

and pleasure parks. The government lulled its citizens into accepting everything, by a benevolent despotism. Slavery for a portion of the people was taken as a matter of course.

Looking closer, Prof. Frank gained the impression of a nation going to sleep. No new ideas, not a single vital product of literature, no art except borrowings, no industrial leadership disturbed the lethargy of this strange "Golden Age" of Rome!

Economic decay, which actually was setting in, was preceded, it appears, by

an earlier era of really prosperous farming.

Monumental as Prof. Frank's five-volume work is, such a study of Rome's lengthy economic experience leaves a good many questions unanswered. The data known from the past are still—and may always be—tantalizingly incomplete. Prof. Frank himself said that he dared not guess the cause of Rome's oncoming atrophy. He added: "If we knew the real meaning of the Antonine period, perhaps we should find a formula of some value for our own future."

*Science News Letter, May 11, 1940*

## ENGINEERING

## Electrical "Thunder Screen" Brings Sounds To The Theater

### All Varieties of Crashes Except High-Pitched Ones Can Be Duplicated with New Compact Device

A PIECE of common window screening, an old-fashioned radio loud speaker, and electric circuits have brought to the sound effects repertoire of the theater new thrills for the ear, Prof. Harold Burris-Meyer of Stevens Institute of Technology told the meeting of the Acoustical Society of America in Washington.

The new screen, compact and light in weight, replaces the huge "thunder drums" which have been a cumbersome prop of the theater for many a year. These thunder drums are great pieces of raw hide, five feet on a side, stretched in a heavy wooden frame. An hour or more before a performance this raw hide had to be heated by powerful lamps or electric heaters so that it would become taut and vibrate with the roll of distant thunder.

Vincent Mallory, research consultant working with Prof. Burris-Meyer in the design and construction of acoustical apparatus for the theater, said in an interview that the little "thunder screen" which has been developed can produce a great variety of sounds as the operator becomes skilled in its use.

Sounds of machine gun fire come out of it by slowly drawing a stylus across the screen with the proper tempo. A rapid motion by the stylus produces a ripping, tearing sound like the tearing of heavy fabric—an airplane wing covering or a heavy sail.

Sounds of cannon shot are produced by the device if it is struck with a cov-

ered mallet, and only the first part of the vibration picked up electrically with the rest of the vibration cut off. In contrast, distant thunder is produced by striking the screen and then, by volume control, amplifying and controlling the continuing, damped vibrations.

All varieties of crash noises can be duplicated, Mr. Mallory said, except very high pitched crashes. For this reason the device cannot duplicate the breaking of glass with its high-pitched tinkle.

In operation, the thunder screen is simple. The screen wire is mounted vertically and connected by a rigid wire directly on to the movable part of an old electromagnet type of loud speaker. As the screen is scratched, or struck, its vibrations are conveyed to the electromagnet and converted into electrical pulses that can be sent through circuits to whatever loud speakers in the theater are to be used.

Elaborate control techniques and the trick of chopping out whole octaves of the sounds which are created can produce amazingly dramatic sounds. The emphasis at Stevens, Mr. Mallory said, has been to strive for the maximum emotional effect of sounds. In one recent play loud speakers were rigidly mounted to the floor of the auditorium and on loud amplified sounds the feet of the audience could actually "feel" the vibrations. Two members of the audience unexpectedly became somewhat ill from this unique and novel use of acoustics to augment the drama.

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## PLANT PATHOLOGY

## Virus Disease Transmitted Along with Bud Grafts

A SERIOUS leaf disease that has been making trouble for growers of Italian prunes in the Northwest has been traced to a virus origin by Dr. Earle C. Blodgett of the University of Idaho. When new trees are produced by bud-grafting, the disease goes right along in the buds. Greater care in the selection of healthy buds for grafting should result in a reduction of losses.

Symptoms, appearing early in summer, include numerous spots on the leaves, which in more serious development die through and become shot-holes. Sometimes trees are defoliated. In any case, such reduction in food-making areas of the trees results in reduction of the crop. Economic seriousness of the disease is stressed by the fact that in Idaho alone the prune crop averages 20,000 tons a year.

Dr. Blodgett reports his studies in the current issue of *Phytopathology*, official journal of scientists who specialize in the study of plant diseases.

*Science News Letter, May 11, 1940*

Scientists report that wild geese have no single leader to a flock, but take turns leading the flight.

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