cm; the radius of curvature: about 7 m).

The lens behind the covering is that of a Tessar Zeiss camera. (f=40 cm. 1: 4.5) And following modes of covering were used.

1. The edge vertical in front of the light source and the edge vertical in front of the camera lens.

2. The slit horizontal in front of the light source, (3.5 cm in horizontal length, 0.35 cm in vertical length) and the bar-stop.

3. The circular slit (r=0.35 cm) in front of the light source and the circular stop in front of the lens.

Thus we obtained various figures of Schlieren which vary as the mode of covering.

51. Bubbles in Glass. (II)

Deformation of Bubbles in Sheet Glasses.

Masao Mine and *Masatami Takeda.*

The characteristics of the shape of bubbles in the drawn sheet glass were studied to obtain knowledge on their deformation processes in shaping the glass. The relations among the length A, the width B and the thickness C of the typical bubble were found to be expressed as follows:

$$(A/D_0)=(B/D_0)^{N_A}, \quad (C/D_0)=(B/D_0)^{N_C}$$

The constants N_A and N_C are determined by the type of deformation of glass and the observed value of N_A=1.8, N_C=0.4 for any drawn sheet glass. On the other hand, the constant length D_0, obtained by extrapolating the linear relations of $\log A$: $\log B$ and $\log C$: $\log B$ is determined by the degree of the deformation of glass and the observed value of D_0 for sheet glass of 2 mm thick made by the Colburn process is about 4.3×10^{-4} cm.

Three sections of the typical bubbles observed by microphotograph are found all to be made of curves of parabolic type, but all of these sectional curves lie between ellipse and quadratic parabola with axes of the same length. These results were verified by measuring the volume of fragments of relatively large bubbles by filling mercury therein. The diameter of the sphere having the same volume as the real bubble in sheet glass is estimated to be about 7 % less than that of the sphere having the same volume as the ellipsoide, with three axes, A, B and C.

52. Enamel Defects due to Hydrogen in Steel.

Megumi Tashiro and *Tsuneo Okamura.*

It is well known that hydrogen is absorbed by steel by the pickling operation.