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ENGINEERING ABSTRACTS

TELEVISION NEARER REALITY

According to Philo T. Farnsworth, television is now a reality. This 24-year old experimenter, who is one of the world's foremost television experts, has developed apparatus for television sending and receiving which works without mechanical aid. What other televisionists do with motors and scanning disks, Farnsworth does electrically. In his system he uses special vacuum tubes—a "disecter" and an "oscilight." The former, the transmitting tube, looks like a fruit jar and contains the equipment for scanning an image electrically. The receiving tube or "oscilight" is pear-shaped and has a picture screen four inches square in the flat end. Like other systems, however, his system requires radio transmitters and receivers. The pictures his system produces are said to be sharper than those of other systems.

NEW MICROSCOPE

Those who like to look at magnified images of tiny things will be interested in the new microscope recently described by Professor William Seifriz of the University of Pennsylvania. By means of a new lighting scheme, the latest type of instrument makes visible the submicroscopic details of cell structure. The secrets and mysteries of minute life have long escaped the searches of scientists because they were too small to be seen. Most of the added power of the new instrument is furnished by a minute mirror of platinum or gold, plated on the upper side of the lower lens. This mirror reflects the light down on the object being studied. The specimen reflects the light back where it passes around the sides of the mirror, through the upper lens and into the observer's eye. With such an instrument living protoplasm is said to show up as parallel strands of fibers on a background of gray.

MAGNETIC STRAIN GAUGE

One of the most interesting features on the program of the annual meeting of the American Society of Civil Engineers, recently held in New York City, was the demonstration of a magnetic strain gauge, in the course of development by Brian Wheeler, a Westinghouse engineer.

Mr. Wheeler demonstrated the gauge attached to a small aluminum beam about six feet long and weighing 11 pounds. It was shown that the device is so sensitive it will record different readings when the beam is turned on its two flange sides and without the application of any weight other than that of the light, exhibition beam. These readings are instantaneous and visual, a feature which is regarded as a marked improvement over those types of strain gauges which require mathematical calculations.

In construction, the gauge is about eight inches long with bolt holes in the two ends. The center section has two coils of wire which carry an electric current. A moving armature is adjustable within narrow limits and the slightest movement of this armature between the pole pieces changes

the air gap across which the flux must pass from the two pole pieces to the ends of the armature.

Three wires carry the current through the gauge and either to the recording instrument or to the oscillograph where readings can be made or photographs taken as desired. The changes in the length of the air gaps upset the balance of the voltages across the gauge coils and indicate the degree of strain in the beam or rail at the point to which the gauge is attached.

MINING EQUIPMENT SHIPPED TO INTERIOR OF NEW GUINEA BY AIR

Through the sky, over the woolly heads of cannibals in Papua, British New Guinea, will soon soar three airplanes bearing mining equipment and bound for the interior, 32 miles from the coast.

Mining materials used in this far away gold field, where authentic cannibals still roam through the jungle, have flown to the site of operations. Trucks, tractors, building materials and even 1000 pounds of beer per week, have been transferred safely from the coast to the gold fields in the interior.

Flying these materials and supplies to their destination is the most efficient mode of transportation open to the Bulolo Gold Dredging Company. The interior of British New Guinea is almost impassable because of the fact that the rivers are scarcely navigable. Most of the interior is unexplored territory inhabited by man-eating savages.

WELDED STEEL TUBING

A new process for electrically welding high carbon structural steel tubing has been developed by the Republic Steel Corporation at Cleveland. Much greater strength is claimed for this new weld, along with increased rigidity. The old style of welding used a brazing material whereas the new electric weld is formed by a union of the metal itself at the seam.

The tube, when welded, is homogeneous and the seam is almost imperceptible. It will withstand severe mechanical bending and forming operations and can also be hot-galvanized which was not possible with the old brazed tubing.

—*American Machinist.*

TUNNEL METHODS DISCUSSED

Although the art of tunneling dates back to centuries B. C., some of the greatest advances have been made in recent years. In fact, most of the development in methods has occurred since the invention of dynamite by Nobel. At a session of the 140th general meeting of the American Institute of Mining and Metallurgical Engineers February 16 at the Engineers Building, New York City, Theodore Marvin, editor of *The Explosive Engineer*, discussed some of these later improvements in driving tunnels.

Although large tunnel jobs are considered construction projects, mining engineers drive tremendous distances underground in search of ore

and for its excavation. Nearly every construction project, according to officials of the Institute, includes among its personnel "hard rock" miners and mining engineers who apply their mining experience to the tasks of driving railroad bores, bringing water to cities, and producing electric power from the energy of rivers.

Among the tunnel projects included in a recent volume "Rock Tunnel Methods" compiled by Marvin, is the Brooklyn Water Tunnel, also known as New York Tunnel No. 2. This bore is of interest to residents of Greater New York City because, when finished, it will carry water twenty-one miles from Yonkers down through Queens to the lower part of Brooklyn near Point Hamilton.

This water tunnel, when completed in about 1934, will provide Brooklyn with a direct water supply independent of that of Manhattan. This tremendous undertaking is being carried on day and night from seventeen shafts located at different points along the tunnel route. The depth of the tunnel below the city street is about 550 feet.

Another tunnel described in this publication is the New Cascade Tunnel in the state of Washington, constructed for the Great Northern Railway. This 41,151 ft. tunnel was excavated to a cross section of 25 feet high by 18 feet wide. A pioneer tunnel first was driven, from which cross-cut tunnels were excavated to the line of the big bore, and work was started in several places. President Hoover initiated the celebration which signaled the completion of this project. The festivities, many people will remember, were broadcast over a coast-to-coast radio hook-up in January, 1929.

Radio proved a valuable aid in the construction of the 13½ mile Florence Lake Tunnel which is a part of the Big Creek Hydro-electric Development, Fresno County, California. As several of the camps were absolutely isolated for nearly five months, communication between units and with the outside world was maintained by radio.

The most important difference in modern methods as compared to older ones is the degree of mechanization of methods, it was brought out at the meeting. With the advent of explosives which blast the rock as desired, the use of electrical power, and efficient mechanical leaders, tunnel records always seem to be in jeopardy.

A revolutionary step forward in motor truck transportation is seen in the announcement of a new dual engine, six-wheel, heavy duty truck. Driven by two huge engines, the new model, according to its designers, is the most powerful truck ever built and it will be the fastest heavy duty truck in existence.

The new truck is equipped with two straight eight cylinder truck type engines with a combined power of 275 horse power which is applied to the drive in a radically new way. Each engine delivers power to a separate relay rear axle.

In the new dual-motor model each engine drives one rear axle independently of the other. The engines may be used in combination, or one at a time. Each engine has its own transmission. An air mechanism shifts the twin transmissions in perfectly synchronized time. One lever will shift both gears when both engines are in use. Two

simple movements from the driver's seat connect or disconnect either engine.

The new model is equipped with heavy duty air brakes and air connections for trailers. Twin emergency brakes offer an added margin of safety in stopping.

Improved riding qualities, saving on tires, and better distribution of the load are possible in the new model because of the relay axle. This principle which suspends the load like a pendulum, allowing it to swing back and forth, greatly reduces horizontal impacts on all the rear wheels.

Many new features for the convenience and comfort of the driver have been provided. Among these are an adjustable driver's seat, sleeping accommodations, and unusual ease in steering and operating the controls. A hydraulic booster mechanism on the steering apparatus eliminates all steering strain. Should the "booster" mechanism get out of order, the driver can steer automatically.

Summed up, the unusual mechanical advancements on the new truck are: two engines, dual drive, seven speeds, booster steering, power shift, relay axle suspension, air brakes, and multiple traction. Similarly, in performance the new improvements permit express speed on the highways, carload capacity loads, driver economy, double dependability because of the two engines, highway protection, and maximum safety.

The opportunity for saving on gasoline and oil consumption by cutting off one of the engines when the truck is running empty or with a small load is a considerable factor of economy.

Tests by the Federal Bureau of Public roads have shown that six wheels are much more effective in highway preservation than four. With the addition of the relay axle principle, the new dual engine truck is an improvement of inestimable value in reducing road wear.

A telescopic instrument called a "clinometer," designed to enable measurement of cloud heights at night for information of aircraft has been invented by Dr. Charles F. Marvin, chief of the Weather Bureau, Department of Agriculture.

"Appropriations and, in many cases, expenditures for the improvement and expansion of water supply systems in 52 cities, widely scattered throughout the United States, since January 1, 1930, approximated \$100,000,000.

Every 24 hours American aircraft are flying in this country a scheduled distance equal to four times around the equator, and further extensions and developments are in prospect.

Of the 14,986 first degrees awarded to men graduates in land grant colleges, engineering leads the list in number of degrees awarded, with a total of 4,239. Arts and sciences came second with 3,481. Agriculture, including forestry and veterinary medicine, was third, with 1,931.

RAILROAD LAND GRANTS

The fact that the railroads, in their development stage, received land grants from the government is frequently cited as complete justification for the present policy of developing inland waterway transportation systems through the use of public tax funds. The latest official statement of this character was made by Secretary of War

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ENGINEERING ABSTRACTS

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Patrick J. Hurley in his recent address before the Mississippi Valley Association at St. Louis.

"Long stretches of the public land domain were freely bestowed upon the railroad companies that built our great railroads." Subsequently in his address, the Secretary referred to the grants as "gift land."

The fact is that the government has not only been compensated for these grants, but is still being amply rewarded. Under the terms of the transaction the government receives reduced rates—averaging from 12 to 15 per cent—for the transportation of mail, government troops, materials and so on. Applying these reduced rates to the acreage of land grants, it will be found that the railroads, even on a peace-time basis, pay for these land grants every 25 years.

ORGAN-TYPE CONSOLE CONTROLS THEATER LIGHTS

By means of vacuum tubes, a light artist at the color console of Cleveland's Severance Memorial Hall has hue and intensity of auditorium and stage lighting at his finger and toe tips, just as a pipe organist finds pitch and volume of sound at his command.

The unique lighting switchboard, built into an ordinary organ console, has the ability to remember; four complete scenes may be set up in advance and tucked away in its mechanical brain, to be called forth at will by throwing a master switch. The different scenes can form a contin-

uous program, one scene automatically merging into the other at accurately controlled rates. A master control gives proportional dimming. The vacuum tube control scheme is the means of reaching, for the first time, the long sought goal of proportional dimming—that is, previously set intensities of various groups of lamps keep their same relative brilliance while being dimmed. However, the light organist at his console, watching the lighting effects, is ever the master mind; every circuit remains subject to his will at all times.

Hitherto, theater lighting switchboards have lurked in the wings, because they were too ugly and cumbersome to be placed in more desirable locations. A new means of governing the grids of vacuum tubes enabled engineers to concentrate the nerve centers of nearly 4000 lighting combinations in an ordinary organ console. The console is portable and a 40-foot extension cord allows it to sit on the stage or ride the elevator platform in the orchestra pit.

Like a once popular type of radio control, this light console has thirty-six main control drums projecting three-quarters of an inch above the face of its keyboard panel—which brighten or dim the 110 lighting circuits as the operator fingers them. Like piano keys, these controls are spaced only fifteen-sixteenths of an inch apart.

If the operator needs his hands for other work, or his fingers tire, a flip of a switch transfers the intensity control to a group of nine horizontal foot pedals. Four slanting foot pedals can be made master control for groups of circuits. For instance, half the lights could be dimmed simultaneously while the other half increased in brilliance by manipulating two of these master pedals.

On the diagonal sides of the console are 110 cross-connecting switches for distributing the various circuits among the 36 control pedals. Relays in the basement apparatus room do the actual work of connecting the proper vacuum tube to its associated equipment.

PROPER LIGHTING MAKES THE WINDOW- LESS OFFICE POSSIBLE

Architects have been slaves to windows for a long time—in large buildings the need of them becomes a determining factor in design. Rooms opening only into an airshaft have been undesirable; rooms with no windows at all, unthinkable. With modern ventilation systems one necessity for windows disappeared—development in the art of lighting now removes the other. To judge from an experimental office in daily use at Bloomfield, N. J., since April, 1930, a windowless interior may represent improvement in health, comfort, convenience, and charm.

The room is flooded with light from unobtrusive sources which are architectural elements of the walls or ceiling. In color, the light is of daylight quality and its intensity, 12-foot candles, produces an effect quite different from what people are accustomed to regard as typical of "artificial lighting." Distribution is controlled to produce balanced illumination of objects in different parts of the interior. A certain percentage of ultra-violet sources provides a sunlight value lacking in the light that filters through ordinary windows. Thus living in such a room can be healthier than living outdoors! False windows can be provided

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