sound amplifying system to make announcements and to introduce speakers without unnecessary loss of time and detraction from the scientific subject matter. The chest microphone was demonstrated as a distinct aid. Such devices, well planned by the technical program committee, provide the speaker with more time and ease in presenting his subject and more satisfaction for the listeners.

The technical session opened at 9:30 A.M., September 29, in the Crystal Ballroom of the Hotel Cortez. General chairman Haigh presided and M. A. Harlan, mayor of El Paso, welcomed the convention. H. A. Hemphill responded in behalf of the West Texas Geological Society and Donald C. Barton responded in behalf of the Association. It is planned to publish the papers as a New Mexico-West Texas Permian Basin symposium in the Association *Bulletin* as soon as the manuscripts are completed.

1. ED W. OWEN, geologist, L. H. Wentz Oil Division, San Antonio: Summary of Regional Geology and Oil Development of the West Texas Permian Basin.

2. JAMES FITZGERALD, JR., division manager, lands and leases, Skelly Oil Company, Midland, presenting the following two cross sections.

2a. W. C. FRITZ, geologist, Skelly Oil Company, Midland: South-North Cross Section from Pecos County through Ector County, Texas, to Roosevelt County, New Mexico (abstract).

The section extending from Shell-Kirby University No. 1 in central Pecos County, Texas, to Franklin Gephart No. 1 in northern Roosevelt County, New Mexico, is carried generally along the eastern part of the Central Basin platform. It traverses most of the upper Castile basin of deposition and shows its northern limit. Through Crane, Ector and Andrews counties, the cross section is along the strike of the beds of the Whitehorse formation. It shows the progressively increasing depth of the porous and producing zones from the Whitehorse formation into the San Andres formation, although the only oil wells shown on the section are producing from the San Andres or older formations. Some idea of the magnitude of the unconformity at the base of the Permian is indicated in the first ten wells in the section. The suspected relationship of the Glorieta (base of San Andres) with the undifferentiated Permian of the southern part of the Central Basin platform is also shown.

2b. E. HAZEN WOODS, geologist, Sinclair Prairie Oil Company, Midland: South-North Cross Section from Pecos County through Winkler County, Texas, to Roosevelt County, New Mexico.

The section extends from Shell-Kirby University No. 1 in Pecos County to Sloan & Smith Lovern No. 1 in Roosevelt County, New Mexico. The first eighteen wells along the western part of the Central Basin platform show the generally accepted interpretation of reef production in the Whitehorse formation of Ward and Winkler counties, Texas, and southeastern Lea County, New Mexico. The section shows also the reef and the lagoonal facies of the Whitehorse and attendant production. North of the Vacuum pool of Lea County, the transition from predominantly dolomitic deposition to the broken anhydrite, salt and sand facies of the Whitehorse and San Andres formations in Roosevelt County, New Mexico, is shown.

3. ROBERT I. DICKEY, geologist, Stanolind Oil and Gas Company, Mid-

land: Geologic Section from Fisher County through Andrews County, Texas, to Eddy County, New Mexico.

The geologic section presented herewith has been compiled from sample logs of the West Texas-New Mexico Permian basin. It shows chiefly the continuity of the formations of the Whitehorse group from the east side to the west side of the basin. The gradation of sediments in the San Andres and Clear Fork from a shale and evaporite section on the east-side outcrop to an almost solid dolomite section in the subsurface in the basin is brought out by the large scale of the section and detailed character of the logs. In addition, the thicknesses of the formations are shown and the depths to producing strata in the basin.

4. E. H. SELLARDS, director, Bureau of Economic Geology, Austin, Texas: Early Paleozoic Formations in Texas.

The purpose of this paper is to summarize the available data derived from surface exposures and drilling records as to the extent of early Paleozoic seas in Texas. The first Paleozoic sea to invade Texas, so far as known, was that of Upper Cambrian time. This sea spread widely across central Texas, occupying a seaway extending from Oklahoma southwestward to El Paso. The Lower Ordovician sea occupied a similar seaway and may have extended somewhat more widely to the northwest. The Middle Ordovician sea covered at least the southern part of the Permian basin and probably connected through the Llanoria geosyncline with the Ouachita region of Oklahoma. The Upper Ordovician sea occupied the Llanoria geosyncline and a large part of trans-Pecos Texas. A Silurian sea is believed to have extended into northeast Texas, lying in the Llanoria geosyncline. A Silurian sea likewise submerged the Diablo Plateau-El Paso region of trans-Pecos Texas. Evidence is lacking to prove the connection of the two seas across Texas. A Devonian sea is believed to have extended across Texas, occupying the Llanoria geosyncline.

Starting with an emergent condition at the beginning of Paleozoic time, the major changes of Paleozoic time in the Texas region are: submergence through Cambrian, with maximum submergence in Lower Ordovician; emergence through Middle and Upper Ordovician, with maximum emergence in Silurian; submergence in Devonian and Mississippian, with maximum submergence about Upper Pennsylvanian; emergence reaching maximum at close of Permian or in Triassic.

5. M. G. CHENEY, consulting geologist, Coleman, Texas: Geology of North-Central and Central Texas.

Cross sections and maps reveal the Concho arch as an imposing northwest trending structural feature, denuded in the Llano uplift area. The similarity of this arch to the Central Kansas uplift would be more obvious except for greater westward tilting of the Texas area. As in central Kansas, a comparatively thin Pennsylvanian section rests on truncated Ordovician and older beds along this broad axis. Uplift and erosion of the Ordovician evidently began during pre-Mississippian time. The Bend, and, to a greater degree, the Millsap Lake, Garner, and Mineral Wells beds show both pronounced thinning and some truncation over this broad regional feature.

Attention is also given to the evidence of progressive development of the Ouachita-Marathon mountains, the Electra and Muenster arches, the Bend flexure and other large structural features of this region.