

### The Dendrograph—An Instrument That Keeps Tabs on Tree Growth

By Dr. Wm. A. Murrill, N. Y. Botanical Gardens

IT is a matter of common observation that some trees, like the pines, poplars, willows, and soft maples, are of rapid growth; while others, like the hard maples and most of the oaks, grow more slowly and produce wood of greater strength and firmness. The dendrograph is an instrument designed to record minutely and accurately all changes in the size of the trunk of a growing tree. When once properly attached to the trunk, it requires no further attention except the weekly winding of the clock-work and the insertion of a new record sheet on the recording cylinder.

Such an instrument was installed on March 4 of the present year on a young sugar maple about a foot in diameter growing in the New York Botanical Garden. So much interest has been exhibited in this experiment by the visiting public that it has been necessary to erect a wire cage about the tree to prevent undue interference with its growth and the operation of the recording apparatus.

The most conspicuous part of this instrument is the recording drum with its record sheet, protected by a tin cover attached to the trunk and caused to rotate by clock-work; but the essential feature is a yoke composed of slotted bars of bario—an alloy with a very low temperature coefficient—held in place by upright "fingers" of spring brass wire, which hold the yoke in position without exerting any notable pressure on the tree.

A belt of wooden blocks, serving as a support for the essential parts of the apparatus, is clasped about the trunk in such a way as to touch it at only a few points and therefore to interfere as little as possible with its growth. These blocks are placed horizontally about a yard above the ground, the block bearing the recorder being on the south side of the tree. Changes in the distance between the contact screw on the opposite side of the trunk and the arm of the bearing lever are accurately registered on the drum by the recording rod and indicate changes in the size of the tree at that point. In other words, a curve of growth is traced on the revolving drum as it passes beneath the point of the rod, whose position is gradually changed as the trunk expands in the process of growing.



The usual tank car and a steam pump mounted alongside the tank go to make this railroad fire-fighting equipment

### A Fire-Fighting Equipment on Rails

A MIDDLE-WEST railroad which has been more or less troubled with fires along its right-of-way for some time has gone to work and constructed the ingenious fire-fighting equipment which is depicted in the above view. Upon one of the usual tank cars is pump along-side the reservoir. The water is drawn from the locomotive by means of hose connections on both

method for making thermal analysis has been evolved.

The newly-designed furnace obviates the necessity of varying the heating current. Changes in temperature of the objects under observation are produced by raising and lowering the sample in the furnace kept at constant temperature. Designed especially for determining the thermal critical points of steel, the method developed by the Bureau of Standards is also economical in practice.

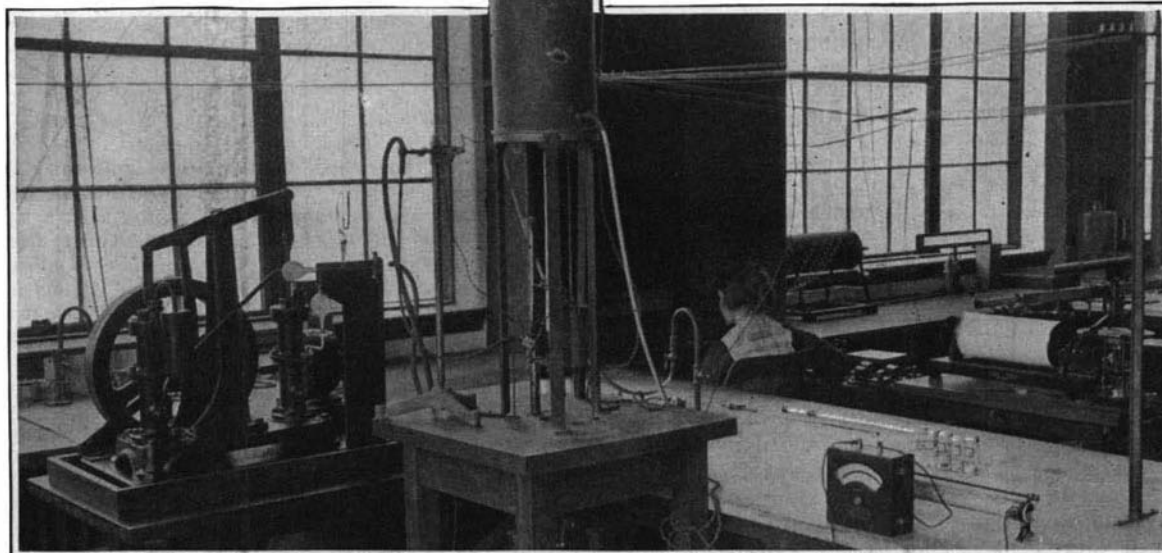
The usual method of recording inverse heating and cooling curves is by the use of a chronograph, observing the consecutive time intervals. This practice necessarily entails the use of an expensive apparatus, not easily available at present.

Of additional consideration is the time element, from one to two hours required to tabulate the time intervals from the chronograph sheet. As an economical substitute, the Bureau of Standards has found two stop watches as accurate and convenient in performance as the chronograph. Likewise the new process is a time-saving one.

Although a modified form of the Rosenhain thermal-analysis furnace, the Bureau of Standards deviated from his principle of construction in two essential particulars: A gravity-drive rate control was adopted, and the sample introduced through the bottom and cold end of the furnace.

The designers are of the opinion that they have surmounted the difficulties indicated by Rosenhain in the construction of a furnace intended chiefly for the thermal analysis of metals by the inverse-rate method, namely, the uniformity of the rate of heating or cooling being inadequate for the degree of accuracy desired. Moreover, it is believed, judging from the volume of requests for information on the new type of furnace, that manufacturers will freely adopt and in all probability will find ways to improve the construction.

—By S. R. Winters.

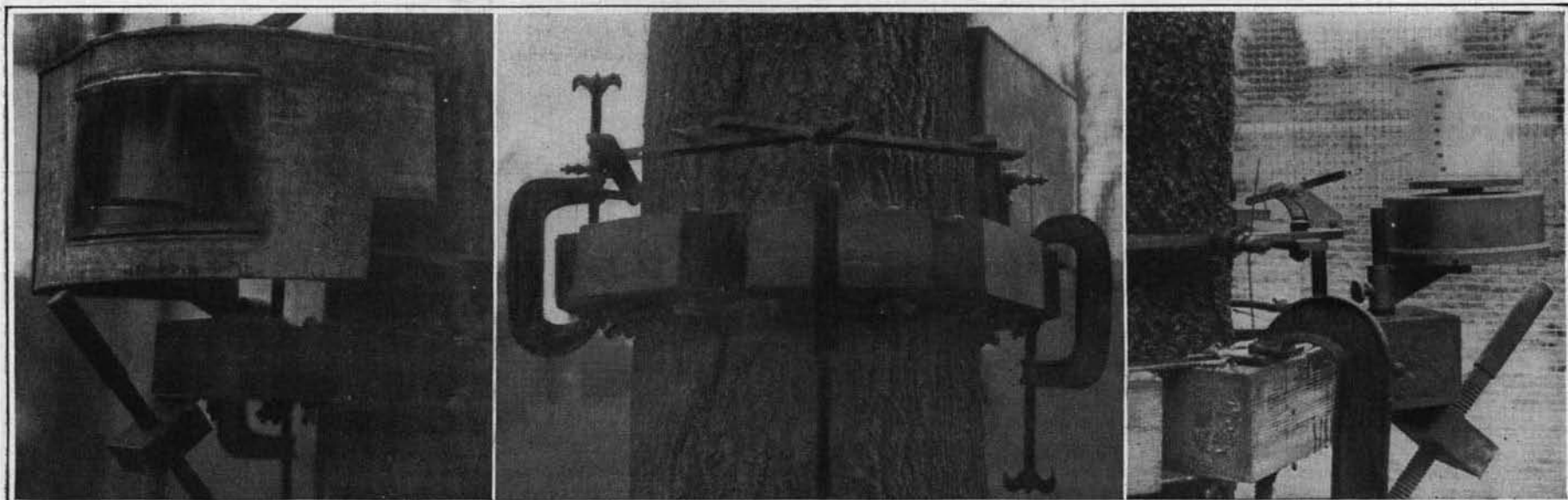


Modified Rosenhain furnace for thermal analysis of metals and especially for determining the thermal and critical points of steel

crew can direct three streams of water at the same time, thus providing a volume of water adequate to extinguish forest fires of considerable area.

This case is very much in line with what other railroads have done to prevent conflagrations in the first place, and to check them in the second, in woods and forests along their right-of-way. Railroads passing through thickly forested regions are providing their locomotive funnels with spark arresters of various designs in order to reduce the fire hazard to a minimum.

—By G. Orb.



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Three views of the dendrograph, showing the case with the glass window, the belt of blocks, and the recording mechanism exposed to view