

to the size of the pipe and the character of the ground, but in every case there should be sufficient space between the pipe and the sides of the trench to make it possible to thoroughly ram the backfilling around the pipe and to secure tight joints.

Pipe Laying

The laying of pipes in finished trenches should be commenced at the lowest point, so that the spigot ends point in the direction of flow.

All pipes should be laid with ends abutting and true to line and grade. They should be fitted and matched so that when laid in the work they will form a sewer with a smooth and uniform invert.

It is necessary to use all possible care when shoving the pipes together, so that the joints will not be unnecessarily large.

Bells should be carefully cleaned before pipes are lowered into trenches. The pipes should be so lowered as to avoid unnecessary handling in the trench.

The pipes should be set firmly according to line and grade, and the joints carefully adjusted and filled with the jointing material.

Joints should be made in the following manner: A closely twisted hemp or oakum gasket of suitable diameter, in no case less than $\frac{3}{4}$ in., and in one piece of sufficient length to pass around the pipe and lap at the top, should be solidly rammed into the annular spaces between the pipes with a suitable caulking tool. When cement joints are used, the gasket should first be saturated with neat cement grout. The remainder of the space should then be completely filled with the jointing materials.

Backfilling Trenches

All trenches and excavations should be backfilled immediately after the pipes are laid therein, unless other protection of the pipe line is directed. The backfilling material should be selected and deposited with special reference to the future safety of the pipes. Clean earth, sand or rock dust should be solidly tamped about the pipes up to a level at least 2 ft. above the top of the pipes. This material should be carefully deposited in uniform layers. Unless otherwise permitted, each layer should be carefully and solidly tamped or rammed with proper tools so as not to injure or disturb the pipe line.

Puddling or water flooding for consolidating the backfilling is recommended only for sandy and gravelly materials. If this method is used, the first flooding should be applied after the backfilling has been compacted by tamping up to 2 ft. above the top of the pipes, and the second flooding during or after the subsequent filling of the trench. An excess of water should be avoided, in order to prevent disturbance of the earth under and around the pipes and also to prevent an undue excess of pressure upon them.

Walking or working on the completed sewer, except as may be necessary in tamping or backfilling, should not be permitted until the trench has been backfilled to a height of at least 2 ft. over the top of the pipes.

The filling of the trench should be carried on simultaneously on both sides of the pipes in such a manner that injurious side pressures do not occur.

An important programme of mining development is being undertaken by the Duchy of Cornwall, England, the principal object being the recovery of wolfram. This mineral is at present in great demand for the production of tungsten, a metal which is necessary for the manufacture of high-speed steel.

THE POSITION OF THE ENGINEER IN THE COMMUNITY AND HIS RELATIONS TO THE CONTRACTOR*

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THE engineer is primarily a man whose life is devoted to promoting and planning things that actually happen, and without doubt he is slowly but surely assuming his rightful position in the world, because it is becoming universally recognized that he, above all of his fellows, is better fitted by his education, experience, and, generally, his temperament to fill those positions in the direction of the world's material progress which require, among other things, sound, sane and intelligent judgment and at the same time administrative ability, energy, technical and scientific knowledge of a high and varied order.

Of course, initiative, candor, truthfulness and efficiency, and, above all, integrity, are presupposed and, let us hope, can usually be taken for granted.

Engineering is an art and a science. It is a science in so far as certain physical laws are its basis. It is an art in so far as in the application of these laws the best judgment inherent in or acquired by man must be exercised. It is the engineer who is the pathfinder and pace-maker in modern civilization, and it is he who more nearly than any other individual can be likened unto Jove of old, whose command of the elements used to be universally acknowledged and is proverbial, and it is the engineer who, to-day, is largely charged with encroaching on his ancient and honorable preserve.

Little progress would be made in the modern world if the engineer did not blaze the way, and a giant's share of the progress in material things which has been made since the birth of the First Napoleon has been made by engineers, and incidentally it may be observed that, since his birth, there has been more actual progress than was made during two thousand years that preceded it. That there is far more difference between our world and that in which Bonaparte was the central figure than there was between his world and that of Julius Caesar, most of which difference has mainly been brought about by the engineer, cannot be disputed. Much yet remains to be accomplished. Unknown and exhaustive domains no doubt are still to be explored and exploited, but, stupendous as is the task, the engineer will, when the day of reckoning arrives, be found to be in the forefront.

To cope with those impediments which Nature and man set up in the way of material progress, and to transmute or convert these into processes for the use and convenience of mankind, is the acknowledged function of the engineer, and he has not heretofore been, nor shall he in the future be, found wanting.

To be more specific, in the ultimate analysis the elemental components, physical, mental and moral, which in the ensemble constitute the engineer, as herein stated, may be said to be character and experience, imagination, efficiency, executive and technical ability and scientific knowledge. While no one of these principles can be said to dominate the rest, still in a general sense there is no disputing the fact that character stands first. It is the framework or foundation on which the other characteristics are built.

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