

correspondent of the Palestine Exploration Fund, and is composed of letters almost identical with those on the Moabite stone. The Palestine Exploration Fund have been doing excellent work on the west side of Jordan, and have now finally decided on a painstaking and accurate survey of the east side, which as it stands today is a blank upon the maps. Much assistance may be expected for Biblical scholars in the recovery of local names, which in the Eastern exploration have already thrown so much light upon the historical books of the old Testament. Many personal appellations have been already identified with geographical names as *Belka* with *Bulak*, *Shihdn* with *Sihon*, and a host of others, while the scripture names of *Oreb*, *Zeeb* and *Salmaneh* are of frequent occurrence among the Arab tribes under their modern forms of *Gorhab*, *Diab* and *Selameh*. The expedition will have started in all probability by the time these lines are read.

Engineering, Civil & Mechanical.

WATER AS A BLASTING POWER.

It appears that at some of the fiery coal pits near Barnsley, in Yorkshire, England, there is a system of blasting in vogue where water is used in addition to gunpowder, with the best possible results. The system is simple in the extreme, and, so far from its being costly, it is an economy, for, in the blasting operations performed with water in conjunction with gunpowder, a greater amount of work is done with considerably less powder and the powder is rendered harmless. The value of the foregoing will be best appreciated by a short description of the operation. Ordinarily, blasting with gunpowder is done somewhat as follows: A bore hole is made in the face of the coal about 2 inches in diameter and 4 or 5 feet deep. Into this hole a powder cartridge is inserted, with a slow fuse attached; the hole is then tamped—that is to say, it is filled with any available dry refuse rammed in tight; the fuse is lit and the cartridge fired. In this operation a flame, very dangerous in fiery pits, is created, and carbonic acid and sulphurous acid gases and smoke are generated. Blasting with water and gunpowder is performed in the following manner: Into the bore hole is inserted a powder cartridge, with fuse attached; next to the powder cartridge is inserted into the bore hole a tube containing water. These tubes should be as large as the bore hole will admit, and of any convenient length, the longer the better. They may be made of any convenient cheap material—thin tin plate, or of stout brown paper turned round on a wooden roller and pasted together, the ends closed with corks; the bore hole is then tamped, the fuse lit and the cartridge fired in the usual manner. The result of this operation may be briefly summed up. The powder, in exploding, bursts the tube containing the water, the rending force of the powder is extended through the water by the well-known principles of hydraulics, demonstrated years ago by Bramah, over the enlarged interior area of the bore hole, due to the space occupied by the water tube. A much larger quantity of coal is thereby brought down with a smaller quantity of powder; the heat given off by the burning of the powder and the gases converts a portion of the water into steam, the elastic force of which assists in the operation of blasting; the steam and water together put out the flame and flash of the powder, and absorb and neutralize the greater portion of the gases and smoke resulting from the explosion. It will readily be seen that herein are met together economy and safety by the adoption of a system simple as it is effective, and it is to be hoped that, in the best interests of humanity, our large and intelligent coal-owners will not be slow to adopt an amelioration in their present crude and dangerous practice of blasting, which will tend, in a great measure, to make explosions in coal mines a thing of the past, rather than of almost daily occurrence.

THE FOREMAN.

In these days of fierce and sometimes unscrupulous competition, and of rapid mechanical advancement abroad as well as at home, it is in the highest degree essential that our own leaders of workmen should not idly rest upon the laurels they may have

won in time past. They must, on the contrary,—if the firms they serve are to be kept out of the *Gazette*, and themselves saved from ruin, study thoroughly the theoretical as well as the practical sections of their various occupations, and abandon the old "rule-of-thumb" modes of procedure in conducting them. This dictum applies to all branches of manufacturing industry, but to none more strongly than to those of Building and Engineering. In point of fact these may now almost be said to be, as it were, wedded to each other, and it is difficult to draw a very broad line of demarcation between them. In view of what is taking place in respect of the training of young workmen in France and other countries of the continent, by means of apprenticeship schools, &c., and the certainty that there is of a superior grade of foremen being the upshot of it, we may indicate what we consider to be some of the main requirements and qualifications demanded of English foremen of builders, or of engineers of the present day.

To begin with, they must be skilful workmen, or it will manifestly be impossible for them to direct those who are placed under their control and guidance. Indeed, unless a foreman be capable of taking his place among a number of workmen, and, by quickness of perception, carefulness, and the exhibition of superior manipulative skill, proving to them that he has a perfect mastery in these directions, his authority over them will be minimised. Workmen are appreciative in the highest degree of real talent and knowledge in their leaders, but so also they are not slow in exhibiting their contempt for those who merely assume such characteristics.

When a foreman has demonstrated his capabilities for laying out work, and in arranging the various processes for completing it, he has done much towards insuring successful results, and he will gain the respect alike of master and man. Further, a good foreman should become thoroughly conversant with the peculiarities of construction, and the action of machines and machine tools, of which so many varieties exist, and which are of infinite importance as to economy of time and money. Without such accurate knowledge he could certainly not estimate, with any degree of exactitude, the amount of duty to be obtained from the use of such appliances, nor the approximate cost of the work to be done by them. In conducting and governing properly the multifarious duties of the workshop or the factory, a ready method delineating forms, and of thus conveying to others, through the medium of the eye, his own ideas of pieces of mechanism or the details of machinery, is a necessary accomplishment for a foreman. By such means he will readily instruct his men, and that in a manner which no mere verbal explanation would make intelligible. Pencil or chalk discreetly used by the foreman thus becomes one of the most forcible and plain teachers of workmen.

The previous training and experience of the latter prepare them to understand sketches, and thus he who can best produce the latter economises the time of all concerned, and saves his employers from needless expense. The power of making diagrams with precision and rapidity is, in fact, an invaluable acquisition for the leader of a staff of mechanics. It is a qualification which, like many others requisite for making a really efficient foreman, can only be gained by constant practice, and we most earnestly advise those young workmen who aspire (as all should do) to come to the front, and "take the lead," to miss no opportunity for acquiring it. A fair knowledge of geometry and arithmetic, and of the nature of the materials employed in works of construction, is simply indispensable. The foreman, too, must be possessed of prompt energy, and of a readiness of expedient, so as to enable him to grapple successfully with emergencies, and overcome practical difficulties that may crop up unexpectedly, as subsidences of foundations, break-downs of machinery, &c.

The duly qualified foreman will find no difficulty in deciding as to the length of time which should be occupied over any detail placed for completion in the hands of a workman under him, for he knows how long it would take if he did it himself. It would be easy to extend our remarks upon the practical essentials of good foremanship, but it seems scarcely desirable to do so, and therefore with a word or two as to moral requirements, we shall conclude. Among these last stand out prominently a love of truth and a total absence of duplicity. Let it be generally known that a foreman is above and beyond acting or speaking otherwise than conscientiously, and his moral power will be great indeed. Faith will then be placed in his judgment, and while workpeople will, as a rule, repay him with respect and ready obedience, employers will as certainly repose in him the utmost confidence.