$$M_x = \frac{g}{12} \cdot \left[3x^2 - a^2 + \frac{1}{m} \cdot (3y^2 - a^2)\right]$$

$$M_y = \frac{g}{12}\left[\frac{1}{m} \cdot (3x^2 - a^2) + 3y^2 - a^2\right].$$

Taking $m = 3$,

$$M_x = \frac{g}{12} \cdot \left(3x^2 + y^2 - \frac{4}{3} a^2\right)$$

$$M_y = \frac{g}{12} \cdot \left(x^2 + 3y^2 - \frac{4}{3} a^2\right).$$

These moments, parallel to the axes, can be shown to be the maximum moments, and the stresses $c_x$ and $c_y$ to be the maximum stresses in points $x, y, \frac{h}{2}$. The bending moments vary only with the value c of the normal stress in the upper and lower side of the slab

$$M = \frac{h^2}{6} \cdot c,$$

the question of the direction of the maximum bending moments is accordingly reduced to that of the direction of the principal stresses. To find these advantage is taken of the fact that the stress distribution is a "plane" one for all points in the plane $z = \pm \frac{h}{2}$; the normal stress $c_z$ (parallel to the z-axis) can with sufficient accuracy be assumed O and furthermore the shear stresses $s_x = s_y =$ O for the same reasons as for an ordinary beam. The necessary and sufficient requirements for a plane stress distribution are thus fulfilled.

To fully determine the stresses in the points $x, y, \pm \frac{h}{2}$ it is now only necessary to know the values of the shear stresses $s_z$. Grashof gives

$$s_z = \frac{m - 1}{m} \cdot A \cdot \frac{h}{2} \cdot \frac{\delta^2{}_z}{\delta_x \cdot \delta_y}$$

As the equation for z does not contain any product of x and y, $\frac{\delta^2{}_z}{\delta_x \delta_y} = 0$ and therefore $s_z = O$; consequently $c_x$ and $c_y$ derived above are the principal stresses at the point, and then again $M_x$ and $M_y$ the maximum bending moments.

The distribution of the bending moments over the entire slab is given by the equations for the bending moments; by substituting $\frac{l}{2}$ for a (l the span) the equations will take the form

$$M_x = \frac{gl^2}{12} \cdot \left[3 \cdot \left(\frac{x}{l}\right)^2 + \left(\frac{y}{l}\right)^2 - \frac{1}{3}\right]$$

$$M_y = \frac{gl^2}{12} \cdot \left[\left(\frac{x}{l}\right)^2 + 3\left(\frac{y}{l}\right)^2 - \frac{1}{3}\right]$$

In the following table is given the bending moments for different values of $\frac{x}{l}$ and $\frac{y}{l}$

$\frac{x}{l} =$

| | 0.x centre of slab | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
|---|---|---|---|---|---|---|
| 0.x | $+\frac{gl^2}{36}$ | $+\frac{gl^2}{39.6}$ | $+\frac{gl^2}{56.3}$ | $+\frac{gl^2}{189}$ | $-\frac{gl^2}{81.9}$ | $-\frac{gl^2}{28.8}$ |
| 0.1 | $+\frac{gl^2}{37.1}$ | $+\frac{gl^2}{40.9}$ | $+\frac{gl^2}{59}$ | $+\frac{gl^2}{225}$ | $-\frac{gl^2}{76.7}$ | $-\frac{gl^2}{28.1}$ |
| 0.2 | $+\frac{gl^2}{40.9}$ | $+\frac{gl^2}{45.6}$ | $+\frac{gl^2}{69.3}$ | $+\frac{gl^2}{514}$ | $-\frac{gl^2}{64.3}$ | $-\frac{gl^2}{26.3}$ |
| 0.3 | $+\frac{gl^2}{49.3}$ | $+\frac{gl^2}{56.3}$ | $+\frac{gl^2}{97.3}$ | $-\frac{gl^2}{450}$ | $-\frac{gl^2}{50.7}$ | $-\frac{gl^2}{23.7}$ |
| 0.4 | $+\frac{gl^2}{69.3}$ | $+\frac{gl^2}{83.8}$ | $+\frac{gl^2}{225}$ | $-\frac{gl^2}{124}$ | $-\frac{gl^2}{39.1}$ | $-\frac{gl^2}{20.8}$ |
| 0.5 | $+\frac{gl^2}{133}$ | $+\frac{gl^2}{225}$ | $-\frac{gl^2}{327}$ | $-\frac{gl^2}{64.3}$ | $-\frac{gl^2}{33}$ | $-\frac{gl^2}{18}$ |

(Over column)

The bending moments parallel to, and along the sides of the panel are thus positive at the middle point and equal to $+\frac{gl^2}{133}$ (see last line of table), decreasing to $-\frac{gl^2}{18}$ over the support; perpendicular to the sides the bending moments are negative (last column) over the entire length, $-\frac{gl^2}{28.8}$ at the middle point and $-\frac{gl^2}{18}$ over the support.

As the above calculations are based on a uniformly distributed loading, the negative moments derived therefrom can be considered as the maximum values for which the slab has to be dimensioned. The positive moments attain their maximum by partial loading. Judging from similar cases (continuous slabs and beams) it seems reasonable to assume that the maximum positive moment from a live load p per square unit will be

$$2 \cdot \frac{pl^2}{36} = \frac{pl^2}{18},$$

$\frac{pl^2}{36}$ being the maximum moment at the centre of the slab for a uniformly distributed load. The resulting moment from a dead load g per square unit and live load p per square unit would therefore be

$$M = \frac{gl^2}{36} + \frac{pl^2}{18}$$

or for values of g varying from $\frac{3}{4}$p to $\frac{1}{3}$p, which covers nearly all practical cases, the maximum positive bending moment can be taken as

$$M = \frac{gl^2}{22},$$

where g is the total load per square unit (g = g + p).

Above Poisson's constant, m, has been taken equal to 3 which, according to the not very numerous experiments made so far on this continent and on the other side of the ocean, seems a fair figure. That the value of m is not of great significance will be seen by the table below, which gives the maximum negative moment over the