is formed of loose stones or coarse gravel, the pressures of sand and water remain distinct, each substance transmitting its own pressure, and the gravel alone producing friction ; if the material is a water-tight clay, the weight of the water above is equivalent to that of any other load, increasing definitely the pressure of the clay and causing additional friction ;* if, however, as is commonly the case, the material be something between these extremes, a fine sand, a silt, or mixture of the two, the water neither penetrates the whole with perfect freedom nor remains as a weight on the top of a substance which it does not enter ; its action is therefore dependent on capillary attraction and matters which cannot be measured precisely ; and while the total pressure would not differ materially from that in either of the two preceding cases, the portion of that pressure which is transmitted by the sand, and which alone produces friction, would be somewhat greater than in the case of the gravel and less than with the clay. This could be better guarded against by an empirical allowance than measured by exact computation ; in estimating friction, accordingly, the calculations were made by the formula given above, but the value given to w was the full weight of the saturated sand, and not its submerged weight alone ; this, undoubtedly, gave excessive results, but as no allowance was made for the portion of the pressure of the superposed water transmitted by the sand, this discrepancy was a little less than might at first be supposed.

The coefficient of friction of wet Kansas City sand upon itself was ascertained by experiment to be about .8 ; the least observed was .725, which corresponds very nearly to $a = 54°$; this, substituted in the above formula, gives

$$P = 0.1298\, h^2\, w. \qquad (b.)$$

Substituting for w the immersed weight of the heaviest sand weighed, or 69.5 pounds:—

$$P = 9.02\, h^2. \qquad (c.)$$

And if w be made the full weight of a cubic foot of such sand saturated,

$$P = 17.13\, h^2. \qquad (d.)$$

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* In this case the actual and not the submerged weight of the clay must be used in computation ; but the cohesion of the particles of clay is so great that this formula would give very excessive results.