GENERAL SCIENCE

Pittsburgh Rises and Falls On Daily Moon Tide in Rocks

National Research Council Tour Learns of Modern Feats in Geophysical Prospecting and Communication

PITTSBURGH is rising and falling from 13 to 23 inches each day, it was disclosed at the research laboratories of the Gulf Refining Company there.

Dr. Paul Foote, director of the laboratories, told members of the National Research Council's industrial tour for banking and business executives that long-time measures of the force of gravity showed the startling effect of land rise and fall due to moon tides in the solid crust of the earth. (See *SNL, Nov.* 2, p. 286 for other reports of the tour.)

Such gravity measurements, Dr. Foote pointed out, are necessary in geophysical oil prospecting and are widely used by field parties to detect oil deposits thousands of feet below the surface. The extremely sensitive gravity apparatus is constantly being checked and tested in the laboratory and from these continuous records Pittsburgh's rise and fall each day is disclosed.

The sensitivity of the equipment is such that forces equal to only one ten-millionth of gravity are detectable. This is about like saying that if a fireman on a 500,000 pound locomotive threw off a small lump of coal the apparatus could detect the weight difference.

Betters Chances

The importance of geophysical prospecting, by which geophysicists discover oil wells without making costly test drills, lies in a reduction of wasteful chances. In the Texas Gulf region, where oil is plentiful, there is but one chance in 1,000 of hitting oil by simply sinking a well. By the geophysical method, chances are now lowered to only one in ten or even less.

Coupled with the sensitive gravity measurements are magnetic and earth-wave reflection tests. The magnetic measurements determine the minute changes in the force of the earth's magnetism due to different layers of rock below the surface. The magnetic materials are in the basic levels, and oil-bearing rocks are found above them.

Tremor measurements are taken also on earthquake wave apparatus, the seismograph. Small charges of dynamite are set off which set up earth tremors. Some come direct to the recording instruments set up along the earth's surface. Others, however, go downward and are reflected back upward off underlying layers and indicate the presence of various types of rock strata which may contain oil.

Linking the three methods together —gravity, magnetic and man-made earthquake measurements — scientists have discovered mountain ranges which lie 5,000 feet below the surface. The Amarillo mountains in Texas are typical of these regions, which lay hidden below the earth's surface until disclosed by geophysical prospecting.

Above the buried mountains lie the oil-bearing sands and salt domes of the great Texas oil field.

Better Telephone

A new type of telephone transmitter for desk type phones, which brings as much improvement in the art as all the previous developments in the last forty years, was announced at the Bell Telephone Laboratories.

Two thousand installations of the high quality, improved type phone are now being put into commercial operation for study in actual service use, Harvey A. Frederick, engineer in charge of the development, stated.

In a test demonstration the industrial and financial executives listened in on a phone conversation between two desk stand instruments. The average amount of line and room noise was then inserted in the circuit and the transmission gradually weakened until it was barely possible to hear what was being said. A further increase in the noise level was then made. With these unfavorable conditions, under which it was found impossible to understand the conversation, the new telephone set was switched in, and the listeners found they could again hear clearly.

Still using the new development set, normal noise conditions were reestablished and the listeners were shown what happens if the range of sound frequencies is varied. Lack of low-pitched sounds makes the talk seem thin and faint, while cutting out high-pitched sounds makes it difficult to understand.

In appearance the new set differs radically from previous types, for all parts of the telephone in a user's home are on the desk or table. The familiar black box mounted on the wall now serves as the base of the set and contains a more compact bell ringer, the induction coil and a quieter dialing device.

The transmitting unit is known as the capsule type. It is a simplified, compact adaptation of the costly radio microphone. No accessory amplifying equipment is needed, however. Its frequency range, Mr. Frederick explained, runs from the bass tones of the human voice, at about 150 cycles, into a treble pitch of about 5,000 cycles.

Over 300,000 installations of this new type of capsule transmitter have already been made in present hand-set type phones with the aid of an adapter. Less than one in a thousand of these have failed in service.

No Sure Thing

Research has nothing of the miraculous or magical about it; it is not certain to pay in any given project. Only its net result pays, and pays big, in the long run, said Dr. C. E. K. Mees, director of the Eastman Research Laboratories. Research, he stressed, is gambling on results, and while the odds are something better than even, it is no sure thing. Many failures may block the path before success is reached. The saving factor is that one single success is often so important and has such unforeseen and wide ramifications that it is profitable to industry.

"The real problem in directing research," said Dr. Mees, "is what research shall you do and when shall you stop doing it. The decision is usually in the hands of some important body.

Who Should Judge

"Now in my opinion the best person to decide is the man who is doing the research, and the next best person is the head of the department, who knows all about the subject and the work.

"After that, you leave the field of the best people and start on increasingly worse groups: the research director who is wrong about half the time, a committee wrong most of the time, or a committee of vice-presidents who are wrong all the time."

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Government scientists are investigating the so-called sulphur sponge, a pest that bores into shells of oysters and stunts their growth.