these bars were not given as great importance as the others in the plotting of the curves.

A piece 18" long was cut off from each specimen for the tension test. The remaining lengths were then subjected to transverse test, resting flat on supports 40" apart, the load being applied at the centre by the Emery machine bearing the bar down to the point of yielding. The deflection curves obtained for the different specimens are shown on curve 33 with the relative condition of yielding. It may be observed on reference to this curve that some difficulty would be experienced in determining the point of yielding, particularly for the higher carbons, and it may be here noted that the values tabulated farther on were obtained from curve 33 by drawing a line parallel to the higher carbons, cutting the yield point of the curves at a distance of .1" from their straight course.

The value of Young's Modulus was then determined both from values between certain loads and also from the curves plotted, the latter being taken with respect to consideration of the different specimens in the different tests. In plotting the curve through these values it was seen that a constant value of E might be found for the steel specimens of different carbons. The tension specimens were then broken in the Wicksteed machine, the higher carbon pieces having to be split or planed down for the purpose.

It was difficult to obtain accurate stress strain curves up to the elastic limit, owing to the bars slipping in their grips. Careful note was made of their respective yield points and maximum loads, the latter values being uncertain, however, in the case of the .75 and .90 carbon specimens owing to their having broken inside the grip. The stress strain curves obtained after the yield point had been reached are shown on curve 34. For the indentation tests the pieces tested transversely were employed.

In addition to the .75" diameter spherical punch three other types were made, a 60° cone, a 90° cone, and a paraboloid having in a plane through its axis a curve of the value $y = \pi x^2$, this value being desired in order that a measure of the indentation would also be a measure of the projected area of indent at the surface of the specimen, it being found that this is the necessary factor in determining the relative degree of hardness of different specimens.

It was found, however, impossible to maintain the initial shape of any of the punches under the severe conditions of the harder specimens, and while the depth of the indentation was measured, it was done more with a view to checking the maximum diameter of the indent, or as a means of noting any slight variation in diameter hard to distinguish by a scale.