

for oil-making until even the bacteria of the bottom slime had taken from them such materials as they wanted.

This bottom bacterial action seems to be of the highest importance in the formation of the stuffs that eventually become petroleum. Crude plant materials, and such fishes and other animal carcasses as settle to the bottom, have relatively high nitrogenous and carbohydrate contents, which are unsuitable for working over into oil. The food requirements of the bacteria seem to be especially aimed at these non-oil-producing food materials, thereby leaving the organic debris in better condition for the oil-making processes themselves.

Oil-making seems to be an exceedingly slow job. It is not going on in the sediments now forming on the ocean bottom, but it is in progress in sediments laid down on the sea bottoms of geological yesterdays. The steps are not known with anything like satisfactory certainty, but there seems to be no doubt that great increase in sedimentary thickness, with resulting pressure and heat, squeeze and fry out the material that eventually becomes petroleum. It then seeps along migration paths through sandy strata, and collects in pools where impervious rock layers bar its further wanderings.

*Science News Letter, May 27, 1933*

HOROLOGY

# New Inventions Make Possible More Accurate Time Keeping

## Watches Regulated in Ten Minutes Instead of Ten Days "Robot" Clock Errs Less Than 1-1000 Second in 24 Hours

**T**EN MINUTES instead of ten days is the time required by a jeweler to regulate a watch to maximum time-keeping efficiency with the use of a new electric watch timer demonstrated to the Horological Institute.

Accurate time intervals are given by a special electrical current of 100 cycles per second accurate to one part in ten million furnished by telephone companies from a constant frequency generator in New York. This current drives a synchronous motor similar to those that have come into such wide use in electric clocks.

Within the new timer developed by the Bell Telephone Laboratories an image of the watch balance wheel is reflected on a mirror and a flashing lamp controlled by the precise synchronous motor flashes. This makes the watch's

balance wheel seem to stand still when the watch and motor have exactly the same speed.

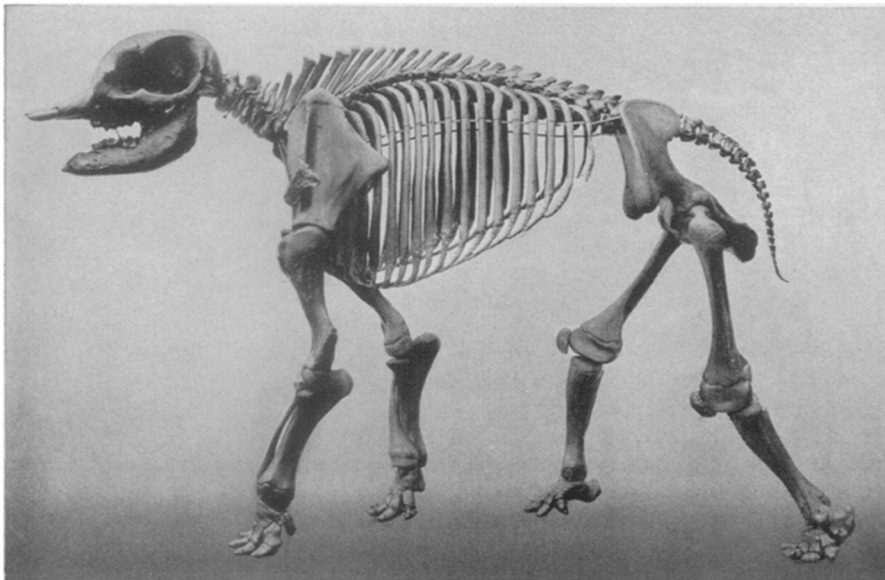
The stroboscopic effect allows the jewelers to inspect and diagnose any trouble in a watch as well as regulate its time-keeping quickly and accurately.

Future time signals from the U. S. Navy's great radio station at Arlington, NAA, will be more frequent, more accurate, and yet require no additions to the Naval Observatory personnel, because of a remarkable new type of crystal-controlled "robot" clock which has been invented by two members of the Naval Research Laboratory. The clock was described before the meeting of the American Geophysical Union, by Paul Sollenberger, astronomer of the Naval Observatory.

Three such clocks have been built. They embody a new principal in crystal control, in that the piece of quartz whose vibrations govern the movement is longer than in former clocks and therefore vibrates at a rate so low as to require no electrical reduction, as is the case in crystal-controlled clocks now in common use. Tests of the new clocks indicate that they will run indefinitely with an accuracy within a thousandth of a second a day.

An automatic mechanism has been developed by Mr. Sollenberger which will attend to the sending of the NAA time signals, performing all its functions without human prompting. In carrying out this automatic program it will start and stop the recording chronograph and turn on the radio receivers. The presence of an operator, however, will be required because the frequencies to which the receivers must be tuned vary from signal to signal. The duties of the human attendant, however, are so much lightened by the "robot" activities of the program device that although a time-signal program may in future be sent twenty times or more in a day, no new men will need to be taken on for this increased work.

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### POOR LITTLE MASTODON

*This victim of the great Ice Age asphalt trap at Rancho La Brea stands five feet high and measures five feet six inches in length, a size approximately equivalent to that of a five-year-old Indian elephant. The condition of bones indicates that his few years were not entirely untroubled. It is evident that he suffered from curvature of the spine, and one of the limb bones is marked by an exostosis probably resulting from an injury. Two broken ribs which were completely healed indicate an early accident. So far as is known, no specimens of the young of this elephant-like creature have been recorded outside of Rancho La Brea, and this skeleton recently put on exhibit in the Los Angeles Museum is the only mounted specimen of a baby mastodon in existence.*