taken by blockade. Plevna, in 1876, was more of an attack on a field position than a regular siege, and it was not till the Siege of Port Arthur in 1904 showed the possibilities of close fighting at sieges under modern conditions, that the almost forgotten art of siege warfare was again studied.

The siege manœuvres of 1907 are so recent that nothing further need be said about them, except that they were carried out on a more extensive scale, and have been more elaborately recorded than any previous siege manœuvres carried out in this country.

Bridging manœuvres have been carried out over the Medway on various occasions. When Colonel Leahy was Instructor in Fieldworks (1871–1876) a pontoon bridge was thrown across the Medway at Upnor. The infantry of the garrison and a field battery were marched over the bridge. Later, in August, 1877, similar manœuvres were held at Wouldham, and in 1898 again at Upnor.

A scheme is being prepared for similar manœuvres to be carried out during the present year at Upnor.

The following are a few of the fortification text books which have been got out at the S.M.E. since Pasley's first *Standing Orders*, in 1818 :—

Rules for Conducting the Practical Operations of a Siege, by Lieut.-Colonel C. W. Pasley, R.E., F.R.S., 1829.

Rules for Sapping, issued by Colonel H. D. Jones, 1854.

Batteries, etc., in Accordance with the Field Instruction at the R.E. Establishment, by Major F. C. Hassard, 1858.

The Sapper's Manual, by Capt. W. A. Frankland, 1868. This appears to have been the original form of the *Manual of Military Engineering*, the present engineering text book for officers of all arms.

Shortly afterwards, a single bulky volume, entitled *Instruction in Military Engineering*, was got out, and in 1872 the first edition of the present series, in six parts, of field engineering text books was published under the same title. The title has recently been altered to *Military Engineering*. These text books are constantly under revision.

The present course for officers lasts for 105 days, the sapper recruits' course lasting 71 days. Sappers destined for Fortress (Electric Light) Companies go through a shortened course of 56 days.

In May and August in each year courses for officers of the Territorial Force are carried out. A course for the rank and file of the Territorial Force is also conducted in August.

A course for cavalry pioneers—officers and men—is carried out in October.

A Qr.-Mr.-Sergt. Instructor is sent for two months every year to the Cavalry School at Netheravon to instruct officers and men in fieldworks, and similarly Qr.-Mr.-Sergt. Instructors are sent to the Anglesey and Monmouth Militia—now Territorial Force.

An annual refreshing class is held for N.C.O.'s of R.E. service units. This course lasts 40 days. N.C.O.'s destined for duty on the Permanent Staff of R.E. Territorial units go through a course of 60 days' fieldworks. R.E. N.C.O.'s selected for service in India go through a six weeks' course at the Fortification School. A 12 days' course for infantry pioneer sergeants is also held annually.

In addition to all this instructional work, the Fortification School is kept busily employed in experimental work. For instance, a new bridge equipment for field troops, mining tools, and stores for demolitions, have all recently been taken in hand. This work is carried out under the direction of the R.E. Committee.

Medals are given to junior officers under instruction, and to recruits, for proficiency in fieldworks. These medals are provided from a fund forming the balance of subscriptions raised to commemorate the late Capt. Alfred E. Haynes, R.E. A short obituary notice of this officer was published by Sir Charles Warren in the *R.E. Journal* of the 1st September, 1896.

Capt. Haynes obtained his first commission in 1880, and was killed in action in East Africa in 1896. He had done good service as a subaltern in 1882 under Colonel Warren in the Desert of Sinai.

Twelve years later Haynes published an account of this expedition—which was undertaken in order to bring to justice the murderers of Palmer and Gill—in a book entitled *Manhunting in the Desert*, published in 1894. He was again employed in 1884 under Colonel Warren, who, in organizing the Bechuanaland Expedition, selected Haynes as his private secretary. For his services in this capacity he was mentioned in despatches.

Haynes' connection with the S.M.E. extended over a period of several years. From 1890 to 1895 he was employed under Major A. O. Green as Assistant Instructor in Survey. In 1895 and 1896 he was in command of A Company. This duty he carried out so well that he was informed, on leaving the S.M.E., that probably the most useful period of his career had been the year in which he was employed on the duty of commanding a company of the Training Battalion.

In May, 1896, he sailed for Mauritius in command of the 43rd Company, which had just been raised. He reached Durban with his company in the *Garth Castle* at the end of June. Affairs were at that time in a critical condition in Mashonaland. Haynes telegraphed to the G.O.C., Cape Town, for permission to join the force then being organized under Colonel Alderson. The offer was at once accepted. Haynes and his party of 3 officers and 91 rank and file did good service on the expedition, and he himself was killed—shot through the head—while leading an assaulting party which captured Makoni's stronghold on the 3rd August, 1896. A memorial tablet to Capt. Haynes has been erected in the South Transept of Rochester Cathedral.

The first award of Haynes Memorial Medals was made in 1902. A bronze medal is given to the officer in each batch of young officers after going through the course of fieldworks, the nomination being made by the Commandant, S.M.E.

The following officers have been awarded the medal up to date:—

1902.—2nd Lieut. E. W. Cox.
" S. W. S. Hamilton.
" C. W. Bushell.
1903.— " A. H. L. Mount.
1904.— " C. R. Satterthwaite.
" E. V. Binney.
1905.— " L. C. B. Deed.
" L. E. Becher.
1906.— " J. A. A. Pickard.
" E. M. Sinauer.
1907.—Lieut. R. Hamilton.
2nd Lieut. H. L. Woodhouse.

A bronze medal is also given to the sapper in each batch of recruits who is best qualified in fieldworks after going through the recruits'

course in that subject, the nomination being made by the Officer Commanding Training Battalion.

The following sappers have been awarded the medal up to date :—

Regl. No.	Name.	No. of Squad or Party.	Year.
9322	C. R. Duhy.	(51)	1902
1838	P. Harcourt.	(52)	,,
9482	F. Deeks.	(53)	,,
9689	A. Watkins.	(54)	,,
9936	G. Gurnsey.	(55)	,,
9983	J. H. Howard.	(56)	,,
6849	F. Millar.	(57)	,,
10445	S. F. Poole.	(58)	,,
10458	J. McWilliams.	(59)	,,
10565	W. Andrew.	(60)	,,
10453	W. Betts.	(61)	,,
2396	W. R. Cullen.	(62)	,,
11062	G. H. Webber.	(63)	,,
11119	E. G. Lehern.	(64)	1903
11261	A. E. Drew.	(65)	,,
11362	J. Hanna.	(66)	,,
11409	W. J. Edwardes.	(67)	,,
11459	J. Hurst.	(68)	,,
11747	F. J. Padfield.	(69)	,,
11870	E. Mahoney.	(70)	,,
11905	C. Stevens.	(71)	,,
12004	F. A. Robson.	(72)	,,
12095	L. Lloyd.	(73)	,,
4458	N. Wall.	(74)	,,
12717	H. Gibbons.	(76)	1904
12738	A. J. Alabaster.	(77)	,,
12511	T. Wilson.	(75)	,,
12750	J. Mealy.	(78)	,,
12673	E. Pickford.	(79)	,,
12836	T. H. E. Wood.	(80)	,,
12859	F. Ridd.	(81)	,,
12910	A. Mackercher.	(82)	,,
12940	J. Tanner.	(83)	,,
12967	E. W. Hoyton.	(84)	,,
13139	W. J. Ruse.	(85)	,,
13250	H. Hearn.	(86)	,,
13393	A. R. Lidstone.	(87)	,,
13576	G. R. Smith.	(88)	,,
13755	H. Seviour.	(89)	1905
13771	S. H. Wass.	(90)	,,
14081	S. Woods.	(92)	,,
10523	A. Humphreys.	(91)	,,

Regtl. No.	Name.	No. of Squad or Party.	Year.
14335	J. Ward.	(93)	1905 (*cont.*)
14341	G. E. Balfe.	(94)	,,
13656	G. Glover.	(95)	,,
14572	W. J. Hadley.	(96)	1906
14610	S. H. Oborne.	(97)	,,
14707	C. H. Milne.	(98)	,,
10100	W. W. Parsons.	(99)	,,
14806	G. Beatty.	(100)	,,
10153	T. Deveney.	(101)	,,
15064	B. Hobdey.	(102)	,,
11244	J. E. Hughes.	(104)	,,
15140	A. H. Godfrey.	(103)	,,
15423	A. A. Irwin.	(105)	,,
15665	W. Wilson.	(106)	,,
15710	G. Alesbury.	(107)	1907
15868	A. R. Box.	(108)	,,
16054	H. M. Mace.	(109)	,,
15249	E. Smith.	(110)	,,
16481	J. Gardner.	(111)	,,
13735	J. W. Barnett.	(112)	,,
16275	H. Goodfellow.	(113)	,,
16641	O. W. Ennever.	(114)	1908
4519	H. Gunning.	(115)	,,
16760	R. Shirley.	(116)	,,

The following is a complete list, as far as can now be ascertained, of the various officers who have held the appointments of Instructor and Assistant Instructor in this branch of study.

During the early years of the R.E. Establishment, the instruction was no doubt mainly carried out by the Director and the Adjutant.

INSTRUCTORS IN FIELDWORKS.

Adjutants up to...	1841-
2nd Capt. J. W. Gordon	1846-
Major Hassard	1855-1859
,, J. W. Lovell	1859-1865
Brevet Colonel W. O. Lennox, V.C. ...	1865-1871
Brevet Lieut.-Colonel A. Leahy ...	1871-1876
Lieut.-Colonel J. P. Maquay	1876-1879
Major A. G. Durnford	1879-1883
,, M. T. Sale, C.M.G.	1883-1887
,, J. W. Savage	1887-1891
,, T. R. Main	1891-1896
,, L. C. Jackson	1896-1902
,, G. M. Heath, D.S.O.	1902-1906
Brevet Lieut.-Colonel G. H. Fowke ...	1906-

ASSISTANT INSTRUCTORS IN FIELDWORKS.

Lieut. G. Phillips	1855-1858
„ A. W. Durnford	1858-
„ C. G. Gordon	1859-
„ V. G. Clayton	1859-1860
„ J. M. H. Maitland	1861-1862
„ V. G. Clayton	1862-1866
„ J. J. Robertson	1866-1867
„ T. Fraser	1868-1873
Capt. W. Merriman	1871-1875
„ R. H. Williams	1873-
„ M. T. Sale	1873-1876
Lieut. S. Waller	1876-1878
Capt. J. Matheson	1875-1881
Lieut. M. H. Gregson	1879-1883
„ T. R. Main	1881-1887
„ H. N. Smith	1883-1884
Capt. H. W. Renny-Tailyour	1884-1886
Lieut. G. E. Shute	1884-1889
Capt. H. J. W. Jerome...	1887-1888
Lieut. A. W. Roper	1888-1892
Capt. W. M. Hodder	1889-1891
Lieut. J. R. Young	1891-1896
„ E. McL. Blair	1892-1896
„ J. C. Matheson	1896-1902
„ E. D. Swinton (S.A. 1899-1902)	1896-1902
„ R. L. B. Thompson	1901-1904
„ C. B. Thomson	1902-1905
„ R. L. Waller	1904-1908
„ A. H. du Boulay	1905-

MEMOIRS.

Lieut.-General James John McLeod Innes, v.c., c.b.

Lieut.-General James John McLeod Innes, v.c., c.b., who died in last December, was born on the 5th February, 1830, and was the son of James Innes, Esq., Surgeon, Bengal Army. He joined the H.E.I. Company's Military College at Addiscombe in February, 1847, and passed out at the head of his term, and with the Pollock Medal, in December, 1848. He was the second cadet to receive the Pollock Medal, the first recipient being the late General Sir Edward Sparshot Williams, R.E., Colonel Commandant, Royal (Bengal) Engineers, whose death in October last only preceded that of General Innes by two months.

Lieut. Innes arrived in India in November, 1850, and was employed in the P.W.D. on the construction of the Baree Doab Canal, in the Punjab; but, on the annexation of Oude, he was transferred as Assistant to the Chief Engineer in that Province, and consequently served throughout the Mutiny Campaign, in Oude, from May, 1857, to April, 1858.

At the outbreak of the Mutiny he was placed in charge of the Muchee Bhowan at Lucknow, with orders to fortify it so that it might serve as a place of refuge.

After the action at Chinhut, the post had to be evacuated and the whole force concentrated at the Residency. The troops were successfully withdrawn, and the fort blown up under the direction of McLeod Innes. He served throughout the defence of the Residency, and was especially distinguished in the direction of the mining operations. One of the defences was known as Innes's post, and it was unsuccessfully attacked by the enemy on several occasions. On the relief of Lucknow by Havelock, McLeod Innes took part in several sorties, and was then placed in charge of the mining operations in the new position occupied by the relieving force.

Early on the morning of July 20th, 1857, the officer on the look-out tower of the Residency reported that the enemy was moving in large masses, and was evidently assembling for a vigorous attack. Every man was at his post, when suddenly a mine was exploded by the enemy in the direction of the Redan Battery, leaving an enormous crater. Innes's post bore the brunt of the attack. The enemy

advanced boldly, leaving a scaling ladder in the ditch, but were repulsed and driven off by hand grenades.

As an instance of the heavy fire brought to bear on the position in September, shortly before Havelock's relief, may be mentioned the cutting down of the upper story of a brick building by musketry fire only. This building was in a most exposed position just behind the Cawnpore Battery. All the shots which just missed the top of the rampart cut into a dead wall almost in a straight line, and at length cut right through and brought the upper story tumbling down. The upper structure on the top of the Brigade Mess also fell in. The Residency house was a wreck. Capt. Anderson's post had long been knocked down, and Innes's post also fell in. These two were the most exposed positions in the garrison, and were riddled with round shot. The effect of the rains, too, was to bring down all the shaky buildings to the ground, leaving the defenders only some shattered defences to cling to. The mining was continuously persevered in; defensive mines were resorted to, and were exploded in several directions, thus destroying the enemy's underground approaches.

After the relief by General Havelock the defence was chiefly confined to mining and countermining operations. General Outram wrote on the subject in his despatch dated November 25th :—

"I am aware of no parallel to our system of mines in modern war. Twenty-one shafts, aggregating 200 feet in depth, and 3,291 feet of gallery have been executed. The enemy advanced 20 mines against the palaces and outposts; of these they exploded three, which cost us loss of life, and two which did no injury; seven have been blown in, and out of seven others the enemy have been driven, and their galleries taken possession of by our miners, results of which the Engineer Department may well be proud."

In March, 1858, Lieut. Innes was attached to the Jownpore Field Force, under Brigadier-General Franks. This force joined the army under Sir Colin Campbell before Lucknow on March 5th, after a march of 150 miles. Whilst with it Lieut. Innes performed an act of gallantry for which he received the V.C. The incident is thus narrated by General Franks :—"I have already mentioned his distinguished conduct in the attack on Dhowrara" (he had been severely wounded whilst endeavouring to burst open the door of a house, within which some mutineers had barricaded themselves). "It is now his due to relate that at the action of Sultanpore, far in advance of the leading skirmishers, he was the first to secure a gun which the enemy was abandoning. Retiring from this, they rallied round another gun further back, from which the shot would in another instant have played through our advancing columns, when Lieut. Innes rode up, unsupported, shot the gunner about to apply the match, and remained undaunted at his post, the mark for a hundred matchlockmen sheltered in some adjoining huts, and kept the

artillerymen at bay until assistance reached him. For this act of gallantry, surpassed by none within my experience, it is my intention to recommend him for the honourable distinction of the V.C."

When Addiscombe was finally done away with on 7th June, 1861, Sir Charles Wood—who was Secretary of State for India—presided at the last examination and delivered an address on the breaking up of the College. He drew attention to the success of the establishment, which was to be found in the number of distinguished officers who had been trained within its walls, and proceeded in his address as follows:—

"Without going back to the more recent times, I may refer to the severe trials which fell upon our Indian Empire by the Mutiny of 1857, and on that occasion those who were the most remarkable for their exertions, gallantry, bravery, and skill were those distinguished officers who were trained within the walls of Addiscombe College. I hardly know whether I should be justified in naming particular persons, as it might appear invidious, when all have behaved so well, to select them; but I will venture to speak of Sir Henry Lawrence, Sir Robert Napier, Sir Archdale Wilson, to whom Delhi fell, and other officers whom I would willingly name; but I am afraid, if I were to do so, it might appear that I had selected them with less discrimination than I should like to show on the present occasion. In every branch of the Service the warmest testimony has been given by the Authorities of India to the gallant conduct of the gentlemen educated in this College. Recently Lord Canning, in conferring the V.C. on one of the Engineer officers, spoke of him in the highest and warmest terms, for, whether in civil or military engineering, Addiscombe has never been excelled, and I may say that the skill with which the sieges have been conducted by the Engineers of India exceeded that of any other country in the world."

The Engineer officer referred to by Sir Charles Wood was Major McLeod Innes, and it may not be inappropriate to quote the words used by the Viceroy when presenting the Victoria Cross in 1858. Lord Canning said: "I must add that it is a peculiar pleasure to me to present this cross to an officer of the Bengal Engineers, for I say to you—not as a compliment, but in the words of sober truth—that I do not believe that there has ever existed, in any army, a body of men who have rendered, individually and collectively, more constant and valuable services to their country than the Engineers of Her Majesty's Indian Forces. Men, all of them of proved ability and highly cultivated intellect, they have been unceasingly called upon in peace, as much as in war, to achieve great tasks for the protection and advancement of India, and they have never been found wanting. That, when summoned to meet an enemy in the field, they can carry their lives in their hands as lightly as any man your own deeds, and those of many of your brother

officers, have abundantly proved. It is in itself a distinction to belong to such a Corps, and you, Major Innes, have the proud satisfaction to know that while you have derived honour from being enrolled among the Engineers of the Army of Bengal, you have done all that a gallant soldier can do to repay that honour in augmenting, by your own acts, the lustre and reputation of your distinguished regiment."

After the conclusion of the Mutiny Campaign, Major Innes was appointed Garrison Engineer of Fort William, and served in various grades in the P.W.D. in the Central Provinces and Punjab until 1867.

In 1868 he was employed on the Commission for investigating the failure of the Bank of Bombay; and in 1869 he started the upper section of the Indus Valley Railway. In 1870 he was appointed Accountant-General of the P.W.D., and held this important post for 10 years. In 1881 he was appointed Inspector-General of Military Works, and as such drew up designs for coast and frontier defences, and carried out most of the new internal defences.

He received a Brevet Majority on the 28th August, 1858, attained the rank of Major-General, 28th November, 1885, and retired in March, 1886, as a Lieutenant-General.

In the *Gazette* of June, 1907, he was made a C.B.

After his retirement General Innes devoted himself to literature, and published, among other works, *Lucknow and Oudh in the Mutiny; The Sepoy Revolt, 1857; Sir Henry Lawrence* (Rulers of India Series), 1898; *Life of Sir James Browne, K.C.S.I., R.E.*

General McLeod Innes suffered from severe illness during the latter years of his life. He was married in 1855 to the daughter of Prof. Hugh Macpherson, of Aberdeen, and died on the 13th December, 1907.

I am indebted to Colonel H. M. Vibart, R.E. for many of the above details, which have been derived from his excellent book, *Addiscombe: Its Heroes and Men of Note.*

EDWARD T. THACKERAY.

COLONEL HENRY FRANCIS BLAIR.

ON the 13th April, in his 72nd year, there died, in his house in Paddington, Colonel Henry Francis Blair—the fifth of the old Corps of Bengal Engineers who has passed away in the last year. He was a native of Lunan, Forfarshire, and came of a fighting race. His father, Brigadier-General Blair, an old Company's officer for 40 years, served with distinction in India, commanding the Nizam's Cavalry from 1835 to 1847.

Blair and I entered Addiscombe on the same day, the 1st August, 1854, and from an alleged partiality to suet pudding he was immediately known as Dough (pronounced Duff) Blair. Afterwards, in the Punjab, he was always Toony Blair. He was by no means an exemplary cadet. His rollicking high spirits got him into occasional scrapes, and he lost his corporal's epaulettes after an uproarious, but illegal, midnight supper. But a more popular cadet there did not exist; and so it was in after life. His cheery, genial manners, his kindly heart, and his big, manly personality, made friends for him everywhere.

After the ordinary two years' course at Addiscombe, Blair and I received our commissions in the Bengal Engineers, and went for 18 months to Chatham, going to India early in 1858, just in time for the last Mutiny campaign. For the rest of our service we saw very little of each other. He was posted to the Public Works Department in the Punjab. I was an Irrigation man in what is now called the United Provinces of Agra and Oudh. But from time to time amusing stories used to find their way down country of Blair's energy and independent way of doing work.

These were active days in the Punjab, and Blair and his bosom friend, "Buster" Browne, working under a beloved Chief Engineer, General Sir Alexander Taylor, have left their mark behind them in many miles of good roads, in bridges, and in Government buildings, including churches at six frontier stations. I believe he was the first to employ British soldiers in making hill roads during the hot months that they would otherwise have been spending in hot plains stations.

There was a famous story—and a true one—of timber being urgently required to roof some barracks, and of Blair's starting off to the deodar forests of Kharghan, and personally conducting a string of rafts 200 miles down the River Jhelum in flood, he himself riding a water skin.

But all this time Blair did not cease to be a soldier. He knew no fear, and his reckless courage and self-exposure, called forth on him once his General's reproof—who told him that he wanted his services as an engineer, not as a gladiator. He served throughout the Umbeyla campaign, and was present in several hot fights. He served throughout the Afghan campaigns from 1878 to 1880, receiving a medal and clasp, and a brevet lieutenant-colonelcy. He did notable work in keeping the hill roads of communication fit for artillery, due to his rare gift of winning the affection of wild tribesmen, and persuading them to work for him. His plan for floating the sick and wounded in Afghanistan, on rafts down the Kabul River to Dakka, proved a boon to many, and received special thanks.

In 1868 Blair married the daughter of Capt. John Bott, of the Bengal Cavalry, who was killed in the retreat from Kabul in 1842. She survives her husband, with a family of three sons and two daughters.

Blair retired from the Service in 1883. He settled in Paddington, and in 1886 was elected a member of the Vestry, on which he served continuously until it was transformed, in 1900, into a Borough Council, of which he became an Alderman. Here began a fresh career of usefulness.

A local paper says of him :—"His vigorous nature, sound common sense, and unswerving rectitude, soon gave him a prominent position among his colleagues, whose esteem he enjoyed without distinction of party. He did good work for the ratepayers, and he also, for 17 years, played an active part on the Paddington Board of Guardians. . . . and, though he used very plain language on occasion, even his opponents admired his outspoken frankness, and transparent honesty of character."

For years he also served on the Board of Management of St. Mary's Hospital.

It is easy to imagine what a blow it must have been to one who was an athlete and first-class all-round sportsman when, 17 years ago, he was stricken with blindness. It would have crushed the spirit of most men; but Blair's was not crushed, rather he sought to show how a brave heart could triumph over such drawbacks. Not even in the intimacy of his own family did he ever give way to depression. He made as little change in his life as possible. He traversed London streets alone. He told me, with *glee*, how once a man on a bicycle ran him down and had his leg broken, and how he put him in a cab and carried him off to a hospital. He did not even give up fly-fishing, and was proud of the skill he retained in catching salmon in the Don, in Aberdeenshire. He was as sunny and cheerful, his temper as sweet and unruffled, as in early days on the Punjab frontier.

For the last few months his health had been failing, but his pluck was indomitable to the end. All must join in feeling deep sympathy with his widow and family in their sorrow.

The crowd that attended his funeral helped to show how much "the blind Colonel" was loved and respected.

COLIN SCOTT-MONCRIEFF.

MAJOR-GENERAL CHARLES NASSAU MARTIN.

MAJOR-GENERAL C. N. MARTIN, of Mount Long Castle, County Cork, Ireland, was born in 1832, and educated in Germany, and afterwards at the Royal Military Academy, Woolwich, where he became senior under officer, and passed, first of his batch, into the Royal Engineers in 1851, with the sword of honour and several prizes. After the usual course of instruction at Chatham, he served in Jersey,

Guernsey, and Devonport, before going to the Crimea, in September, 1854. He was present at the Battles of Alma and Inkerman (horse killed), and at the siege of Sebastopol, where he was severely wounded in November, 1854.

In a letter to his sister, the late General Sir Gerald Graham, V.C., G.C.B., wrote with reference to his friend Martin :—"Before Sebastopol, November 23rd, 1854.—Since I last wrote an unfortunate accident has occurred, which I feel very deeply, though I trust it will not turn out to be so serious as I first feared. The day before yesterday (while inspecting some work in front of the trenches) poor Martin was shot by one of the Russian outlying riflemen. The ball entered his stomach and entered his groin somewhere, the same ball passing through another officer's clothes* without hurting him. I went over yesterday, a terribly wet day, to see Martin, or at least to hear how he was. On arriving there, however, I found that it was thought better I should not see him, as it would only excite or disturb him. Whilst there the doctors came to search for and, if possible, extract the ball, which they had not been able to find the day before. This time they found it, but could not extract the ball. I am told he bears the pain like a true soldier. Indeed, in every respect Martin is of a very high chivalrous spirit. He is in fact, unconsciously, quite a 'beau ideal' of chivalry, at once the bravest and the gentlest. You will of course think that my sorrow at his misfortune makes me overrate his virtues, but I will give you a few instances. On the day of the Battle of Inkerman I lost sight of him, and afterwards found that he had gone further than I had into the field, and had his horse shot under him. He also was the officer of ours who sketched the chief part of our position, and, disguised as a rifleman, went out with the advanced skirmishers in order to see as much of the ground in front as possible, being a first-rate sketcher. For his extreme courtesy and gentleness ask his equals, or, better still, his inferiors, to whom I never yet heard him address a harsh or unkind word. However, I hope and believe I am not writing his epitaph. The news to-day is that he is getting on very well."

Martin was several times mentioned in despatches, and received the Crimean Medal with three clasps, and the Turkish Medal; also the Order of Knighthood of the Legion of Honour and the Order of the Medjidie. He was recommended for the Victoria Cross, but, owing to its very limited award, he never received it, much to General Graham's vexation, as I have reason to know. On being invalided home from the Crimea, several efforts were made by eminent surgeons, both in England and in France, with the object of removing the bullet embedded in his body, but the extreme danger of the requisite operation prevented its extraction. Throughout his life its presence

* Capt. (afterwards General Sir) M. Biddulph.

caused him much suffering, especially at times, when he was obliged to use crutches. His fortitude and endurance were wonderful, however, and his natural constitution must have been excellent to have enabled him to live so many years, and to carry on his duties so efficiently. Martin was employed in the London District during 1856–7, and as an Instructor of Fortification at the R.M. College, Sandhurst, in 1858. In the course of that time he, in conjunction with the "famous" General Charles G. Gordon, assisted Sir Harry D. Jones (then Governor of the R.M. College) in compiling the record of the siege operations at Sebastopol.

From 1858 to 1866 Martin was employed on the Ordnance Survey in Scotland, and at Southampton; also in Ireland. After a short ordinary service in Ireland, he became, in 1867, Instructor of Fortification at the R.M.A., Woolwich, until 1875, when he was appointed Instructor of Surveying at the S.M.E., Chatham.

In 1879 he was again employed as head of the branch of the Ordnance Survey at Phœnix Park, Ireland, until his retirement in 1881. After his retirement he lived in London for some years, and for about three years held the post of Registrar of the School of Science and Art at South Kensington. He afterwards resided at Weymouth for the rest of his life. Martin married Miss Horrocks, at Lymington, in 1863. She died some years ago. He had two sons and two daughters; his elder son, Capt. C. F. Martin, Highland Light Infantry, died in 1893; his younger son, Capt. C. R. Martin, and his elder daughter (now the wife of Major H. A. Pratt, R.A.) still survive, but his younger daughter, who had lived with him at Weymouth for many years, died only a few months ago, and her loss was a terrible grief to him.

General E. R. James says: "We were cadets together in 1848–51; we were associated at Chatham, both being inclined to surveying work. I chiefly remember him for his amiable disposition, and for his charming Irish songs. I did not see him after that until 1855, when I landed in the Crimea, but as he was lying wounded and lingering between life and death, I hardly spoke to him. I can only speak of him as a man of the most amiable and lovable disposition, who was universally a favourite; his long-suffering patience under the intense pain caused by his wound was the most remarkable thing I ever remember."

The late General Sir J. W. Gordon, when C.R.E. in the Crimea, in a report, dated Camp before Sebastopol, 25th November, 1854, wrote: "Lieut. Martin signalized himself for ability, zeal, and cheerfulness in the execution of his duties, and while condoling with Capt. Chapman in deploring the loss of Lieut. Martin's services, I have great satisfaction in taking this opportunity of bringing his name favourably to the notice of the Inspector-General of Fortifications."

In Sir Harry D. Jones' final despatch, of 20th September, 1855, he

says: "Lieut. Martin is named as one of the officers who particularly distinguished themselves."

The late Field Marshal Sir J. F. Burgoyne, in a letter to Colonel Matson, D.A. General, R.E., said: "Lieut. Martin was dangerously wounded last night, at the advanced trench of our Left Attack. He is a great loss, as he is one (among several) who have always been reported on as most gallant, zealous, and energetic."

It was whilst he was Instructor of Fortification at the R.M. College at Sandhurst, that I first had the pleasure of Martin's acquaintance. I afterwards served with him as an Instructor of Fortification at the R.M.A., Woolwich, for several years, and was quartered concurrently with him at Chatham and Dublin, besides being intimate with him in London afterwards, and in fact right up to the time of his death on the 30th March last. It was for the latter reason that General E. R. James (to whom I am indebted for valuable assistance) suggested my writing this memoir, though he himself was a cadet with Martin at the R.M.A., and served with him afterwards in the Crimean War.

In Martin the Corps has lost an old officer of distinction and talent. Many of the senior officers still serving, besides his own contemporaries (now comparatively few), will grieve for the blank left by his death, as he was one of the kindest and most genial of men, with a nature which was never ruffled, and one whose sterling qualities caused him to be loved by all who knew him.

H. F. C. LEWIN.

CAPT. C. E. VICKERS, R.E.

CAPT. CHARLES ERNEST VICKERS was the youngest son of the late Henry Thomas Vickers, barrister-at-law, of the Hermitage, Blackrock, co. Dublin, and nephew of the late Major-General John William Playfair, R.E. Born on February 23rd, 1873, he was at first educated at Mrs. Strangway's School, at St. Stephen's Green, Dublin, where he remained from 1885 till 1887, and at Clifton College. After nearly two years in the classical side of the college he was transferred to the military and engineering branch, where he distinguished himself in mathematics and drawing.

In the summer of 1890 he passed direct from Clifton into the Royal Military Academy, and obtained a commission in the Engineers in July, 1892, passing out top of his term and gaining the Pollock Medal, as well as the prizes for artillery, fortification, chemistry, physics, and freehand drawing.

After the usual two years' course at the S.M.E. Vickers commenced to take up that line of work in which he afterwards specialized, and spent a year at Derby going through a traffic course on the Midland

Railway. Upon completion of this course he joined the 10th Company at Woolwich, where he spent the next 2½ years, being chiefly employed on railway work in Woolwich Arsenal. In April, 1898, he left England for his first tour of foreign service, and joined the 42nd (Fortress) Company at Malta, where he remained until the end of 1899. During his stay in this station, though there was none of his own special work to be done, Vickers put his whole heart into the division work and other duties which came his way, and also entered keenly into the social life of the place. It was here that the literary turn of which he was possessed first showed itself, for he became a correspondent of the *Daily Malta Chronicle*, and was for some time acrostic editor of that journal. His original and humorous contributions, published under the pseudonym of "Charles V.," were always worth looking for; and in his quiet way Vickers contributed to the gaiety of the station.

In October, 1899, the 42nd Company left Malta for South Africa, and he went out with it, though, once landed, he did not remain with the unit for very long. There was a great demand for officers with railway experience on the railways, and Vickers was very soon placed on the technical staff as Traffic Superintendent of the Midland Field Section round Naauwpoort, Cape Colony. He held this post at Naauwpoort, Rensburg, Colesberg, and other places during the strenuous times of General French's operations round Colesberg, and finally moved up to Bloemfontein. When the army advanced from Bloemfontein Vickers became Railhead Traffic Officer, which most arduous post he held right away till Kaapmuiden was reached. He was then employed in various capacities in the traffic department of the railways until he was appointed Deputy-Assistant Director of Railways in October, 1901. He continued to hold this post till after the end of the war in July, 1902, when he was transferred for duties under the Commissioner of Railways. After three years in South Africa, during which he had performed most valuable services in that branch of an Engineer officer's duty in which he had specialized, he returned home in November, 1902.

After a short period at Salisbury Plain he was attached for duty at Headquarters in the Office of the Inspector-General of Fortifications, and was appointed Staff Captain at Headquarters in April, 1905. At the time of his death he was under orders to proceed to Gibraltar at the expiration of this appointment.

Vickers—who a short time previously had become engaged to be married—was attacked in January of this year by influenza, and with his usual zeal continued to try and carry on his duties when perhaps he should have been in bed. When he was at last forced to go upon the sick list complications set in, and he died after an operation on February 6th. He was laid to rest with full military honours beside his parents in Mount Jerome Cemetery, Dublin.

Besides his great devotion to his work he had other and outside interests. He was extremely musical and artistic; was a neat pen-and-ink draughtsman, and had done a considerable amount of etching on copper, some of his prints being exhibited. His literary tastes, which have already been alluded to, found more extended scope during his tour of duty in London, and many original articles from his pen appeared in different periodicals. His last finished effort in this direction—a story of war—appeared in *Blackwood's Magazine* only the month before his death, under the pseudonym of "105." He was also a constant contributor of reviews and extracts upon matters of railway and general Corps interest to the *R.E. Journal*.

Of a somewhat retiring nature, Vickers worked most unobtrusively though assiduously, and it was perhaps only those who were personally in contact with him and what he did who properly realized his great ability, his intense capacity for hard work, and his conscientiousness. Genial, unselfish, and kindhearted, he had many friends, and his influence was ever for good. It was a trait of his character that he was always much liked as well as respected by all those under him, who would have done anything for him.

E. D. SWINTON.

THE LATE SIR H. TYLER.

CAPT. SIR H. TYLER, whose memoir appeared in last month's *Journal*, should have been described as a Knight Bachelor instead of a K.C.B.

REVIEWS.

PANORAMA SKETCHING.

In recent years Panorama Sketching has come to the front chiefly owing to its having been made a subject of examination for the Staff College. The result is the publication of books on sketching, the most recent of which are by Capt. P. E. Lewis, R.F.A., and by Capt. A. F. Green, R.G.A. Both books are published by Hugh Rees, Ltd., 119, Pall Mall.

The book by Capt. Lewis, *Panorama Drawing*, price 1s. 6d., is a short treatise containing the essential information for producing a simple clear sketch. It is divided into three subheads:—(1) How to draw a panorama from nature; (2) How to draw a panorama from a map; and (3) How to draw a contoured sketch from a panorama. Three plates are inset at the end of the book, one giving a scale for reading angles at sight from a contoured map, and the other two giving practical examples of a panorama drawn from a map and one drawn from nature.

Capt. Green's book is more pretentious. It is divided into eight chapters, dealing with Equipment Hints; Conventional Signs; Procedure—Finishing up; Shading; Perspective; Reproductions in the Field; A Chapter on Hints; and Panoramas from Maps, and *vice versâ*. Both authors deal with their subject in a clear and methodical manner.

The present fashion is not only to make landscape sketches from nature, but also to make them from maps, and *vice versâ* to construct maps from landscape sketches. Hence both authors are constrained to deal with these latter developments. As ingenious exercises for the student they may have some value, but little reliance could be placed in practice upon the results produced. This is acknowledged by Capt. Green, who devotes some space to the praise of landscape sketching as a military study. With many of his conclusions one may agree, but he rather runs *amok* on the subjects of Photography and Map Reproduction. Without a sufficient acquaintance with those subjects it is unfair to condemn them.

Under conditions suitable for useful panorama sketches, photography with the aid of ortho-chromatic plates, the colour screen, and the stereoscope can produce more accurate and generally better military results in less time than the landscape sketches. Hence, the question is not, as Capt. Green supposes, as to which is the more efficient, but as to whether such views, however good, are of sufficient practical value in war to justify the expense of photographic *personnel* and equipment. As in country with marked features their value has been proved, there is little doubt that the answer in such a case is in the affirmative.

TRAINING AND TACTICS.

By CAPT. H. M. JOHNSTONE, LATE R.E.—(Oliver & Boyd).

A small, handy little volume of 166 pages—of the same size as the training manuals—and well arranged and printed.

The book is intended as an aid to the study of infantry and combined trainings, and is specially written for officers of the Territorial Forces. It should, however, prove very useful to all those officers who have to do with the training of the soldier. It is written in a clear and pleasant style, and the subject-matter is logically and convincingly dealt with. Each principle is illustrated by excellent little company and section schemes. Although in the main the author follows the training manuals, he occasionally criticizes them, as for example, in his remarks on the "Holding Attack" (on page 110). Starting with the training and tactics of the individual soldier, the author next deals with the tactics of the section and company in chapters on "The Service of Security," "Patrols," and "The Company in Combat." A very useful chapter called "Some Principles" gives a *résumé* of more general tactical principles. "Attack and Defence," "Field Fortification," "Orders and Reports," and "Marching" are also more generally dealt with. Lastly, a small, concise appendix gives a useful summary of the organization of the three arms. Although neither taking the place of, nor intended to take the place of, the training manuals, this small volume will prove a great boon to many company and half-company commanders.

WEAPONS.

By B. E. SERGEAUNT.—(Hugh Rees, Ltd. Price, 2s. 6d. net).

Mr. Sergeaunt—who is assistant curator of the R.U.S. Museum—has done his work thoroughly, and under the headings of "Weapons for Stunning," "Weapons for Cutting," "Weapons for Thrusting and Stabbing," and "Miscellaneous Weapons" has given a very interesting account of "Hand Weapons other than Firearms."

The book deals with a variety of weapons, both of ancient times and the present day. Little-known weapons such as the morgenstern, the voulge, the gisarme, the partizan, and the misericorde are fully explained. The book is well illustrated with photographs of the various weapons described, and is likely to prove very welcome to those interested in the subject.

CORRESPONDENCE.

JOHN HEPBURN, ENGINEER AND CLERIC.

DEAR SIR,

I found the enclosed letter a few days ago among some original correspondence of the Earl of Peterborough's dating between the years 1705–1711.

There is no mention of this Rev. Engineer in Porter's *History of the Corps*, and the letter would therefore seem to be of sufficient interest to publish in the *Journal*.*

Let us hope that Mr. Hepburn ultimately succeeded in getting a "Living in the Queen's Guift," especially as the Duke of Marlborough, Lord Sunderland, and Sir Charles Hedges seem to have considered his services as an Engineer at Gibraltar qualified him so well for the Church!

Yours very truly,

M. ELRINGTON-BISSET,

The Editor, *R.E. Journal*. *Capt., late R.E.*

P.S.—The rev. gentleman's arithmetic is somewhat shaky. He seems to have been due £630 instead of £530.

TO HIS EXCELLENCY THE EARL OF PETERBROUGH.

A Memorial of the service of John Hepburn Engineer. First by the orders of Her Majties most Honble Privy Councill. Afterwards under your Excellencies command in Spaine.

In the year 1702 after the English took Gibraltar, there being no Engineers there, I made an exact Draught and Survey of the Fortifications with a particular account of the Ruins and defects thereof and proposed the best method to repair and improve them. This I brought into England and presented to the Most Honble Privy Councill who referred me several times to be examined by Sir Henry Sheers who returned two letters in my favour, importing that I was very well qualified to serve as Engineer at Gibraltar or any where else: upon this account Sir Charles Hedges often promised me the first living that fell in Her Majties guift because my share of the prizes that were taken by the ship whereof I was Chaplain, during my being on shore by order of the Most Honble Privy Councill, amounted to above Two hundred pounds My expences with my servants for eight months was at least £100. But instead of the performance of Sir Charles Hedges repeated promises or any consideration for the loss of my Prize money and great expences my ship of near £200 per annum was taken from me and I thrown intirely upon your Lordship's generosity.

The first service I was put upon by your Excelcy was to draw the lines between the detachment you left with the King, and Barcelona which I humbly presume was done to your Lordship's satisfaction. After this I attended your Excelcy at the other Camp & you ordered me

* He is not however overlooked in the *Roll of the Corps*, published by the R.E. Institute, and is shown in it as "ultimately becoming Chaplain to Colonel William Stanhope's Regiment of Dragoons."—ED., *R.E.J.*

immediately to attend Brigadier Richards during the Siege. Two days after Adjutant Collier was wounded and I did both his duty and my own. Two days after that Brigadier Richards was wounded so that the two last days of the siege I did the whole duty of the Trenches and was myself wounded by the last guns that was fired from the Town, and was eighteen days in Hospital and in great danger of loosing my leg.

The next duty I was put upon by your Excelcy was in Alcira. and to avoid all Imputations against me I wrote a letter to Mr Furly sixteen days before the Town was besieged that I would not take upon me to defend the Town, And desired him to communicate the same to your Lordship and record it.

The last duty I did was at Tortosa, from the Governr thereof I brought your Excelcy an honourable certificate, Notwithstanding some accidents I had there he did not approve. And as yet I have not received the least compensation for the damages susteined which are as follows :

	£
My Prize Money about	200
My own and Servants attendance By order of the Most Honble Privy Councill 8 months	100
My baggage was lost with your Excellencies...	100
The Princes Councill took my ship away from me	130
A year out of all Business	100
TOTAL	£530

This is all I can be accused of getting by being an Engineer. Though His Grace the Duke of Marlborough was pleased to tell me he believed I very well deserved a living in the Queens guift and added he would speak to my Lord Sunderland about it, and my Lord Sunderland told me he had, and that His Lordship himself would do what he could for me.—

Copied from the original in my possession.

M. E. BISSET.

RECENT PUBLICATIONS OF MILITARY INTEREST.

APRIL, 1908.

(*Published Quarterly*).

THE following extracts from the list compiled by the General Staff, War Office, are published in the *R.E. Journal* by permission of the Army Council.

HISTORICAL.

MODERN EGYPT. By the Earl of Cromer. 2 vols. 594 and 600 pp. With map. 8vo. London, 1908. Macmillan. 24s. the two volumes.

Lord Cromer, after a brief introduction, outlines the political history of Egypt from 1863 to 1876, and discusses the financial crisis which led to intervention by the Powers of Europe, and notably of France and Great Britain. The author shows that the institution of a Commission of Inquiry into the finances of Egypt was a necessary corollary to this intervention, and how Ismail Pasha endeavoured unsuccessfully to wreck the Commission by means of a *coup d'état* designed to rid the country of European advisers.

After the deposition of Ismail in 1879, Great Britain and France re-established a joint control over Egypt, and Sir Evelyn Baring (Lord Cromer) was appointed British Controller, a position he held until June, 1880.

From the beginning of 1881 the want of discipline in the Egyptian Army gave serious cause for alarm, and after two successful mutinies the army got completely out of hand, the authority of the Khedive was destroyed, and Egypt was reduced to a state of anarchy. An outbreak against Europeans at Alexandria in June, 1882, brought matters to a crisis. Arabi Pasha, the leader of the military party, had become "a power to be reckoned with."

The action of the British Government in ordering the bombardment of Alexandria is described by Lord Cromer as being "perfectly justifiable, because it was clear that, in the absence of effectual Turkish or International action, the duty of crushing Arabi devolved upon England." Arabi withdrew his army from the vicinity of Alexandria after the bombardment, and issued a proclamation stating that irreconcilable war existed between the Egyptians and the English.

Lord Cromer writes: "The history of the next two months may be summarized in a single sentence. England stepped in, and with one rapid and well-delivered blow crushed the rebellion." The author, however, shows that England acted alone only after every diplomatic resource had been exhausted in the endeavour to persuade

the French, Italian, and Turkish Governments to co-operate in the work.

After Tel-el-Kebir, in September, 1882, and the final rout of Arabi's Army, Lord Dufferin was sent to Egypt to report on the situation, and the result was that a policy of reform was adopted which connoted with an indefinite prolongation of the British occupation and the abolition of the dual control, which was only effected after some sharp diplomatic skirmishing with France. It then became clear that for some long while to come the representative of the British Government in Egypt would of necessity be more than an ordinary diplomatic agent. Sir Edward Malet having been promoted, the British Government offered the appointment to Sir E. Baring, who accepted the offer, and arrived in Egypt in September, 1883.

Part III. of Lord Cromer's work deals with the story of the Sudan from 1881 to 1907. After describing the vast area over which the Khedive still exercised a nominal control, and after calling attention to the misgovernment that existed throughout the country, Lord Cromer shows that everything was ripe for a successful rising when a man named Mohammed Ahmed proclaimed himself Mahdi of the Sudan in 1881.

Egypt at this time maintained garrisons at Khartoum, El Obeid, and other distant places in the Sudan, but when in the spring of 1883 the Mahdist movement had become formidable, the military and financial resources upon which Egypt could rely to quell the rebellion are thus described by Lord Cromer: "The Treasury was exhausted; the army was unpaid, undisciplined, untrained, partially disloyal, and, therefore, worthless as a fighting machine." These facts were well known to the British Government of the day, and Lord Cromer censures it for not interfering in the despatch of the ill-fated expedition under General Hicks from Dueim in September, 1883.

The policy of evacuating the Sudan was now urged by Sir Evelyn Baring, accepted by the British Government, and finally acquiesced in by the Egyptian Government, and in answer to popular clamour in England, General Gordon was sent to Khartoum early in 1884 to concert measures for the withdrawal of the Egyptian garrisons still in the Sudan. But after the defeat of General Hicks, events followed each other with startling rapidity: Egyptian troops were defeated at Tamanieb; Slatin Bey surrendered Dara, and the Province of Darfour fell into the hands of the Mahdi; General Valentine Baker's force was defeated at El Teb; Berber fell, and Khartoum was cut off and besieged by overwhelming numbers of Dervishes. The only success among this series of disasters was the victory of Sir Gerald Graham's force at Tamai.

Lord Cromer deals with these events in a forcible and impartial manner. He criticizes the dilatoriness of the British Government in despatching a force to the relief of Gordon, but eulogizes the gallantry of the British troops, and the strenuous efforts made by all, when once the expedition started, to arrive in time. While he calls

attention to a want of consistency in some of General Gordon's actions, he nevertheless pays an eloquent tribute to the bravery and devotion of this national hero :—

"History has recorded few incidents more calculated to strike the imagination than that presented by this brave man, who, strong in the faith which sustained him, stood undismayed amidst dangers which might well have appalled the stoutest heart. . . . Hordes of savage fanatics surged around him. Shot and shell poured into the town which he was defending against fearful odds. Starvation stared him in the face."

Lord Cromer, in reviewing this period, makes the following comments :—

"Looking more closely to the details in the execution of the British policy, the following are the conclusions at which I arrive :—

"In the first place, it was a mistake to send any British official to Khartoum. The task he had to perform was well-nigh impossible of execution, and his nomination involved the assumption of responsibilities on the part of the British Government which it was desirable to avoid.

"Secondly, if anyone were to be sent, it was a mistake to choose General Gordon. In spite of many noble traits in his character, he was wanting in some of the qualities which were essential to the successful accomplishment of his mission.

"Thirdly, when once General Gordon had been sent, he should have been left a free hand, so long as he kept within the main lines of the policy which he was authorized to execute. It is, in my opinion, to be regretted that General Gordon was not allowed to employ Zobeir Pasha, but any view held as to the probable results of employing him must be conjectural.

"Fourthly, the question of whether an expedition should or should not have been sent from Suakin to Berber in the spring of 1884 depends on the military practicability of the undertaking, a point on which the best military authorities differed in opinion.

"Fifthly, a great and inexcusable mistake was made in delaying for so long the despatch of the Gordon Relief Expedition.

"Sixthly, the Government acted wisely, after the fall of Khartoum, in eventually adopting a defensive policy, and in ordering a retreat to Wadi Halfa."

Lord Cromer raises another point which was much discussed at the time, namely, the delay of three days in despatching steamers from Gubat after the arrival of the desert column at that place on the 21st January, 1885.

"If the steamers had left Gubat on the afternoon of the 21st they would probably have arrived at Khartoum in time to save the town." This conclusion is probably sound.

Lord Cromer states that it is beyond the scope of this work to write a detailed history of the military operations which took place in the Sudan, but he gives a brief summary of the chief events connected with the Nile Campaign of 1884–85.

On receipt of the news that Gordon had been killed and Khartoum taken, British public opinion was so intensely aroused that it appeared probable for a time that active operations would be undertaken for the recapture of the town, but, eventually, it was decided to pursue a more logical course and to withdraw the British troops to a good strategical position in the valley of the Nile and to there await the attack of the Mahdist forces.

The years from 1886 to 1892 were devoted to the defence of Egypt proper north of Wadi Halfa and to maintaining an Egyptian post at Suakin.

Although British military aid to a limited extent was subsequently on one or two occasions afforded to the Egyptian Government, it may be said that from the date of the Battle of Ginniss (December 30th, 1885) the defence of Egypt against the Dervishes practically devolved on the Egyptian Army.

The Egyptian Army as it existed prior to Tel-el-Kebir was disbanded immediately after that battle and the work of reorganizing it was entrusted in the first instance to Sir Evelyn Wood and a devoted body of British officers. Lord Cromer shows how its organization and fighting efficiency gradually improved under the methods inaugurated by Sir Evelyn Wood and continued under his successors, Sir Francis Grenfell and Sir Herbert Kitchener, with the result that when the re-conquest of the Sudan was begun in 1895 the Egyptian Army had been converted into a formidable fighting machine.

Speaking of the final stages of the Khartoum campaign in which the Egyptian Army was reinforced by British troops, Lord Cromer writes :—

"Early in August (1898), the Sirdar (Lord Kitchener) whose calculations of time were never once at fault, warned me that I ought to be back in Cairo by September 1st. . . . The long-expected battle took place under the walls of Omdurman on September 2nd. . . . The Dervish loss was, in truth, terrible. Out of an army whose strength was estimated at from 40,000 to 50,000 men, some 11,000 were killed, and about 16,000 wounded. . . . The financial success was no less remarkable than the military. The total cost of the campaigns of 1896–1898, was £E.2,354,000, of which £E.1,200,000 was spent on railways and telegraphs and £E.155,000 on gun-boats. The military expenditure, so called, only amounted to £E.996,000. Of the total sum rather less than £E.800,000 was paid by the British. The conditions under which the campaign was conducted were very peculiar. . . . The Sirdar was, from the commencement of the operations, placed under my orders in all matters. The War Office assumed no responsibility and issued no orders. The result was that I found myself in the somewhat singular position of a civilian who had had some little military training in my youth but who had had no experience of war, whose proper functions were diplomacy and administration, but who under the stress of circumstances in the

'Land of Paradox,' had to be ultimately responsible for the maintenance of even to some extent for the movements of an army of some 25,000 men in the field."

The Sudan having been reconquered, the question of the future political status of the country naturally presented itself for solution, and Lord Cromer explains the political reasons which rendered it "necessary to invent some method by which the Sudan should be, at one and the same time, Egyptian to such an extent as to satisfy equitable and political exigencies and yet sufficiently British to prevent the administration of the country from being hampered by the international burr which necessarily hung on the skirts of Egyptian political existence." Lord Cromer devised such a method, and the flags of Great Britain and Egypt which now float side by side throughout the Sudan betoken that the Sudan is governed by a partnership of two, of which England is the predominant partner.

Under the new *régime*, the Anglo-Egyptian official is described as requiring qualifications of the highest order, and comparing the position of military and civilian officials, Lord Cromer says: "The British officers of the Egyptian Army have had to contend against considerable difficulties, but as compared with their civilian colleagues, they have from one important point of view been at an advantage. There is a reality about the position of the soldier which does not exist in the case of the civilian. . . . The Sirdar is, therefore, master of the situation. . . . He is not obliged to trim his sails to every passing political breeze."

Lord Cromer devotes the remainder of his work, which he hopes will be of some special interest to those of his fellow countrymen who are or who at some future time may be engaged in Oriental administration, to discussing the Egyptian Puzzle; British policy in Egypt up to 1887 with one chapter devoted to the subsequent Anglo-French Agreement of 1904; the reforms effected, and a concluding chapter on the future of Egypt.

THE SECOND AFGHAN WAR, 1878-80. Abridged Official Account. Produced in the Intelligence Branch, Army Headquarters, India. 631 pp., with appendices, maps, and plans. 8vo. London, 1907. Murray. 21s.

This book was originally the work of Major-General Sir C. MacGregor, and was produced in the "eighties," but was treated as a secret work. It has now been revised and produced by Major Cardew, Indian Army, and the Intelligence Branch of Army Headquarters, India.

The book gives a detailed and voluminous account of the operations from October, 1878, to the close of the war in the end of 1880, and contains numerous maps, plans, and illustrations.

The nature of the campaign was such that a full account must be a somewhat disjointed narrative, so the different phases in each theatre are dealt with in turn.

It includes a number of despatches which are, in many cases, very interesting, especially those of Lord (then Sir F.) Roberts, in Chapter XII., and those of Sir D. Stewart.

The accounts of the principal engagements are clear, and accompanied by good plans and sometimes by eye-sketches, which give the reader a very good idea of the country.

Although plans are given of nearly every skirmish and engagement, some of which were of very small importance, there is no general map of the country over which the operations extended, and there is no map of the line of communication from Peshawar to Kabul, nor of the line of communication from Quetta to Kandahar. This fact very much detracts from the value of the book, for, with the exception of the operations in the immediate vicinity of Kabul and Kandahar, it is impossible to follow the course of events, and numbers of places are mentioned the exact location of which can only be a matter of guesswork for the uninitiated or the general reader who does not happen to be provided with an atlas.

We should say that the book had a greater value as a record than as a military history, for, owing to the defects mentioned above, it is difficult for the student to extract those lessons which are the valuable result of studying campaigns. There is little or no account of such points as the organization of the lines of communication and generally of the working of the administrative services, though the difficulties of supply and transport are clearly brought out in some of the despatches, notably in Chapter XI. These difficulties, which occurred on both the northern and southern lines, prove the extreme difficulty, if not impossibility, of employing large forces in Afghanistan without railway communication. There are references to the scales of rations in Appendix XIX. and other places, but it would have been better and more easy for reference had such subjects been grouped under their separate headings and not interspersed among the accounts of the operations.

As readers will have to consult maps, a list is given below of those most likely to be useful :—

1. General map of Afghanistan.—Map of Afghanistan published by General Staff in 1906. 1 inch to 32 miles.
2. Frontier as settled by the Treaty of Gandamak, and for communications in the early stages of the war.—Stanford's large-scale map of Afghanistan, published 1879. 1 inch to 22 miles.
3. Communications in later stages.—Map of Afghanistan published by Survey of India, 1883. 1 inch to 24 miles.
4. For operations of line of communications (more detailed study).—N.W. Trans-Frontier Survey. 1 inch to 8 miles. Sheets 27, 28 for northern lines, sheets 21, 21 S.E. for southern.

SPICHEREN (6TH AUGUST, 1870) (Spicheren, 6 août 1870). By Lieut.-Colonel Maistre, 79th Infantry Regiment, and former Professor

at the Staff College. With a Preface by General H. Langlois. 420 pp., with 9 maps and 10 panoramic views. 8vo. Paris, 1908. Berger-Levrault. 10s.

General Langlois contributes a preface to this volume, in which he urges the importance of the study of the war of 1870–71, because it was fought in Europe, and because its events and lessons are thoroughly known and have been impartially discussed in the sober light of history. He points out, on the other hand, that the Manchurian War is of too recent date for its teachings to be fully accepted and to be of real value in every respect; it was, moreover, like the South African War, though in a lesser degree, fought under conditions very different to those which would obtain in a European war. The South African War produced a whole crop of false conclusions; though the Russo-Japanese War has done a great service in correcting a number of these, care must be taken to prevent it from creating a fresh series of ideas and theories, of a different nature, but almost equally unsound and misleading.

General Langlois therefore agrees with the author in his view that, for a European nation, the thoroughly digested lessons of 1870–71 are still of very great importance. The story of this war has been told so many times, and in such detail, that it would seem difficult to write anything fresh on the subject. Lieut.-Colonel Maistre, however, has set himself the task of dealing with the personal equation in the Franco-German War, the tactical training of the troops, the qualities of the higher leaders, and above all, the spirit which animated the opposing forces, from general to private soldier. He is of opinion that the disasters suffered by his countrymen were mainly attributable to the loss of the offensive spirit, which was as striking a characteristic of the French armies of the First Republic and of the First Empire, as it was of the Prussians in 1866 and of the Germans in 1870. With the object of dealing at length with the question of *moral*, Lieut.-Colonel Maistre determined to make a thorough and searching analysis of one of the great battles of 1870; he chose Spicheren as the most suitable for his purpose, a battle which he describes as the "apotheosis of the initiative."

The object of this volume is not to attack individuals, but the system by which brave men and talented generals were robbed of their energy and power of action, a system of inaction and want of initiative which would have paralyzed any army and any leaders, and was more especially foreign and repugnant to the particular genius of the French nation. The author emphasizes the fact that no army can win victory by contenting itself with merely repulsing an enemy and warding off his blows; the surest road to success is by means of attack, a constant and energetic offensive, and a determination to conquer, which will repair any temporary checks that may be caused by an excess of ardour on the part of individual commanders: if, however, a defensive attitude should be temporarily imposed upon an army, then its commander must be prepared and

determined to assume the offensive on the first favourable opportunity, to wrest the initiative from the enemy, and to crush him by a decisive counter-attack delivered by a powerful general reserve.

General Langlois also lays stress on the fact that it seems highly likely that France's next great war will again be fought against her ancient enemy, Germany, whose troops will be animated with the same spirit of the offensive as in 1870; he dwells on the necessity of cultivating the initiative, a plant which grows slowly and requires constant attention. He concludes with a few words of praise for Lieut.-Colonel Maistre's work, which he is sure will attain its object of "seeking in the wars of the past the lessons which will prepare us for the wars of the future."

Lieut.-Colonel Maistre's history of Spicheren is accurate, impartial, and interesting; it is, of course, written with a particular object, that of proving that the defeat of his countrymen was due to false doctrines and over-confidence, to a lack of enterprise and initiative: that the Germans owed their victory to their offensive spirit, and to the energy and initiative of their leaders, not to any superiority in courage or endurance. He has pleaded his cause with eloquence and, we think, with success; it was not the French soldiers who were defeated at Wörth, Spicheren, and Vionville, but their leaders, whose natural abilities had been blunted by false theories and vicious doctrines.

The arguments employed by the author are clear and convincing; he writes with knowledge and conviction, and with an evidently strong sense of a patriotic duty—that of educating his countrymen and of inculcating in them the moral qualities which are necessary for success in war. He is a member, and an able member, of the great school of thought presided over by such men as Generals Bonnal and Langlois, whose lives are devoted to the attempt to teach the French nation the spirit of modern war. They believe in the necessity of the offensive; that success can only be obtained by attack, preferably by constant attacks, like the Germans in 1870–71, and the Japanese in 1904–05, but, if necessary, by defensive action; always provided that it be followed by a resolute and vigorous counterstroke.

Lieut.-Colonel Maistre points out very clearly the disastrous results that are certain to accrue from a merely passive defensive action. At Spicheren, as in other battles, the French made use of their reserves for local counter-attacks and *retours offensifs*; there was, however, no determination to conquer by means of a great stroke by a powerful general reserve, and therefore the French were invariably beaten, just as and for the same reason that the Russians were constantly defeated in Manchuria.

The author compares the vigour and energy of the Prussian generals, especially von Alvensleben, whose determination to conquer secured the victory, with the want of offensive spirit shown by the French leaders, who only sought to maintain their positions and not to defeat the enemy. He also emphasizes the necessity for mutual

co-operation, both on the field of battle and in marching to the sound of the guns.

The book abounds in able criticisms and valuable lessons; the views expressed and the principles enunciated are fully in accordance with the teachings of our own regulations, with the result that the volume cannot fail to be of considerable interest and utility to the British officer and student of military history.

THE CAMPAIGN IN BOHEMIA, 1866. By T. Miller Maguire, M.A., LL.D. Reprinted from the *United Service Magazine*. 33 pp. 8vo. London, 1908. 2s. 6d.

This little book, which is designed to convey a clear idea of the principal features of the war of 1866, is the result, as the author says in the preface, of the translation of a series of articles which were written by an anonymous writer, and which appeared in *La Revue des Deux Mondes*, in 1868.

The author himself summarizes the events which led to the war, and adds some remarks on the strategy and results of the campaign.

THE AUSTRO-PRUSSIAN WAR IN BOHEMIA, 1866. By J. H. Anderson, F.R. HIST. SOC. 88 pp., with maps and plans. London, 1908. Rees. 3s. 6d.

This is a condensed account of the 1866 campaign, with comments. There is a good general map, and there are plans of the various actions. The plans are not of very much assistance to the reader, for they in no way show the features of the ground. This book may be useful as a companion to larger works.

WATERLOO.—OPERATIONS OF THE PRUSSIAN ARMY OF THE LOWER RHINE (Waterloo.—Opérations de l'armée prussienne du bas-Rhin). By Winand-Aerts. 316 pp., with sketches and photographs. 8vo. Brussels, 1908. Spineux. 4s. 3d.

This is an account of the Waterloo Campaign from the point of view of the Prussian Army. The book commences with a review of the Prussian Army from 1806 to 1815, as regards organization, *moral*, leadership, and tactical training. Discussing the events of the 16th June, reference is made to the well-worn controversy as to whether Wellington induced Blücher to fight at Ligny in order to cover his own still uncompleted concentration; the authorities on either side are cited, but no conclusion is arrived at. Neither can the author throw any fresh light on the movements of d'Erlon's corps during the battle of the 16th. The delay in giving Grouchy his orders on the morning of the 17th is, perhaps, reasonably accounted for by the Emperor's desire to have fuller reports from his cavalry (Pajol) as to the alleged retreat of the Prussians on Namur, and by the vague reports sent in by Ney as to the fighting at Quatre Bras.

Gneisenau's despatch on the Battle of Ligny is cited to show that Wellington accepted battle at Waterloo on condition of Blücher's co-operation with two corps, while Gneisenau's hesitation and evident mistrust of the English is in striking contrast with Blücher's determination to come "not with two corps, but with my whole army."

In considering to whom the chief merit is due, the author divides the honours. The two Staffs were in frequent communication. Wellington would not have fought at Waterloo had Blücher not promised to co-operate, nor would Blücher have moved to Mount St. Jean on the 18th had Wellington retired on Ostend after Quatre Bras.

The book is a readable and impartial account, but throws little fresh light on the old controversies.

PRÉCIS OF GREAT CAMPAIGNS, 1796–1815. By J. H. Anderson, F.R. HIST. S. 138 pp., with maps and plans. 4to. London, 1907. Rees. 10s. 6d.

This book is divided as follows:—

1. First Coalition, 1796–7.
2. French Expedition to Egypt and Syria.
3. Second Coalition, 1798–1801.
4. Third Coalition, 1805.
5. Fourth Coalition, 1805–7.
6. Fifth Coalition, 1809.
7. Campaign in Russia.
8. Sixth Coalition, 1813–14.
9. The Peninsular War, 1807–14.
10. The Seventh Coalition, 1815.
11. The War with the United States, 1812–15.

Appendices give details regarding the great Generals of both sides, French military institutions, the frontiers of France, fortresses and the military forces of England, Russia, Prussia, and Austria.

The book is, as its title indicates, only a *précis* of the campaigns above indicated, but the accounts given are easily followed, and the maps are good and clear. Maps are given of the campaign areas and of most of the principal battles, though, curiously enough, Salamanca and Vittoria are omitted. The book may be recommended as a companion to the more detailed accounts of the campaigns with which it deals, but though it gives short general remarks and strategical and tactical comments, the lessons to be learnt by a campaign cannot be studied by a perusal of a *précis*. It will, however, be useful as a book of reference. In the appendix the author draws attention to the fact that all the great generals of that time studied assiduously.

NAPOLEON. Vols. III. and IV. (First two volumes published in 1904). Great Captains series. By Theodore Aynault Dodge, U.S. Army. Vol. III., 747 pp. Vol. IV., 741 pp. Appendix and Index.

Illustrated and numerous maps. 8vo. London, 1907. Gay & Bird. 18s. each volume.

A narrative of the campaigns from 1808 to 1815, furnishing a study of the causes which led to Napoleon's downfall. His rise to power is dealt with in Vols. I. and II. This work is a study of the military life of Napoleon; political events and personal matters are only touched upon to throw light on Napoleon's character as a soldier. A valuable work for the purely military student.

THE EMPEROR NAPOLEON'S CAMPAIGN IN SPAIN (1808–09) (Campagne de l'Empereur Napoléon en Espagne, 1808–09). By Commandant Balagny. 4th volume, 546 pp., 8 maps and sketches. 5th volume, 563 pp., 5 maps and sketches. 8vo. Paris. Vol. IV., '06. Vol. V., '07. Berger-Levrault. 10s. each volume.

The 4th volume of this important work deals with the operation connected with the Battle of Benavente, December 24th, 1808, to January 2nd, 1809; the pursuit of the English Army, January 2nd to 16th, 1809; the operations in Galicia in January, 1809; the retreat of Sahagun and the operations of the English armies up to January 16th.

The 5th volume gives an account of the operations round Madrid, December 22nd, 1808, to January, 1809, and the history of the war up to the departure of Napoleon. The correspondence of Napoleon and the French general staff is fully given.

SEYDLITZ (Seydlitz). By Colonel Emil Buxbaum. 4th edition. 216 pp., 5 illustrations, and 3 maps. 8vo. Leipzig, 1907. Wigand. 7s. 6d.

The book deals with the early life of this great cavalry leader, and chapters are devoted to following his career through the grades of squadron leader, regimental commander, and finally Inspector-General of the Silesian cavalry. His vicissitudes during the Seven Years' War are closely followed, an account of which campaign is concisely given in Chapter IV. The Battles of Rossbach and Zorndorf are dealt with in some detail, more especially as regards the action of the cavalry, which is graphically described. Not the least interesting portion of the book is that contained in the few pages of Chapter V. which deal with the excellent tactical qualities of this cavalry soldier and his aptitude for interpreting, and applying correctly, the tactics as laid down in the regulations of the period for the Prussian cavalry.

MILITARY HISTORY AND ART (2nd Part). Vol. II.—The War, 1870–71. Vol. III.—The Wars from 1871 to 1905: Oversea Expeditions, Mountain Warfare. Histoire et Art Militaires, by General Frédéric Canonge, former Professor of l'École Supérieure de Guerre. Vol. II.—696 pp., 81 maps and sketches. Vol. III.—540 pp., 67 maps and sketches. 4to. Paris. Vol. II., 1902. Vol. III., 1905. G. Fanchon. Vol. II. (2nd Part), 20s. Vol. III., 16s.

Previously published:—Vol. I. (1st Part), Dès l'Origine à 1786. Vol. II. (1st Part), from 1853 to 1870.

Both "Couronné" in 1904 by the Académie Française.

Vol. II. is divided into three parts, which deal respectively with the events which led up to the war and the history of the war up to the end of the Empire, the history of the national defence up to the fall of Paris, and from that time to the conclusion of peace.

The author describes the war as the victory of science and reflection over ignorance and presumption.

This is a well-arranged and detailed critical history of the war.

In the first part of Vol. III., 93 pages are devoted to a study of the Russo-Turkish War of 1877–78 in both theatres, and 94 pages to the Russo-Japanese War.

The Greeco-Turkish and Spanish-American Wars are dealt with shortly.

The second part contains studies of the following French oversea campaigns:—China, 1860; Mexico, 1861–1867; Tonkin, 1881–1885; Dahomey, 1892–1894; Madagascar, 1895; and the British campaigns in Abyssinia, 1868; and Transvaal, 1899–1900. The China War, 1900, 1901 is briefly referred to, and some notes of medical and veterinary interest are given.

The third part of this volume comprises short accounts of campaigns in the Alps and Tyrol from 1635 to 1866.

POLITICAL.

THE HUNGARIAN QUESTION FROM A HISTORICAL, ECONOMICAL, AND ETHNOGRAPHICAL POINT OF VIEW. Translated from the Hungarian by Ilona and C. Arthur Ginever. 95 pp. 8vo. London, 1908. Kegan Paul. 2s. 6d.

The translators state that this book was written by a distinguished Hungarian publicist with the object of making Hungary's attitude on military and economic questions, and on her relations with Austria, comprehensible to English readers, and they explain that information concerning Hungary usually comes through Viennese channels, and takes a distinctly Austrian colour in its course, the number of English journalists who are acquainted with the Hungarian language being exceedingly small.

The book contains a sketch of the history of Hungary and of the relations between that State and Austria. This is followed by a discussion of the ethnical situation in Hungary and of the language question. The author then deals with the chief problems of the crisis and their solution, and attempts to discover what he terms "a practical policy which can lead, without very great disturbance, to such a transformation in the relations between Hungary and Austria as shall accord with the distribution of strength among the nations ruled by the Habsburgs, and shall thus create a real organic link between the countries in place of the existing ties which are purely mechanical."

In conclusion the writer states that the Hungarian Kingdom is predestined to become very soon a united and solid State, while Austria, on the other hand, is driven towards a federal organization

of her separate nationalities. The direct and final aim of the Hungarian people cannot be the establishment of an entirely separate Hungary. An endeavour must be made to place the monarchy, while still ruled by the Habsburgs, upon natural foundations, and Hungary must then stand at the head of the new confederacy of States. The Hungarian question will thus be solved so as to promote the interests both of the Hungarian nation and of the Habsburg dynasty.

EUROPE AND THE TURKS. By Noel Buxton. 143 pp., 2 maps. 8vo. London, 1907. Murray. 2s. 6d.

Mr. Noel Buxton is a member of the Macedonian Reform Committee and has, as he states in the preface, written this book with the object of inducing the British public to take a more active and intelligent interest in the Macedonian question. After sketching the past history of Turkey in Europe, he discusses the various factors in the problem of the Nearer Eastern Question and the cause of the present trouble in Turkey. He then examines the work of the Powers in their efforts to introduce reform in Macedonia, and submits a definite proposal in order that peace in that country may be secured.

THE SULTAN, ISLAM, AND THE POWERS (Le Sultan, l'Islam, et les Puissances). By Victor Bérard. 443 pp., 2 maps. 8vo. Paris, 1907. Colin. 3s. 4d.

This book deals with the two great railway projects at present on foot in the Ottoman Empire, viz., the Hejaz and Baghdad Railways, and discusses the relations between the Turks and the Arabs on the one hand, and between Turkey and the Powers on the other hand in respect to those projects.

THE NETHERLANDS AND BELGIUM (Nederland en Belgie). By R. Klerck. 110 pp. 8vo. The Hague, 1907. Van Stockum. 3s. 2d.

The author reviews the historical and legal aspects of Belgian neutrality, but can find nothing in the treaties examined to prevent Belgium from contracting defensive alliances. Stress is laid on the reality of the "German danger" for the Low Countries. The construction of the large military railway station at Daelhem, the objections raised to the fortifications of Liège and Namur, and the obvious advantages to Germany of the Dutch and Belgian harbours, are instanced in respect of this. As regards Holland, the book traces the persistent, though unsuccessful efforts of German writers to represent France as her enemy and Germany as her natural protector. Holland has, however, no real reason to seek an alliance with Germany, and the "English danger" to the Dutch commerce and colonies, which such an alliance might involve, is an important factor.

As regards the violation of Belgian neutrality, this is thought to be more probable on the part of Germany than of France, since the policy of the Republic has been eminently pacific (witness Fashoda and Algeciras). But the combined armies of Holland and Belgium would be too strong to be neglected by either belligerent, especially

if Maestricht, Liège, and Namur were adequately fortified, so as to afford the field army the fullest liberty of manœuvre. Such an alliance, the author concludes, is most urgently to be desired both for economic and for military reasons.

THE COMING STRUGGLE IN EASTERN ASIA. By B. L. Putnam Weale. 640 pp., with one map and numerous illustrations. London, 1908. Macmillan. 12s. 6d.

The author has accumulated a mass of details, many of which are conveniently given in tabular form. The data concerning the defensive resources of the various countries in question are, generally speaking, accurate; his deductions are coloured, however, by strong sympathies which he does not attempt to conceal.

The book is divided into three parts:—

Part I. deals with Russia's Far Eastern possessions and Siberia.

Part II. treats of the Japanese sphere of influence in Manchuria. Japan's constitution, her system of finance, industries, commerce, and fighting resources, are next described. The last chapter, "Greater Japan," deals largely with Korea.

In Part III., "The Struggle round China," the author discusses the recently instituted reforms in the Peking Government and the army, the internal condition of China and its attitude towards Europe and Japan. The concluding chapters of the book contain reflections on the position of the United States and Great Britain in the Far East.

An excellent description is given of Vladivostok, with its fine natural harbour. Despite the strong fortifications erected since the last war, the writer considers the position of the fortress as somewhat precarious. He comments on Russia's geographical weakness in the Ussuri province, owing to the interposition of Manchuria between it and Siberia, and on the facilities which the dense belt of forest, extending southward from the Vladivostok-Harbin line, along a portion of its course, would afford to an enemy advancing from the Tiumen river of placing himself astride of this the shortest link between Russia and her maritime province.

The writer draws attention to the influx of Chinese and Koreans into Vladivostok, the Ussuri province, and along the River Amur, and points to the impossibility of extensive Russian colonization alongside of this Asiatic immigration.

The abundance of cereals in Manchuria, and the erection of numerous flour mills, facilitated the rationing of the Russian field armies in 1904–5 "to a degree that contemporary military critics were quite unaware of."

Some interesting figures are given, illustrative of Russian railway work during the last war. At the beginning, six trains a day were run each way. In June, 1905, there were 16, "the maximum that could conveniently be handled." The speed had increased meanwhile from 5 to 8 miles an hour.

The various schemes of Russian railway expansion in Siberia are clearly depicted.

The following are said to be projected :—

(i.). The extension of the Ekaterinburg-Tiumen (Western Siberia) line to Omsk, which is tantamount to doubling the western portion of the trunk line.

(ii.). The doubling of the Omsk-Tomsk section.

(iii.). The construction of a line from Tashkent, *viâ* Semipalatinsk, to join the Trans-Siberian Railway west of Lake Baikal, thus linking up the Caucasian and Siberian systems, and enclosing China from the west as well as from the north and north-east.

Regarding the position of the Russians in Asia, he observes: "In latent strength and reserves of men and materials their superiority is so vast that no one in the world can afford to ignore them or their future."

The author enlarges upon Japan's commanding position in Manchuria, resulting from her acquisition of the railway line up to Kuan-chêng-tzu, and speaks somewhat disparagingly of her colonizing methods in the new sphere. British officers who know Japan will agree that "in military, as in all other affairs, the Japanese mind has always inclined to finally adopt rigid Prussian methods."

His estimate of the total strength of the Japanese forces at the Battle of Mukden is too high.

Of China he says that, notwithstanding many defects in her military forces, she is now quite capable of policing her empire, and indulges in some interesting reflections as to the effect on international politics which a continued increase in her armed strength may entail.

The information about railway and mining concessions, about internal disorders, and the Chinese opinion on some recent conventions between Powers, will greatly assist students of Chinese affairs. Of interest, too, are the comments on the American position in the Pacific and the existing Anglo-Japanese alliance.

In spite of a certain exuberance of style the book is a most readable and instructive one.

STRATEGICAL AND TACTICAL.

NOTES ON THE DEVELOPMENT OF TACTICS FROM 1740 TO THE PRESENT DAY. By Major C. Ross, D.S.O. 42 pp. 8vo. London, 1908. Rees. 1s.

This is an outline of the development of tactics within the period above mentioned. Major Ross considers the period under the following headings :—

Period of Frederick the Great, 1744–1763.
Napoleonic Era, 1792–1815.
Wellington's Tactics, 1808–1815.
Crimean Period, 1854–1855.
Austro-Prussian War, 1866.
Franco-German War, 1870–1871.
Russo-Turkish War, 1877–1878.
Boer War, 1899–1902.
Russo-Japanese War, 1904–1905.

Each period is divided into (*a*) Grand Tactics; (*b*) Infantry Tactics; (*c*) Artillery Tactics; (*d*) Cavalry Tactics. Major Ross concludes with some general remarks, in the course of which he outlines the possible future development of tactics, the general purport of which is that "the principle of success is immutable, but the application of this principle must be modified according to ever-changing circumstances." . . . "Secrecy and thoroughness in preparation, rapidity and resolution in execution; in these is comprised the whole secret of success in war. And these demand, inexorably, the display of the very highest qualities, both mental and physical, not only by the warriors of a nation, but by the nation as a whole."

Some of the conclusions drawn from the Boer War seem to be open to argument, but generally the book will be a useful one to students.

FRONTIERS (The Romanes Lecture). By Lord Curzon of Kedleston. 58 pp. 8vo. London, 1907. Frowde. 2s.

In Lord Curzon's words, "The majority of the most important wars of the century have been Frontier Wars. Wars of religion, of alliances, of rebellion, of aggrandizement, of dynastic intrigue or ambition . . . tend to be replaced by frontier wars, *i.e.*, wars arising out of the expansion of states and kingdoms, carried to a point, as the habitable globe shrinks, at which the interests or ambitions of one state come into sharp and irreconcilable collision with those of another." As instances of wars caused by frontier questions, Lord Curzon quotes the wars of '66, '70, '71, and the Russo-Turkish War of 1877, which, he says, originated in a revolt on the frontier states. Other instances he gives are the Afghan Wars of 1839 and 1878, the Tibetan Expedition of 1904, and he includes the Russo-Japanese War.

Besides the above, Lord Curzon gives various cases of recent frontier disputes, and shows how the British Empire has the greatest extent of territorial frontier of any dominion in the globe. From this subject he proceeds to discuss the origin of frontiers and natural frontiers which he classifies under the following types:—(1) Sea; (2) Desert; (3) Mountain; (4) River; and (5) Forest, Marshes, and Swamps.

The subject of natural frontiers leads on to artificial frontiers, "by which are meant those boundary lines which, not being dependent upon natural features of the earth's surface for their selection, have been artifically or arbitrarily created by man." Under this heading are considered neutral zones, buffer states, neutralixed states, and, finally, frontiers created by following a parallel of longitude and latitude by drawing a line from point to point, or by referring to some existing feature or condition.

Under the heading of modern expedients are considered Protectorates, giving Lord Curzon an opportunity of showing the results of the Durand Agreement of 1893, Spheres of Influence, Leases, and Spheres of Interest.

Lord Curzon concludes with a statement of the evidences of modern progress in respect of the delimitation of frontiers and with a brief reference to the influence of frontiers on the American and British nations. In his peroration Lord Curzon calls on the Universities not to forget their mission, "still from the cloistered alleys and the hallowed groves of Oxford, true to her old traditions, but widened in her activities and scope, let there come forth the invincible spirit and the unexhausted moral fibre of our race."

From the above summary it may be seen that the lecture, though, as Lord Curzon says, it ignores large portions of the subject, is of great interest to all concerned for the safety, honour, and welfare of the British Empire.

ON WAR. By General Carl von Clausewitz. Translated by Colonel J. J. Graham. New and revised edition, with introduction and notes by Colonel F. N. Maude, C.B. (late Capt., R.E.). 3 vols., 315, 415, and 324 pp. 8vo. London, 1908. Kegan Paul. 21s.

An "Editor's Note" on page 9 of Volume III. dealing with a re-arrangement of the author's MS., would lead one to infer that the present text had been carefully compared with the original by Colonel Maude; a reference to the original, however, shows that the note was written by the "Editress," for von Clausewitz's papers were prepared for the Press by his widow. The translation under review appears to be a hurried reprint of Colonel Graham's one-volume work (issued in 1873), and reproduces even his errors of spelling; it has been expanded into three volumes by the use of smaller paper, larger type, and the employment of large capitals for the numerous headings. Colonel Graham's index, owing, no doubt, to the change of pagination thus introduced, has been omitted. The introduction is short, and the notes are few in number.

A considerable portion of Clausewitz's classic work has now only an historic value; this part might well have been given in the smallest type, so that the reader should not be fatigued by the perusal of it, but should be directed at once to the great and important truths of the philosophy of war contained in the remainder of the book. The editor has given no such help, nor has he attempted to attract readers by re-drafting Colonel Graham's somewhat heavy and closely-following-the-German periods.

It is much to be regretted that no cheaper translation of a work of such great importance to the Army should be available.

THE CAMPAIGN OF LANDSHUT (La manœuvre de Landshut: étude sur la stratégie de Napoléon et sa psychologie militaire depuis le milieu de l'année 1808 jusqu'au 30 Avril 1809). By General H. Bonnal. 360 pp., good and numerous maps. 8vo. Paris, 1905. Chapelot. 8s.

This book, written in easy French, gives a graphic and most interesting description of a campaign which is perhaps hardly as

well known in England as it deserves to be. Napoleon himself considered this campaign to be one of his greatest masterpieces. In 1809 Napoleon was apparently at the zenith of his power, and believed himself to be infallible and his troops invincible; General Bonnal points out with his usual clearness and lucidity that the Emperor's genius was still as bright as ever, but that it was warped by overweening pride and conceit.

Napoleon remedied Berthier's initial errors of deployment with masterly skill, intuitively divined his opponent's intentions, and evolved a clever plan for the defeat of the Austrian Army. Up to this point his dispositions were brilliant in the extreme, but he now made several fatal mistakes; he attached too much importance to the moral influence of his own presence, and prepared to cut off the Archduke Charles' retreat, without waiting for the latter's army to be defeated. Instead of considering the capture of Vienna as the prize of a decisive victory, he made the fatal error of regarding the hostile capital as at once his primary and main objective, imagining that the magic of his name would be sufficient to transform a mere repulse into a rout. General Bonnal shows very admirably the extraordinary energy and rapidity of thought displayed by Napoleon, when, during the early hours of April 22nd, he realized his mistake; it was, however, too late, and the Emperor had allowed a great victory to slip from his grasp, a victory which would have spared him the bloody repulse of Aspern, and the doubtful success of Wagram.

General Bonnal has made a very deep study of Napoleon, whose genius and marvellous military talents he fully appreciates, whilst he does not hesitate to expose his faults and errors; the description of Napoleon's character, his methods, his military views and precepts, is most valuable. He deals with the various marshals, their failures and shortcomings, and shows how some of them, notably Masséna, had deteriorated, and had become indolent and tired of war; he also emphasizes their inability for independent action, which was to prove so fatal in 1813 and in 1815. On the other hand, he draws attention to the great qualities of Marshal Davout, still as resolute and skilful as at Austerlitz and Auerstädt, and makes the English reader congratulate himself that the marshal was left at Paris in June, 1815, instead of being in Ney's place on June 16th–18th.

Amongst numerous important lessons and points of interest brought out in this able work are the following:—

(1). The difficulty of remedying a faulty initial deployment, though General Bonnal considers that this difficulty is no longer so great at the present time, owing to the increased delaying power given to *troupes de couverture* by modern arms.

(2). The necessity of ensuring the enemy's defeat, before diverting troops to cut off his retreat. Napoleon despatched Masséna and Oudinot to intercept the Austrians before the latter had been beaten, and without considering the possibility of their adopting another line of retreat.

(3). The necessity of rapid and energetic offensive action. The Archduke Charles lost a great chance of inflicting a severe defeat on the French between April 19th and 21st, when he might have crushed Davout's corps.

(4). The importance of issuing definite orders as to the destruction of bridges was exemplified by the action of the French 65th Regiment at Ratisbon; the failure to destroy the stone bridge at this place greatly facilitated the junction of the Austrian forces on and after April 22nd.

(5). The fatal mistake of underrating the enemy; Napoleon constantly underrated the Austrians throughout this campaign.

(6). The extraordinary marching powers of the French infantry.

(7). The wonderful influence of Napoleon over the troops under his command, both French and Germans.

THE ANGLO-PORTUGUESE ALLIANCE AND COAST DEFENCE. Translated by Capt. A. F. Custance, late (XXIX.) The Worcestershire Regt. By Moraes Sarmento. xvi.+206 pp., 6 plans. 8vo. London, 1908. Rees. 5s.

This is a translation of a book published in 1904. The translator points out that some of the theories put forward by the author require considerable modification owing to the changes which have taken place not only in Weltpolitik but also in our own home affairs. The reader will, however, easily recognize when this is the case. The author refers to a contract which he assumes to be of an offensive and defensive character, and the terms of which he states to have been recently (1904) ratified between Great Britain and Portugal. He examines the advantages of such an alliance to each of the contracting powers respectively, and then proceeds to discuss to what ends Portugal can most profitably devote her limited resources while at the same time fulfilling her obligations to Great Britain. After quoting many historical and contemporary examples the author comes to the conclusion that the rules laid down by Bonamico for Italy apply equally to Portugal, namely:—

(i.). To give up the illusion of attempting to defend indefensible localities by the erection of local defences.

(ii.). To give up the system of dividing coast defence into sections, which invites disaster.

(iii.). To establish a system of defence which shall consist of two large zones having Lisbon as their common base.

(iv.). To defend the latter harbour suitably on the seaward and land fronts.

(v.). To select a type of vessel which must be used exclusively for purposes of home defence under cover of the British fleet which will be engaged in holding the main lines of communication.

(vi.). To select types of torpedo-boats and scouts to suit the two separate zones in which they operate.

Finally, having outlined the part to be played by the naval forces, the author suggests that any money left over after providing suitable defences for Lisbon should be devoted to the better organization of the army—

(*a*). To defend the land frontiers in the event of Spain being hostile.

(*b*). To co-operate with Great Britain, oversea if required, in the event of Spain being friendly or neutral.

THE TACTICS OF HOME DEFENCE. By Colonel C. E. Callwell, C.B. 206 pp. 8vo. London, 1908. Blackwood. 3s. 6d.

In his introductory chapter Colonel Callwell expresses the opinion that the influence which the peculiar topographical conditions prevailing in the United Kingdom have upon tactics has not been studied as it ought to be, and he states that the object of his book is to draw attention to that influence. He alludes to the fact that the Territorial Forces are rarely exercised in enclosed country, but generally at one of the great military camps where the ground is totally different from the country in which they might expect to fight in case of an invasion.

In the first two chapters he deals with the influence which sea transport and the enclosed character of the country are likely to exert on the composition of an enemy's force and concludes that mounted units must be largely eliminated, that artillery must be reduced, and that cyclists would be a prominent feature.

Colonel Callwell then proceeds to consider the study of ground and of topographical features, and, treating this subject in detail, he indicates the difference which the seasons make in the appearance of a country, the effect of the atmosphere, and he goes deeply into the subject of hedgerows and fences. After some general remarks on troop-leading in enclosed countries he passes on to infantry tactics, when he again insists on the tactical importance of hedgerows and on the necessity of an eye for ground; he also insists on the necessity for subordinate leaders being prepared to accept responsibility, because the difficulty of maintaining communication is enhanced in close country, and he touches on the questions of ammunition, supply, and scouts. The question of cyclists forms the subject of the next chapter, and the author is enthusiastic about the probable utility of corps of cyclists for use in the United Kingdom and their ability to take the place, in a large measure, of mounted troops, but, as he observes, since trained corps of cyclists do not exist, it is all the more important that our yeomanry should be trained to carry out the cavalry duties of an army. In the chapter on artillery tactics, Colonel Callwell deals with the difficulty of central control in enclosed country, and, consequently, the possibility of dissemination of batteries and even sections, and he also alludes to the question of the support afforded to infantry by artillery and to the selection of positions and other artillery questions. He

considers that howitzers and mountain guns would be most useful, but that heavy guns would not be so.

The book closes with a chapter on positions, their occupation and preparation for defence, and the pith of it may be summed up in the author's words:—"It cannot be too strongly insisted upon that the paramount requisite of a position is that the locality chosen should comply with the plan of operations, and that it should satisfy the general situation in the theatre of war."

The book will be read with interest by all students of the subject, and there are many points which the author brings out the consideration of which will prove instructive to all soldiers. The book is written in the easy readable style with which all readers of Colonel Callwell's books are familiar.

THE FIGHT ABOUT FORTIFIED FIELD POSITIONS (Der Kampf um befestigte Feldstellungen). By Major von Fritsch (Instructor at the Staff College in Berlin). 68 pp., 3 maps. 8vo. Berlin, 1908. Liebelsche Buchhandlung. 4s.

This is a book, written by an expert, offering much valuable instruction on the important subject of fortified field positions.

The author divides his work into two parts, the first dealing with theoretical principles, the second with the application of these principles. As Major Fritsch explains in his preface, the first part is not intended to be in the nature of a manual on the fight about fortified field positions, but rather explains and discusses a series of conceptions and questions on the subject.

The second part gives a set of three problems, under the headings: (A) Choice of a position; (B) Defence; (C) Attack; and furnishes, in each case, an interesting solution of the problem, worked out in considerable detail.

A special map is provided for each problem.

INTELLIGENCE AND SCOUTING.

RECONNAISSANCE IN THE RUSSO-JAPANESE WAR. By Asiaticus. Translated from the German by Lieut. J. Montgomery, 3rd Hussars. 147 pp., with plans. London, 1907. Rees. 4s.

The book opens with an introduction which briefly outlines the way in which cavalry should carry out its reconnaissance duties. The writer then deals with the characteristics of the two cavalries, but he throws no very new light on this subject. He then gives a rather remarkable account of the way in which the Japanese organized a system of espionage, which they were able to carry out owing to their knowledge of the natives and how to treat them.

The first study in this book is that of Mishschenko's Cossack brigade in Northern Korea. The action of the cavalry on both sides is criticized, and, in the author's opinion, the Japanese worked their cavalry considerably the better of the two.

The next four chapters deal with Rennenkamp's reconnoitring

activity round Sai-ma-chi, and here again the Russian comes in for a considerable amount of criticism, though the author praises the marching power of the Cossacks. It seems that the Russians never attempted to surprise the Japanese, while frequently surprised themselves, and the lack of the most ordinary precautions, both in camp and on the march, is hardly credible. It is, as the author says, an example of how a commander, "full of zeal, self-sacrifice, and energy, as Rennenkampf undoubtedly was, was unable to bring to a successful issue his given task. . . . What was the net result of all this activity? Really nothing at all."

The next chapter describes the operations of the 1st Japanese Cavalry Brigade, under Major-General Akiyama, from 30th May to 16th June, 1904. Here, again, the author severely criticizes the Russians, and praises the Japanese; and the energy and enterprise of Akiyama certainly seem in striking contrast to the apathy and lack of vigour of the Russians.

The next operation dealt with is Mishchenko's raid on Ying-kou in January, 1905. In this raid we find the Russian leader altering his plan and diverting his force to a secondary objective, with the result that the enterprise failed with considerable loss. The Russian want of precaution is shown by the fact that this force, entirely composed of cavalry, was surprised by infantry.

The book concludes with a review of the work done, and considers what new methods and measures have established a claim to future consideration and may be applicable to European theatres of war. The author considers that the value of cavalry has not in any way suffered by the experiences of the war, but that its training and employment seem to be a matter of increasing difficulty.

The book generally is well worthy of the attention of cavalry and general staff officers. The maps are clear, but are often inserted in inconvenient places.

INSTRUCTIONAL.

BATTLE ORDERS (Gefechtsbefehle). By Lieut. von Kiesling. 89 pp., 2 maps. 8vo. Berlin, 1907. Eisenschmidt. 3s.

This is a study of the orders written and given during an action in a division and in its brigades and regiments. The author remarks very justly in his preface that the writing of orders for and during a battle is not so much practised as the preparation of march, halt, and deployment orders; in consequence, while there are numerous junior officers who can draft orders of the latter categories, there are very few who understand what orders are possible during a battle, and how they should be given.

The specimens of orders presented by the author, while absolutely clear, are models as regards brevity; the author writes the names of units in the body of the orders in thick fat letters so that they strike the eye and cannot well be overlooked by the receiver, who is thus

enabled to see at once whether his unit is concerned and, if so, what is expected of it.

The following order is extracted to show the style; it is longer in English than in German, as such useful words as *marschbereit* (prepared to march at any moment) and *nächtigen* (to pass the night) are not available in our language.

P...23.11. 6.30 P.M. Divisional Order No. 4 for the 23.11.

1. *Enemy* beaten, withdrawing everywhere.

2. *Army* pursues to-day 23, as far as A.. 2nd Division with left wing *viâ* Y... M...

3. *1st Division* pursues *viâ* K... towards F...

4. *11th Infantry Brigade,* plus 2nd Hussars and 7th F.A.R., advances on B... and seizes the bridge there.

5. *1st Infantry Brigade* advances into area Y... and B... *2nd Infantry Brigade* into area G... and K..., where they will probably pass the night. They will cook and make ready for the night, but be prepared to march at any moment. S.A.A. wagons and 2nd line transport not yet up will be sent on by the Division.

6. *Divisional Staff* until 7 at P... afterwards B..., where order-receivers to be 7.30 P.M.

TRAVEL AND TOPOGRAPHICAL.

THE AMU DARYA AND ITS FLOTILLA. By Colonel V. I. Treteski. 57 pp. 8vo. Charjui, 1906. K. M. Baranov. 8d.

A concise account of the small flotilla of steamers and barges which the Russian Government maintains on the Amu Darya (Oxus River) with the dual object of supplying a means of communication to and from the military posts on that river and of facilitating the transit of passengers and private goods through Southern Bokhara.

The author, who is the Commandant of the flotilla, prefaces his work by stating that his object in publishing it is to emphasize the commercial rather than the strategical importance of the flotilla, in the hope that the attention of the public may thus be drawn to the advantages which might accrue from an extension of its capabilities.

The subject is divided into the following headings, viz.:—

(i.). Historical sketch of the origin and development of the flotilla.
(ii.). Its strength and composition.
(iii.). Brief description of the Amu Darya, and notes on its navigability.
(iv.). Details of construction and carrying capacity of vessels.
(v.). Ports and landing-stages on the Amu Darya.
(vi.). Commercial significance of the flotilla.
(vii.). General *raison d'être* of the flotilla.
(viii.). The climate of the Amu Darya.
(ix.). Graphic table showing rise and fall of the Amu Darya by months during the period 1886–1905.

FROM THE NIGER TO THE NILE. By Lieut. Boyd Alexander. 2 vols., about 400 pp. each, with maps and illustrations. 8vo. London, 1907. Arnold. 36s.

These two volumes contain the record of an exceedingly interesting journey across Africa, which, as an exhibition of endurance and persistence, has not been equalled since the days of the pioneer explorers. The chief fact which emerges is that it is possible, or rather nearly possible, to go across the continent from west to east in a boat. During a journey which lasted three years, Mr. Alexander was only obliged to carry his boat for 14 days.

As regards the geographical work accomplished, the most important piece of mapping carried out by the expedition is the strip surveyed by the late Capt. Claud Alexander and Mr. Talbot between Ibi on the Benue and Lake Chad, a strip about 550 miles long and of varying width. This is a useful addition to the material at our disposal for the formation of maps of N. Nigeria.

Some time was spent in exploring Lake Chad. It appears that the lake was at a lower level than was the case at the time of Capt. Tilho's explorations, and Mr. Alexander found it impossible to journey by boat from the western portion of the lake into the eastern. A map of the lake is bound up in the second volume. The map is constructed from traverses carried out by Mr. Boyd Alexander and Mr. Talbot, and is adjusted to four points previously fixed astronomically by the French. It is, indeed, to the French that we owe the bulk of present knowledge of Lake Chad, and the work of Tilho, d'Adhemar, Andoin, and others of the same nationality should never be forgotten in discussing the shape and character of the lake. It was by the French that the first exact map of Lake Chad was made, and it is chiefly on their fixed points that additional information is adjusted.

The river Bamingi (meaning "Plenty Water") was ascended for about 130 miles; it had never been previously explored.

Instead of a five-day march from Yei, a Belgian post, to Rejaf on the Nile, Lieut. Alexander determined to try and find a waterway to the Nile by using the Yei River. Little was known of the river, but it was believed to fall into the Bahr-el-Ghazal at Meshra-el-Rek. The author shows that it is navigable in its lower reaches and could be used to shorten by six days the transport of supplies to our garrisons in the Bahr-el-Ghazal province which are entirely dependent on Khartoum for their corn. The Yei was found to terminate in marsh and sudd, but Lieut. Alexander believes that if this sudd, and that in the parallel river, the Naam or Rohl, was cut through, the increased water supply to the Nile would greatly improve the irrigation of the Sudan and Egypt.

Though most of this eventful journey was made by water, still, from a strategic and also commercial point of view, this route is useless owing to lack of water in many portions of it for several months in the year. Lieut. Alexander points out that sleeping

sickness, which has only of recent years been known in the Lado Enclave, is gradually making its way up to the Bahr-el-Ghazal.

Great credit is due to Lieut. Alexander and his party for the manner in which they dealt with the natives; much of the country passed through was very unsettled and inhabited by most truculent tribes. In spite of this, there never was any serious trouble, and most useful information was gained of many hitherto almost unknown tribes. It would be difficult to find a better lesson in the treatment of and conduct towards natives than is contained in the pages of these two most interesting volumes.

MISCELLANEOUS.

MILITARY QUESTIONS OF TO-DAY (Questions militaires d'actualité). 2nd series. By General H. Bonnal. 287 pp. 12mo. Paris, 1908. Chapelot. 3s.

This is a series of short essays on a comprehensive variety of military subjects. The first is a forecast of what will be the strategy and tactics of both belligerents, but more especially the Germans, in the next Franco-German War. The next two in importance are "The Effect of the Two Years' Service Law" and "The Organization and Employment of Cavalry." In the former of these a comparison is made of the respective strengths of the military forces of France and Germany.

Among the other subjects dealt with are:

The Duties of the Staff;
The Character of Commanders;
Discipline;
A National Army; and
The German Imperial Manœuvres of 1906.

SOME NEGLECTED ASPECTS OF WAR. By Capt. A. T. Mahan, United States Navy, H. S. Pritchett, and Julian S. Corbett. 193 pp. 8vo. London, 1908. Sampson Low. 6s.

This book is a reprint of articles and lectures and contains the following:—

The Power that Makes for Peace. By H. S. Pritchett.
The Capture of Private Property at Sea. By Julian Corbett

and

The Moral Aspect of War;
The Practical Aspect of War;
War from the Christian Standpoint;
The Hague Conference of 1907, and the Question of Immunity for Belligerent Merchant Shipping;

all by Capt. Mahan.

It is unnecessary to commend the writings of Capt. Mahan and Mr. Corbett to the officers of the Army, they are already sufficiently

well known and Mr. Pritchett appears worthy of his company. The subjects of the essays are sufficiently indicated by their titles, and the object of collecting them under one cover is given by Capt. Mahan in the preface as follows:—

"Convinced that the cause of peace is jeopardized by the exaggerations and oversights of its noisier followers, I have thought it expedient to collect under one cover a few articles in which the rationale and justification of war and its procedure have been considered under different aspects."

Many points could be noted in these essays which are of interest and value, but it will be enough to say that the high reputation of the authors is well maintained, and the book should be read by all interested in questions of international policy and of arbitration.

THE INDIA OF THE FUTURE. Reprint of articles in the *U.S. Magazine* by Colonel L. J. H. Grey, C.S.I., with a preface by Lieut.-General Sir Edmond R. Elles, G.C.I.E., K.C.B. 52 pp. London, 1907. Clowes. 1s.

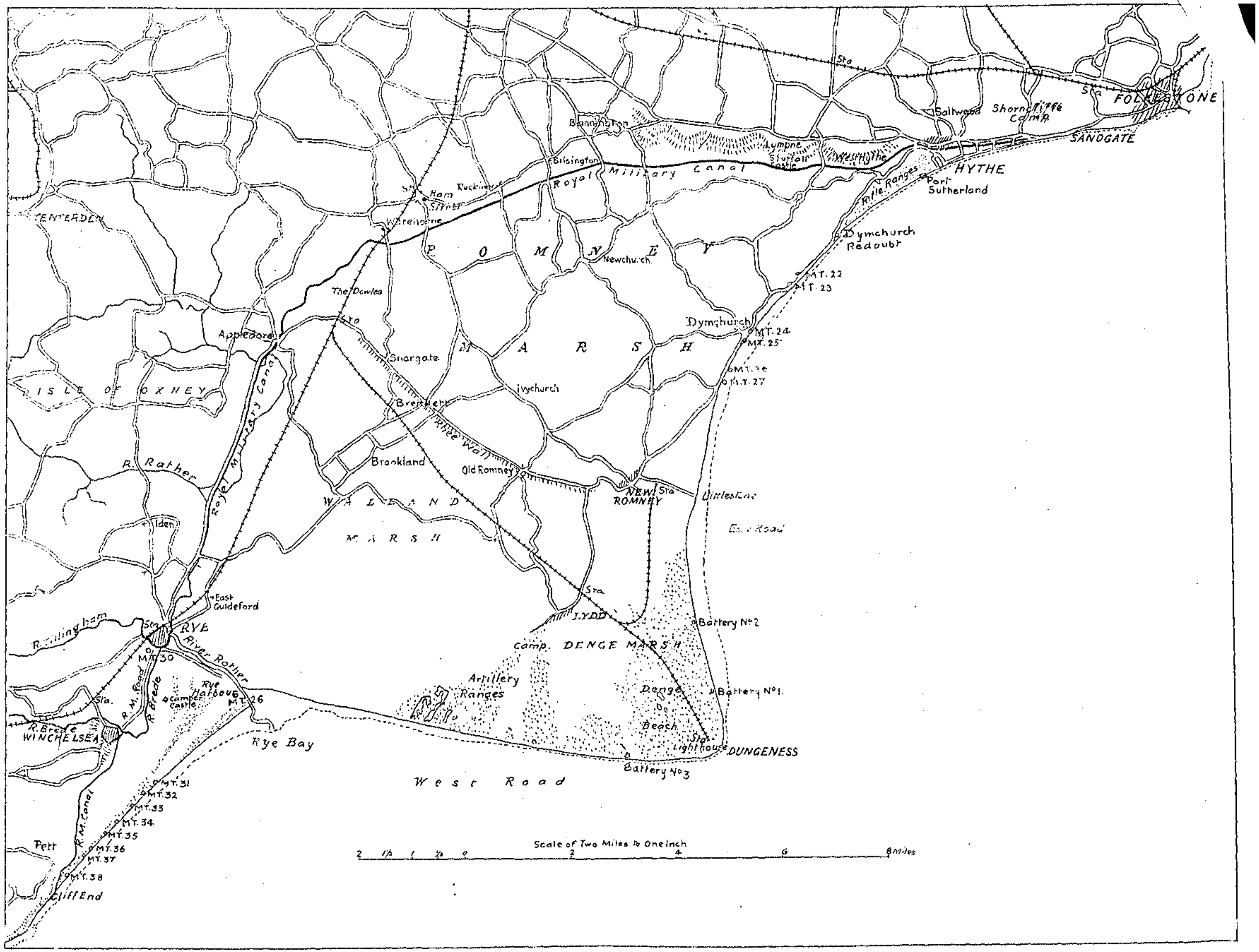
The author considers that the problem of the defence of India is to be solved by the gradual devolution of administration and of provision of the means of defence upon the Indian chiefs and nobles.

He advocates the extension of the system of Imperial Service Troops, estimating that it would eventually give us an army of 200,000 men. He considers that the natural result would be the transfer of the Imperial Service Troops from the control of the Foreign Office to that of the Commander-in-Chief, but General Elles is of opinion that the Imperial Service Troops should remain generally under the administration of the Native States, and that any transfer to the Commander-in-Chief would be resented by the chiefs as an unnecessary interference.

POCKET HANDBOOK OF THE WORLD'S NAVIES (Taschenbuch der Kriegsflotten, 1908). By B. Weyer. 468 pp., with photos and diagrams. 8vo. Munich, 1908. J. F. Lehmann. 1s. 6d.

Contents. Part I.—Lists of ships of various navies, with diagrams of types. Part II.—Comparisons of the chief navies. Part III.—Artillery. Part IV.—Miscellaneous. Part V.—Tables, etc.

PLAT


FOLKESTONE
SANDOGATE
Shorncliffe Camp
Saltwood
HYTHE
Port Sutherland
Rifle Ranges
West Hythe
Lympne
Stutfall Castle
Bonnington
Bilsington
Royal Military Canal
Ruckinge
Ham Street
Warehorne
TENTERDEN
ROMNEY MARSH
Newchurch
Dymchurch Redoubt
M.T. 22
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Dymchurch
M.T. 24
M.T. 25
M.T. 27
The Dowles
Appledore
Snargate
Ivychurch
Brenzett
Rhee Wall
Brookland
Old Romney
NEW ROMNEY
Littlestone
ISLE OF OXNEY
R. Rather
WALLAND MARSH
Iden
East Guldeford
RYE
River Rother
R. Brede
R.M. Road
M.T. 30
Rye Harbour
Camber Castle
M.T. 26
WINCHELSEA
Rye Bay
LYDD
Camp
DENGE MARSH
Artillery Ranges
Denge Beach
Lighthouse
DUNGENESS
Battery No 1.
Battery No 2
Battery No 3
West Road
M.T. 31
M.T. 32
M.T. 33
M.T. 34
M.T. 35
M.T. 36
M.T. 37
M.T. 38
R.M. Canal
Pett
Cliff End
Scale of Two Miles to One Inch
8 Miles

SECTION OF BEACH AND DESIGN FOR A GROYNE.

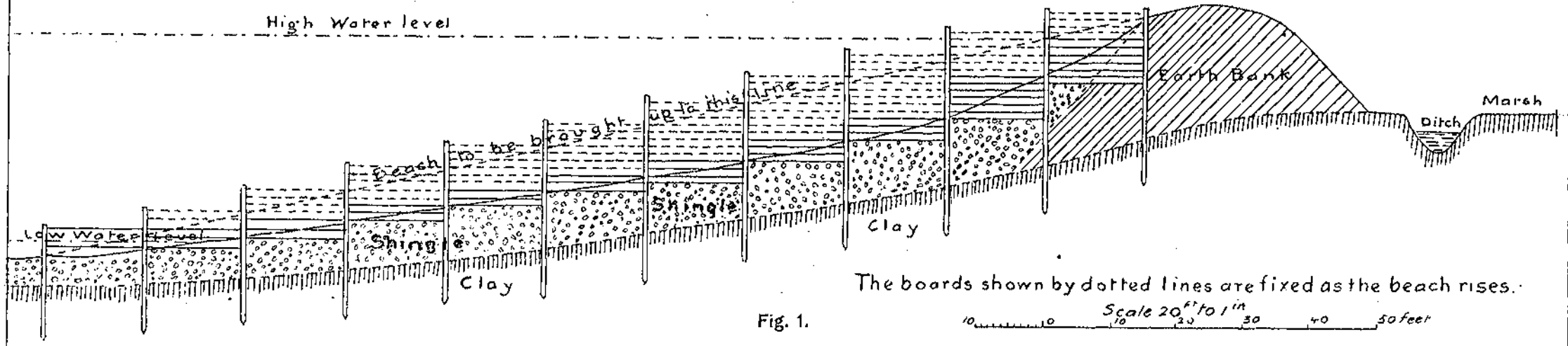

Fig. 1.

DETAILS OF GROYNE.

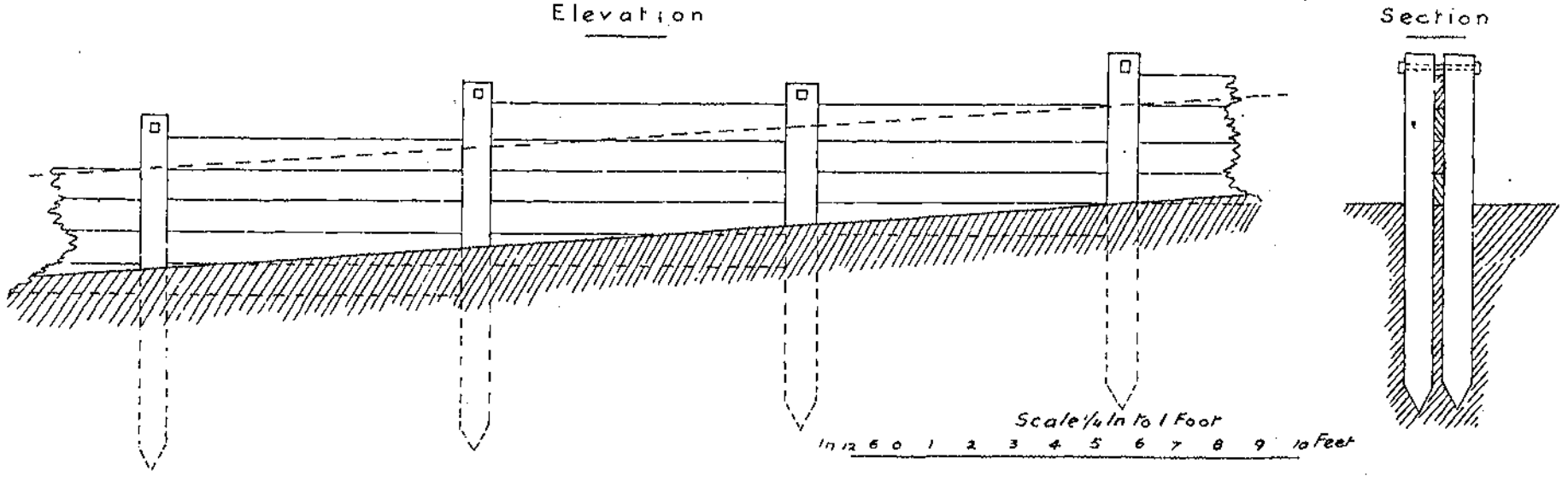

Fig. 2.

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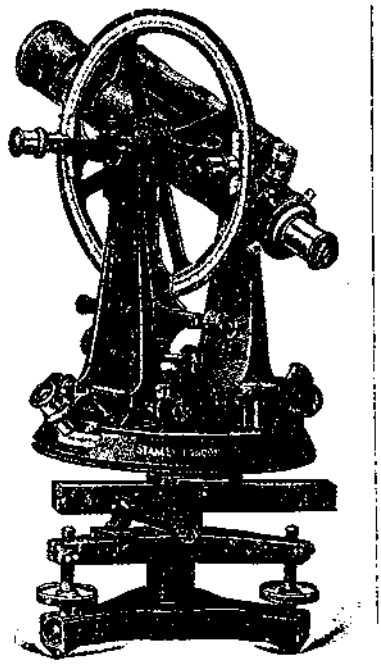

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PLATE I.

DEVELOPMENT OF DUNGENESS POINT

SOURCES OF INFORMATION.

3 Lithographed Plans, obtained by the Hythe Town Council

Survey of the Coast between Chichester and Ramsgate by Desmaretz and Foucquet 1736

High and Low Water Marks Ordnance Survey 1810

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corrected by Capt.n (Lieut. Gen.) Ardagh. 1873.

High and Low Water Marks Ordnance Survey 1893.

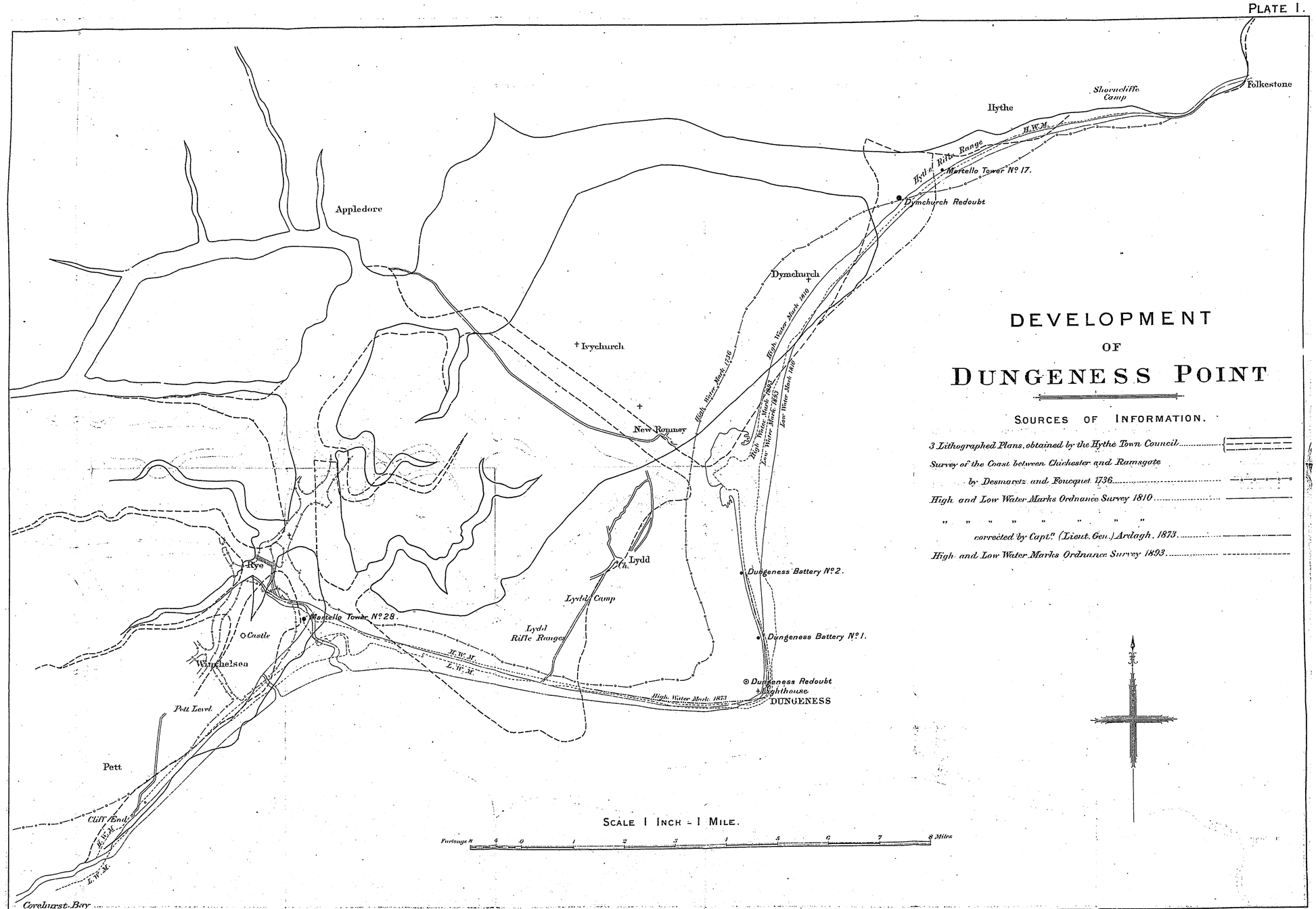
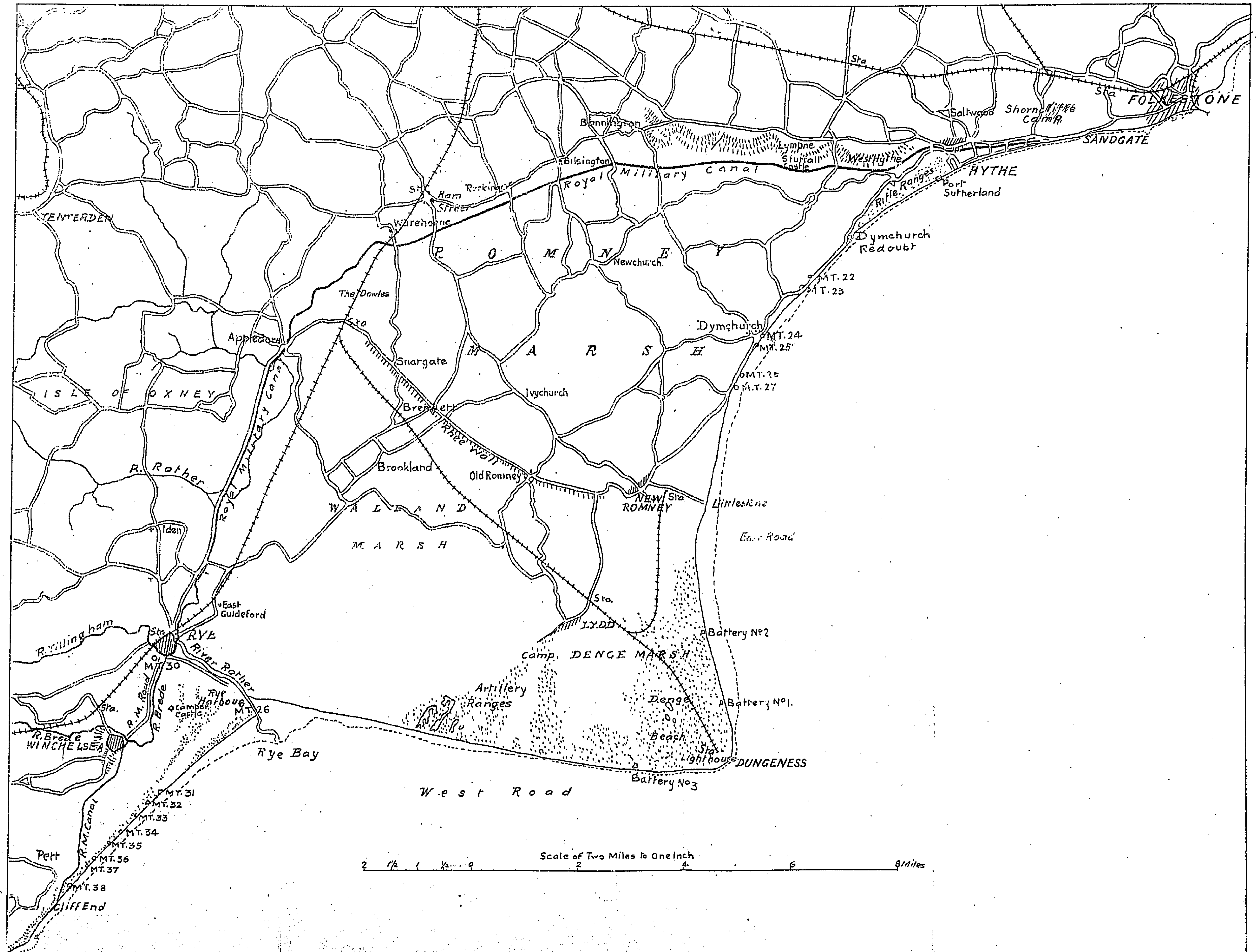


PLATE II.



FOLKESTONE
SANDGATE
HYTHE
Sta
Saltwood
Shorncliffe Camp
Bonnington
Bilsington
Lympne
Stutfall Castle
West Hythe
Royal Military Canal
Port Sutherland
Rifle Ranges
Ruckinge
Ham Street
Warehorne
TENTERDEN
ROMNEY MARSH
Newchurch
Dymchurch Redoubt
M.T. 22
M.T. 23
Dymchurch
M.T. 24
M.T. 25
M.T. 26
M.T. 27
The Dowles
Appledore
Snargate
Ivychurch
Brenzett
ISLE OF OXNEY
Rhee Wall
Brookland
Old Romney
NEW ROMNEY
R. Rother
WALLAND MARSH
Iden
East Guldeford
LYDD
Battery No 2
Camp
DENGE MARSH
Artillery Ranges
Denge Beach
Battery No 1
Lighthouse
DUNGENESS
Battery No 3
RYE
River Rother
M.T. 30
Rye Harbour
Camber Castle
M.T. 26
R. Brede
R. M. Road
WINCHELSEA
Rye Bay
West Road
M.T. 31
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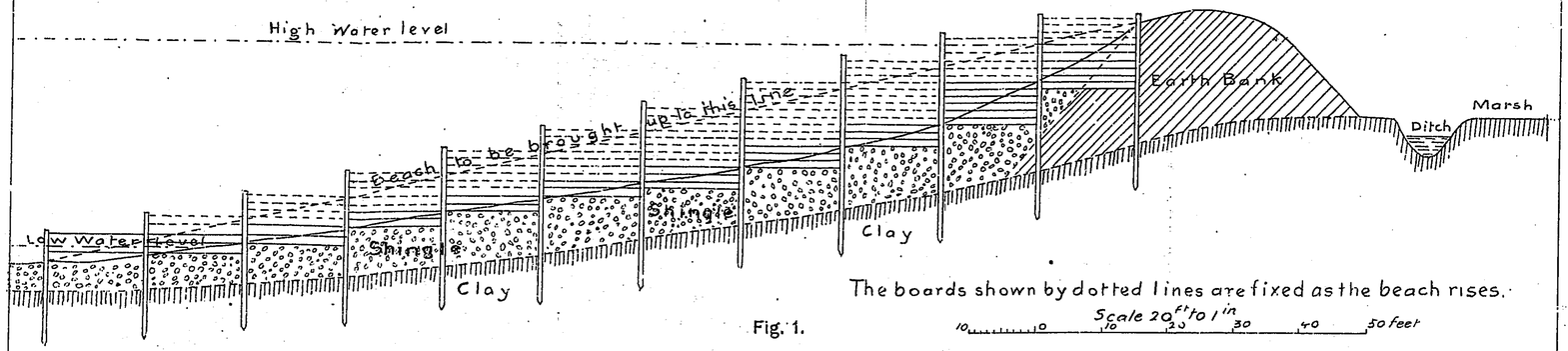
M.T. 34
M.T. 35
M.T. 36
M.T. 37
M.T. 38
R. M. Canal
Pett
Cliff End
Scale of Two Miles to One Inch
2 1½ 1 ½ 0 2 4 6 8 Miles

PLATE III.

SECTION OF BEACH AND DESIGN FOR A GROYNE.



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DETAILS OF GROYNE.

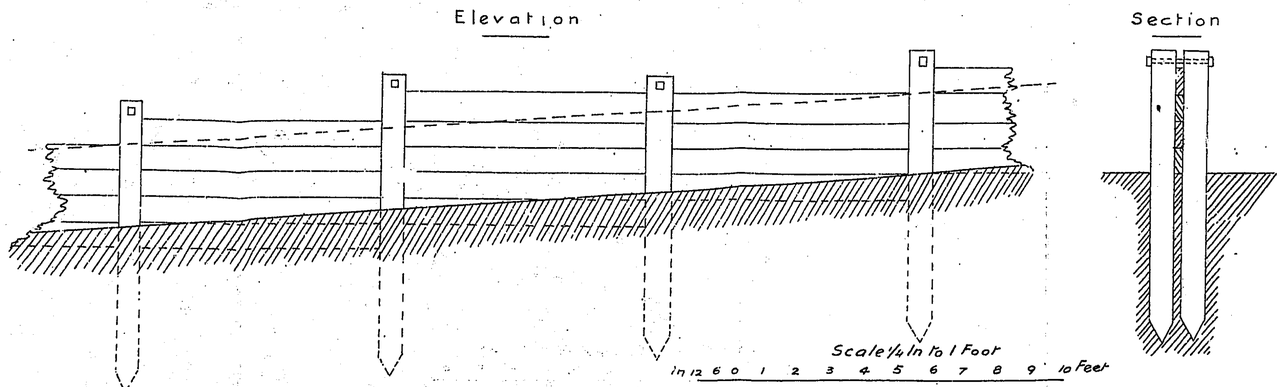

Fig. 2.