Dec. 26, 1939. A. B. BRYAN 2,184,953

TIME LINES RECORDING APPARATUS

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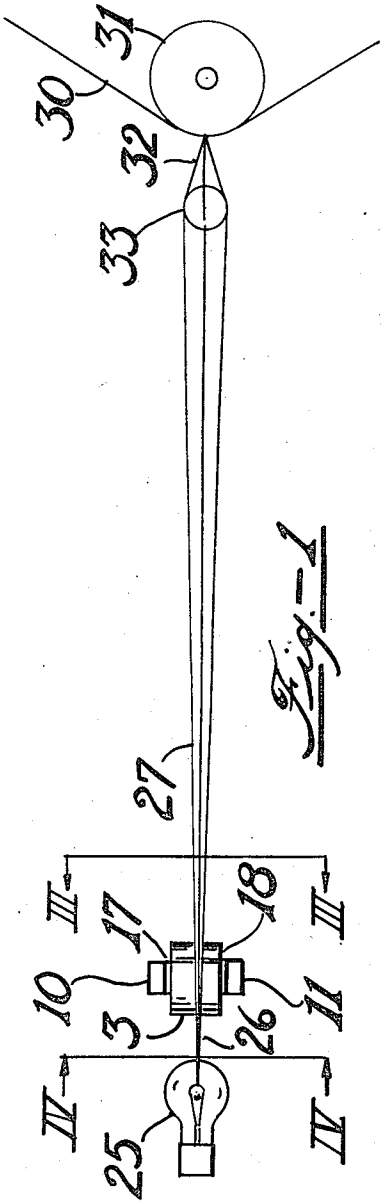


Fig. -1

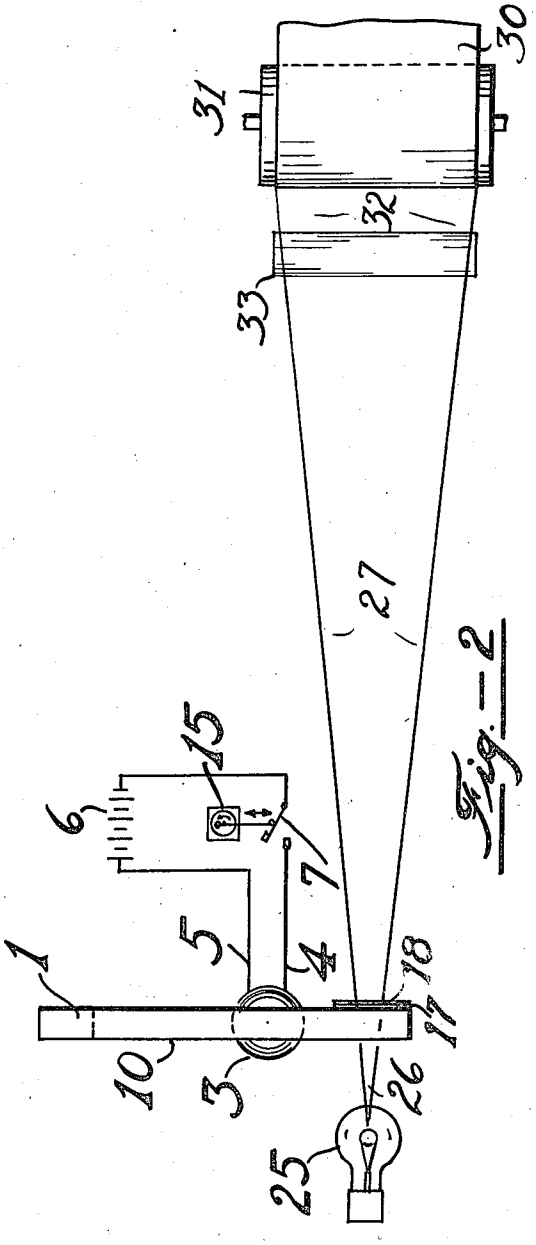


Fig. -2

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TIME LINES RECORDING APPARATUS

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Fig. — 3

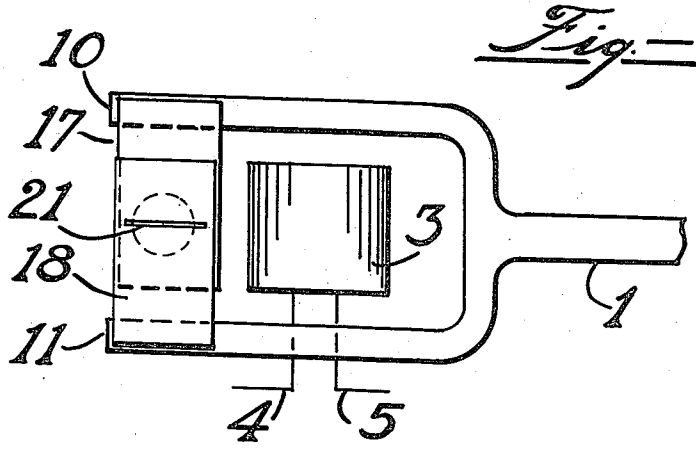
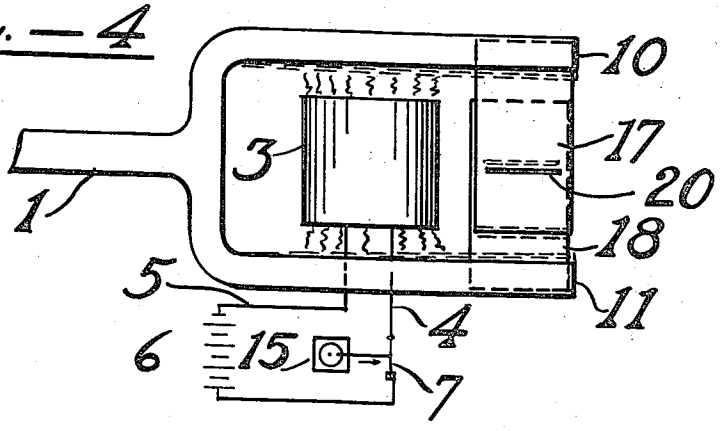


Fig. — 4



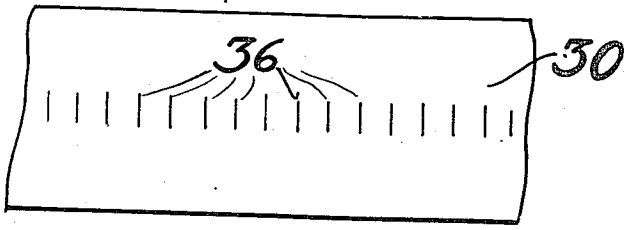


Fig. — 5

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TIME LINES RECORDING APPARATUS

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Application May 13, 1936, Serial No. 79,470

1 Claim. (Cl. 234—36)

This invention relates to improvements in a device for obtaining time lines on a record.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, in which latter—

Fig. 1 is a side elevational view of the device;

Fig. 2 is a top plan view of the device;

Fig. 3 is a side elevational view of the tuning fork assembly looking along the line III—III of Fig. 1;

Fig. 4 is a side elevational view of the tuning fork assembly looking along the line IV—IV of Fig. 1, showing the tuning fork in vibration, and

Fig. 5 is a front elevational view of a record showing the time lines thereon.

Referring particularly to the drawings, reference numeral 1 designates a tuning fork. A vibratory reed or any other suitable vibratory system of given frequency can be used in place of the tuning fork and some of the advantages of the invention will be retained. The tuning fork 1 is electrically started by means of an electro-magnet 3. Leads 4 and 5 of the electro-magnet are connected to a suitable driving mechanism including a battery 6. The circuit through the leads 4 and 5 is completed by means of a switch 7. In the embodiment illustrated the electro-magnet 3 is disposed between the prongs or arms 10 and 11 of the tuning fork. When the switch 7 of the circuit is closed, the electro-magnet 3 operates to pull the prongs 10 and 11 together. When the switch 7 is opened the prongs are thereupon immediately released to permit the prongs 10 and 11 to vibrate freely. The switch 7 is operated by a manual control designated 15, which serves to close the switch 7 and then open it again immediately, and also to start the driving means, not shown, which rotates the recording drum 31 and moves the sensitive film 30. Free vibration of the tuning fork is thus attained, since the fork is acted upon by no external forces during the time that the film is moving.

Flashes of light are caused to be created at intervals proportional to the vibrations of the tuning fork, as follows: The prong 10 of the tuning fork is provided with a shutter 17 which is secured to the end of the prong and extends toward the prong 11 of the tuning fork and terminates in slightly spaced relation to the prong 11, so as not to interfere with vibration of the prong 11. A shutter 18 is secured to the prong 11 and extends parallel with and in slightly spaced relation to the shutter 17 in overlapping relation with respect to the shutter 17. The shutters 17 and 18 are provided with slits 20 and 21 respectively, which are in alignment with each other when the prongs of the tuning fork are in their rest position, as can be clearly seen in Fig. 1. A source of light, such as a lamp 25, is disposed on one side of the tuning fork in position to direct a beam of light 26 through the slits 20 and 21 when they are in their aligned position. The beam of light 26 passes through the slits 20 and 21 intermittently, creating flashes of light 27. In one form of the invention, the tuning fork 1 may have a cycle of 50 vibrations per second. During the vibration of the fork the slits 20 and 21 are in alignment every half cycle. Thus, light from the lamp 25 passes through the shutters at intervals of $\frac{1}{100}$ seconds.

The flashes of light 27 are recorded upon a recording device to create time lines, as follows: In the embodiment illustrated, the recording device includes a sensitive film 30 carried by a recording drum 31 and driven in travel by any suitable means (not shown). The flashes of light 27 from the lamp 25 are focused upon the film 30 as indicated at 32, by means of a cylindrical lens 33.

A record formed by the flashes of light is illustrated in Fig. 5, which shows dark time lines 36 across the film 30.

In utilizing the device, an electric current is caused to flow through the electro-magnet 3 for a sufficient length of time only to start the tuning fork in vibration. At the same time, the film 30 is driven in movement across the face of the drum 31. The free vibrations of the tuning fork result in the formation of intermittent flashes of light which are recorded upon the travelling film. The film is driven at a constant rate of speed.

By the construction described, a timing device is provided which is extremely simple in construction. The device is of particular application for use in placing time lines upon a seismograph record obtained in making seismic explorations. In seismic explorations, it is customary to create a source of seismic vibrations at a given shot point and to record the vibrations, such as those reflected from a subterranean earth stratum, by means of one or more seismographs located at a receiving station spaced from the shot point. The free vibrations of the tuning fork give time lines on the record for a sufficient length of time to record seismic vibrations. The length of time necessary to record the vibrations may be in practice, for example, one or two seconds. During this interval of time the fork is acted upon by no external forces. Furthermore,

there are no electrical circuits associated with the tuning fork during its vibration to affect the frequency of vibrations of the tuning fork. The electric circuit connected to the electro-magnet 3 is open after the initial excitation of the tuning fork. The effect on the frequency of the decay in amplitude of the vibrations of the tuning fork during the time interval for which the records are run, is negligible. The frequency of the tuning fork is entirely stable, while the reading is being made. There are no associated electrical circuits connected to the tuning fork which would function to cause disturbances in the other circuits of the seismograph apparatus.

Various changes and alternate arrangements may be made within the scope of the appended claim, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

A device for obtaining time lines on a record for approximately 2 seconds during the unsustained vibrations only of a tuning fork, comprising a tuning fork having a cycle of approximately 50 vibrations per second, a shutter carried by each prong of the fork, the shutters overlapping and having aligned slits when in rest position, means for starting the prongs in vibration to give unsustained vibrations only, a light sensitive film on one side of the shutters movable at a constant speed transversely of the slits, a stationary point of light on an opposite side of the shutters whereby a gradually widening beam of light passes through the slits of the shutters when they are in alignment, and a cylindrical lens having its long axis parallel with the slits disposed between the shutters and film and relatively close to the film to focus the beam of light upon the film whereby successive time lines are recorded on the film at intervals of about $\frac{1}{100}$ of a second.

ANDREW B. BRYAN.