When such compilations are made, the question arises as to what to include in the figures for research. The historian who is looking into some problem can rightly say he is engaged in research. But the figures quoted are largely for inquiries and developments in the physical and natural sciences, the fields in which chemists, physicists, engineers, biologists, etc. work.

Chemical concerns practice research to a larger extent than the average. Here are some reports: 2.3% of net sales; 2.4% of gross sales; 5% of net sales; 7% of net sales, etc.

Medicine and health fields see considerable expenditures for research, the results of which are mostly measured in better health and less human suffering.

Research pays magnificently, often thousands of per cent. in dollars and more in gains to civilization.

Data from "Expenditures for Agricultural and Industrial Research Compared" by Howard P. Barss, Office of Experiment Stations, U. S. Department of Agriculture. 6 p. Order Document 1062 from the American Documentation Institute, 2101 Constitution Ave., Washington, D. C. remitting 26c for microfilm and 80c for photoprint copy.

Science News Letter, April 2, 1938

SEISMOLOGY

Earthquake Reported Near British Columbia Coast

AN EARTHQUAKE occurred near the coast of British Columbia on Tuesday, March 22, at 10:22.3 a. m., EST, seismologists of the U. S. Coast and Goedetic Survey stated after examination of data transmitted through Science Service by ten observatories. Location of the epicenter was in 53 degrees north latitude, 131.8 degrees west longitude. This point is in Skidgate Inlet, on the west side of Hecate Strait, in the Queen Charlotte Islands. A very severe earthquake was recorded from the same region several years ago.

Stations reporting data were: University of California, Berkeley, Calif.; Seismological Observatory, Pasadena, Calif.; Dominion Meteorological Observatory, Victoria, B. C.; Franklin Institute, Philadelphia; Canisius College, Buffalo, N. Y.; Williams College, Williamstown, Mass.; St. Louis University, St. Louis, Mo.; Georgetown University, Washington, D. C.; Manila Observatory, Manila, P. I., and the observatory of the U. S. Coast and Geodetic Survey at Sitka, Alaska.

Science News Letter, April 2, 1938

TACTICS

Value of Tanks Questioned By Italian Military Writer

Experience in Spanish War Declared Disappointing; Light Tanks Vulnerable, Heavies Can't Shoot Straight

TANKS, hailed as the one major military invention of the World War, are already on the way out, in the opinion of Lieut. Col. Emilio Canevari, Italian writer on military subjects (*Army Ordnance,* March).

Tanks scored their great success against the Germans, the Italian writer holds, because German manpower had been badly depleted and what was left was of inferior quality and shaken in morale. Similarly, in early actions in the present Spanish war, tanks frightened and broke the Government militia while the men were still raw and inexperienced. But after they had learned the business of fighting, the tanks got decidedly the worse of the argument.

Light tanks, that can make speed and get into places, are mere traveling tinpots, easily subject to fatal puncture by heavy machine-guns firing armor-piercing ammunition. Heavy tanks have to keep moving, for as soon as a tank stops, field guns promptly find it and end its career. And even while they are still under way the lumbering "heavies" can be put out of action by 37-millimeter guns and even by the new anti-tank guns of only about half that caliber.

Infantry Destroy Tanks

Furthermore, a moving heavy tank is of relatively little effectiveness, except as a flame thrower. It shakes and lurches so much that its machine-guns and light cannon lose most of their ammunition into either air or earth. Infantry have learned that at close range a heavy tank need not be feared, and in Spain the Government troops have been ruining them by exploding grenades in their tractor treads, or pouring gasoline on them and setting fire to it.

Col. Canevari likens tanks to the heavy cavalry of old-fashioned warfare. These cuirassiers and dragoons could be loosed in thundering charges to complete the demoralization and destruction of troops already defeated in action by artillery and infantry. But if launched against unshaken infantry the heavy horsemen only went to their doom, as Napoleon's desperately launched regiments did at Waterloo.

Development of the present heavy Russian tank into a self-contained armored artillery unit containing its own ammunition is seen by Col. Canevari as a possible continuance of the experiments with tanks, which he noted have not been satisfactory. But as a piece of movable artillery, such a tank would be used behind infantry rather than ahead of it, he points out.

Mechanization a Dream

But the completely mechanized army, subject of absorbing military fantasies during the past few years, has never been an actuality, will never come into existence and has been doomed by the experiences of the Spanish Civil War, Col. Canevari declares. He finds that earlier pictures of large mechanized bodies of troops, every man operating a tank or another piece of mobile lethal machinery, are not borne out by Spanish military events.

Nor is motorized transport possible in the fighting zone, for motorized units are tied to the highways on which they roll. Destruction of the highways by skillfully retreating enemies can cause havoc to motorized attackers. Bogged down by bad roads, they are an easy victim of attack planes.

Concluding his study of the 20 months of fighting that have seen everything from guerilla fighting to mass frontal assaults, the Italian observer finds that the advantage still lies with the defense, largely because of the ease of building obstacles to an advance and because of the development of rapid-fire arms. Whether Col. Canevari, now in the army reserve, bases his observations on actual service with Italian troops in Spain is not stated.

Science News Letter, April 2, 1938

Traces of black, brown, and red color on the Egyptian pyramids have been studied by a British scientist, who concludes these are not traces of ancient paint on the pyramids, but are natural coloring derived from the stone itself.