MEDICINE

Heart Power Measured

Which hearts are likely to fail and are in need of rescue? Predictions are possible now that heart's efficiency as pump can be graded accurately by a new instrument.

By JANE STAFFORD

➤ HUMAN HEARTS now have a new kind of test that promises to spot trouble before it happens in the blood-pumping mechanism.

Take two case histories from the clinical laboratory where this new type of instrument is having its first clinical usage. The ballistocardiograph principles are old, but the type of instrumentation and the techniques are new.

The captain had been picked for an important, two-year mission in the Middle East. He was one of our older pilots, a man of experience and he was judged to be just right for the job.

Before he left, Civil Aeronautics Administration medical men, who have the responsibility for seeing pilots are fit, gave him a careful examination, including electrocardiograms of his heart. Their tests showed him in good condition and he was okayed for the mission.

To be sure, one test showed a heart abnormality. But this was a new test given the captain, along with many other pilots, as a trial of the test's value. Within a few weeks after arrival at his foreign post, the captain had a heart attack and had to be sent home.

Continuous Progress Made

The heart attack could have been predicted from the new test's findings, but no one at the time was sure about it. The other clinical story has a happier ending.

A 55-year-old business man wanted to go on flying his own plane. CAA turned him down for renewal of his pilot's license because of abnormal electrocardiogram findings. The man protested that his heart never bothered him and did not keep him from doing what he wanted to do. The new test showed he was right. His heart abnormality was not interfering with its functioning.

These examples indicate that there is continuous progress in keeping track of the human heart. They show that a new test of the heart now being developed may make the CAA examinations even better in the future. The new test will also, it is believed, help doctors generally to better diagnosis of the state of their patients' hearts.

A number of medical scientists have devised machines for the ballistocardiograph test in recent years. Unfortunately, there has been considerable variation in results due to variations in techniques and equipment. Dr. J. E. Smith, cardiologist for CAA, has been working toward standardization of the equipment and technique.

The ballistocardiograph, he explained, measures the efficiency of the heart as a pump. That is, it tells how fast fluid, or blood, is coming out of the pump. Dr. Smith compared the information about the heart given by the ballistocardiograph to the horsepower measure of an automobile's power. An electrocardiograph can be compared to instruments for testing the battery and spark plugs of an automobile. Both kinds of information are needed about hearts and automobiles.

Scale Pointer Quivers

The ballistocardiograph gets its name from the fact that each time the heart forces blood out into the body there is a shock, something like the recoil of a gun. The first part of the name comes from a Greek word meaning to throw and is familiar to military men from the word ballistics. Cardio refers to the heart and the graph is the record.

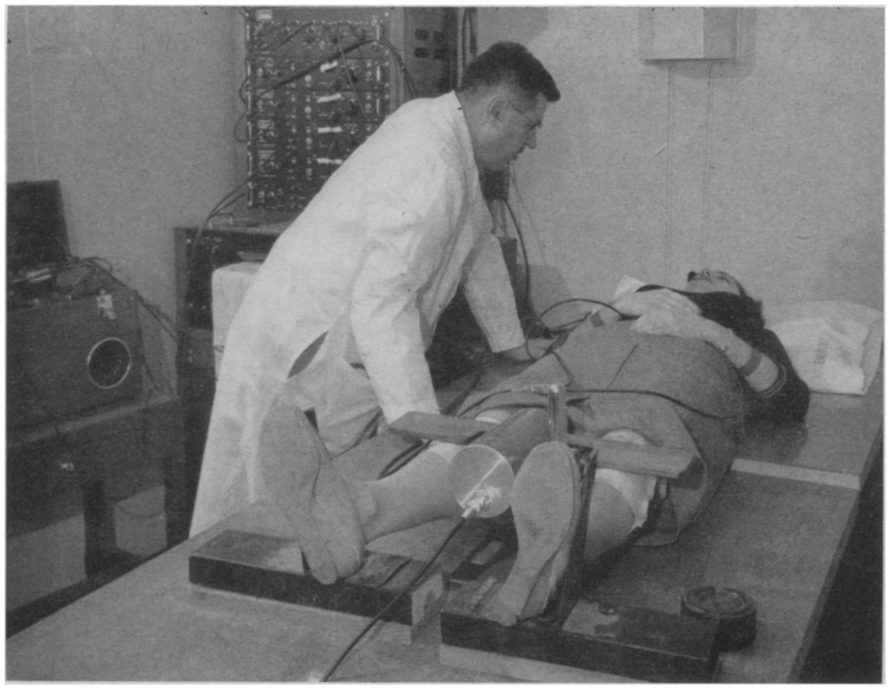
If you stand on a well-balanced spring scale and watch the pointer quiver, you will be seeing the shock of ejection of blood from the heart. The idea for the first ballistocardiograph is said to have come to a medical scientist when watching this scale pointer quiver.

Body's Movement Measured

Earlier ballistocardiographs measured the displacement of the body, that is, how far it travels, with each of these shocks. Dr. Smith and associates have been developing an instrument to measure the velocity and acceleration of motion of the body due to ejection of blood from the heart. The displacement, velocity and acceleration, in response to each heart beat are, Dr. Smith finds, all related to the force of the heart beat.

Working with scientists at the National Bureau of Standards, he was able to devise a machine that measures all components of the same heart beat simultaneously. And he has found a way to make the machine keep its calibration, so that it is always in adjustment and does not need to be set right before each use.

Vibration from motors, elevators and the



HEART HAMMERS OUT INFORMATION—Dr. J. E. Smith gives a patient a ballistocardiograph test. Some patients need reassurance, because wires and dials, especially when an electrocardiogram is made at the same time, as on this patient, are frightening. Pilots, used to many wires and dials, take the first test more calmly.

like in a building can throw the delicate machine off. So the instrument Dr. Smith works with at George Washington University Hospital, Washington, is set on a concrete block. The patient lies on a wooden table top placed on the concrete block. It is rather hard, but the test does not take long.

The patient's feet rest on two blocks and a wooden board attached to a bar magnet lies across his shins.

If a rigid spike could be put into the shin bone, the measurement of the heart's ejection force and power could be measured without interference from the movement of the instrument. Since this was obviously not practical, Dr. Smith and associates designed a bar magnet of exactly the right weight which picks up the motion of the body and sends an amplification of this to the graph record.

Dr. Smith believes that with this type of instrument, a reliable indication of heart valve damage can be obtained, such as in aortic insufficiency when the aortic valve leaks and puts a strain on the left side of the heart. Obstructions of the aorta (main artery leaving the heart) will give characteristic patterns only in the displacement curves.

In angina pectoris, the low forces of ejection can be seen much more clearly on the acceleration curves when the displacement curves look normal.

The instrument is now being used to study patients with heart valve disease called "mitral stenosis." It may be helpful in determining the severity of the valve damage as well as to show improvement in blood flow after operation on the valve.

The ballistocardiograph may help prevent heart attacks by giving more exact information about heart function. When doctors find evidences of faulty conditions, it may be possible to change the heart pumping mechanisms so that heart attacks will be less likely to occur.

Among the first 50 pilots between 40 and 50 years of age Dr. Smith tested, all of whom were normal by regular CAA tests, eight showed an abnormal heart condition on his test.

Of these eight pilots, three have developed definite heart trouble, with one death within two years.

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AGRICULTURE

World Horse Shortage

➤ A SHORTAGE of work horses is affecting farm production in Russia.

A world survey has shown that having too few draft horses is a factor holding down agricultural production in Russia, India, China, Vietnam and the Philippines.

The total number of horses in the world continues to decline, the U. S. Foreign Agricultural Service reported in *Foreign Crops and Markets* (May 23).

Estimating the current population at 74,500,000, the agriculturalists pointed out that this is a one percent drop between 1953 and 1954, and a 22% decline since prewar days. The continuous decline reflects the increasing use of farm machinery.

Geographic areas showed contrasting trends. The number of horses has noticeably decreased in North America, Western Europe and Oceania. On the other hand, there have been increases in Russia and Eastern Europe.

Continued use of horses for work and transportation can be expected in Asia and some parts of Africa, Central and South America, the report said, but "it seems probable that animal draft power will give way to the increased use of tractors, automobiles and trucks in Eastern Europe, the U.S.S.R. and many areas of Africa and South America in the years ahead."

The latest estimates, as compiled by the Service, put the 1955 U. S. horse population at about 3,106,000. In 1953, Russia was reported to have had 15,300,000; Brazil, more than 7,000,000, and China, over 5,600,000.

The survey also tallied the number of mules and water buffaloes in the world. The world total for mules and asses is about 50,000,000. It is estimated that the U. S. mule population is down 69% since before World War II, now numbering 1,400,000.

Water buffaloes, used for both draft purposes and as milk producers, are estimated to number approximately 78,000,000.

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MEDICINE

One in Seven Older Men Goes to Hospital a Year

➤ ONE OF every seven men aged 60 or over goes to the hospital in the course of a year, statisticians of the Metropolitan Life Insurance Company in New York reported.

The findings are based on the company's personnel protected by the company's group insurance program. It included those actively at work, the permanently disabled and the retired, but not those in Pacific coast states and Canada.

The men 60 years and older went to the hospital at a rate about twice that of men under 45.

Leading causes of hospitalization in the older group were, in order of numerical importance, diseases of the heart, diseases of the digestive system, operation for removal of the prostate gland and hernia operations.

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The *birch* leaf-mining sawfly has been a major pest of gray birch, white birch and paper birch since its introduction from Europe more than 30 years ago.