

selected men for outpost duty and sharp-shooting. He trusted that our line would never be abolished, we may modify it, because it wants flexibility in rapid movements. Each company to take up 100 paces; 430 paces for the front; then allow more freedom, say ten paces between each company. All formations to be as compact as possible, until within range of fire, then open out. A position cannot be taken by a direct assault, without being accompanied by a flank attack. During the late war no direct attack succeeded without being aided by a flank attack. The final blow is given by a combination of small attacks and knots of men along the whole front. It seems to be a natural sequence of all attacks that the angle is towards the enemy. In moving the third section should support the first section; supports, except in case of difficult ground, should not be more than 400 yards in rear of the skirmishers. As the enemy's position is approached, the leading sections ought to be reinforced, and the position rapidly enclosed, the line should pass through the skirmishers, then give the final assault by converging towards a point, and closing in. The lecturer condemned our system of flying into square at the appearance of cavalry, and instanced how French skirmishers in the late war annihilated the German carabiniers. The lecturer concluded, amid great applause with another apt quotation from Colonel Hamley.

NAVAL STEAM ENGINES.

In a paper "on Steam in the Navy," before the Cleveland, England, Institution of Engineers, Mr. R. C. Oldknow, R. N. one of the Engineers belonging to Her Majesty's yacht *Osborne* said:

Although the Committee on Naval Design that I before alluded to, recommended that none but compound engines be in future, built for Her Majesty's ships. I am myself in great doubt whether this will be found practicable in the case of the largest engines with only one screw. Consider for a moment what an enormous low pressure cylinder would have been required in the *Blonde*, guaranteed to work up to 7,500 horses, had she been supplied with the two cylinder variety of compound engines, which are the only ones hitherto successful in the royal navy. Getting a perfect cast iron cylinder of the necessary size could have not been depended on, and even if the casting were all right, the odds are ten to one that one or more serious cracks would make their appearance very shortly after they were set to work, as has been the case in so many of our largest cylinders already. If then it is determined, that cost what it may, compound engines are absolutely necessary to the complete efficiency of ships of war, it seems to me that we are landed on the horns of a dilemma—either the plan of increasing the number of cylinders must, with all its disadvantages, be adopted or the material of which the cylinders are made must be changed. If the former course is decided on, the French system of one high pressure cylinder between two low pressure ones seems to promise the best

chance of success; and I am not without hope that some day, increased skill in forging will give us cylinders in wrought iron, or else that some suitable form of bronze or gun metal alloy will be discovered which may enable us to combine the advantages of a perfect casting of the largest size with durability and smoothness of working. Of course, the consideration of prime cost would not be allowed for one moment to interfere with the production of a perfect cylinder of enormous diameter. Wrought iron and steel in combination with cast iron have been tried, but the inequality of expansion appears to me to be an almost insuperable objection to this plan. With very large horizontal cylinders extreme care and watchfulness are necessary, or they will get scored and cut like a piece of curdurey. This used to be especially the case when the piston had nothing but the front rods to bear its weight. Whatever the designs of the engines may be, a back trunk for support is now considered a necessity for large pistons. I am inclined to think there is a tendency with some makers to reduce the depth of their pistons almost below fair limits and that this has had something to do with the scoring of cylinders. It has been held for many years almost a *sine qua non* that the cylinders of a screw ship of war should be horizontal; but lately the protection afforded by belts of armor has induced the Admiralty to approve of some vertical inverted cylinder engines, which are now in course of construction. This is a matter for congratulation, as there can be no doubt that the perpendicular is the natural normal, and most proper position for a piston and cylinder where there is no potent objection to its adoption. Attention to detail is being more and more studied by engine builders, and so it ought to be. If I had my way, I would never allow a man who had not been to sea to have any hand in designing the smallest and seemingly most unimportant bit of a marine engine. No single bolt or nut, or split pin is unimportant. I can remember some years ago when Her Majesty's ship *Pelican* broke down in a gale of wind on the North coast of Africa. An iron bound shore was under her lee, the sails were useless, there was no haven of refuge for 500 miles, and the engineers had simply to run a race with death, which I am happy to say they succeeded in winning by about twenty minutes. A very little while back some makers always put on their smaller covers and bonnets with screws instead of studs and nuts. Nay, I am credibly informed that such misguided or malignant manufacturers may still be found in various parts of these dominions. If they were to be shipmates for three years with such doors or bonnets they would never fasten them with screws any more."

INCREASED PRODUCTION OF GOLD.—The largely increased production of gold in the world was shown by a letter to the *Economist* to-day from Mr. Thomson Hankey. During the last ten years he says, "the export of gold (exclusive of gold coin) from the Australian colonies has not been less than

about 17,000,000 oz., or equal to £68,000,000 and the gold coin exported from the same colonies would add about £20,000,000, making a total of not far short of £88,000,000. The export from the Australian colonies during the previous ten years—says from 1852 to 1862—was at least equal to that during the past ten years ending 31st December last: if so the total export of gold from the Australian colonies since the first discoveries of gold cannot have been much less than £170,000,000 to £180,000,000, and if the export from California during the like period has been only £120,000,000, we have a gross total of not less than 300,000,000 of gold added to the stock of gold in the world since 1852-'53. Here is only reckoned the gold produced in Australia and California, the production of gold in other parts of the world, previous to 1852, was considered to be equal to from £3,000,000 to £5,000,000 value annually, only reckon it at three millions, there will have been a further addition of £60,000,000, so as to make a grand total of at least £60,000,000 and possibly considerably more, to the gold already in the world before the discoveries of gold in California and Australia."

The monument in memory of Prince Albert has been formally opened by Queen Victoria. The remarkable features of the work are the four groups at the corners, representing Asia, Africa, America and Europe. Of the way in which America is honoured, the *London Standard* says: "America, by John Bell, whose many careful and poetic conceptions have raised him to the highest position among modern sculptors is the finest of all the groups in our own as well as in general estimation. Its superiority is particularly manifested in the composition and in the delicacy of the sentiment, as well as in the distinctness with which the story it tells is expressed. The representative figure of America riding on the wild and shaggy bison is a fine and spirited conception, whilst the frank admission of the United States leading the way in the affairs of the Western Continent, whilst Canada, with true loyalty, still presses the rose of England to her breast, displays a prominent and estimable fact, acknowledged alike by sovereign and by people here. Asia is the least to be admired by the English, and there is some complaint because Australasia is not down somewhere. The smaller groups represent the industries and various devices of peace and war by which England has grown so great."

A DETACHMENT of the U. S. Coast Survey Corps, under the command of Captain A. M. Harrison, U. S. Army established there camp at Porryville, R. I., August 8, and will continue the topographical survey of the coast of Rhode Island, from the termination of the work last season, near the Magee Weedon farm toward the Connecticut line. The survey of Narragansett Bay has already been completed by the Captain and his assistants an engraving of a large and finely-executed chart of which is already finished, and soon to be issued from the department at Washington. The work has been carried southward and westward a distance of four miles beyond Point Judith, at which point it is about to be resumed. The survey extends inland about three miles and a half, and presents a minute and detailed delineation of the topography of the country included within the area of the survey. The party was on duty during the last winter on the eastern coast of Florida below St. August line.