

ENGINEERING

"Auditory Perspective" Given To Electrical Transmission

New Method Will Bring Orchestra To National Academy With Greater Range and Control of Tone and Volume

THREE LOUD SPEAKERS on a stage empty of human beings but bathed in colorful light, three telephone lines running to three microphones in a sound-proof room containing the Philadelphia Symphony Orchestra, Leopold Stokowski whirling electrical control knobs instead of wielding a baton, telephone engineers alert in operating the electrical circuits.

These were the ingredients of the most advanced development of musical reproduction that will be introduced to the public in a Philadelphia-Washington concert for the National Academy of Sciences on April 27.

In a private preview for scientists and music critics held at the Academy of Music in Philadelphia, the American Telephone and Telegraph Company engineers demonstrated the results of two years of scientific research conducted with the collaboration of Director Stokowski.

Whispers and Thunder

Wagnerian music was played with whispering pianissimi and thunderous crescendos hitherto unheard by human ears. Stokowski by the turn of a control knob could subdue his orchestra, isolated in another part of the theater, to a mere trickle of sound or he could build up their music to the sound of two thousand musicians at a peak of output.

Brünhilde, sung by Miss Agnes Davis, became an electrical super-vocalist, rising above the orchestral accompaniment of the *Götterdämmerung*. Wagner's music was rendered as probably he never dared to dream it might be played.

This merging of music and telephone science has introduced jointly three factors in the electrical reproduction of orchestral music: 1. Auditory perspective. 2. Tone and overtone control. 3. Volume control.

Three loud speakers at left, right and center of the empty stage, each connected with a similarly placed microphone on the remote stage of the actual performers, give perspective to the music

and sounds. Musicians could tell just where the violins or horns were placed. In one demonstration, stage hands moved across the distant stage and the audience of the empty stage "followed" them about the empty stage by using their ears. Engineers had previously felt that this illusion of auditory perspective might be obtained only with many loudspeakers on the empty stage, but three were found to give perfect results when the electrical transmission had high quality.

Nine Octaves

A wide range of nine musical octaves, from three below middle C to nearly six above, was utilized for the first time in electrical transmission of music. This corresponds to all frequencies from about 35 cycles per second to about 16,000 cycles per second. Radio by federal regulation is limited to a band of 5,000 cycles per second. When experimentally the high and low frequencies are chopped off by electrical filters the damage to the tone and overtone qualities was readily apparent. Each of the three telephone wires carried the full range of frequencies, and the frequency channels utilized therefore roughly totaled nine times those of the most perfect radio transmission.

In loudness range, the orchestra or other sound being transmitted can be varied from an output equivalent to a millionth of a watt to a sustained hun-

dred watts and even a kilowatt at momentary peaks without distortion. The sound in the demonstration was raised from the rustle of leaves to beyond that of a roaring airplane engine.

Practical applications are foreseen by the telephone engineers and Director Stokowski. A symphony orchestra in one place may render its concerts with perfect tonal quality and with improved volume in a hundred or a thousand different halls in distant cities. Music may be spread from high towers so that 100,000 may enjoy it in large parks. The musician and composer can add electrical amplification and control to his material out of which beautiful sound compositions are wrought.

Science News Letter, April 22, 1933

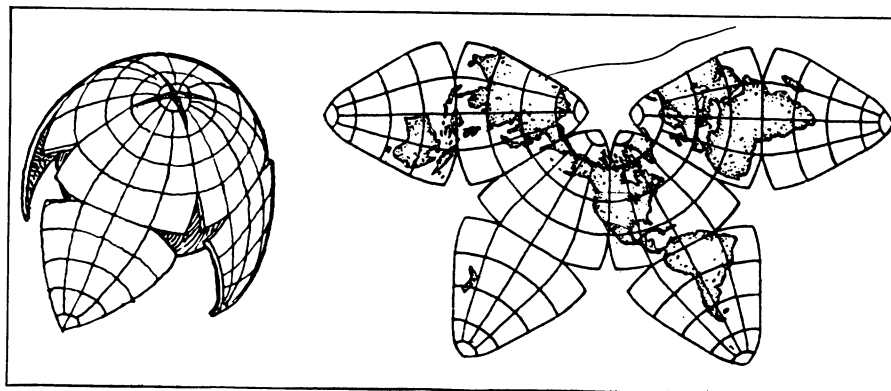
GEOGRAPHY

New Map Suggested As Accurate World Picture

CANADA'S size is no longer misrepresented to the world and Russia's vast domains are reduced to their proper proportions on a new map proposed by B. J. S. Cahill, an architect of Oakland, Calif.

Slice an orange into quarters and mash the peeling flat under a glass allowing the quarters to pop open a bit along the equator. That is the way the new map is formed and hence, from its peculiar shape, the name butterfly map. The idea was proposed by Mr. Cahill 23 years ago, but he has recently expanded the original suggestion and worked out three forms of the butterfly map in detail.

One form, pictured below, projects the area of the earth accurately so that the size of a far north country may be fairly compared with that of one nearer the equator. Thus Canada is properly represented smaller than the United States instead of more than (*Turn Page*)



SLICING UP THE EARTH

twice the size of this country, as it appears on the Mercator maps widely used in geographies and atlases.

On a chart of another form of the butterfly map, any straight line is a great circle. Thus it is possible to find the exact distance between any two points simply by measuring it directly on the map. At the present time such a course must be calculated. A straight line

across Mercator's map from San Francisco to Libson, for example, would go through the United States to Chesapeake Bay, whereas the real short route is by way of Winnipeg, Hudson Bay and Labrador.

A third type of the butterfly map is suggested as a base for weather charts. Its scale increases equally in both directions.

Science News Letter, April 22, 1933

MEDICINE

Monoxide Poison Victim Unable to do Arithmetic

A CASE of carbon monoxide poisoning which left the patient unable to do any arithmetic has been reported by Drs. H. Douglas Singer and Abraham Low of Chicago, Ill. The name of the strange ailment is acalculia, meaning inability to do simple arithmetical calculations.

The patient was the 44-year-old assistant superintendent of a firm of boiler and water tank engineers. In the course of his work he had to estimate the costs of jobs and to keep track of the time and wages of the men under him. His employers had been well satisfied with his work. When the psychiatrists examined him following the poisoning, he was unable to do such simple arithmetic as adding 5 plus 6.

He had been found unconscious in his garage one day after work, evidently overcome by carbon monoxide from the exhaust of his automobile which he had been inspecting. He was unconscious for several days. When he regained consciousness he suffered from confusion and forgetfulness of various things. For example, he could not dress himself properly, putting his right foot into his left trouser leg. When the sheet on the left side of his bed became wrinkled, he pulled at the sheet on the right side in an effort to straighten it. He had difficulty in locating and using his fingers and could not tell time, although he could tell the numerals on a watch or clock.

He gradually improved in these respects, but could not learn to write legibly nor to do simple arithmetic, even after months of instruction. He could do what psychologists call mental counting, meaning the one, two, three, four, kind. But he could not count or add three trucks and four automobiles

to make a total of seven vehicles. That is, he could not count discontinuous objects.

A number of cases of acalculia have been reported in cases of mental disease in which there were other signs of aphasia or forgetfulness. However, this is apparently the first case of this strange condition occurring as the only after-effect of carbon monoxide poisoning.

Science News Letter, April 22, 1933

TOXICOLOGY

Scientist Wants Liquor Regulated as Narcotic

AFTER REPEAL of the eighteenth amendment the stronger alcoholic beverages must be absolutely separated from the weaker ones and controlled essentially as morphine and cocaine are controlled under the Harrison act.

So warned Prof. Yandell Henderson of Yale University, who, as he expressed it to the medical scientists meeting in Cincinnati, acted as toxicologist for Congress of the United States. It was on Prof. Henderson's authority that the alcoholic content of beer was fixed at 3.2 per cent.

The alcohol question is a problem in national toxicology, Prof. Henderson declared. He considers the stronger alcoholic beverages to be in a class with the narcotic drugs, morphine and cocaine, while the weaker alcoholic beverages he classes with coffee and tobacco.

He pointed out that what the chemists call the mass law applies to this question. That is, any chemical in high concentration acts powerfully, but when sufficiently diluted it loses its harmful action.

Science News Letter, April 22, 1933

PSYCHOLOGY

Man Sees Gray World Entirely Without Colors

THE DISCOVERY of a young man who sees a completely colorless, gray world was revealed by Dr. Frank A. Geldard, of the University of Virginia.

Only ten other such cases have hitherto been discovered in America. There are many who cannot tell the green of a "go" light from the red of a "stop" light, but inability to see any thing but gray color in spring flowers, vivid millinery, or gaily painted pictures is extremely rare.

Mr. J. M., 23-year-old graduate student, as Dr. Geldard identified the unusual individual in reporting him to the scientists, was asked to pick out a card containing red or reddish dots. He picked one with red, green and gray spots. Then the test cards were shuffled and he was asked to pick a card with green or greenish dots. He picked the same red, green, gray dotted card.

Careful study of this interesting case, which was facilitated by the fact that Mr. J. M. is a graduate student and cooperated willingly, showed conclusively that the eyesight defect is caused by failure of the cones of the eye's retina to operate, Dr. Geldard said.

Mr. J. M.'s vision is entirely through the rods of his retina, giving him vision only in twilight illuminations. His acuity of vision is only one-tenth normal and he is extremely nearsighted. Bright flashes of light temporarily blind him and crossing a street on a sunshiny day is a dangerous adventure for him.

Science News Letter, April 22, 1933

CHEMISTRY

New Light-Sensitive Substance Found

A NEW MEMBER of the family of chemical substances that turn dark on exposure to light was announced to the American Chemical Society by Dr. Oskar Baudisch of Yale University and Dr. F. L. Gates of Harvard University.

This is piperidine vanadate. Its crystals change from their original white to black or brown on exposure to light just a little down the wave-length scale from the invisible ultraviolet. The new compound, however, is still so new that practical applications have not yet been suggested.

Science News Letter, April 22, 1933