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*This little pile contains 80 cents' worth of steel but 8,000 hours of precision work. To make each pinion required 24 operations, using 11 different machines. They are accurate to .0001 inch.*

GEOLOGY

## Submarine Canyons May Be Caused by Artesian Springs

### Mudflows and Submarine Landslides Following Cave-Ins Might Account for Unexplained Breaks in Cables

**A** NEW theory to account for the creation of the tremendous submarine canyons that gash the sea bottom off all continental shores of the world is advanced by Prof. Douglas Johnson of Columbia University. These enormous submerged gullies, some of them rivalling the Grand Canyon of Arizona in width and depth, may have been caused by undermining and collapse of the layered rocks of the ocean bottom by long-continued action of submarine artesian springs, Prof. Johnson suggests.

Existence of these submarine canyons is one of the most recent of major geological discoveries. New ones are still being turned up, and further exploration of old ones constantly yields new wonders—and new puzzles for the scientists.

At first, it was thought that the canyons owed their existence to deep erosion during a time when ocean levels were lower than they are now. This

view is still widely accepted. However, serious difficulties have arisen through the discovery of canyons more than two miles below present-day sea level, which of course demands a tremendous amount of change in relatively short geologic time.

Prof. Johnson points out that his theory, of undercutting of the sea bottom by waters working under pressure beneath it, could account for canyons at any depth, and that it has the further advantage of allowing plenty of time. Instead of being confined to the mere million years or so of the Pleistocene ice age, the work of canyon formation could have gone on ever since the Cretaceous period, more than a hundred million years ago, when great saurians still wallowed in the swamps and swam in the seas.

According to the theory, submarine canyons could be formed wherever the layered formation of rocks under the

sea, and a sufficient supply of water under pressure from heights somewhere back inland, combined under favoring circumstances. This could be connected with existing river valleys, as is known to be the case in such places as the famous canyon off the mouth of the Hudson river. However, canyon formation could also take place unassociated with any existing river; and such submarine canyons are known.

Of course, when bottom cave-ins occurred, they would be followed by mudflows, submarine landslides and other adjustments of unconsolidated bottom sediments, which would modify their outlines considerably. Prof. Johnson thinks that such flows and slides account for some of the breaks in trans-oceanic cables that have occurred without any accompanying earthquakes to take the blame.

Prof. Johnson has also invoked a theory of artesian spring action to account for the famous "bays" of the Carolina coastal plain. These are great, shallow, saucer-like elliptical depressions in the land, which another theory holds were created by the impact and explosion of a shower of enormous meteor fragments many thousands of years ago.

*Science News Letter, January 20, 1940*

AERONAUTICS

## New Airplane Design Will Increase Safety at Take-off

**B**Y PROPER design the giant four-motored airliners of the future should be able to clear a 50-foot obstacle 3,000 feet from the start of take-off, even if one motor fails, Clarence L. Johnson, chief research engineer, Lockheed Aircraft Corporation, told the meeting of the Society of Automotive Engineers at Detroit.

Take-off time is perhaps the most hazardous period because, during those few brief seconds, engine failure may make a forced landing necessary.

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