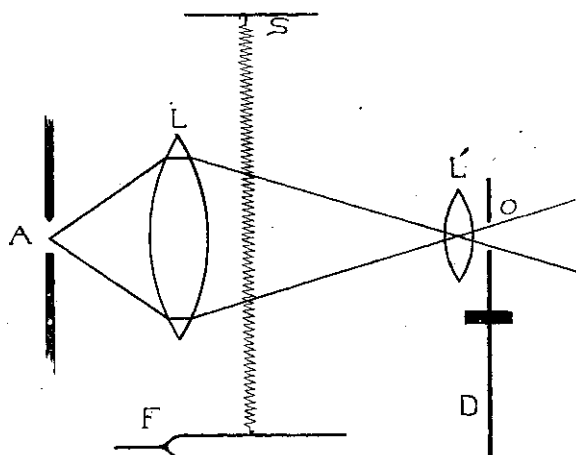


## A LECTURE EXPERIMENT IN LONGITUDINAL STATIONARY WAVES.

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The arrangement of apparatus shown in the accompanying figure may be used very satisfactorily to illustrate stationary longitudinal waves. Before the condensing lens *L* of the lantern, the scheme of which is shown in the figure by the arc light



A, condensing lens *L*, and projecting lens *L'*, there is mounted from a firm support *S*, a coil of spring brass wire No. 28, 1.3 cms. in diameter and about 70 turns long, the lower end being fastened to one of the prongs of an electrically driven tuning fork *F*, whose period is about 75 vibrations per second. If a fork is not available, a buzzer can be used, though it is not so satisfactory, as its rate of vibration is apt to vary.

The fork being set in vibration, that turn of the coil is found by trial which must be held in the clamp *S* to give the coil the proper length for producing stationary waves. This arrangement of spring and fork will result in three or four complete

segments of the stationary wave being in the field of the lantern and capable of projection upon the screen. The coil, as projected upon the screen by the focusing lens  $L'$ , will then show the turns at the nodes sharply, indicating little motion, and those in the neighborhood of the antinodes will be blurred, showing motion. To exhibit the phenomenon more in detail a light cardboard disk, mounted on the shaft of a motor, and provided with a single circular aperture,  $O$ , is rotated immediately before the focusing lens  $L'$ . The speed of rotation is adjusted by the use of a rheostat in the motor circuit or by the pressure of the fingers on the motor shaft till the stroboscopic effect is obtained. The separate turns of the coil as shown on the screen may then be made to move through their respective vibratory paths so slowly that the eye can follow their movements with ease. The turns of the coil at the nodes are seen practically stationary while the coils on either side move in opposite directions with amplitudes of vibration increasing in size till the antinodes are reached. In fact the statement commonly made of stationary waves in organ pipes, that the nodes are places of minimum motion and maximum change of density of the vibrating medium, while the antinodes are places of maximum motion and minimum change of density, is very clearly shown, as the turns at the nodes are alternately compressed and pulled apart, though suffering but small displacements, while the turns at the antinodes, though moving through the largest amplitudes, maintain approximately the same distance between the adjacent coils. Other points usually made in explaining stationary waves in air columns may be illustrated with equal success by this vibrating spring.

If the beam from the focusing lens  $L'$  be made approximately a parallel beam and directed along a string vibrating as in Melde's experiment, the cord, being intermittently illuminated by the rotating disk may be made to apparently stand still and expose its configuration or to seem to move very slowly through its successive positions, by properly speeding the motor.

The experiments as above described are doubtless in use in many places but the fact that they illustrate so successfully a phenomenon rather difficult for beginners to get a clear idea of, and at the same time require only apparatus which is in nearly all schools, i. e., a lantern and a motor, made it seem worth while to show them at the recent Physical Conference of the Michigan Schoolmasters Club.