where a large floor space free from pillars is desirable. The strength is satisfactory even for some railroad trestles. The degree of curvature that can be built into laminated structures even allows boats to keep their streamlined outlines, yet have greater strength and stiffness than similar hulls mechanically joined.

Success of laminated structures depends largely upon the glue used to join the sections. Many new types of glue have been developed by modern chemists to supplement the old fish and animal glues, so that the woodworker can now choose from a number of bonding materials.

Casein glue, made from waste milk products, is generally used to hold plywood sheets together. Several kinds of new adhesives are made from resins, allied to plastics in composition.

Studies of each of these types of glue were undertaken by the Forest Products Laboratory during World War II. The armed services wanted to determine which types would hold up best in the kinds of joints usually used in making boxes and furniture. Packaging for the tropics was the immediate problem, as the extreme heat and humidity of tropical conditions is hard on glued furniture.

Variations in durability of glued joints were found, depending on how the pieces of wood were put together. Side-grain to side-grain joints are those used for laminated construction. These joints stood up better in all the tests than the side-to-end joining used to put furniture together. A synthetic phenol-resorcinol-resin type of glue gave the best durability, under conditions far more rugged than those found on any baseball diamond.

Science News Letter, March 13, 1954

METEOROLOGY

Tornado Warnings

➤ LIVES CAN be saved and property damage minimized if local communities set up a tornado warning system.

At the present time, tornado forecasts cover a wide area, such as a Midwestern state, warning that twisters may occur, but Weather Bureau experts are not yet able to pinpoint the exact time and place they will strike.

A tornado can be spotted as a spinning, funnel-shaped cloud extending toward the earth from the base of a thundercloud.

In addition to a local warning system, such as visual reports to police, communities can use outdated radar sets obtained from the Weather Bureau to keep a vigilant watch for the twisters. (See SNL, Feb. 13, p. 106.) These sets can be modified, for about $10,000, to scan the skies for tornadoes within a 200-mile radius. This is $50,000 less than a new one costs.

Over a dozen communities in Texas are now part of such a tornado-warning system, having raised on their own the money needed to modify the radar sets.

The network will work like this:

Weather Bureau forecasters will alert areas that have conditions most likely to produce severe thunderstorms, from which tornadoes are sometimes spawned. When the bright picture that means a thunderstorm is spotted on the radar screen, the weather observer will try to find out directly from the community what kind of storm is hitting the area.

Knowing that a tornado exists, the weatherman can plot the path it will follow, pinpointing the time it will hit a particular town or city. An advance warning to residents in the twister's path should give them a chance to take proper precautions.

The following safety rules have been suggested by Weather Bureau experts:

1. When time permits, go to a tornado celler, cave or underground excavation.

2. If you are in open country, move at right angles to the tornado's path. If there is no time to escape, lie flat in the nearest depression such as a ditch or ravine.

3. In a home, the southwest corner of the lowest floor or of the basement offers the greatest safety. If you are in a city or town, seek inside shelter, preferably in a steel reinforced building. Stay away from windows.

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TECHNOLOGY

Coal-Burning Turbine May Challenge Diesels

➤ A McGILL University professor has invented a coal-burning gas turbine engine which he believes will challenge the oil-burning diesel's favor with railroad men. By pulling a train four times as far for a given amount of coal, it also is expected to outclass its steam-powered ancestors.

At a recent unveiling of the experimental model, Prof. Donald L. Mordell told high-ranking Canadian government and railroad officials that his engine is more economical, more compact and more powerful than its diesel counterpart.

It burns all grades of coal, even low grades that steam engines cannot use. It extracts 20% to 24% of the thermal energy from coal in contrast to the steam engine's six percent figure. It gets around one engineering "bug" that has plagued previous engines of this sort through use of a new operating cycle which permits only clean air to drive the turbine blades. Formerly, coal-ash damage to these blades was considerable.

Prof. Mordell and his research team in Montreal developed the engine under sponsorship of the Department of Mines and Technical Surveys and with a $300,000 grant from the government.

Science News Letter, March 13, 1954