with the .75" D. sphere, the 90° cone, and the paraboloid may be found tabulated farther on.

Load-area curves for the different specimens are shown, plotted from the values obtained from load-indentation curves. The respective values of the hardness factors are shown on curves 38, 39, and 40. It will be observed that the hardness factor rises slightly with the load, the rise in the curve being more pronounced in the harder specimens of higher carbons, though several of the lower carbon specimens appear to have curves rising considerably with the load, but this may be explained by the fact that particularly in the case of the .10% carbon the flow of metal tended to cease on the punch approaching the under side of the bar, when with a deeper bar it would have continued flowing.

It is believed that the slope of this hardness factor load curve bears a definite relation to the percent elongation in the tension test, the harder and less ductile the specimen the greater the slope. With the specimens at hand it was not possible to investigate this relation more fully. Again, the area obtained in the use of the different punches under the same load would vary slightly with the co-efficient of friction between the surface of the punch moving along and against the surface of the specimen, the effect of the friction would vary with the shape of the punch, and the co-efficient would vary with the degree of hardness of the punch relative to the specimen indented. This effect may be seen on referring to the indentation test sheets farther on, where, in the use of two different punches in the case of the cone and paraboloid in obtaining four indentations for one load, a distinct difference may be noted in the results obtained in the two cases, due in a large measure to the difference in the friction co-efficients of the two punches of different hardness.

It is the purpose of the Author to take up at a later period a more careful study of these effects, dwelling in particular upon the theory of these experiments in regard to the flow of solids.

Curves 41 and 42 serve to indicate the relation between the yield point, maximum load, percent reduction in area, and percent extension in the tension test to the hardness factors obtained by the indentation test with the different punches. The values of the hardness factors obtained by the 90° cone and paraboloid are almost identical, while those obtained by the .75" D. sphere are lower.

It was intended to experiment also with a sphere .5" in diameter to determine more definitely the relation of the hardness factor to the diameter of the indenter. It was found impossible,