INTRODUCTION

Normal faults were observed in the Wasatch Range near Provo, Utah, nearly a century ago by S. F. Emmons during his exploration along the 40th parallel (Emmons and Hague, 1877). Thrust faults have been known in the range since the work of Boutwell more than 50 years ago (Boutwell, 1912) and the subsequent work of Blackwelder in the northern part of the range (Blackwelder, 1910). Gilbert (1928) reviewed the structure of the range and recent work by Calkins and Crittenden has made notable contributions to the knowledge of the geologic structure of the range north of the area described in this paper.

Thrust faulting in the Wasatch Range near Provo was mapped by the writer in 1938 and was found to be a major structural feature of the range. Stratigraphic sequences of greatly different character are separated by a zone of thrust faults (Baker, Huddle, and Kinney, 1949). A pre-Tertiary section in the overriding block is about 50,000 feet thick as contrasted with the thickness of the comparable section in the overridden block which is about 15,000 feet. These sections which have come to be known as the thick and the thin facies are believed to be infallible guides to the location of the thrust zone where other evidence of faulting might not be discernible.

The Mesozoic part of the section shows little change in character or thickness in crossing the zone of thrust faulting. The main change occurs in the rocks of late Paleozoic age. On Figure 1 a comparison is made of the Paleozoic parts of the section in the two facies. Rocks of Mississippian age rest upon rocks of Cambrian age in both facies. Little difference exists between the facies for the older formations of Mississippian age up through the Humbug Formation. In the younger Mississippian the great thickness of the Great Blue Limestone and the overlying Manning Canyon shale and limestone in the thick facies are represented in the thin facies by shale and limestone that generally is only 200 to 400 feet thick. In the thick section the upper part of the Manning Canyon Shale and the overlying Oquirrh Formation, consisting of fairly homogeneous sandstone with minor amounts of limestone are more than 25,000 feet thick. Together they seem to be representative of all the Pennsylvanian and in addition the Oquirrh Formation includes the lower part of the Permian. The counterpart of the Oquirrh Formation in the thin section includes the Round Valley Limestone and the Weber Quartzite which have a combined thickness of only a few thousand feet and appear to be representative of only early Pennsylvanian time. The Kirkman Limestone and Diamond Creek Sandstone representing part of Permian time in the thick section are entirely missing on the other side of the zone of thrust faulting. The Park City Formation is about 2,000 feet thick in the thick section but has an attenuated counterpart in the thin section. The magnitude of these changes suggests rather extensive aggregate horizontal displacement along the series of thrust faults to juxtapose facies that must have been deposited at rather widely separated localities.

The map (Fig. 2) shows the pattern of faulting in the Wasatch Range between American Fork and Spanish Fork. A few contact lines and letter symbols are shown on the map to provide a general picture of rock distribution and fault relationships but no attempt is made to show the details of the geology as they have been mapped. The areas of Tertiary sediments are shown and the stippling along the left margin represents the position of the shore and sediments of Lake Bonneville.

THRUST FAULTS

CHARLESTON THRUST FAULTS

The base of the principal zone of thrust faulting crosses the Provo River near Charleston, a few miles southwest of Heber and the sole fault is named the Charleston Thrust Fault. At that locality the Charleston Thrust Fault dips less than 20 degrees south with Precambrian quartzite resting on shale and limestone of the Jurassic Twin Creek Formation which also dips to the south. The Precambrian quartzite on the west side of the Provo River Valley appears to be overlain in normal sequence by the Tintic Quartzite that crops out on the east side of the valley and for several miles west of the river. The Tintic Quartzite along the road on the east side of the valley is overlain by a thin wedge of Mississippian limestone that lies between a thrust fault, designated the Upper Charleston Thrust, separating the limestone from the Tintic Quartzite below and another thrust fault that is below the overlying Oquirrh Formation. The faults and the strata have a more or less concordant dip but large segments of the section are absent between the Tintic Quartzite and the Mississippian limestone and between the Mississippian...