

## ENGINEERING

# New Magnetic Oil Clutch

Of number one importance, this oil contains millions of iron dust particles or other magnetic material, which may also be used in automobile brakes.

➤ **MAGNETIC** oil is the key to a new automobile fluid clutch just revealed by the National Bureau of Standards. Its development is a discovery of number one importance. The oil contains millions of tiny particles of iron dust or other magnetic material. The car electric system magnetizes them as needed.

This new magnetic fluid clutch is very simple. It has three elements only, a driving shaft with a plate at its end, a driven shaft and plate, and the iron-saturated oil between. When a magnetic field is established between the two parallel plates, the magnetic particles form chains which bind the two plates together as tightly as if they were held by strong spring clamps.

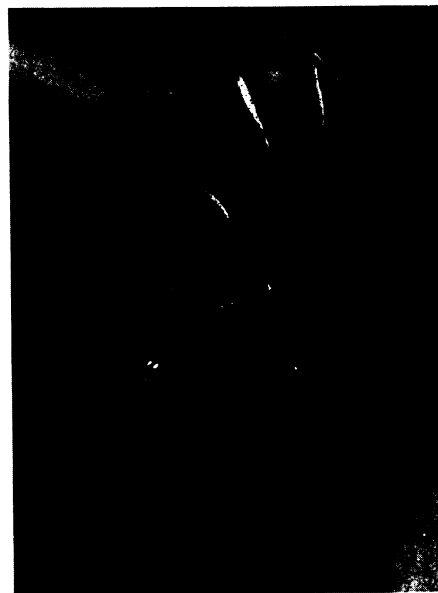
Operation of the clutch is described as extremely smooth and without "chatter." The locking force is practically constant, and the bond between the two plates is a function of the gradual increase of the magnetic field, which is electrically controlled. The relation between the amount of magnetization and the bond between the plates is independent of speed. There is no point at which the clutch suddenly tightens to produce a jerk. Slip-

page is practically completely eliminated.

This magnetic oil may be used in brakes as well as in clutches, but according to its inventor, Jacob Rabinow of the Bureau staff, it has other applications which may be even more important. These are in servo-mechanisms, instruments to translate electronic "information" into appropriate action in purely mechanical equipment. Such devices are used for power steering of large trucks, tanks, steamships and airplanes. They are also used in printing presses, power machinery, for the control of radar antennas, gun direction control, and in high-speed electronic computers.

Since the amounts of electric power required to control the magnetic fluid clutch are small, it is a simple matter to interlock the electrical circuits with the speed, throttle setting and power demands. It has been found by experiment that the nature of the oil used has relatively little bearing on performance. Hence silicone liquids may be employed with excellent results, enabling the clutch to operate at very low and very high temperatures.

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**MAGNETIC FLUID**—It consists of a mixture of fine iron powder and oil which forms the heart of the NBS magnetic fluid clutch. When acted upon by a small permanent magnet, that portion of the mixture in the magnetic field "solidifies", as the iron particles become mutually attracted, and adheres to the magnet.

the U. S. Public Health Service, when he tried it as a remedy for leprosy. Promin has proved so successful in leprosy that now the number of patients who get well and can be discharged from the National Leprosarium at Carville, La., is greater each year than the number of new patients coming to the institution.

These results with promin given by vein encouraged the Mayo Clinic group to try it again in tuberculosis. Studies with guinea pigs showed it was just as effective whether given by mouth, by vein or by injection under the skin.

By combining promin with streptomycin and either promizole or PAS, each of which has some effect against TB germs, the Mayo group hopes to get the sum of the benefit of each. In other words, the new treatment should be three times as effective as treatment with either drug alone.

Fortunately, the damaging effects do not add up that way. Promin can damage red blood cells, streptomycin can damage nerve cells, and promizole and PAS may have bad effects on stomach and intestinal tract. When all three drugs are given, it is possible to give small enough ones of each to avoid the dam-

## MEDICINE

# Triple-Play Attack on TB

Promin, streptomycin, promizole and para-aminosalicylic acid are being used to fight the disease. Doctors hope to triple results.

➤ A **NEW** triple-play attack on tuberculosis is being made by scientists at the Mayo Clinic and Foundation, in Rochester, Minn. Promin, a drug once tried and abandoned, is being used together with two other anti-TB chemicals.

Streptomycin, most hopeful of the drugs combatting TB, is one of the trio, while both promizole and PAS (para-aminosalicylic acid) are used as the third chemical.

Results three times as good as with any one drug alone are hoped for.

News of this three-pronged attack on the white plague will reach medical

scientists through a report by Drs. William H. Feldman, Alfred G. Karlson and H. Corwin Hinshaw in the *Proceedings of the Staff Meetings of the Mayo Clinic* (March 3).

Promin had been tried as a TB remedy as early as 1940. But then it was being given to the patients in pills or capsules, and it had a damaging effect on red blood cells. So not enough could be given to get any good results.

Now it is known that much larger doses can be given safely if the drug is injected into the patient's veins. This was discovered by Dr. G. H. Faget, of

aging effects without reducing the anti-TB action.

It will be "most difficult," the scientists point out, to determine the benefits of the mixture to the patients. But they

are also interested in the results on the tuberculosis germs. The combination treatment might delay the development of resistance by germs to streptomycin.

*Science News Letter, April 3, 1948*

#### CHEMISTRY

## Improve Synthetic Rubber

**This new low-temperature product, after exhaustive fire tests, has proved to be superior to other synthetically produced rubber and better than natural rubber.**

► **SYNTHETIC** rubber, produced at much lower temperatures than used in most Buna S production, is better than the natural product, University of Minnesota chemists claim. The low-temperature process was developed in the university laboratories, at Minneapolis, and may result in sweeping changes in the American rubber industry's production methods.

The Minnesota process has been tested and modified in several industrial laboratories and has been tried out on a pilot plant stage, Dr. I. M. Kolthoff of the university staff stated. Exhaustive tire tests have proved that the new product is superior to any synthetic rubber previously produced and considerably better than natural rubber, he said.

Under usual methods of production of Buna S, the rubber formation in the mixture used takes place at a temperature of 122 degrees Fahrenheit, and the process requires from 12 to 14 hours. In the new process it is possible to make rubber within a reasonably short time at temperatures in the vicinity of the freezing point of water. In this process

an organic peroxide is used as a catalyst instead of the inorganic salts usually employed.

Key to the superiority of the new rubber lies in the fact that its molecules are more uniform than those in other rubbers, he explained. This uniformity results from effecting the polymerization process at the lower temperatures.

In making Buna S (GRS) rubber, the standard ingredients are 70 parts butadiene, derived from either petroleum or alcohol, and 30 parts styrene, chiefly a coal derivative. When the mixture is put into a container, the top layer is made up of these two ingredients, while below is a layer of water containing a dissolved emulsifier such as soap and usually a dissolved catalyst, an activating chemical agent.

When the mixture is stirred or rotated, polymerization takes place, and the resulting rubber particles remain suspended in the aqueous, or water, layer. With the addition of acid, such as sulfuric acid, the rubber particles coagulate into a pliable mass easily separated.

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#### ENGINEERING

## Navy Checks Silt Deposits

► A SURVEY of the silt that threatens to fill the bottom of the Grand Canyon of the Colorado under the surface of the great reservoir behind Hoover Dam is now underway. Navy men and a miniature Navy fleet are assisting the Department of the Interior in this job.

The Navy fleet consists of a self-propelled 107 by 21 foot barge and smaller boats, all brought overland from the ocean. The men are divers but are also technical experts in the use of depth-sounding equipment, underwater photography and surveying. The investigations will show the amount of silt already deposited in the 12 years since water

was impounded. Anti-silting measures will follow.

The silting of this artificial lake, which when constructed had a capacity of 32,000,000 acre-feet of water, was foreseen when the dam was built. It was known that the turbulent Colorado would deposit its load of fine earth and sand when it reached the quiet waters in the reservoir. Reliable estimates of the rapidity with which the lake's bottom would rise could be made then. The data to be obtained now will assist engineers in designing the best silt-control methods suitable for use in this particular application, and much infor-

mation for applying elsewhere.

The Hoover Dam is a combination flood-control, irrigation, hydroelectric power, and domestic water construction. Before its construction the "untamable" Colorado, as it was called, destroyed annually farmlands, homes, bridges and highways from near the Nevada boundary to the Gulf of California. Electric plants at the dam have a capacity of over 1,000,000 kilowatts. No water for irrigation and domestic uses is taken from Lake Mead, the Hoover Dam reservoir, but it is taken at lower points. These lower dams on the river, now safe from destruction by the flood-controlling Hoover Dam, supply water for giant irrigation projects in Arizona and California, and domestic water for the Los Angeles area.

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