

SCIENCE

VOL. 92

FRIDAY, DECEMBER 20, 1940

No. 2399

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RECENT GENERAL TRENDS IN MATHEMATICS¹

By Professor ARISTOTLE D. MICHAL

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EXCEPTING some comparatively isolated researches in elementary geometry and algebra, mathematical research in the first decade of the twentieth century was largely concerned with subjects whose roots were in the theory of functions of real or complex variables and in a large number of special functional transformations of such functions. It is true that in both America and Europe, the mathematical world was then dimly aware that there was such a thing as a theory of functions of abstract (or general) variables, but outside of a few distinguished workers, notably E. H. Moore in America and M. Fréchet in Europe, no one seemed to have done anything about it. This trend towards general function theories made itself felt during the next two succeeding decades in certain branches of functional analysis, topology and algebra. It was not, however, until the last ten years that general analysis and general algebra permeated, or at least influenced, practically every nook and corner of

¹ An address delivered by invitation at the University of Illinois, April 30, 1940.

mathematics and symbolic logic. The American and Polish schools of abstract thought have played a leading role in this development. It is gratifying to see that a large number of young men in American centers of learning are making important contributions to general analysis and general algebra. In the interest of clarity it should be remarked in this connection that excellent progress has been made during the last decade in the theory of functions of real and complex variables and their application to various topics in functional equations, to the calculus of variations and to classical differential geometry. The point we wish to emphasize here, however, is that much of this progress was directly or indirectly inspired by ideas current in general analysis.

One of the reasons why general analysis and general algebra are so far-reaching and very concrete indeed when understood is that one can, by special interpretation of a few general variables and operations, obtain old as well as numerous new results by methods that brush aside the unessential and historically acci-

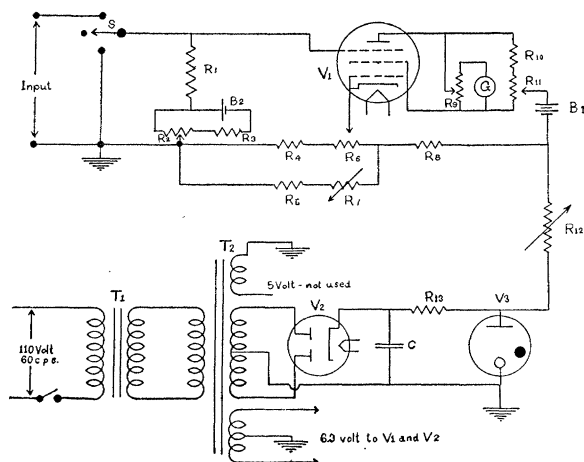


FIGURE 1

R_1	100 meg	S S white	65 X Resistor
R_3	10 meg	"	"
R_4	500 ohm	International Resistance Co.—Type A B Resistor	
R_5	2000	"	"
R_8	2000	"	"
R_{10}	5000	"	"
R_{13}	7500	"	"
R_2	1 meg	Potentiometer	(on panel)
R_6	200 ohm	(Yaxley X)	"
R_7	200	"	"
R_9	20000	"	"
R_{11}	5000	"	"
R_{12}	10000	"	"
S	switch	"	"
C	8 μ fd	450 volt electrolytic condenser	
T_1	constant voltage transformer	(Sola 3000)	
T_2	Thordarson T 13R19 transformer		
V_1	RCA 6J7	in Steatite socket (Amphenol R-SS-8)	
V_2	6 X 5 tube		
V_3	VR-105 tube		
G	galvanometer		

One PH unit or 60 millivolts input will cause 8 microamperes to flow through G when R_9 is set at maximum sensitivity. Thus the required galvanometer sensitivity can be calculated in terms of the PH range it is desired to cover.

ence. Hence the galvanometer is not much affected by such disturbances.

The response of the galvanometer to changes in filament voltage can be reduced nearly to zero by the proper adjustment of R_{11} .

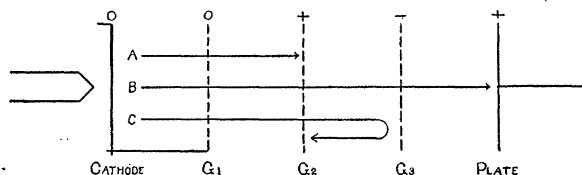


FIGURE 2

If a small extra source of voltage such as a battery be inserted in series with the plate and screen supply, it becomes possible to adjust R_{12} so that the set is prac-

tically insensitive to changes in B voltage. The effect of fluctuations of B voltage is always small, however, and the above expedient may not be necessary. We find 1.5 to 4.5 volts suitable for the battery.

The resistor R_6 is used to adjust to free grid—i.e., so that the galvanometer does not shift as the switch is rotated from the short to the open position. The grid current, however, is always very small in this tube, so this adjustment and the bias cell might well be omitted.

We have used RCA 6J7 tubes. They must be selected, as they are not uniform. The shell must be grounded—not connected to cathode. 6SJ7 and 6J7-G tubes have not been satisfactory.

The important features of this design are (1) the push-pull connection between plate and screen of a single tube, and (2) the cascaded use of several devices to secure isolation from line voltage variations.

In the present design we have (1) the regulating transformer, (2) the gaseous discharge tube, (3) the push-pull connections. None of these would be good enough alone to absorb line voltage variations completely and provide stable operation. Since each of these devices gives only a moderate degree of isolation, none is critical in design or adjustment.

If the whole task of isolating the set from the line depended on one regulator or one push-pull connection this would involve a quite critical adjustment. Such an adjustment might be subject to spontaneous drifts. The cascade circuit gives ample isolation with no critical parts.

Since most experimenters wish to record PH over a relatively long period of time, the elimination of batteries without loss in stability will prove to be a convenience.

CRAIG W. GOODWIN

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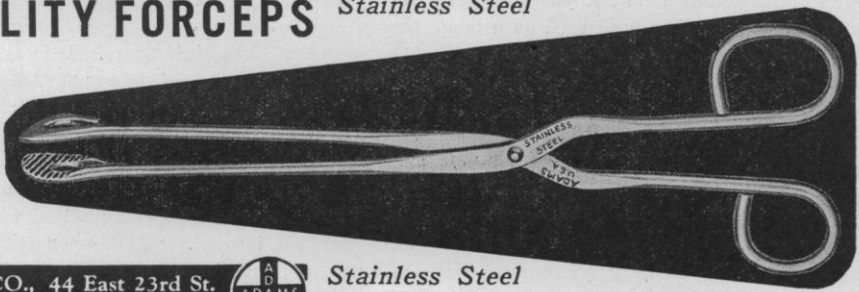
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