

**Semple G (1780) A Treatise on Building in Water in Two Parts. Second Edition.
London Longman**

Part II Building in Water.

Concerning Lime Mortar and Grout.

I HAVE from my Childhood, been well acquainted with the Nature of Lime and Sand made in Mortar, of all sorts, that have been used in Buildings in these Countries, and tried numerous Experiments with them; on which, together with what I have observed and learned from old experienced Workmen, during the Course of upwards of sixty Years, I think, I can safely affirm, that good Mortar, that is, Mortar made of **pure and well-burnt Limestone**, and properly made up with sharp, clean Sand, free from any sort of Earth, Loam or Mud, will within some considerable Time actually petrify, and as it were, turn to the Consistence of a Stone. I remember I had one of my Remarks from an old Scotch Mason, which I shall give you in his own identical Words, that is, "When a hundred Years are past and gane. Then gude Mortar is grown to a Stain (or a Stone.)"

My Father (who was a Workman about the Year 1675) often told me, and my own repeated Observations convince me, that the Methods Masons practised in former Times, in building Churches. Abbeys, Castles or other sumptuous Edifices in this Country, was to this effect. After they laid the outside Courses with large Stones, laid on the flat in swimming Beds of Mortar, they hearted their Walls with their Spawls and smallest Stones, and as they laid them in, they poured in plenty of **boiling Grout, or hot Lime-liquid** among them, so as to incorporate them together, as if it were with melted Lead, whereby the heat of it exhausted the Moisture of the outside Mortar, and united most firmly both it and the Stones, and filled every Pore (which as the Masons term it) set, that is, grew hard immediately, and this Method was taught to our antient Masons, by the Romish Clergy that came to plant Christianity in these Countries, and I affirm, that in many of such old Buildings, I have seen the Mortar, as it were, run together and harder to break than the Stones were.

But with respect to the Matter in hand, I admit that Mortar will not set or grow so soon hard in Water as upon Land; but I am fully convinced, that good Mortar will in reasonable Time grow as firm and as substantial in Water as upon dry Land; but not dwelling upon mere Reports, I shall come to Facts, and I do also affirm, that in pulling down Essex-bridge, and repairing Ormond-bridge, we found the Mortar of the lower Courses of the Piers better cemented to the Stones, than it was in the upper Works; for a wet Stone or a wet Brick imbibes the Mortar, and holds it faster than a dry Stone or Brick will do; the Dust and Dry-ness of either crusts the Mortar immediately, and the wet Stones or Bricks suck and unite with it, as for instance, take two Bricks equally well burned, wet one of them and lay it on a Bed of Mortar, and at some Distance from that lay on the other dry, let them lie so as long as you please, and then take them up, and you will find the wet Brick will bring up its Bed of Mortar with it, but the dry Brick will separate and leave its Bed of Mortar behind it.

There are several sorts of Limestone, some indeed, set much sooner and harder under Water than others, but any good Lime properly mixed, and tempered with sharp clean Sand, will bind and cement as effectually under Water as above it, as I hinted before. What I mean by good Lime, is that which is made of clean, close-grained Limestone. All Marble is Limestone, but all Limestone is not Marble. All Marble will take a polish,

but all Stones that will burn to Lime, will not take a polish. For instance, Chalk will make Lime, but it will neither polish nor make good Lime for any Purpose; therefore, I advise you to choose the closest grained, the hardest, and consequently the heaviest Limestone for any Work, but particularly for Water-works.

I need not explain what I mean by sharp, clean Sand, but I shall give this One Caution, that it is better to put too much Sand in your Mortar than too little. **I know Workmen choose to have their Mortar rich, because it works the pleasanter**, but rich Mortar will not stand the Weather so well, nor grow so hard as poor Mortar will do; if it was all Lime it would have no more Strength in Comparison, than Clay.

Now let us suppose, that a Peck of Roach-lime was slacked into White-wash, and then mixed with two or three Barrels of sharp Sand, so that, every individual particle of Sand partook, and as it were, got a white Coat of this Liquid-lime, such Mortar, that would only appear to be mere Sand, supposing such could be wrought into Mortar, would sooner harden and petrify, either in or out of Water, than if there had been ten Times that Quantity of Lime made up with it; but nevertheless, observe, that I do not recommend that Proportion for Mortar, though it might answer for our present Purposes extremely well.

It is not within my Province to account for the petrifying Qualities of Limestone, Lime or Lime-water, though I have often heard, seen and read of several very remarkable Instances of each of them, but it is sufficient for my present Purpose, that they have these petrifying Qualities to great Degrees; but all sorts of Limestone have not this Quality in the same Proportion, yet I believe, no Limestone whatever can have more excellent Qualities than such as we have in, perhaps, every County in the Kingdom: And indeed, it has some useful Qualities not much known among the Generality of Workmen, as for instance, our Limestone will make exceeding good Tarrass for Water-works, for which purpose you are to prepare it thus: **Get your Roach-lime brought to you hot from the Kiln, and immediately pound or rather grind it with a Wooden maul, on a smooth large Stone, on a dry boarded Floor, till you make it as fine as Flour, then without loss of Time, sift it through a coarse hair or wire Sieve, and to the Quantity of a Hod of your setting Mortar (which on this Account ought to be poorer than ordinary), put in two or three Shovels-full of this fine Flour of the Roach-lime, and let two Men for Expedition sake, beat them together with such Beaters as the Plaisterers make use of, and then use it immediately.** This, I can assure you will not only stand as well, but is really preferable to any Tarrass.

I will give you another Instance which will be hereafter found to come within our Subject, ie. the making Cisterns in which Tarrass is generally used in ordinary Work, build all your outside and inside Rows or Courses with wet Bricks, and with Tarrass-mortar **made as above directed**; observing, that your Mortar is to be a little too soft for Work, and then the heat of the Lime-flour will bring it to a proper Consistence immediately; but never throw Water upon it when you are beating it, for that will chill and slack your Lime-flour, which you ought most carefully to avoid, but make the Men temper it with the utmost Expedition, and what you want in Water to make it fit for your Work, give it in Elbow-grease; and this Rule ought to be observed in making all sorts of Mortar.

The Grout which you lay your middle Row with, must be thus made (in a Tub or Bucket): pour your Water on the Roach-lime, which must be **pure and well burned**,

very leisurely; and when it is boiling, you may strain it through either a wire or hair Sieve, so as it may be tolerably free from Stones, and then let it be used directly, and be sure your Sand is sharp and clean, and when you are using it, do not take the thin that is uppermost, but stir it up and take plenty of the Sand with it; but in Masons Work, when the outside and inside Courses of cut Stone are set, pour in this boiling hot Grout, and instantly lay down your middle Course of wet Bricks between them, in double or single Rows of Stretchers, braking Joints as usual, according as the Largeness or Smallness of the Work may require, and that will press and squeeze the Grout into all the inside Pores that are next to it, and so they will all unite, and by the heat of the Grout and Dryness of the Bricks, they will all set together immediately, and become staunch and solid; but if you were making a Cistern of rough Stone, **mix one fourth of the Powder of Tiles, or well-burned Bricks with your Mortar.**