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# ENGINEERING ABSTRACTS

## AN ICE-WARNING INDICATOR

One of the greatest hazards of flying still remains in the formation of ice on the wings. So far all methods of combating such ice formation have proved unsuccessful. The best plan is to provide the airman with such weather service as will enable him to avoid flying under conditions likely to lead to ice formation, and to instruct pilots carefully as to what to do when there are signs of ice, such as glide down to lower and warmer altitudes, for example. The Boyce Motometer Company of Long Island City has developed an ice-warning indicator which may be useful. The indicator is similar in principle to the strut thermometers often used on Army planes. The bulb of the thermometer is completely filled with Zylene under pressure. Any application of heat or cold at the bulb causes the entire column of liquid to expand or contract. The bulb is connected by a fine capillary tube to a Bourdon spring, which coils or uncoils as the liquid contracts or expands. The movement of the Bourdon spring moves a pointer across a dial mounted in the pilot's cockpit. On the upper scale of the dial, there are graduations from 40 to 100 degrees, Fahrenheit. Mounted below the mechanism described is a secondary movement similar to that employed in the ordinary type of a pressure gauge. When the pointer on the upper scale comes down to 42, a pin engages this secondary movement and the pointer on the lower scale is brought into use, giving a clear indication over an enlarged scale in the cold danger zone. — *The Scientific American*.

## WORLD'S LARGEST STEAM LOCOMOTIVE

The world's largest steam locomotive, which measures nearly half the length of an ordinary city block and three times the length of a standard freight car, has been constructed for the Northern Pacific Railway.

This leviathan of the rails, which is 125 feet long, was shipped recently by the American Locomotive Company from its plant at Schenectady, New York, to H. H. Stevens, vice-president in charge of operation on the Northern Pacific. It is experimental and is of the four-cylinder simple Mallet type.

The enormous proportions of this locomotive, which will ride the rails on 34 wheels, including 12 on the tender, were conceived by its designers and builders with a view to burning semi-bituminous coal, of comparatively low heating value. This coal is obtained from an open pit mine in the Rosebud coal field in southeastern Montana, operated by the Northern Pacific.

Other features of this super-locomotive are:

In working order, with coal and water, it weighs 1,116,000 pounds.

Its height from the top of the rail is sixteen feet, four inches.

It has a normal tractive power of 140,000 pounds and a total tractive power of a 153,000 pounds, including the trailer type booster, with which the engine is equipped.

The firebox, which is built to provide the greatest heating surface for burning the semi-bitumi-

nous coal, is equipped with five thermic siphons, three of which are in the firebox and two in the combustion chamber; the firebox, including the combustion chamber, is 28 feet, 6 inches long by 9 feet, 6 inches wide; the grate is 19 feet, 2 inches long by 9 feet, 6 inches wide, making a total of 182 square feet of grate area.

It has a mechanical stoker, which is of special design and is capable of crushing, delivering, and distributing to the firebox hourly a maximum of 45,000 pounds, or 22½ tons of coal.

Its tender has a capacity of 22,000 gallons of water and 27 tons of coal.

Water is supplied from the tender to the feed water heater and thence to the boiler by two centrifugal pumps. The engine is equipped with all of the most modern devices for efficient and safe operation, including automatic train stop.

This giant locomotive, according to operating officials of the railroad, will be placed in regular freight service between Glendive, Montana, and Mandan, North Dakota. The territory over which it will operate is of undulating profile, with controlling grades of 1 per cent so separated over the territory that it is impractical to establish helper or pusher districts. Up to now, over this section, it has been necessary to handle in two trains the tonnage which is carried in one train both west of Glendive and east of Mandan. This powerful new locomotive has capacity to pull between Glendive and Mandan in one train the same tonnage that is handled east and west of this 216-mile stretch where it will be in service. — *The Scientific American*.

## ELECTRIC MACHINERY COOLED BY HYDROGEN GAS

As much as 50 per cent more power can be handled by the same size electrical apparatus if it is equipped with a new system of cooling developed by the General Electric Company, it was announced by that company recently. The use of hydrogen gas within a totally enclosed rotating machine has made this increase possible without increasing the operating temperature beyond the point of safety the company reports, and it is the temperature which has heretofore limited the load which can be carried.

The first commercial application of the new system of hydrogen cooling has been made on a synchronous condenser installed by the New England Power Company at its Pawtucket, Rhode Island, substation, which has a capacity of 12,500 kilovolt-amperes if an air-cooling system were not used. With hydrogen at 15 pounds gage pressure, the machine would deliver 15,000 kilovolt-amperes without exceeding the normal temperature guarantees, according to General Electric engineers.

Another advantage of the new system, it is said, is to exclude oxygen and dirt. Hydrogen will not support combustion, and fires of any kind, even from short circuits, are consequently impossible, it is further declared. Hydrogen also eliminates the effect of corona on the insulation, the report says. The usual air-cooled equipment can be

(Continued on Page 20)



## IF MILLIONS DEPENDED UPON THE SHOT! ~ ~

**S**UPPOSE you were planning a blast upon the success of which millions of dollars depended. Imagine the care with which you would select and test the materials and prepare the shot. You would do everything humanly possible to guard against a failure.

Did you ever stop to think that this is exactly our position in relation to the blasting caps we sell? The successful performance of many millions of dollars' worth of explosives depends upon the quality of the blasting caps and electric blasting caps that we supply to shoot them.

The care that goes into the manufacture of Hercules Detonators is out of proportion to their sales value. They mean much more to us than the profit from their sale. To us they represent additional insurance for satisfaction from the use of Hercules Explosives. Hercules Detonators furnish the same insurance to all who use them.

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Wilmington, Del.

2653

## ABSTRACTS

(Continued from Page 18)

placed outdoors, thus saving building costs, which is the case at Pawtucket. The totally enclosed apparatus is also said to be exceptionally quiet in operation. — *The Scientific American*.

### MOTOR FUEL FROM SAWDUST IS INDIAN PROJECT

Favorable results are being obtained in India on the experimental production of alcohol from sawdust of the gangwa tree, a fast-growing species, according to the Department of Commerce. Alcohol is regarded as the logical basis of motor fuel in India.

The glucose obtained is fermented to alcohol, and it has been roughly calculated that waste sawdust from Calcutta mills alone would yield 375,000 gallons of power alcohol yearly, on the basis of experiments using sulfuric acid. The use of fuming hydrochloric acid would give 40 per cent greater yields, which would then amount to one-sixth the production in India from all sources. Only 3,000,000 gallons are being produced locally at present.

In the experimental work which is being conducted at the University of Calcutta, yields of 30 to 33 per cent reducing sugar (glucose) have been obtained from sawmill waste by treatment with sulfuric acid; 70 per cent of this sugar material was fermentable, giving 33 to 39 gallons of 90 per cent alcohol per ton of air-dried sawdust. The use of fuming hydrochloric acid in the initial hydrolysis gave higher yields of reducing sugar and 48 to 57 gallons of alcohol per ton of sawdust. Special acid-resisting vessels, such as are being manufactured now from synthetic plastics, would be required if hydrochloric acid is used. — *The Scientific American*.

### EMULSIFICATION OF ASPHALT PRODUCES NEW PAINT

An entirely new paint material for the protection of surfaces exposed to severe conditions of corrosion has been made available by recent development of asphalt emulsions in water. The valuable properties of asphalt have long been recognized but heretofore this material has been applied either in a molten condition or in solution in volatile solvents. Neither of these methods of application is entirely satisfactory from the standpoints of effectiveness, convenience, or economy.

The progress of manufacture of asphalt emulsions involves the breaking up of the substance into extremely minute particles averaging from 1/5000 to 1/10,000 of an inch in diameter in the presence of water and a very small percentage of an inert mineral colloid. This is accomplished by flowing pure asphalt into an especially designed speed emulsifying machine in which propellers disperse the stream of asphalt into minute particles and at the same time combine it with water and the colloid. In this way the particles of asphalt are suspended and held in suspension until after the emulsion has been applied.

The importance which the paint industry attaches to this new development is indicated by the recent announcement that the duPont Company of Boston to market an asphalt emulsion paint to be known as "Asphalt Chromate Emulsion" or "Ace" for short. The incorporation of

(Continued on Page 22)



# One way to trap a beaver

Not everybody in the Hudson's Bay Company was a trapper, any more than everybody in the Bell System is a telephone engineer.

The Hudson's Bay people trapped a good many beavers in the company offices, where the skilful financing and careful business management served to back up the men actually

on the front lines. Organized activity succeeded then just as it does today. The men who put up telephone lines can work the better because back of them are other men who painstakingly design and make their equipment, and still other men who correlate all these activities into a smoothly meshing plan.

## BELL SYSTEM

*A nation-wide system of inter-connecting telephones*



"OUR PIONEERING WORK HAS JUST BEGUN"

APRIL, 1929

## ABSTRACTS

(Continued from Page 13)

chromates in the emulsion is an added feature calculated to render metal surfaces "passive" to corroding influences. This action of certain salts has been known to chemists for some time, and materials used to render metal less susceptible to corrosion are known as inhibitors.

The new paint therefore permits the deposit of a coating of any desired thickness and at the same time incorporates rust inhibitives throughout the depth of the film. It is applied cold with a brush or spray, can be successfully applied to damp surfaces, and will dry in from six to eight hours. The resulting film of asphalt is said to be resistant to extremes of temperature and to be relatively waterproof. The principal use for this protective coat at present is for underground piping but experiments in other fields indicate that it will find application in a wide variety of uses. — *The Scientific American*.

METAL PLANE WITH WIDE CABIN CARRIES  
TWENTY PERSONS

A cabin, fourteen feet wide and having accommodations for twenty passengers, is one of the chief features of an all-metal monoplane which has been designed for fast service between New York and Chicago. The broad, flat shape of the cabin, conforming to the pattern of the wing, is expected to contribute to the ship's sailing qualities. The plane has two motors of 650 horsepower each; its landing wheels fold up into recesses in the bottom of the cabin while in flight, to decrease wind resistance, and a powerful hinged searchlight, which may be adjusted to different angles, has been installed in front to aid in night landings. A speed of 175 miles an hour is expected. The plane has been designed to afford pilots and passengers exceptionally unobstructed vision.

— *Popular Mechanics*.

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