

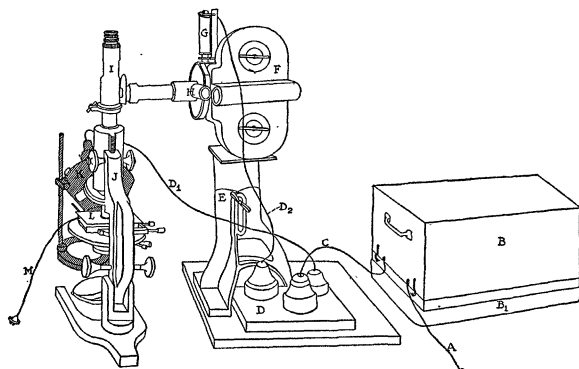


FIG. 2. General arrangement of the apparatus. *A*, power line; *B*, transmitter or timing apparatus; *B*₁, rubber mat; *C*, connecting line to the plug board; *D*, plug board; *D*₁, cable to microscope illuminator; *D*₂, cable to tripping magnet; *E*, base of the camera support; *F*, motion picture camera; *G*, tripping magnet; *H*, lateral, prismatic view finder (Goerz); *I*, "microphot" (Zeiss), bending the light by 90° from the vertical direction of the microscope horizontally into the camera; *J*, microscope; *K*, microscope illuminator; *L*, heating chamber; *M*, cord for heat chamber.

Since the incandescent lamp requires some time (from 1/20 to 1/5 sec.) to come up to brilliancy, the lamp must be lit a definite and constant time ahead of the tripping impulse. The transmitter is driven by a motor (Fig. 1, B) of constant speed. It has three shafts connected in sequence by gears in order to produce a stepping down of the number of revolutions per minute. On the first shaft (Fig. 1, C, highest speed) a cam (Fig. 1, D) is mounted which operates the contact (Fig. 1, E) for the tripping magnet. The second and third shafts (Fig. 1, G and K) bear a disk with a large number of equally spaced holes (Fig. 1, H and L). In these holes pegs are inserted which operate the contact in the lamp circuit. These pegs can be displaced by hand so that the contact can not be pressed when the disk is in rotation. Thus, the intervals between the impulses can be varied from 1 to 20 seconds (*i.e.*, 1, 2, 4, 5, 10, 20 seconds) depending on the number of pegs which press the contact during one revolution (Fig. 1, H). The length of one impulse is adjusted permanently in the machine (to approx. 0.6 sec.) by the location of the point of contact. For intervals longer than 20 seconds the second disk and contact (Fig. 1, L)—called the preparatory contact—is provided. This contact is in series with the lamp contact. While taking pictures in intervals shorter than 20 seconds, the preparatory contact is short-circuited by a switch (Fig. 1, M). If this switch is opened, the lamp contact can only close the lamp circuit when the preparatory contact is closed. In this way the intervals can be changed in steps from 20 to 600 seconds (*i.e.*, 20, 40, 60, 100, 200,

400, 600 seconds) by merely reducing the number of pegs in the second disk.

The different ratios of acceleration during *projection*, resulting from the different ratios of retarded *taking* of the pictures are computed in Table 1. It

TABLE 1

Interval between two pictures	Ratio of acceleration when projected with the physiologically adequate speed of 16 frames per second	A process of 12 hours duration is projected in:	Number of pictures in one hour
1 sec.	1: 16	45 min.	3600
2 sec.	1: 32	22 min. 30 sec.	1800
4 sec.	1: 64	11 min. 15 sec.	900
5 sec.	1: 80	9 min.	720
10 sec.	1: 160	4 min. 30 sec.	360
20 sec.	1: 320	2 min. 15 sec.	180
40 sec.	1: 640	1 min. 7, 5 sec.	90
1 min.	1: 960	45 sec.	60
1 min. 40 sec.	1: 1600	27 sec.	36
2 min.	1: 1920	22, 5 sec.	30
3 min. 20 sec.	1: 3200	13, 5 sec.	18
10 min.	1: 9600	4, 5 sec.	6

also contains the projection time of an actual event taking normally 12 hours and recorded with different ratios of acceleration.

GUSTAV ZECHEL

COLLEGE OF MEDICINE
UNIVERSITY OF CHICAGO

OSCAR MORGENSTERN
TELETYPE CORPORATION, CHICAGO

NOTE ON KEEPING LIVE FROGS FOR EXPERIMENTAL PURPOSES

SINCE the common experience of having frogs die in tanks, particularly in warm weather, is very disconcerting, it was thought worth while to insert in *SCIENCE* a note on our experience in storing these animals in a little electric refrigerator.

We have been able to keep a gross of frogs, in a hardware cloth box which fits in the bottom of our T. V. A. refrigerator, for a month with only three or four fatalities. They are dormant in the box (10° C.), giving only an occasional muffled croak as the machinery starts. When warmed, however, to room temperature, they become normally active with startling suddenness. Certain shipments, badly infected with "red leg," lasted surprisingly well in the refrigerator.

The only care we have given the animals has been to pick them over every day and to wet them with tap water.

W. F. HAMILTON

UNIVERSITY OF GEORGIA SCHOOL
OF MEDICINE