SEISMOLOGY

Survey Earthquake Effects

A survey of the recent earthquake near Yellowstone National Park indicates that a great number of after-shocks may follow, representing a "real life hazard."

A SURVEY of the region of the earthquake that struck southern Montana west of Yellowstone National Park Aug. 17 has been made by Dr. Karl V. Steinbrugge, San Francisco seismologist. It shows that the effects it produced were outstanding.

Most spectacular was one of the largest landslides in the United States ever to have accompanied a historic shock, Dr. Steinbrugge found.

The slide, composed of an estimated 35,000,000 to 50,000,000 cubic yards of rock, killed perhaps 20 people who were camping in the Madison River valley below. This mile-long rock slide effectively dammed the Madison River, and a new lake rose behind it. Nature apparently did a good job in compacting the fill which makes up the new dam. The Army Engineers completed a spillway across it so that the water can discharge over the top without destroying the "quake dam."

The earthquake has been assigned the tentative magnitude of 7.1 by one authority and 7.8 by another.

The man-made Hebgen Dam, located about five miles upstream from "quake dam," is composed of an earth and rock fill, except that it has a full height concrete wall running along its main axis or core wall. The concrete core wall settled very little, but the earth and rock around it settled up to six feet and contained fissures. Subsequent examination showed that, while damaged, the dam was still adequately safe.

Other effects, not so spectacular, are of considerable scientific interest.

About 15 miles of continuous ground breakage north of Hebgen Lake clearly implied vertical faulting, with the north shore of Hebgen Lake dropping with respect to the mountains nearby. South of the lake a small amount of vertical faulting was also noted. In all, there were many breaks, and the detailed pattern is complex. Some of the surface breaks formed cliffs which have been measured at 20 feet in height; these heights were considerably exaggerated by surface effects and should not be considered the amount of fault movement in the rock below.

The over-all effect of the faulting was to "tilt" the land block on which Hebgen Lake sits. The south shore went up eight feet or more, leaving docks out of water. Conversely, the north shore sank perhaps up to the same amount. This sudden tilting of the lake bottom caused a water wave which conservatively has been reliably measured at three feet high in one place and undoubtedly was much higher in others. No doubt the waters of the lake "thrashed about" as was described by some persons.

Building damage was remarkably slight, considering the geologic and seismic evidences of a very strong shock. A number of log cabins as well as hollow unit masonry structures were within yards of the fault scarps, and these in general were not seriously damaged when not directly astride the scarp. Buildings across the fault were, of course, ruined. Masonry chimneys were generally, but not universally, damaged or destroyed. Some of the log cabins shifted on their foundations, but rarely did they go off their foundations. Some log buildings, located near the lake shore where lurching occurred, had broken concrete foundations. Masonry veneer fell from some buildings.

Bridges located in poor ground areas swung back and forth; in one case it swung at least 15 inches. This violent motion damaged the reinforced concrete supporting beams of several bridges.

Predicting future earthquakes as to time, location, and intensity is, at present, impossible. The entire region is geologically young, and destructive earthquakes have occurred in nearby regions. Certainly more shocks in Montana in future years may be expected.

Undoubtedly this earthquake was a "relieving" shock in the sense that accumulated strain was released. If this shock follows the patterns of other western American shocks, a great number of after-shocks may occur for a year or more, with their epicenters varying from the original epicenter. Some of these aftershocks could be of damaging intensity and represent a real life hazard.

Science News Letter, October 3, 1959

RADIO TELESCOPE—Thousand-pound lead weights keep two miles of transmission lines of the world's largest radio telescope taut at Clark Dry Lake in northeastern San Diego County, Calif. Radio signals from remote celestial objects are picked up by the grid of eight parallel rows of north-south dipole elements, spaced 1,443 feet apart along the east-west length of the transmission line. Convair built and operates the telescope.

PHYSICS

Thermodynamics Aids Liquid Helium Production

See Front Cover

THE LEVEL of liquid hydrogen, used as pre-coolant in the liquefaction of helium, gives an indication of the total cost of producing the valuable liquid.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows how an inclined manometer, in the window on the left, is used to measure liquid hydrogen heads.

The initial work in designing this engineering research tool, capable of putting out five gallons of liquid helium per hour, was done by D. B. Mann of the National Bureau of Standards' cryogenic engineering laboratory, Boulder, Colo., and by Prof. R. B. Stewart of the University of Colorado's mechanical engineering department.

Now comprehensive data on the properties of helium, essential in the art of handling the gas in its liquid form at 452 degrees below zero, is available.

Science News Letter, October 3, 1959