

## PHYSICS

## 2,000,000-Volt X-Rays

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➤ X-RAY pictures through extremely thick sections of steel are now possible with new 2,000,000-volt X-ray tubes, recently perfected by two firms, independent of each other. One of these high-voltage precision tubes has been developed by Machlett Laboratories, Inc., Springdale, Conn. The other was described by Dr. Ernest E. Charlton and Willem F. Westendorp, of the Research Laboratory, General Electric Company, Schenectady, N. Y., to the National Electronics Conference in Chicago.

Up to now the most powerful X-ray unit in general use has been a million-volt tube developed for the examination of metal sections. High voltage tubes are also used as an effective tool in cancer research. Both new tubes greatly reduce the exposure time required to make radiographs of metal sections.

The new 2,000,000-volt Machlett tube represents a new development in the previous art of high-voltage tube-making. It is completely sealed-off, like an ordinary radio tube or an electric light bulb, so the high vacuum within it does not have to be maintained by pumping. It is compact and can operate at a constant potential with unvarying reliability of results.

The new precision X-ray tube is so designed and constructed that it achieves extremely fine focusing of the high-speed, 2,000,000-volt electron beam. This made necessary not only a greatly improved electron source, but also a means of accelerating the electrons which would provide a constant rate of acceleration over the entire cathode-to-target distance. The tube was designed to include 180 sections, providing uniform accelerating steps of 12,000 volts each.

The new General Electric unit weighs 5,000 pounds, and can make satisfactory X-ray pictures through a foot of steel. It makes use of a sealed-off electrode tube in which the electrons, starting from the heated filament at the top, are speeded in 24 stages until they have the total rated energy. At a speed of about 179,000 miles a second they strike a copper-backed tungsten target at the end of the tube, and X-rays are generated. These may

either be squirted from the end, like water from a hose, or sprayed from the side. After penetrating the metal specimen, they fall on photographic film to make a picture. Construction of this tube was made possible by the use of fernico between sections of glass. Fernico is an alloy that expands like glass, so that the metal and glass can be fused directly together.

Under typical conditions it may take up to 4½ hours to make an exposure through an 8-inch steel casting with the older million-volt unit, while the new unit does it in 3½ minutes.

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## PSYCHOLOGY

### Pencil-and-Paper Tests Best for Picking Mechanics

➤ YOU CAN pick a radar technician, an airplane engine mechanic or a radio repairman better with a good paper-and-pencil examination than you can with the so-called "practical" tests of ability to take gadgets apart and put them together. This important finding of the Committee on Classification of Military Personnel appointed by the National Research Council at the request of the Army's Adjutant General is reported (*Science*, Sept. 29), by Dr. Walter V. Bingham, chairman of the committee.

As a result, 25 tests formerly given in Army Air Forces Basic Training Centers have been replaced by a battery of four tests, only two of which are performance tests. The proportion of failures in the courses has been substantially reduced.

A new test for night vision has been developed which meets the requirements of simplicity, practicality and reliability, Dr. Bingham revealed. He did not, however, tell what the test is like. One out of ten soldiers, he reported, are unable to recognize an enemy on a dark starlit night at a distance of only ten yards. The best one out of ten can recognize the enemy at 94 yards. The average man can see well enough to recognize a foe at 52 yards.

The Army is still searching for a good personality test. It would be very con-

venient to be able to give a man a test, the score of which would be useful to a special training unit, mental hygiene clinic, discharge board or court martial. So far, however, Dr. Bingham reports, the problem has been difficult and baffling.

The Army has given up the idea of selecting combat leaders by putting the candidates through a grilling "stress situation," even though such methods have apparently proved satisfactory to both the British and the Germans. It has seemed more feasible, Dr. Bingham said, to collect facts about how a candidate acts under the real stresses he meets in training—in the excitement of his first infiltration exercise with live ammunition or when he is being introduced to the poison gas chamber.

New task for the committee has been the development of tests and methods for giving vocational guidance to men who are about to leave the service. A school for training vocational counselors for this purpose has been established in connection with the Separation Center at Fort Dix, Dr. Bingham reported.

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**CHEMICAL DETECTOR**—A miniature gas-analysis set packed into a 2½-pound cotton duck carrier slung by a strap from the wearer's shoulder, will detect the presence of both persistent and non-persistent chemical agents. Gas sentinels equipped with these detection devices are able, by taking frequent tests, to spot the presence of even odorless blister gases. *Signal Corps photograph.*