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HOW TO FORTIFY LONDON,

AND

NULLIFY CHERBOURG.

A LETTER TO MR. ROEBUCK, M.P.

SHEWING THAT THIS MAY BE DONE WITHOUT  
EXPENSE TO THE NATION;

BY

R. J. MORRISON, Esq., R. N.,

AUTHOR OF "THE SOLAR SYSTEM AS IT IS," &c., AND "A LITHOGRAPHIC  
MAP OF ENCKE'S COMET."

LONDON:

W. FREEMAN, 3, QUEEN'S HEAD PASSAGE,  
PATERNOSTER ROW.

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PRICE ONE SHILLING.

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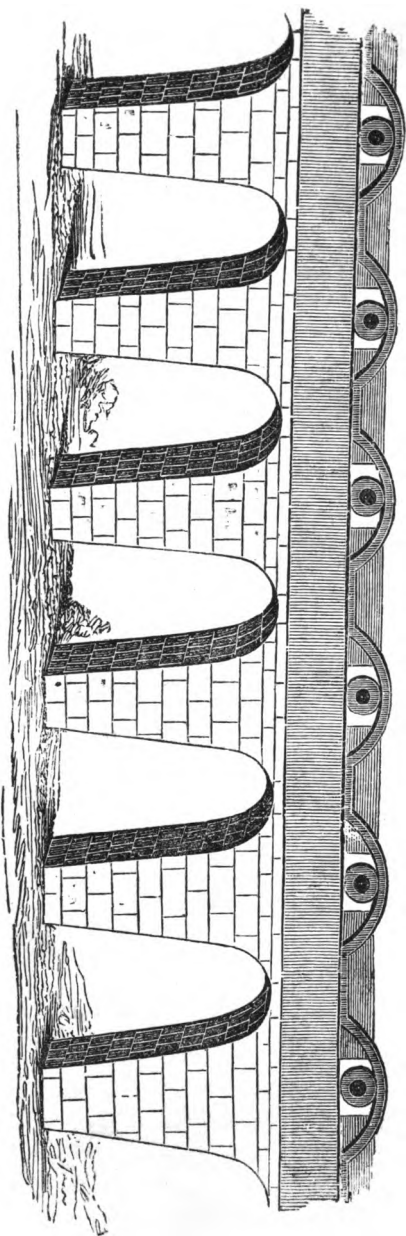
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ELEVATION PLAN OF THE PROPOSED "FORTIFICATION RAILWAY" AROUND LONDON.



TO

JOHN ARTHUR ROEBUCK, ESQ., M.P.

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SIR,

As your name has been recently so much connected with the idea of the possibility of an eventual attack upon Old England being at the bottom of the intentions of those statesmen who first planned the vast system of fortifications, of which Cherbourg is the nucleus, I make no apology for addressing this brochure to you, which I do the more readily because I believe you to be one among the very few honest public men of the present day and generation.

The subject I have selected to write upon does not require any adventitious aid, nor do I address you either because you happen to be a Member of Parliament, or because I am desirous of drawing attention to my humble self by the use of your well-earned public name; but I require a peg on which to expose my wares, a channel through which to introduce my ideas to the public notice, and I might perhaps have chosen instead, some Whig lord, or Conservative commoner of note, if I could feel for either one or the other a tythe of the respect I entertain for your public character, as evinced in a pretty long and very consistent career.

Without farther comment I beg to observe in the opening of my case, that I do not believe the circumstances to be so extremely urgent as to require any degree of precipitation on the one hand, in deciding on any measure for defending either our country, generally, from the evils of a foreign attack, whether *via* Cherbourg, or St. Petersburg, or of the more particular emergency of the defence of the capital city of the world, as London may be denominated ; neither, on the other hand, do I conceive that wisdom or prudence, or even common sense, can deny that, where there is a possibility, the *merest* possibility, of such a gigantic disaster as the capture by a foreign foe, or even the attempted capture, of this vast metropolis, we should do well and wisely to take Time by the forelock, and by a judicious scheme of fortification, if such can be devised, place the barest and most distant possibility of *success* for such an attempt, if ever made, far beyond the bounds, and without the category of things to be imagined. I am willing to go with you, sir, so far as to express my belief that it is neither wise nor prudent for a great nation like this to entrust its safety to the keeping of any human being, and certainly I cannot see in the antecedents of the Emperor of the French, any good and solid reason why we should forget the very cogent and wisdom-born advice of King David, to "put not your trust in Princes." I think on the contrary, that every day in modern times brings forth facts, which should impress upon our minds the verity of the doctrine, that Princes are not to be trusted wherever and whenever their interests appear to run counter to their duties. It may be admitted that there is no present intention in the breast of the master of Cherbourg to make the possession of such a stronghold at all subservient to the furtherance of his ambition. We may go farther, and admit that he never *has* had such an



intention, and that his breast was pure from all ideas approximating to a lust of conquest when he went through the empty form of the public inauguration of that celebrated fortress. We may, if the lovers of peace think fit to ask it, give him, and all future rulers of France, credit for being pure, innocent, and child-like. But do we not know that a certain personage (not to be named to ears polite), "goeth about like a roaring lion, seeking whom he may devour?" And how know we that this roaring lion may not some day fall upon some Imperial ruler, and devour, if not himself, at least all his lamb-like qualities, and so leave him denuded of that robe of innocence in which his admirers would envelope his imperial limbs? Who can say what degree of temptation such an innocent personage could withstand, should the evil one whisper in his ear, "Ah, now is your time for a *coup de main*; England is embroiled with the United States, and obliged to send a large part of her fleet to protect her West India interests. And fresh outbreaks among the Sikhs, who have united with the Affghans, have, you perceive, compelled her to send all her available troops to maintain her Indian Empire; where things look very shaky and uncomfortable. You may never have such another chance. About 30,000 troops, you know, landed suddenly on the coast, might very quickly march to London, or at least get so near it as to enable your General in command, to dictate terms; for instance, such as the surrender of Malta, or Gibraltar, just by way of giving you that 'French Lake,' eh?"

Far be it from me to ask you, sir, to believe that such ideas ever will be really instilled into the mind of England's friend over the water. I only ask you to admit with me that far more unlikely events have happened in this strange world of ours. Therefore, it seems that we are not called on

to act upon the probability of anything untoward arising from present *known* intentions or desires in the mind of the ruler of the French. But that our place is, if we would hand down intact to our children the noble inheritance of our country and our country's freedom, to consider calmly and deliberately, whether it be not within the magic circle of possibilities, that a contingency may arise, adverse to her peace, and dangerous to her existence, ere another generation shall pass away. Who can say what may happen, should the Fates frown on the Dynasty now beginning to be established in France? Do we not see, looming in the distance, a manifest intention to interfere with the present state of things in Italy? Has not the great power of Austria been in some degree already quietly circumvented, by drawing closer the intimacy with Russia? What might not a French army effect, if the Emperor desired to plant his foot in the provinces of Lombardy, and to make another little "King of Italy?" Are we to believe too, that the peaceful qualities of the Emperor, extend to the breasts of all his generals, and that the French colonels are, very many of them, likely to become members of the Peace Society?

These things are certainly, to the last extreme, improbable. On the other hand, do we not see, as has been lately observed, that vast apparent preparations are making for war, by more than one continental state. I pray you, sir, to read the following extract from the "Spectator."

#### EUROPEAN PREPARATIONS FOR WAR.

"France possesses at the present moment two enormous assemblies of troops—one near Lyons, one at Châlons. Lyons is a point from which a weight could be brought to bear either upon Spain, upon Switzerland, or upon Italy. The other camp at Châlons offers a ground upon which the empire can develop its military resources to the highest

degree of perfection; it is this camp over which the emperor presides in person, surrounded by the *élite* of his generals, in Marshals Pelissier, Canrobert, Magnan, and General de Grammont, with many officers of high rank. Marshal Canrobert is the permanent Commander-in-Chief. The camp comprises a complete army, with its infantry, cavalry, artillery, engineers, and even commissariat. Since June last it has been undergoing a thorough training, even in grand manœuvres. Speaking in laudation of the Châlons Camp, the *Moniteur* says, that "the most redoubtable armies at the opening of a campaign have always been those familiarized by a long stay under canvas, in time of peace, with the rough exigencies of discipline and fatigue." Napoleon I. liked to have troops trained as *armies*, habituated to move in organized masses, and his nephew preserves the same strategy. The prime object in rendering the army available for immediate service, has already been attained, "It may now be said," the *Moniteur* announces, "that the education of the troops is complete, not only in a limited sense, as applied to one branch of the service, but as applied to the whole body of troops acting together on a vast field of operations." Has this camp a further purpose, or has it not?

"A little further east we have the vast country inhabited by the Teutonic race, looking, it may be said, like one immense camp. All the different states of Germany have at the present moment under arms what is called the Bundescontingent, that is, the number of troops which they are compelled by the treaty of Vienna, of the 8th of June, 1815, to contribute to the collected army of the Germanic Diet. This *corps d'armée* consists altogether of nearly half a million of men; and is now manœuvring in separated bodies throughout the country beyond the Rhine. Austria is reviewing her contingent of 100,000 men at Neunkirchen, near Vienna, while the other German Governments have their own separate contingents standing ready; thus

Prussia has its 90,000 at Potsdam, Bavaria its 40,000 and odd near Augsburg, and Hanover its 20,000 at Nordstemmen. The Bundescontingent is not likely to be called out for aggressive purposes, at least before the commencement of a war; but the active precaution taken in calling it out at all implies that the German Governments labour under a very cogent apprehension of war; and the German people have, in the military outlay for these musterings and manœuvrings, to pay a very heavy war assurance. But besides these contingents to the joint army of Germany, Austria has her own army, now under inspection on the plains of Lombardy, by the Archduke Ferdinand-Maximilian; while even Prussia has lately been reviewing her troops under the command of the Prince of Prussia; our own Commander-in-Chief, the Duke of Cambridge, assisting in the display.

“Looking still further east, we perceive the mighty Czar Alexander II., *in propria personâ*, at the head of a selected 50,000, intrenched in the camp at Powonski, near Warsaw; and although the forty-five battalions of infantry, the twenty-eight squadrons of cavalry, and eighty pieces of artillery, moving in those marshy plains, form but a feeble representation of the great Eastern Colossus, still their position, so near to Germany and to western civilization, is rather significant as times go.

“Nor must we forget that the French army in Rome has recently been augmented until it amounts to a complete division. This is remarkable in several aspects. In the first place, the alleged pretext is the ill-will between the Papal garrison and the French garrison—provoked, it is said, by the drunken insolence of the French; which in the event of any actual dispute, would have rendered the position of the French garrison critical. Secondly, it is almost an avowal that the division is to be rendered a permanent institution, like the Châlons camp.

“Nor are the preparations of this kind, at once aggressive and defensive, limited to the land. According to the *Pays* Cherbourg and Brest are by no means the only

French ports which the imperial Government has determined to strengthen; on the contrary, Havre, Dunkirk, Dieppe, and Fécamp, are to have respectively £6,000,000, £680,000, £280,000, and £78,000; besides works at Calais and Boulogne; the maritime arsenal of Venice is developed, and the mouths of the Cattaro are to be fortified, It might almost be said that each state in Europe is so anxious for peace, that it is preparing for war, in order to secure a monopoly of the blessing for itself. But when gunpowder is collected into magazines, there is a strong tendency to explosion: a mere spark will serve the purpose."

May I not ask you, Sir, to explain, if the thing be possible, why or wherefore there should be—why in reality there *is* all this *costly* preparation for the purpose of enjoying that PEACE, which so many solemn treaties have ensured to the nations of Europe? Do these things evince any great determination on the part of the several rulers of the world to put *their* trust in princes? Who should know the characters of these said princes so well as they know each other? And why should you, or I, or our countrymen, put all our trust in them, or their professions, when they set us the bad example of putting all *their* trust in their cannon and their bayonets? It is not with any intention, however, of following the bad example of continental despots that I name these things; nor is it with the purpose to encourage you in advocating an increase of the estimates during the next session of Parliament that I have taken up my pen. On the contrary, I would earnestly importune you to tread in the footsteps of that worthy patriot, the late Joseph Hume, and try earnestly to save the people of this country, some portion of the fearful burden of taxation they now groan under.

My object is to shew you, Sir, and the people of this country, that it is not only a wise thing to be prepared for any possible contingency, by which the safety of the great

city of London would be at all hazarded, but that the only way to render this admitted improbable event still more improbable, and to place the inhabitants, and, indeed, the whole country, perfectly at their ease in the matter, is to be fully *prepared* for the worst that ever can possibly happen.

This preparation I contend is not likely to be made until the public can be brought to see the *modus operandi* by which it may be rendered of the utmost importance. To doze away the precious time given us for preparation, and wilfully to close our eyes to the danger, because it is distant, would be as foolish as to exaggerate that danger, and exclaim at every movement of a bush, blown by the wind, "there is a lion in the path." I am for neither of these courses. But I would quietly examine the *whole* of the facts ; and then, if by means of prudent preparation I could shew that, without any national sacrifice of a pecuniary nature, *London may be fortified, to the extent necessary to render it perfectly secure from the only possible mode by which it may ever be attacked*, and that while doing so, we may offer a means of increasing the conveniences its inhabitants now enjoy of locomotion, and mutual intercourse, I can perceive no reason on earth why the proposition I am about to make, should not be listened to ; and, unless some better means for the end in view be offered, why it should not be fully adopted.

In the first place I will, therefore, offer my opinions as to *how* I think that London may be endangered by a foreign foe. There are at present only two nations at all likely to be capable of making the slightest attempt at a descent upon the coasts of England. These are Russia and France. The chances of anything of the kind from Russia are very slight indeed. The circumstances under which such an event could occur would be these : the

escape of a considerable fleet of steam ships from the Baltic, carrying each some 1,200 troops ; and their safe arrival on the coast of Suffolk, and their successful landing of 20,000, or 25,000 troops in the vicinity of Harwich. If this could be done, there does not seem any extreme difficulty in those invaders marching in a couple of days from Harwich to Colchester, and thence, through Chelmsford, to London. The difficulty of the enterprise would be, the avoiding our cruisers and the safe transit from the Naze of Norway to the Suffolk coast ; which, as the run would occupy about three days, under the most favourable circumstances, and as the landing 1,200 troops from each vessel would occupy nearly one other day, the Government would have ample time to collect forces, that might either prevent the landing, or speedily overthrow the enemy, and so avoid their approach towards the metropolis.

The probability of such a descent upon our coast, and of any attack upon London coming, therefore, from such a quarter, is so very faint, that it may be sufficient to have merely named the possibility of such an event.

Let us now, however, examine, whether any attempt might, under any circumstances, be made to effect a *coup de main*, by throwing a body of some 25,000 light and active, courageous, and well-handled troops, from the adjacent coasts of France, upon the southern coast of England ; and within forty-eight hours' march of London.

It is not here, the place to question the probabilities of the thing ever being actually attempted ; but the question is, if it were really attempted, what are the probabilities of those troops actually reaching London, in its present open and undefended condition. In the first place, I shall offer my opinion as to the practicability of such an expedition being planned : in the second place, the probable mode in which it would operate ; thirdly, how the landing

might be effected ; and lastly, how the troops might, when safely landed, very easily reach London, and either burn all the docks, and destroy the city, and so overthrow the prosperity of this nation for ages to come ; or otherwise, levy a contribution of enormous extent, and compel the Government to compromise the evil and to induce the enemy to spare the metropolis, by granting to that enemy a safe conduct back to their own country.

In the first place, then, we have no reasons to doubt that the port at Cherbourg alone, has all the appliances for suddenly collecting and embarking, say, 25,000 troops, at any moment. The quays are there, on which the troops may be collected at any time, in a few short hours. The vessels may be easily brought to those quays ; and on board some twenty-five steam vessels may be placed full 25,000 active soldiers, nothing loath to make a part of such an expedition. But some few smaller vessels might be collected at other ports ; such as Havre, Dieppe, and Boulogne ; while a second division of ships and troops would, of course, be collected at Brest. So far, whenever the *occasion* may occur, I see no difficulty, but every facility for planning an expedition. The thing is *practicable*. In the second place, we have to consider the probable mode in which the expedition would operate. If we conceive these two divisions of steam troop ships, in fact of large men of war, having on an average, 1000 soldiers on board of each ; we may imagine that the Brest division shall sail in the evening, and attempt to land, next morning, some 5,000, or 6,000 troops, upon the coast of Devonshire, about Sidmouth ; and so to threaten Exeter. This would, probably, be only a feint, intended to draw our fleet down the channel ; by which manœuvre, if successful, the grand division from Cherbourg, would be free to run *up* channel, during the ensuing day and following night, so as to



appear on the *next* morning (very early), off Shoreham, and Worthing; there to throw on shore, the body really intended to make its way towards London. But to draw the attention of our authorities and induce them to leave the coast open, a minor division, (despatched from the minor ports), of some 3,000 troops would, perhaps, appear early in the day, (preceding the grand attack), off the coast of Kent, and endeavour to land about Hythe. This, also, would be a feint; well designed to draw our frigates and cruizers, as well as our troops, on shore, from the point to which the enemy would direct his principal forces; which, it is probable, would be the coast of Sussex, as well calculated for landing troops, and also, very near to the metropolis.

Thirdly, the mode of landing may be easily conceived to be simple and speedy. All along we have been considering this as a mere buccaneering expedition, intended to attack by a *coup de main*, and to put under contribution, if not to burn and destroy, a large and wealthy, but totally undefended capital city. Therefore, all that has been written in newspapers and spoken in Parliament, about the *time* required, and the difficulties to be experienced in landing artillery and cavalry, and *matériel*, for an advancing army, is perfectly beside the mark. It is not an attempt to conquer and overcome the country, and hold it for a permanency, that is at all in question; but an attempt to march upon London; and, by its destruction, overthrow the prosperity, and undermine the power of England. Wherefore, we have to look only to what the enemy, who should resolve on such an attempt, would absolutely require. All beyond that requirement may be dismissed from our consideration. When the ships were anchored, to cover the landing with their broadsides, they would proceed to throw the troops on shore, thus: they would be provided

with flat bottomed barges, each capable of holding fifty men. Five of these barges might be towed by one steam barge, which would also be arranged to draw not more than twelve to fifteen inches of water. Each ship might be provided with two steam barges, and these ought to be able to land 500 men in one hour, if the beach were not more than two miles distant. Thus, in from two hours to three hours, each vessel might land 1000 troops, and of course twenty-five vessels could land 25,000 troops, in, say, at the farthest, *four* hours ! But, during the day and while these troops were forming, and commencing their march inland, some few cavalry might be landed ; say ten horses in each boat, per hour ; or sixty in the course of the remainder of the day ; and as there would be, altogether, 200 of these flat bottomed barges to be worked after the troops are landed, they would have ample time and power to land about 2,000 to 2,500 cavalry, and a few light guns ; these would immediately follow, and speedily overtake the infantry, and operate with them. All this appears to be quite feasible, and by no means to be an operation to be pooh-poohed, or treated lightly ; because if it were really effected, London would, in its present state, soon be in considerable danger. The landing of *matériel* would be a very short affair, because, in reality, each soldier would carry three days' provisions about him ; and there really appears no reason to suppose that the whole force might not effect a secure landing within ten to twelve hours from the time they made the land.

It is true that, if any considerable English fleet should fall in with them, during the passage over, the landing might be greatly interfered with, and to some degree retarded, if not wholly frustrated. But we have seen that the object of the enemy would be to mislead our commanders, and draw their attention to false alarms, and

of very possibly the main force *might* succeed in evading the English forces, and in effecting a landing.

Lastly, we have now to examine how the enemy, if once safely landed, would reach London and effect the destructive operation, which would be the chief object and intent of the expedition. The march of an army of 25,000 men from the coast of Sussex to London, with all their *usual* heavy baggage, artillery, and commissariat, would be in the ordinary military routine, a work of some four days at least. They would not, in general, accomplish above a dozen miles a day. But it would be a very different affair with a body of about 22,000 Infantry, and some 3,000 Light Cavalry, equipped for the express purpose of penetrating across a champagne country like the south of England. Such a force would be able to cover the ground, say from Worthing to London, by two forced marches of less than thirty miles each, being unencumbered with baggage or artillery. They would assuredly do this in forty-eight hours from the moment of their landing. Of course all this supposes that they would meet with no effective opposition; that nothing worthy of the name of an army could be got together at a day or two's notice to arrest their march, and effect their overthrow. That the force I have described, 25,000 French troops, could and would be beaten and annihilated if they fell in with even 15,000 English regular troops, no man having observed the antecedents of the two classes of soldiers could hesitate to believe. But would there certainly be 15,000 regular English troops *ready* to meet with them and destroy them? Would not the sudden attempt stun the small faculties of the men of routine who usually have the guidance of all important matters of the kind in this country? Might not the spirit of mismanagement, which destroyed the noble army we sent the other day to the Crimea, again

present itself to prevent any efficient arrangement being made within the fearfully brief period of forty-eight hours, to march a force to the requisite position to enable them to meet and overthrow the enemy? There is no reason to doubt that emissaries from the enemy would be able to break up enough of the rails to destroy the efficiency of any railway whereupon the troops might be intended or expected to move against that enemy. No other means of conveyance would be possible in the brief period allowed to meet the danger. And it is certainly not too much to suppose that in less than three or four days it would be utterly impossible to throw a force of sufficient extent in advance of the approaching enemy. To say nothing of the confusion that such a sudden landing would undoubtedly produce, there would be no provision made for the conveyance of intelligence with rapidity, if the telegraph lines were cut, as in many parts they might be expected to be, under such circumstances. At all events, there would be no *certainty* of the march of the enemy being arrested for *two* or *three* days, which would be certainly most desirable, most important, most essential, to enable the Government to concentrate a sufficient number of troops to attack the enemy, without danger of failure. And what would be the consequences of such a failure? A victorious and infuriated soldiery rushing down upon a defenceless mass of human beings, like the population of London! The idea is horrible to contemplate; and although the reality is and must be far away, yet we ought to remember that it is our duty to do all that lies in our power to render that reality an utter impossibility. And how is this to be effected? The answer to this question is the object and scope of this letter.

It is clear that if *time* could be gained under such cir-

cumstances, the whole spirit of England would be aroused, and that forces would speedily pour down upon and utterly destroy the invaders. But to effect this, it would be necessary to have some means to stop their course and hold them in check for at least two or three days, until the British troops could be collected. That could only be done by means of some fortification, which should cross their path ; and which from its character, they would be unable to storm, or carry suddenly. Now there is absolutely nothing of this nature existing at present, from the coast of Sussex, even unto the Mansion House of the Lord Mayor of London. It may be worthy of your consideration, sir, whether a FORTIFIED RAILROAD might not effect this great and important purpose, if it were made to circumvallate the whole metropolis, at a distance of not less than ten miles, in all directions, from St. Paul's as a centre.

It would be very possible to erect such a circular railroad, extending about 65 to 70 miles in its entire length ; and to make it differ from such erections as little as might be ; and then to make it available for the ordinary purposes of railway traffic ; whereby the cost of its erection and maintenance would be defrayed by the proprietors of the railway. The only feature in which it would differ from ordinary railroads would be the having its outer face converted into a platform and parapet, on which guns of large calibre may be placed and worked, *when the contingency shall arise of their being required.* There would be no necessity, whatever, for the Government, who would, of course, alone have the legal right to arm the "Fortification Railroad," to place a single gun there on any other occasion ; except perhaps at the "Inauguration," as the phrase goes ; when, as the platform would be capable of fighting one large gun at every *ten yards* distance, and as the whole extent of the battery would be, say 70 miles,

there might be a scene worthy of an "Emperor" to witness, if the whole of the *twelve thousand three hundred and twenty guns*, which this gigantic battery would contain, were discharged in one vast salute, *à la mode de Cherbourg!*

To form an idea of the obstacle that such a "fortified railway" would exhibit to the advance of an invading army, we may conceive the effect of a line of guns and mortars, extending *two miles* in length, consisting of 352 guns, &c., being all brought to bear on any given point, whereon an adverse force might be collected. A moderate rate of discharge for each piece of ordnance would be once in three minutes; or twenty times in an hour. This would give a rain of 7,040 balls or shells upon any desired spot, in the course of one hour. It would utterly annihilate any army coming within its range. And as every position of the "fortified railroad" would be capable of being armed to this extent, viz., of having one piece of ordnance at every ten yards, or 176 in every mile of its extent, it follows that an advancing enemy would be effectually stopped, or held in check for some days by such a means of defence. It is true, that by opening trenches the enemy might eventually advance; and, if sufficiently powerful, might at length carry the battery by storm in any one part and so gain possession of such a fortification. But to do this, *time*, some few days at least must be required, during which the Government of the day would be able to overcome the *vis inertiae* of routine and red tape; and be prepared to drive their enemies into the sea.

I shall now offer you, Sir, a few words on

#### A DESCRIPTION OF THE PROPOSED FORTIFICATION RAILWAY.

1st. *Its extent.* The radius of ten miles from St. Paul's would, of course, produce a circumference of about

*sixty-three* miles ; but, as it would be essential to avoid cuttings, and have the whole elevation, which should be about thirty feet, clear for the operation of the mounted ordnance on its platform, we may estimate the probable entire length of the Railroad at *seventy miles*.

2nd. *Its course.* There would be two Termini. The SOUTHERN Terminus would be fixed midway, between the Half-way House and the "magazines," upon Half way Reach. The line would thence run up to Abbey Wood ; and cross the *North Kent Railroad* near the latter place. It would then proceed across the old Dartford road, by Danson Park ; and thence go on through Blenden, over the Eltham and Footscray road, by Chiselhurst and over the end of the Bromley line, at Beckley. It would then proceed by Pickhurst, Wickham Street and Coldharbour to Croydon.

From Croydon it would cross the "Croydon and Epsom Railway," to Carshalton ; thence go on to Morden ; and so cross the South Western Railway, near Cannon Hill. It would next skirt Richmond Park, and cross Ham Common. It would then run along the banks of the Thames, below Richmond, border the Royal Observatory Gardens and pass through Isleworth ; crossing the river Thames near thereto, and not far from Sion Hill House. It would thus traverse the Richmond Railway and then the Brentford line, close to Brentford. Next, it would pass over the Grand Junction Canal, to the south west of Little Ealing, and then proceed northwards and cross the Great Western line at the Hanwell Station. Afterwards the course would tend towards Castlebear Hill, pass Perivale and cross the Paddington canal near Horsington Wood. It would next go through Sudbury Grove to the North Western Railway, near Woodcote Hill. From thence, trending to the north west, it would then pass Kenton

and run through Edgware. It would then skirt Highwood Hill and traverse Totteridge Park. A little beyond East Barnet it would cross the Great Northern Railroad; and passing near Trent Park, it would run along the Chase side and pass a very little beyond Enfield. Thence it would run by Green Street, cross the River Lea and traverse Sewardstone Bury, in its way to Epping Forest; a portion of which it would pass through and then cross the Woodford Railway near King's Place. It would next proceed by Grange Hill and touching upon Hainault Forest, pass by the celebrated Fairlop oak. The course will next cross the Romford road, and the Eastern Counties Railway, near Chadwell Street. Lastly it will come down by Little Porters, and cross the Rainham road, and the Railway near the marsh, and so form its *Northern Terminus*, by the shore of the half-way reach and opposite the *Southern Terminus*.

3. *Its cost.* As the general course of the line would be on a dead level, or nearly so, and as the expense of cuttings would be avoided, and as the land would in general have no very especial value, the cost may be estimated at less than £30,000 per mile. The extreme length being taken at 70 miles, this gives the outside of the entire cost of the whole undertaking, £2,100,000.

4. *The mode of raising the capital.* There being a certain portion of the railroad to be appropriated to the platform, for the purposes of the ordnance, which may be taken at the outside at £3,000 per mile, it may be considered that £210,000 of the capital will be specially applied for the public defence. It will not, therefore, be unreasonable to expect that the Government should guarantee a dividend to the shareholders of 5 per cent. per annum. This would not bring any expense upon the nation so long as the Company could net the sum of £105,000 yearly,



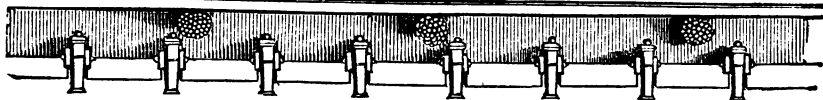
being 5 per cent of the whole capital. And if the profits should fall to as low as 3 per cent., there would still be only the comparatively small sum of £42,000 required of the Government. With such a guarantee, there would be no difficulty in raising the capital required to erect the "Fortification Railroad" round London in the usual mode, by a Joint Stock Company, Limited.

5th. *The receipts and profits.* The railway, as it has been seen, would run through the most populous and wealthy neighbourhoods; it would cross not less than *fourteen* lines of railway, on all of which it would have stations, and be thus able to bring them all into connexion with each other, so that travellers could pass by its means from any one side of this vast metropolis without the delay, and cost, and inconvenience of passing through London by means of cabs, omnibuses, or other carriages. For instance, a person travelling from Dover to any place on the Great Western line, might leave the Dover line at Abbey Wood, and by means of the "Fortification" line, be put upon the Great Western at Hanwell in less than an hour, without trouble or delay, and at very little expense. But as I am not writing a prospectus for forming such a railroad, I omit to say more on this subject, since, if it be considered by our commercial magnates a matter worthy of their notice, there is no doubt that they will enter upon it with a proper spirit.

6th. *The appearance and character of the Fortification Railroad.* The wood cuts will convey a better notion than mere words can do, of the kind of building proposed to be erected for the purpose of fortifying London and securing that "great city" against the unspeakable evil of a sudden warlike attack.

7th. *Mode of arming the Batteries and Working the Artillery.* The great advantage of having a line of rails

in connection with the battery, or batteries, must not be lost sight of, in considering the mode proposed to be



adopted for working the artillery. The locomotives on the rail would, at all times, offer a ready means of bringing any reasonable number of guns and mortars into operation. The whole 70 miles of railroad, would afford space for the working of not less than 12,320 pieces of ordnance ; viz., one for each 10 yards of space, or 176 per mile. But there could, in no case, be a necessity to arm a space of more than about three miles ; which would require, of course, 528 guns ; or guns, mortars and howitzers, &c. Now, as each locomotive might be made capable of removing at least 10 guns, &c., there would be required only 26 engines to bring one half the requisite number of ordnance from the depôt and to place them in position, in about a couple of hours. So that the whole force requisite might be transported from Woolwich Arsenal and located in any part of the battery where required, within from four to five hours. And, therefore, let the enemy come upon us ever so suddenly, we should have at least time for this operation. The necessary ammunition, shot, shell, &c., could be conveyed to the points required by one or two locomotives in the course of a few hours also.

The number of gunners or artillerymen requisite to fight

the guns on even three miles of battery, should the whole 528 pieces of ordnance be called into requisition, would not exceed about 5,000 men. There appears, therefore, no obvious reason why, if such a fortification *existed*, the Government should not, at any time, on having one day's notice, be able to provide all that would, or could, be necessary for the effective defence of the metropolis, by the means here described. Let the enemy be thereby held at bay for only some three days, and a sufficient force could then certainly be drawn together from almost the uttermost parts of the country to entirely destroy them and put *hors de combat* any force whatever that France could land upon our shores.

Objections will, of course, be brought against this scheme, or, indeed, any other that the mind of man may devise. It may be said, that the open parapet from which the enemy would be assailed, would expose the gunners and artillerymen to the aim of the expert riflemen of the French regiments, and that their Minié rifles would clear the parapets, as fast as the guns were manned. And thus the defence would fail and the masses of the invading troops would, therefore, meet with no effectual resistance, unless the guns were covered, or at least worked by means of embrasures, which would greatly increase the cost of the building. To this I reply that I have foreseen this difficulty, and am prepared to meet it, by means of what I term "gun screens." These I propose to have made of iron, sufficiently broad to shelter the upper portion of a man's body and sufficiently thick and strong to stop any kind of musket ball, even though fired from an Enfield rifle. These "screens" should be portable, yet so contrived as to be capable of being placed over each gun and securely fixed into the masonry. They would not interfere with the pointing, elevating or depressing the gun; yet would they offer a perfectly effective security for the gunners and

artillerymen against all kinds of musquetry, and entirely nullify all such attempts as were practised in the celebrated rifle pits, before the fortifications of Sebastopol.

Should circumstances ever arise to render it incumbent on the Government to fortify the Thames, a manifest advantage would accrue from having each *Terminus* of the Fortification Railroad well supported by powerful batteries flanking and commanding the river. These I should suggest might be advantageously constructed to possess several tiers of guns ; so that should an enemy, by any accident seize upon the railway in the vicinity of the river, he would be flanked and enfiladed, to a very considerable extent and very speedily driven from his position.

In conclusion, I must make some apology to you, Sir, for the length of this letter. The subject required more entry into detail than I had intended. But when you reflect on the importance of the objects aimed at, I hope you will not condemn me for being unnecessarily prolix, as almost any defect is better than that of attempted brevity and consequent obscurity.

I have annexed cuts, descriptive of the kind of fortification I propose, in which will be seen the general appearance of the Elevation of a section of the work : whereon the guns are seen protruding over the parapet ; and the portable, "iron screens" are seen affixed thereto ; as they will appear, when prepared for action and effective operations against an enemy.

Trusting that you will deem my ideas on the important subject of "How to fortify London and nullify Cherbourg," if this stronghold be really now intended, or ever hereafter should become a menace to old England, as not unworthy of your consideration and that of our countrymen,

I remain, Sir,

Yours faithfully,

R. J. MORRISON.

## Formulæ for finding the Heliocentric Longitudes and Latitudes of the Planets, by the Cycloid System of Astronomy.

N.B. The Author of the "Solar System, &c.," begs to offer to the notice of Astronomers, the following simple *formula* for finding the true distance of the Earth from the Sun, at any time, by the *Cycloid* system.

$A = \text{Long. of Aphelion.}$

$\text{Mean Anomaly} = A - 90^\circ + \text{Motion of A since Long. Sun} = A - 90^\circ.$

$\text{Mean distance} = 1. \quad \text{Maximum distance} = 1.01679.$   
 $\text{Log. } 9.9927683.$

$\text{Then Log. True Anomaly} = \text{Log. Max. distance} + \text{Log. Mean Anomaly.}$

$\text{Max. dist.} - \text{Mean dist.} = \text{Max. Increment. Log. } 8.225051.$

$\text{Then Log. Increment.} = \text{Log. } 8.225051 + \text{Log. Sine True Anomaly.}$

$\text{And TRUE DISTANCE} = \text{Meandistance} + \text{or} - \text{Increment.}$

The following *formula* will also determine the Heliocentric Latitude of any Planet, by the Cycloid system, after having found the *radius vector of the Planet*, when at the Bend, or being  $90^\circ$  distant from the Node: to do which the following formula will suffice.

Let  $A$ . be the Aphelion Long. And  $P$ . the planet.

$\text{Mean Anomaly} = A - 90^\circ - \text{Long. P.}$

$\text{And True Anomaly} = \text{Log. M.A.} + \text{Log. } 9.997039.$

$\text{Max. dist. P.} - \text{Mean dist. P.} = \text{Max. Increment, or M.I.}$

$\text{Thence Log. Increment} = \text{log. M.I.} + \text{log. sine True Anomaly.}$

$\text{And true dist. P.} = \text{Mean dist. P.} + \text{or} - \text{Increment.}$

## To Find the Heliocentric Latitude of any Planet.

Call the radius Vector at the bend, B. The Max. Hel. Lat. call M. The Max. Elevation of P., above the Ecliptic, call M. E. The dist. in Long. of P. from N. (the node), call D. N. And the actual elevation of P., call E.

Then  $\text{Log. M. E.} = \text{Log B.} + \log. \text{sine M.}$ , And  $\text{Log. E.} = \text{Log. M. E.} + \text{Log sine D. N.}$ ; and

$\text{Log. sine HEL. LAT.} = \text{Log. (A. C.) M. E.} + \text{Log. E.} + \text{Log sine M.}$



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