The influence of a yielding of the supports is readily computed by resolving the movements of the supports A and Binto (1) a sinking (Δ_a at A and Δ_b at B), (2) a turning ϕ_a of the tangents at A (positive clockwise) and ϕ_b at B (positive anti-clockwise), (3) and a lengthening kl of the distance AB. The statically indeterminate quantities will then be

$$X_{\rm au} = -E J \frac{\varphi_{\rm a} + \varphi_{\rm b}}{\delta_{\rm aa}}$$

$$X_{bu} = -E J \frac{\Delta_{b} - \Delta_{a} + \frac{1}{2} l (\phi_{b} - \phi_{a})}{\delta_{bb}}$$
$$X_{ou} = -E J \frac{kl - \eta (\phi_{a} + \phi_{b})}{\delta_{ou}}$$

and the bending moments and normal forces in the arch are then directly computable.

VALUES OF M₁.

$\alpha = I$													
<i>x</i> ,	$\frac{l}{l} =$	5	4	3 [`]	2	—. I	.0	+.1	+.2	•3	•4	•5	
$\frac{l}{l}$	=5	0	0607	0640	0367	.0000	+.0313	+.0480	+.0473	+.0320	+.0113	0	
		0 0 0 0	+.0255 +.0142 +.0053 0011 0051	0090 +.0538 +.0242 +.0022 0120	0179 +.0142 +.0595 +.0181 0101	0130 0086 +.0130 +.0518 +.0080	0031 0187 0156 +.0063 +.0469	+.0054 0198 0278 0186 +.0080	+.0093 0154 0269 0251 0101	+.0078 0086 0174 0186 0120	+.0031 0026 0059 0067 0051	. 0 0 0 0 0	
x_1	$\alpha = .9$												
$\frac{l}{l} =$	5	0	0627	0704	0477	0144	+.0157	+.0336	+.0363	+.0256	+.0093	0	
	4 3 2 1 .0	00000	+.0246 +.0141 +.0058 0002 0041	0119 +.0535 +.0259 +.0050 0080	0230 +.0138 +.0624 +.0229 0046	0196 0092 +.0167 +.0581 +.0152	0103 0193 0115 +.0132 +.0547	0012 0204 0241 0123 +.0152	+.0042 0158 0240 0203 0046	+.0049 0089 0157 0158 0088	+.0022 0027 0054 0058 0041	00000	

PRELIMINARY ESTIMATES IN RAILROAD WORK.

S PEAKING from six years' experience as railroad engineer, Carl A. Gould, C.E., of the Northern Pacific R.R., states, in the Cornell Civil Engineer, that there are many items connected with the conthe most experienced to make provision at the time the first estimate is made.

With the growing tendency among the railroads to eliminate the old style of contract, containing prices for five on five or more classes of material, such as earth, hardpan, l_{008e} more classes of material, such as earth, hardpan, loose rock, shell rock, and solid rock, and place in its stead stead a contract containing only two classes of material, i.e. i.e., common excavation and solid rock, with the solid rock with t rock well defined and all material not coming under the solid rock, with under the solid rock definition classed as common excavation, it has left little chance for argument as to whether material encountered is of one class or another. As there is always a great difference in the prices for handling the different classes of classes of material, naturally the contractor doing the work work work between the tractor doing the t work would feel that the man responsible for the final classification classification should be always on the alert to detect any difference in should be always on the alert to detect any difference in material and establish classification lines to be used on the final remeasured cross-section, on which is based the is based on the final remeasured cross-section, on the case may be As the contractor's profit, or loss, as the case may be the contractor's profit, or loss, as the case may be all be. As this method is practically impossible where all classes of elasses of material are encountered, the question resolves itself into itself into one of personal opinion entirely. Now, as we are setting to a matter of dollars and cents, it is evident that it should require a man of some experience in hand-ing material require a man of some experience at what will be ling material (in excavation) to arrive at what will be considered a fair percentage proportion for the work in question.

Even the most fair-minded contractors are apt to consider the engineers unfair, and on the other hand the engineers usually have good reason to think the contractors are asking too much. However, this condition is found, to a greater extent, among the smaller con-tractors and the engineers of limited experience. It is a fact, that it is a condition which arises on almost every piece of construction work where classification of material is made, and it behooves the engineer to become familiar with the character of the material to be moved, digging test-holes in cuts if necessary, in order that he may make a preliminary estimate which will compare favorably with the actual quantities of each class of material moved during the construction. Although the preliminary estimates are in no way binding on the railway company, this information should be furnished the contractor in order that he may place an intelligent bid, and thereby reduce the wrangling and friction with which so many of the construction jobs are closed.

There is another item which is often overlooked, and indeed difficult to determine at the outset, i.e., slides in cuts and settlement of soft ground under embankments. Allowance should be made for slides and settlements, especially where rainfall is heavy, cuts and fills deep, and ground water present. This allowance can only be approximate at best, but will be necessary when the engineer checks his final quantities with the preliminary estimates.

Over-haul is an item which is effected by all the variations in the quantities moved, and, therefore, the items above mentioned will all have an important part to play in the final over-haul quantity.