as far as nonspace industry is concerned, but industry is ingenious when it is looking for an idea, and remarkable applications of off-beat inventions are not uncommon.

Consider, for example, a sensor developed to detect the tiny impact of micrometeorites on spacecraft and capable of recording the force of a single grain of salt falling one centimeter. Medical researchers looking for new vaccines found that the sensor could be used to monitor bird embryos without damage to the egg. It can detect life after as little as four days of incubation and can readily note changes in heart rate or intensity resulting from chemicals experimentally introduced into the egg.

Research Used

A paint company in Michigan seized on a NASA Tech Brief mentioning a spacecraft coating that was highly resistant to ultraviolet rays and to electron bombardment while serving as a thermal-control coating. Using NASA's preliminary research, the company took off on its own and now has an alkali silicate paint with a number of commercial uses, which in the future may include application as a protective coating for automobile tailpipes and mufflers.

The same paint has also found use as a lining for steel calcining kettles.

Many beer breweries are now using a simpler, less costly, more efficient kind of butterfly valve made possible by a NASA subcontractor's development of a new precision-casting method.

Sending men to the moon is such a prodigious task that if a great deal of technical spinoff is not produced, it may be an indication that the radical new techniques required to do the job within reasonable limits of time and money are not being developed. The Saturn V booster, for example, standing 50 feet higher than the Statue of Liberty and weighing more than 25 fully loaded Boeing 707 jetliners, has produced a wealth of new developments simply through solutions to the problems of putting it together.

Holding the huge sections of the rocket in place for precision welding, for example, was almost impossible using conventional methods. An entirely new kind of clamp had to be designed, and so well was it done, that it has since been adopted by several leading manufacturers of large, precision metal structures.

An "electrodynamic" hammer that knocks out dents with brief but intense electric charges instead of pounding has won what almost amounts to acclaim from different industries.

Most NASA Tech Briefs contain the statement that "NASA encourages commercial use of this innovation. No patent action is contemplated by NASA." Some items are patented by NASA, but even they are all available for royalty-free use.

There are no doubt an incalculable number of scientific advances that could be brought about if scientists only knew which information to reach for in the vast sea of software (the engineer's term for printed matter—documents, plans, etc.). The Technology Utilization Program is an effort to bring selected new information before the people who would most benefit from knowing it.

• Science News, 89:492 June 18, 1966

MILITARY SCIENCE

Silent Turbine Designed For Use at Front Lines

➤ A TURBINE providing 3,000 watts of power so quietly that it could be used in combat near the front lines is being tested by the U.S. Army at Ft. Belvoir, Va.

The turbine works on the Rankine system, by heating a closed container of mercury, and is completely inaudible at about 100 yards. Production units should weigh less than 200 pounds.

The test model will run on any liquid hydrocarbon fuel, including gasoline and JP-4, a kerosene-based jet and rocket fuel. Other silent power sources being tested include a reciprocating steam engine.

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NBS

MAGIC—Paul Meissner, an engineer at the National Bureau of Standards, uses a light pen at MAGIC (Machine for Automatic Graphics Interface to a Computer) to connect an added symbol to a schematic drawing obtained from the machine's memory.

TECHNOLOGY

Computer Holds Pictorial Data in Its Memory

➤ DRAWINGS, maps, plans or schematic diagrams can be created, erased, changed or added to and then stored in the memory of a machine designed to facilitate man's communications with computers.

Pictorial material "drawn" on a screen is recorded and remembered by MAGIC (Machine for Automatic Graphics Interface to a Computer), a research tool developed at the National Bureau of Standards in work supported by NBS and the National Aeronautics and Space Administrations. With the help of computer operations, material can be edited while it is being designed and completed drawings can be retrieved for additional processing or output at a later time.

The basic principle of MAGIC is that a curve can be represented as a series of points along a connected path on the screen's display area. Each point can be described in terms of the values of its Cartesian coordinates and numbers corresponding to its display characteristics. Thus a curve can be described by three parallel lists of numbers giving successive values for two coordinates and the display characteristics.

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