A Timed Vital Capacity Recording Device

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Since Gaensler's article appeared in 1951, the value of the "Timed Vital Capacity" test has been eminently confirmed. With one test, the presence of both restrictive and obstructive ventilating defects is demonstrated. Here presented is a device that has been used for four years as the first step in the evaluation of lung function of all candidates considered for pulmonary surgery at the Glenn Dale Hospital.

It is a very rapid method. The results are recorded graphically, several tracings being made at one sitting. No calculations need be made since a nomogram is used. There has been no mechanical failure or has the unit required recalibration. Ten patients may be examined, evaluated and reports completed in one hour.

Materials and Methods

This apparatus operates as a floating pen moved vertically by a spirometer. A cam produces lateral pulses or "pips" at one second intervals

FIGURE 1: A timed vital capacity recording device. The microswitch, motor and line switch wired in series. Two vital capacity tracings are shown.

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along the vertical line. The pen carriage moves on (A) as the axis — the 2 slots (S) permitting lateral motion. (Fig. 1) A 10" x 14" masonite board is mounted by cleats to the back of a Collins "Vitalometer." The cleats support the two track rods, one of which hangs loosely at A. A 30 rpm. motor is mounted as shown.

The cylindrical counter balancing weight is tapped to accept a short ¼ rod to which the pen carriage rod is attached by rubber tubing. In spite of the weight of the pen carriage, it was found necessary to add 10 grams in addition so that the unit was evenly balanced at the end of a tracing.

A standard laboratory ink cup is mounted near the end of the carriage so that it may be rotated for positioning and cleaning.

Hinge (C) floats — being fixed at a pivot point (D) and attached to the movable rod. "Start" is the point to which the cam is directed at the start of a run. This point must be located with a stop watch or other suitable device so that from the time the microswitch (M) is released and the first second indicated by the pen — exactly one second has elapsed. Recording paper is constructed so that the transverse lines represent intervals of 0.5 liters. The vital capacity in liters then is read directly as the length of the tracing.

![Figure 2](image-url)

**FIGURE 2:** Analysis of a single tracing. A transparent grid has been placed over the recording paper. The vital capacity is 3.4 liters. First second, 75 per cent; second second, 94 per cent; third second, 98 per cent.
The Recording paper is folded and inserted upside down. The pen is raised to its maximum height. This opens the microswitch. As soon as a patient expires into the apparatus, the motor* immediately starts. At the end of expiration there will be no further motion of the pen downward and pips become superimposed on each other. At this point the operator turns the switch off, the cam directed to the starting point again and the pen carriage is elevated for the next tracing.

Mounting clips for the paper are made long enough so that the paper may be withdrawn a few millimeters between each tracing.

The percentage of normal vital capacity is obtained by Meyer's tables or Baldwin, Courand and Richards.1

The speed of expiration is obtained by placing a transparent grid over the most suitable tracing (Fig. 2) so that the extent of the vital capacity lies exactly between 0 and 100. The first, second, and third second pips are then apparent as percentage of the total vital capacity and so recorded.

SUMMARY
An instrument is presented which records multiple Timed Vital Capacity measurements in a form that may be readily interpreted.

RESUMEN
Se presenta un aparato que registra múltiples medidas de la capacidad vital en relación al tiempo, en una forma fácil de leerse.

RESUMÉ
L'auteur présente un instrument qui enregistre les multiples mesures de capacité vitale sous une forme qui permet leur interprétation rapide.

ZUSAMMENFASSUNG
Beschreibung eines Instrumentes, das mehrfache Vitalkapazitätsbestimmungen in einer Form aufzeichnet, die ihre als baldige Auswertung ermöglicht.

REFERENCES

*The motor used is a “Gear Motor” made by the Motorsearch Company of Racine, Wisconsin. Thirty revolutions per minute.