In the year 1816, Sir Home Popham, who had already introduced a new code of signals into the navy, which was admitted on all hands as a great improvement on the old system, both as regarding the number, the arrangement, and the shape of the flags, now turned his attention to the land semaphore, and proposed one on a construction of the same nature with those of M. Chappe and Colonel Pasley, but much simpli­fied. It was, in fact, nothing more than two moveable arms on separate pivots on the same mast, as in the annexed figure.

This machine, on account of its sim­plicity, had obviously the advantage over all others that had been proposed ; and being found of sufficient power and efficiency for all required purposes, it was adopted by the Admiralty, instead of the shutter-telegraph, which had been in use since the year 1795.

Colonel Pasley, however, in 1822, still further simplified this useful machine, at the expense of sacrificing a small portion of its powcrs, by making the two arms revolve on the same pivot, as in this figure, to which he has given the name of the “ universal telegraph.”

The last, but by far the most persevering and voluminous writer on telegraphs, is Lieutenant-Co­lonel Macdonald, who, in 1808, published what he deems improve­ments in the system of telegraphic communications, both as they regard the machine itself, and the dictionary to be used with it. He not only gives the preference, but is so much attached, to the shutter machine, that he is quite in­dignant at its being supplanted by the semaphore ; and so far from being satisfied with the powers of which a six-shutter tele­graph is capable, he has extended his to no less than *thirteen* different boards, as in the annexed figure, by which he certainly gains power enough, but not without producing confusion and perplexity.

As the use of telegraphs is chiefly confined to public purposes, and more especially to convey speedy informa­tion respecting naval and military armaments and opera­tions, the machine to be adopted, and the system of work­ing it, ought to possess *power, certainty, simplicity, cele­rity,* and *secrecy.* The *power* of the machine, or the num­ber of distinct combinations of its moveable parts, should be equal to the conveyance of every possible order or in­formation, either by numbers representing the letters of the alphabet, or words, or sentences. To insure *certainty,* the moveable parts or signs should be so well and clearly defined, so wholly within the field of the telescope, and so completely removed from all ambiguity, as not to be liable to the mistaking of one signal for another ; hence the ad­vantage of the *simplicity* of the machine. And as one of the main usee of the telegraph is to convey instructions or intelligence in a speedier way than the intermediate dis­tance can be travelled over, it is evident that *celerity* is an important quality of telegraphic communication. It is equally obvious, that if such instructions or intelligence could not be conveyed in *secrecy* from him who sent it to him who was to receive it, such a system would be highly defective and objectionable.

Bearing these observations in mind, we shall not have much difficulty in determining on the merits of the several

telegraphic machines above mentioned. The choice, indeed, appears to lie between the six-shutter telegraph, so long used at the Admiralty, to communicate with the se­veral ports ; the semaphore of Sir Home Popham, which superseded it, and is now in use ; and the universal tele­graph of Colonel Pasley. Colonel Macdonald, who con­ceives the shutter telegraph as the perfection of the art, boldly asserts that “ the semaphore arm of proper dimen­sions is not to be seen in clear weather so well as the com­mon sized boards, and in cloudy weather by no means so well and consequently that, “ for this climate, the board­ed telegraph is in all respects more advantageous.” This would be important if correct ; but it is evident that the colonel is not aware of the discussion which took place on this very important part of the subject, on the first adop­tion of the *boarded* telegraph. Had he read the clear and decisive observations of Mr Gamble, he would scarcely have ventured upon such an assertion.

“ It is a theorem in optics,” says Mr Gamble, “ that the apparent magnitude of an object varies nearly in the in­verse ratio of its distance. Hence it follows, that the larger its dimensions, to the greater distance will it be visible. But the nature of our atmosphere, even in its most trans­parent state, is such as to render any calculation, grounded on this principle, extremely erroneous ; and in general its density so obstructs, and its refracting powers cause such confusion in, the rays issuing from those surfaces which are not placed sufficiently distant to be distinct, that their image falling upon the retina is frequently so ill defined, as to render it difficult to determine either their figure or po­sition ; for which reasons, that which I shall term *insula­tion* is generally a quality more requisite to give *distinct­ness* to an object, than magnitude of superficial dimen­sions.”

This is unquestionably true ; but Mr Gamble illustrates his position thus : “ An example of this distinctness arising from insulation cannot be more readily obtained than by taking a page of printed paper, and fixing the eye on some particular letter (as I) ; then retiring from it, the letter will be so confused with the surrounding ones, as not to be easily distinguished. But if the same letter (!) be printed on a plain sheet of paper, standing by itself (or *insulated),* the eye will then not only discern it at a much greater dis­tance, but the image falling single and unencumbered upon the retina, we shall be able to determine whether it be in­clined to the right or to the left, or whether it be placed horizontally on the paper.”

The shutter telegraph is the printed page, and the arm of the semaphore is the letter (I) on a plain sheet of paper.

But actual experiment has completely proved the fallacy of Colonel Macdonald’s assertion, and the justice of Mr Gamble’s theory. Every officer serving on the line of te­legraphs has stated, that at all times, and more especially in cloudy weather, the arms of the semaphore are seen much better than the boards of the telegraph ever were. Lieutenant Pace, who for many years superintended the Admiralty station, declared, that on the first day after the West Square semaphore was erected, he could clearly dis­tinguish the positions of the arms *without a telescope,* and accurately take down any signals that could be made, which he had never been able to do, under any circumstance what­ever, with the shutter telegraph. He also stated that he had frequently an open communication with the semaphore at West Square, while St Paul’s was capt by a fog, which was at all times considered by him and his assistant as the conclusive sign that the boarded telegraph could not be worked. But in order to set the matter entirely at rest, the shutter telegraph on Nunhead, near Newcross, was left standing on the same hill with the new semaphore, in order to try their comparative distinctness, for a whole winter. The result was, that the semaphore was frequently dis-