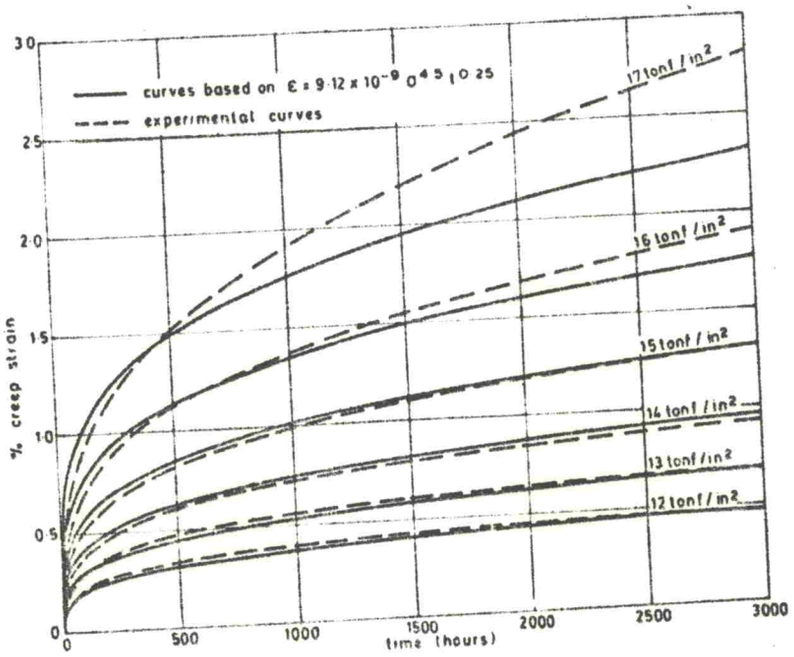

FIG. 12 COMPARISON OF PREDICTED TENSION CREEP CURVES WITH EXPERIMENTAL CURVES (0.18 PERCENT CARBON STEEL AT 400°C)

Figure 12 shows the comparison between the experimental tension creep curves and those predicted by Eq. (28). Here the fit is very good apart from the 17 ton-f/in.^{2} stress level. This suggests that a different set of constants may be required for this stress and higher.

The torsion creep data was correlated with the tension data using the von Mises flow rule and in one case allowing for the changing stress in the constant load tension data and in the other ignoring it [1]. Figure 13 gives the results of this, and it is seen that there is a marked difference between theories even at the 12 ton-f/in.^{2} stress level. Therefore, it is clear that any correlation between thick-walled cylinder creep and constant load tension creep can be only approximate.

Using the Crossland theory [7], the initial plastic torsion data has been used to predict the pressure initial expansion curve for a cylinder with k ratio = 2. The prediction is compared with the experimental data obtained in the loading up of the pressure creep tests in Fig. 14. An excellent correlation has been achieved. The isochronous pressure expansion curves obtained from the torsion data times up to 3,000 h are shown in Fig. 15. Figures 16 to 22 show each of the experimental creep curves for the thick-walled cylinders compared with the curves predicted by the various theories, i.e.,

(1) simple Bailey using torsion creep data,

(2) simple Bailey using tension creep data,

(3) mean diameter theory using torsion creep data,

(4) modified Bailey taking account of wall thinning and using torsion creep data, and

(5) isochronous theory using torsion data.

In every case the simple Bailey theory using torsion creep data is the lowest of the theoretical predictions and becomes steadily worse as the test pressure is higher. The simple Bailey theory using tension creep data is higher than that using torsion, as is to be expected because the actual stresses in the tension tests are greater than the nominal values.

For the 8 ton-f/in.^{2} pressure creep test the mean diameter theory overestimates the strain, but as the test pressure level increases, it is seen that the effect of wall thinning overtakes this effect, and the prediction becomes steadily worse. Nevertheless, at the lower pressures this simple theory gives a reasonable prediction.

The modified Bailey theory using torsion creep data is a big improvement over the simple Bailey theory and shows clearly that for the present magnitude of strains the effect of wall thinning is considerable. At the lowest pressure, the effect is quite