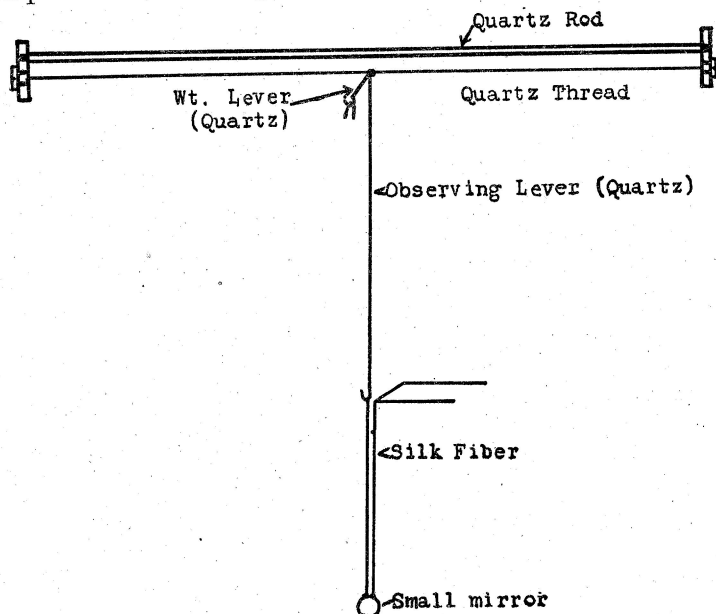


EFFECT OF LUNAR GRAVITY UPON A QUARTZ THREAD BALANCE

R. C. HARTSOUGH, ILLINOIS WESLEYAN UNIVERSITY

The construction and description of the apparatus. The construction of the balance is somewhat after Threlfall's "Gravity Balance." The chief addition is a long vertical lever arm and suspended mirror for magnifying small movements. This is due to Lord Kelvin in his "Lunar Disturbance of Gravity" experiments.

The shape of the apparatus is of a large T; the horizontal part is 60 cm. long and the vertical part is 50 cm. long.



Instead of silvering, plating and soldering the mounting of the quartz thread, type metal was found entirely satisfactory and much surer and quicker of application.

These specifications, together with the following drawing of the apparatus, will give a correct idea of the balance as used.

Size of quartz thread.....	0.04 mm. diameter
Length of quartz thread.....	55.7 cm.
Length of short weight-lever.....	2.0 cm.
Length of long observing-lever...	26.5 cm.
Weight on weight-lever.....	0.10 gm.

Five complete twists were given each end of the quartz thread in order to hold the weight-lever horizontal and the observing lever perpendicular.

The apparatus was enclosed in a T-shaped tube of brass and was evacuated to 0.03 mm. mercury pressure, and dried with phosphorous pentoxide. The apparatus was placed in the basement on a solid base; however, passing trucks gave a very noticeable vibration. The temperature of this room was constant to within one degree in 24 hours. A galvanometer telescope-scale was used for observing deflections. Distance was 60 cm. The following readings and curve are typical of many taken.

Date	Time	Scale	Room Temp.	Remarks
Nov. 7	7.30 AM	23.2	19.0°C	
	8.45 AM	26.7	18.5	
	12.00 Noon	22.0	19.0	
	2.30 PM	19.2	19.2	
	5.30 PM	17.4	19.4	
	6.00 PM	16.6	19.5	Moon at zenith 6.12
	6.14 PM	15.9	19.5	
	6.20 PM	15.8	19.3	
	8.00 PM	16.1	19.8	
	Nov. 8	8.15 PM	16.5	19.8
6.30 AM		22.7	19.3	
8.00 AM		23.5	19.2	

The evidence of this experiment shows that if the earth's gravitational force is balanced against the torque in a quartz fiber, the moon will disturb that balance gradually over 24 hour periods. A maximum decrease of the earth's gravitation occurs with the moon at its upper culmination and a minimum at the moon's lower culmination.

The author expects in the near future to try to detect any lag effect in the gravitation of the moon and the sun. Of course many changes will be necessary to adapt the apparatus to such measurements.

The facilities of the Laboratory of Physics of the University of Illinois through the courtesy of Professor A. P. Carman were placed at my disposal for this investigation, while the council and help of Dr. C. T. Knipp were a large factor in its success.

Laboratory of Physics
University of Illinois
September, 1921