

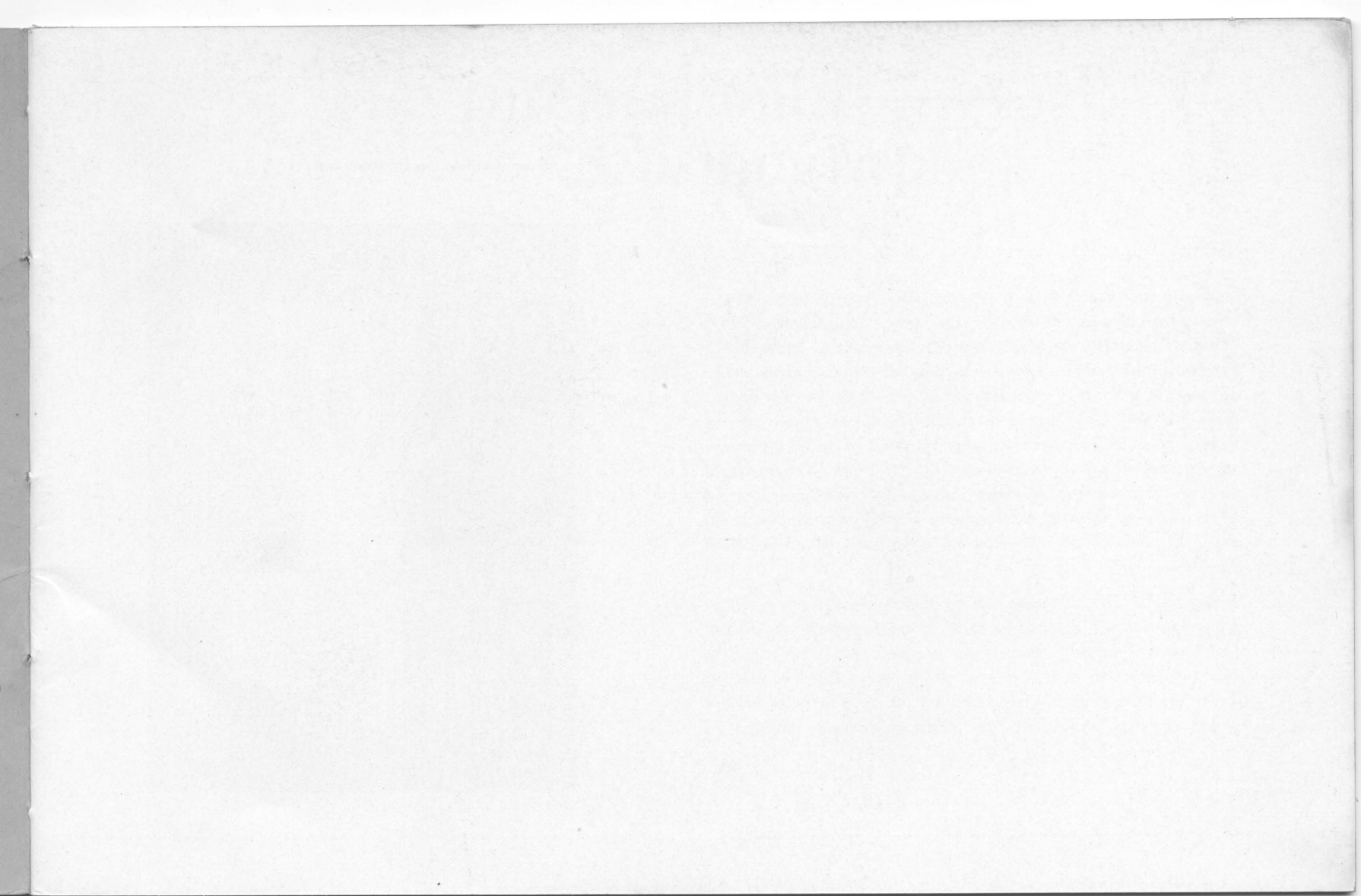


17A

INTERNATIONAL COSMOGRAPH

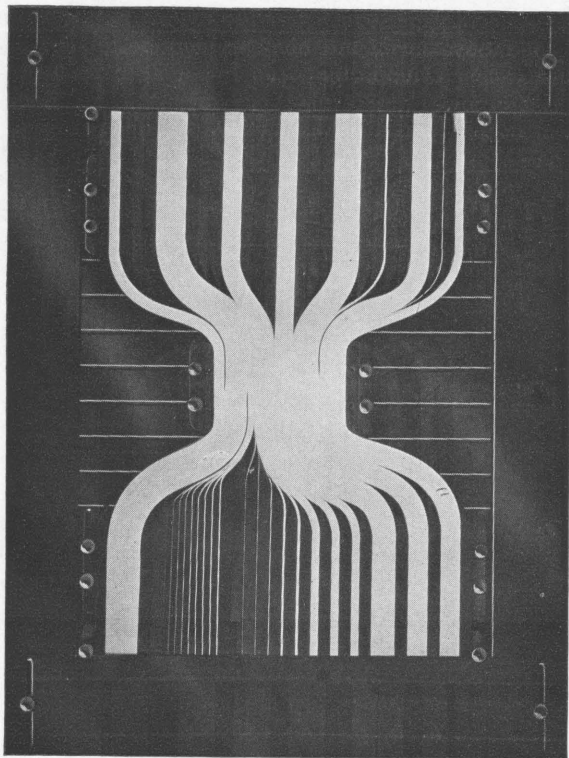
MANUAL OF OPERATION







The International ——— ————— Cosmograph



The International Cosmograph is a device which produces graphic analyses of figure facts without the drawing of graphs. The finished Cosmograph chart not only has all the advantages of the drawn graph, but also is executed with a degree of accuracy seldom reached in drawn presentations. The drawing of graphs usually requires the time and skill of an accomplished draughtsman. The Cosmograph, however, due to its simplicity of construction and operation, requires no skill or foreknowledge beyond that imparted in a few moments' instruction. Further, the Cosmograph chart is completed in considerably less time than any similar chart obtained by means of drawing.

The underlying principle of the device is that it furnishes a flexible charting medium of white material, in the form of strips of paper which are laid out and securely fastened to a background of black board. The board is then photostatted and the negative print is the finished chart. In this print the black background appears in white, and the white paper in black.

The shape assumed by the pliable strips of paper constitutes the body of the chart, and this only is visible in the photostatic print. The finished chart is made up of curved lines which are both pleasing and effective, and tend to give a quick and comprehensive visual impression of the facts.

The outstanding advantage of the Cosmograph lies in the fact that percentages are counted, no measurement or computing for measurement being necessary. Each component part of the problem to be charted is expressed in terms of percentage of the total. Each minimum unit of percent is represented by a physical unit of charting material—a strip of paper. The strips are counted and any desired group is set aside from all other groups, while remaining, at the same time, distinctly a part of the whole.

The Cosmograph device consists of a base-board of wood and bakelite, long and narrow strips of paper set on edge, wedges and clamps. In their idle position the paper strips are straight and compact. For charting, they are counted out in groups to represent the desired percentages, wedges are inserted to separate the groups, the ends of the paper are arranged to form suitable curves and clamps are set to retain the whole arrangement firmly in position.

A complete set of paper charting strips represents 100% and consists of 1000 strips. Each strip, therefore, represents 1/10th of 1%. In the original assembly of the set, red and blue marking strips are inserted as sectional guides to facilitate the counting operation. A blue strip is positioned at each 1% mark and a red strip at each 5% mark. The arrangement of the complete set is as follows: nine white strips plus one blue strip represent 1% of the whole; five such groups represent 5%, and a red strip is substituted for the last blue strip in order to mark this point. The totals of the white and colored strips are, therefore:

900	—	white
80	—	blue
20	—	red
Total 1000 — complete set		

The use of these colored sectional guides reduces to a minimum the separate counting of single strips. The desired percentages are counted by inspection to the nearest red strip and further to the nearest blue strip. The white strips only are counted by hand—nine of them or less.

A secondary purpose of the red strips is to serve as a visual gauge in the finished chart. The red strips reproduce as white against the adjacent black areas obtained from the white strips. Thus each 5% mark throughout the finished print is indicated by a fine white line.

The background or frame of the device consists of a series of bakelite strips fastened to a slotted baseboard. Adjustable clamps which fasten in these slots, and wedges of various sizes complete the accessories on the board. The slots are so arranged that the clamps may be made secure at any position on the board. Consequently, the direction, spacing and location of the charting strips are practically unrestricted. This flexibility and the physical pliability of the paper strips themselves make possible a free manipulation of the device to picture any desired diagram or graph. The series of typical graphic studies presented in the following pages clearly illustrate charting methods and show the flexibility and unrestricted positioning of the charting medium.

The Cosmograph lends itself ideally to the graphic presentation of such universally recognized business figures as—

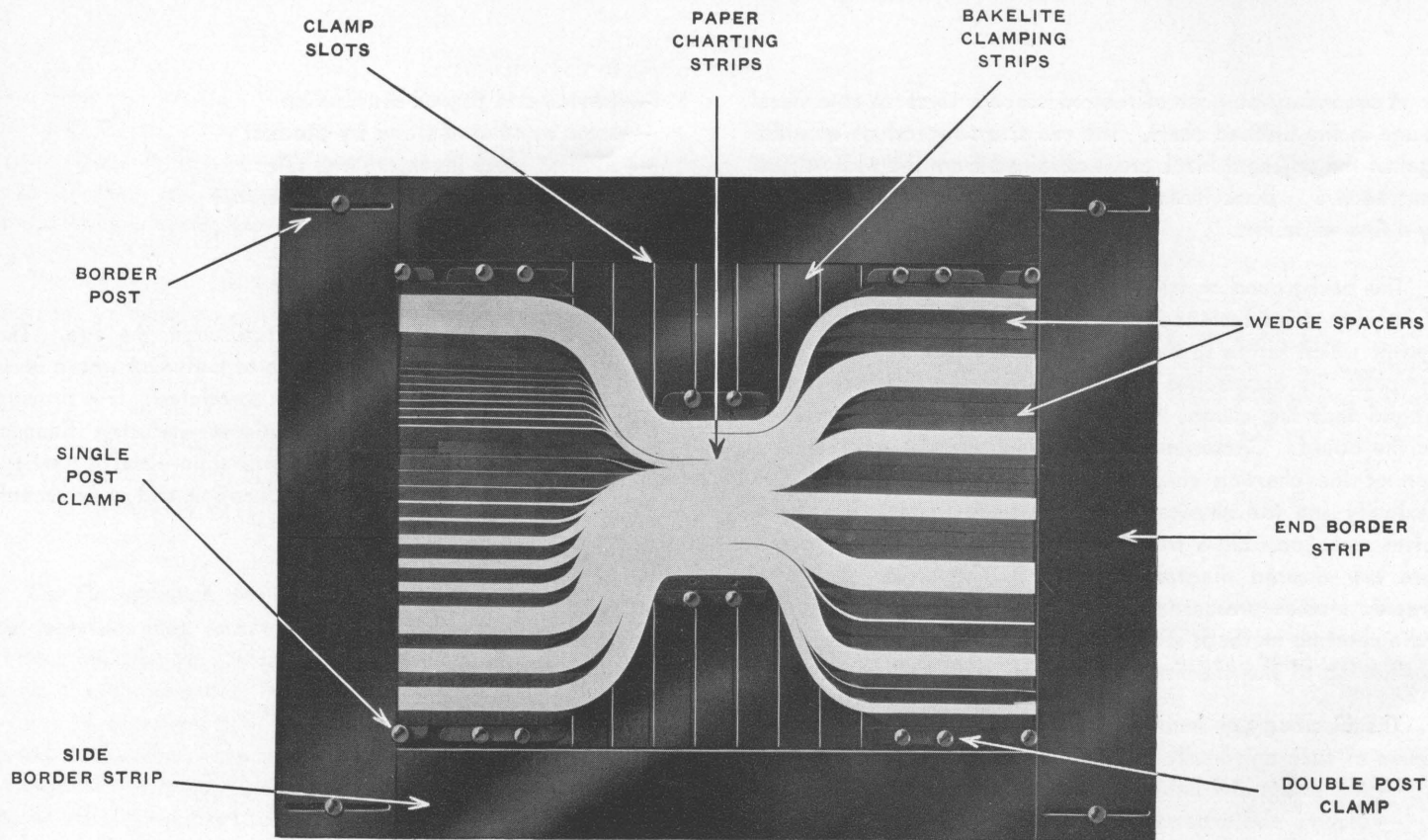
- the assets and liabilities of a balance sheet
- income and expenditures

- payroll and payroll distribution
- sales by salesman and by product
- finished stock inventory and sales
- production, shipments and inventory
- status reports
- comparative figures of all types

The shortest path to the mind is through the eye. The Cosmograph is applicable in every line of endeavor where facts must be quickly perceived and quickly correlated. It is proving valuable in all lines of modern business—industry, finance, public utilities, oil production and distribution—and is particularly valuable in the great fields of education and government.



THE INTERNATIONAL COSMOGRAPH



THE COSMOGRAPH

PARTS DESCRIPTION

BASE—The base consists of a board $30\frac{1}{2}'' \times 23\frac{1}{2}'' \times \frac{3}{4}''$, in which twenty slots are cut in the direction of the shorter dimension.

CLAMPING STRIPS—Bakelite strips are fastened to the surface of the baseboard in such a manner as to form inverted "T" slots in which the clamp bolts fasten. The accompanying diagram points out the slots and strips.

CLAMPS—Each clamp consists of a small block of wood through which one or two small bolts are inserted. The head of the bolt is long and narrow so that when placed in the slot and turned, it automatically locks to permit tightening of the clamp. The bolt nut is a small hard-rubber knob with a knurled surface to aid in tightening the clamp in any desired position.

WEDGE SPACERS—The wedges are made of blocks of wood with tapered ends. Several sizes are furnished to permit a variety of spacings.

CHARTING MEDIUM—The charting medium consists of 1,000 strips of paper, each $\frac{1}{2}$ inch wide and 30 inches long. These are set on edge and held on the board by the clamps. Light markings on the clamping strips, perpendicular to the slots, serve as guides in laying out the paper strips in parallel groups. Further description of these paper strips is contained in the general explanation of the device.

BORDER STRIPS—The border strips are made of bakelite and are so constructed that they may be conveniently placed to serve as an outside border for the chart. Clamp posts, similar to the previously described clamps, are used to fasten the border strips.

All parts, with the exception of the paper charting strips, are black in color.

PARTS SPECIFICATIONS

The complete parts specifications for one Cosmograph are as follows:—

- 1 Baseboard $30\frac{1}{2}'' \times 23\frac{1}{2}''$
- 2 Side Border Strips
- 2 End Border Strips
- 12 Double Post Clamps
- 12 Single Post Clamps
- 60 Wedge Spacers $4'' \times \frac{1}{2}'' \times \frac{1}{4}''$
- 24 " " $6'' \times \frac{1}{2}'' \times \frac{1}{2}''$
- 24 " " $7'' \times \frac{1}{2}'' \times \frac{1}{2}''$
- 24 " " $8'' \times \frac{1}{2}'' \times \frac{1}{2}''$
- 24 " " $9'' \times \frac{1}{2}'' \times \frac{1}{2}''$
- 24 " " $10'' \times \frac{1}{2}'' \times \frac{1}{2}''$
- 50 Spacers $3'' \times \frac{1}{2}'' \times \frac{1}{8}''$
- 50 Strips of heavy black paper $\frac{1}{2}$ inch wide
 - 1 Set of paper charting strips, 30 inches long and $\frac{1}{2}$ inch wide (1000 collated)
 - 1 Fibre carrying case.

Accessories necessary for the preparation of bar charts, using the standard Cosmograph baseboard, are furnished by the Tabulating Machine Company for a small additional charge.

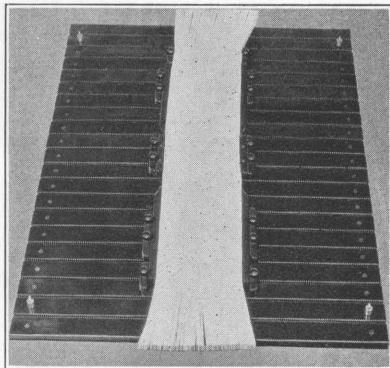
OPERATING PROCEDURE

PHOTO 1

The first step in procedure is to reduce the quantities or amounts to be charted to whole percentages and tenths. This is done by designating the total of all quantities or amounts as 100%. The proportion of each item to the total then gives the percentage value of each component part of the chart. The individual group percentages are progressively added, the last progressive total being always 100%. The purpose of these progressive totals is to reduce to a minimum the counting of single strips. The strips are counted by inspection to the nearest red strip and further to the nearest blue strip, the white strips only being counted by hand—nine of them or less. It is obvious that if each group percentage were counted out separately, the odd number of white strips on each side of the group would necessarily have to be counted by hand. The use of progressive totals, however, eliminates this separate group counting, since the progressive total numbers

automatically separate the groups. From a study of the figures to be presented, the most suitable general shape or type of chart is determined—that is, the number and location of the trunks and the general direction of the branches. The ability to predetermine quickly the general outline of a chart is easily acquired after the operator is thoroughly familiar with the procedure.

The first step in actual operation of the board is to locate and firmly clamp the trunk into position (see Photo 2). This must be done carefully since the trunk clamps are relied upon to hold the paper strips on the board during the succeeding operations. The strips are then spread from the trunk by counting off the progressive percentages and loosely inserting a wedge to separate each group of strips (see Photos 3 & 4). The spreading of one side is completed before another side is started. The chart is now ready for proper aligning and shaping.

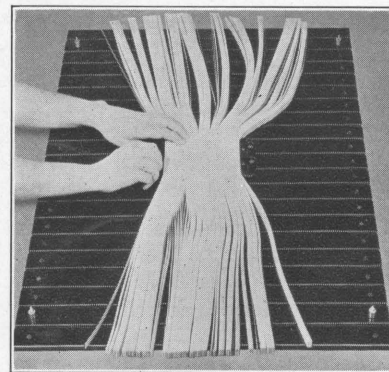


PHOTO 2

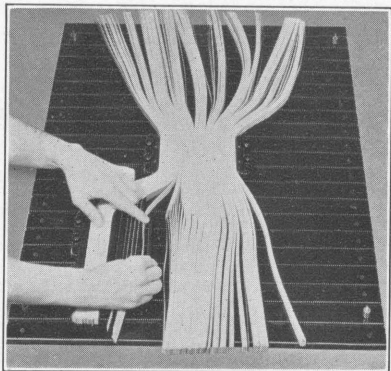


PHOTO 3

The groups of strips are curved from the trunk to obtain the desired direction and shape of branches. Wedge spacers and bar spacers are inserted between the groups to give them the proper distance from each other and to balance the chart. Wedges are pushed tightly against the trunk in order to give a clean breakaway of the branches, and the set-up is permanently clamped into position (See Photo 5). Care should be exercised to prevent any looseness of strips within a single group. Any space between the strips causes the appearance of a white line on the photostat, due to the black background being visible through the spread strips. If spreading occurs, it may be quickly corrected by pulling the ends of the strips of the spread group and then firmly reclamping the set-up. After the chart has been properly spaced, balanced and clamped, the border guides are placed

in position around the backboard to give the desired outside dimensions to the chart (see Photo 6). These border guides serve to block out the excess ends of paper strips and give the chart a clear-cut border outline.

In order that the final chart may be clearly understandable, each branch and trunk should be marked with percentages or other pertinent data. There are two general methods for marking the chart—the captions may be typed or lettered directly on the photostatic print, or they may be pasted on the board before the photostat is taken. When the latter method is used, the captions are pasted directly to the surface of the strips or wedges. Only rubber cement should be used, as other types of adhesives

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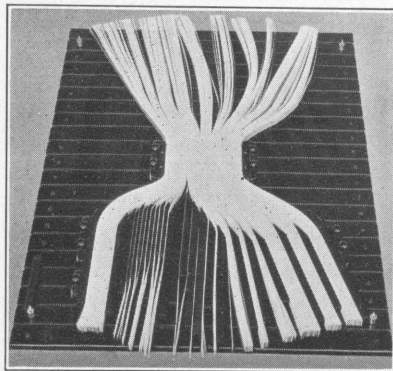


PHOTO 4

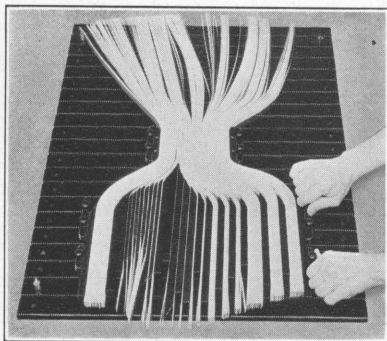


PHOTO 5

this method of reproduction, almost any size of print may be specified, the size being governed by the use to be made of the chart. A negative print of the board results in a black and white chart in which all black portions of the board reproduce as white and the white portions as black. A positive print reverses the color arrangement, and many ingenious possibilities of labelling and coloring can be applied to these prints. Whenever multiple copies of a chart are necessary, the photo-offset method of reproduction is recommended. This is by far the

are not removable. Captions may be placed also on the border strips, close to their inside edges. The advantage of pasting captions directly to the board is that the completely labelled chart is obtained in one print.

After the type of labelling has been decided upon, the board is ready for photostating.

least expensive means of multiple reproduction. Hundreds of prints can be made by this process at a very low cost.

After the board has been photostatted, it is recommended that the set-up be dismantled immediately and the paper charting strips be arranged and clamped in their idle position (see Photo 1). Whenever the board is not in use the strips should remain in this position to keep them straight and compact.

If it is desirable to chart quantities or amounts directly instead of by percentage, each strip may be assigned to represent any convenient unit. After this unit has been determined, any excess strips in the complete set of 1000 are temporarily removed from the set. The branches are then formed by counting off the required number of units (strips) to each. The spacing, wedging, balancing and clamping procedure does not differ from that outlined for charting by percentages.

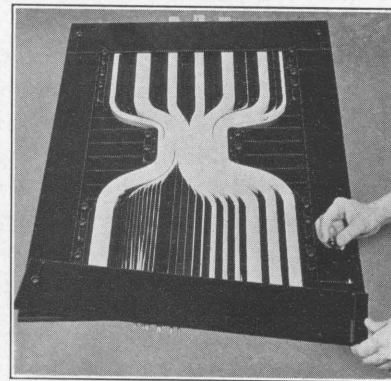
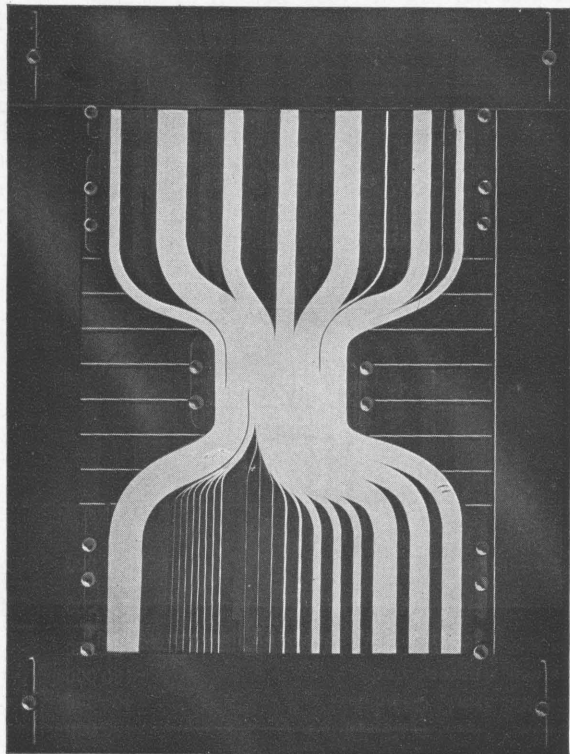
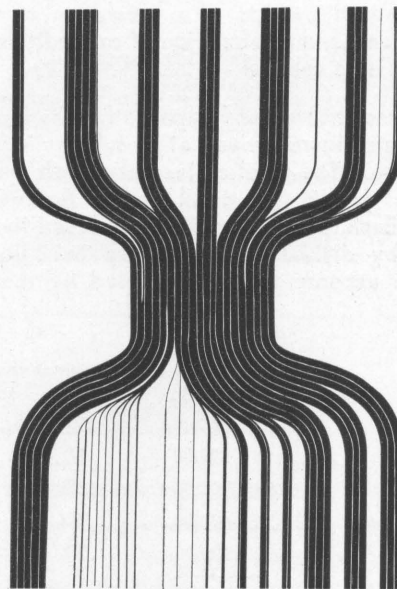


PHOTO 6



The Cosmograph Ready for Photostatting



The first or negative photostatic print of the Cosmograph set-up at the left.

Note that all black portions of the device fail to reproduce, only the chart itself being printed in black.

STUDY 1

The problem is to chart the estimated budget of a company. The data submitted consists of a tabulation of the expected income by sources, and a tabulation of expenditures by sources. The procedure is as follows:—

The estimated income and expense figures are first totaled and the net profit figure arrived at by subtracting the expenses from the income. The total of income equals the total of expenses plus net profit. The total income figure is considered to be 100%. Each source item is then reduced to a percentage of the total by dividing each by the total income figure. Similarly, each expense figure is divided by the total of ex-

penditures plus net profit. (See below). The individual item percentages are then added progressively as shown below. The trunk of the chart represents 100%. Income is to be shown on the left of the chart and expenses and net profit on the right. Starting from the top and counting down, each progressive total is located and a wedge spacer inserted to mark the position. This separates each item of income and expense. The groups of strips representing each item are then curved and positioned to give a comprehensive picture. One side is completed before the second side is started. The chart shown on the opposite page is the completed chart.

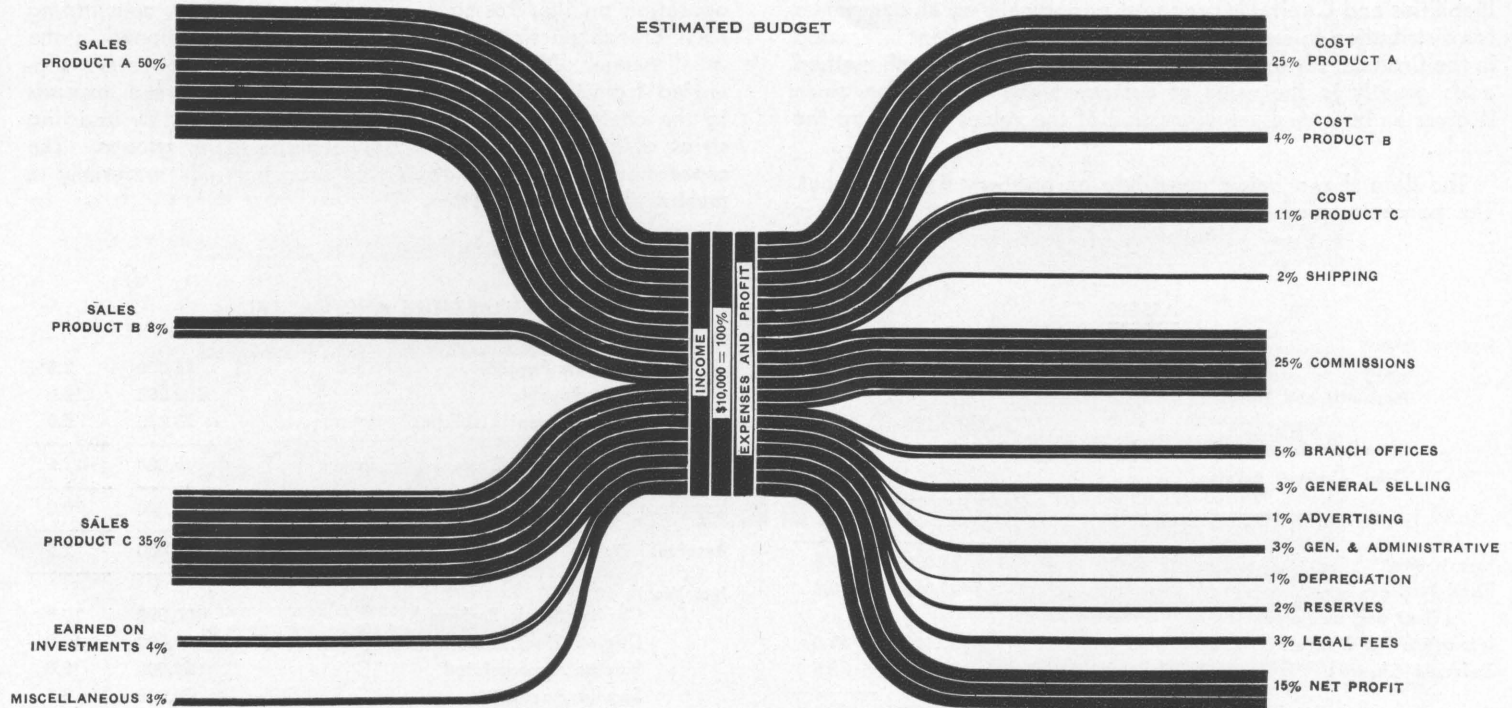
DATA

	<u>Income</u>		
Sales Product A	\$ 5000.00	50%	50%
" " B	800.00	8%	58%
" " C	3500.00	35%	93%
Earned on Investments	400.00	4%	97%
Miscellaneous	300.00	3%	100%
Total Income	\$ 10000.00		
Total Exp.	\$ 8500.00		
Net Profit	\$ 1500.00		

	<u>Expenditures and Net Profit</u>		
Cost Product A	\$ 2500.00	25%	25%
" " B	400.00	4%	29%
" " C	1100.00	11%	40%
Shipping	200.00	2%	42%
Commissions	2500.00	25%	67%
Branch Offices	500.00	5%	72%
General Selling	300.00	3%	75%
Advertising	100.00	1%	76%
Gen. & Administrative	300.00	3%	79%
Depreciation	100.00	1%	80%
Reserves	200.00	2%	82%
Legal Fees	300.00	3%	85%
Net Profit	1500.00	15%	100%
Total	\$ 10000.00		

CHART 1

ESTIMATED BUDGET



STUDY 2

The graphic presentation of a Balance Sheet is peculiarly well adapted to the Cosmograph. A tabulation of Assets, Liabilities and Capital is prepared periodically by all companies for distribution to executives, investors and all persons interested in the financial status of the business. The Cosmograph method adds greatly to the value of Balance Sheet information, since it gives an instant visual impression of the values making up the whole.

The data shown below constitute an ordinary Balance Sheet. The percentage of each item to the total amount is shown in

the column at the right. As previously explained, these percentages are added progressively to facilitate the counting operation on the Cosmograph. The paper strips constituting each branch on the chart are counted and positioned in the usual manner. Note, however, that the major groups are separated from each other by a heavy white line which extends to the center of the trunk. This line is obtained by inserting strips of heavy black paper between the major groups. The separation and proper spacing of branches aids materially in making the chart effective.

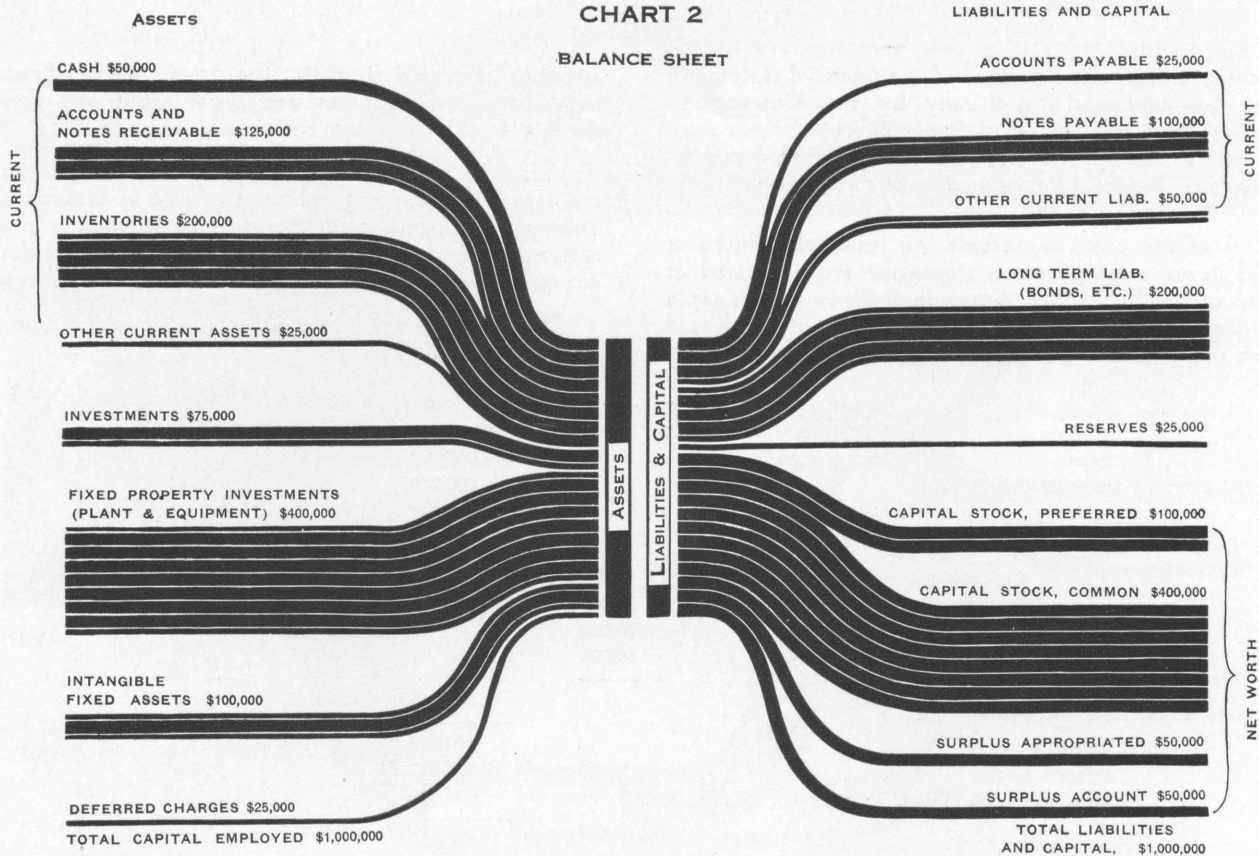
DATA

<u>ASSETS</u>		
Current Assets		
Cash	\$ 50,000	5.0%
Accounts and Notes Receivable	125,000	12.5
Inventories	200,000	20.0
Other Current Assets	25,000	2.5
Total Current Assets	400,000	40.0
Investments	75,000	7.5
Fixed Property Investments (Plant and Equipment)	400,000	40.0
Intangible Fixed Assets	100,000	10.0
Deferred Charges	25,000	2.5
Total Capital Employed	\$ 1,000,000	100.0%

<u>LIABILITIES AND CAPITAL</u>		
Current Liabilities		
Accounts Payable	\$ 25,000	2.5%
Notes Payable	100,000	10.0
Other Current Liabilities	50,000	5.0
Total Current Liabilities	175,000	17.5
Long-term Liabilities (Notes, etc.)	200,000	20.0
Reserves	25,000	2.5
Net Worth		
Capital Stock, Preferred	100,000	10.0
Capital Stock, Common	400,000	40.0
Surplus Appropriated	50,000	5.0
Surplus Account	50,000	5.0
Total Net Worth	600,000	60.0
Total Liabilities and Capital	\$ 1,000,000	100.0%

CHART 2

BALANCE SHEET



STUDY 3

The Income Statement is another of the financial statements which may be expressed graphically by the Cosmograph method. The chart is in effect a flow chart with the added feature of having each branch of such thickness as to represent its percentage of the total figure involved.

The trunk of the chart represents the total sales figure or 100%. All items on the income statement are expressed as percentages of this total 100% figure in order to permit rapid charting. The trunk is clamped at the left side of the board and the two major divisions of "cost of goods sold" and "gross

earnings" are split from it. The gross earnings branch is then subdivided into expenses and gross profit and these further divided to show the itemized sources of each.

This chart clearly illustrates the flexibility of the charting medium in making a graphical study of a detailed statement. This type of chart is used also to great advantage in the preparation of organization charts where many detailed departments are combined and assembled to make up the total organization.

The data shown below refer to the chart shown on the opposite page.

THE CONDENSED INCOME STATEMENT

Sales	\$ 1,000,000	100%
Cost of Goods Sold	700,000	70%
	<hr/>	<hr/>
Gross Earnings	300,000	30%
Expenses		
Commissions	\$ 70,000	7%
Br. Offices	30,000	3%
Gen. Admin.	70,000	7%
Miscellaneous	40,000	4%
	<hr/>	<hr/>
	210,000	21%
	<hr/>	<hr/>
Operating Profit	90,000	9%
Interest Costs	25,500	2.5%
Misc. Loss and Gain	4,500	.5%
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Surplus Net Profit	\$ 60,000	6%

CHART 3

INCOME STATEMENT

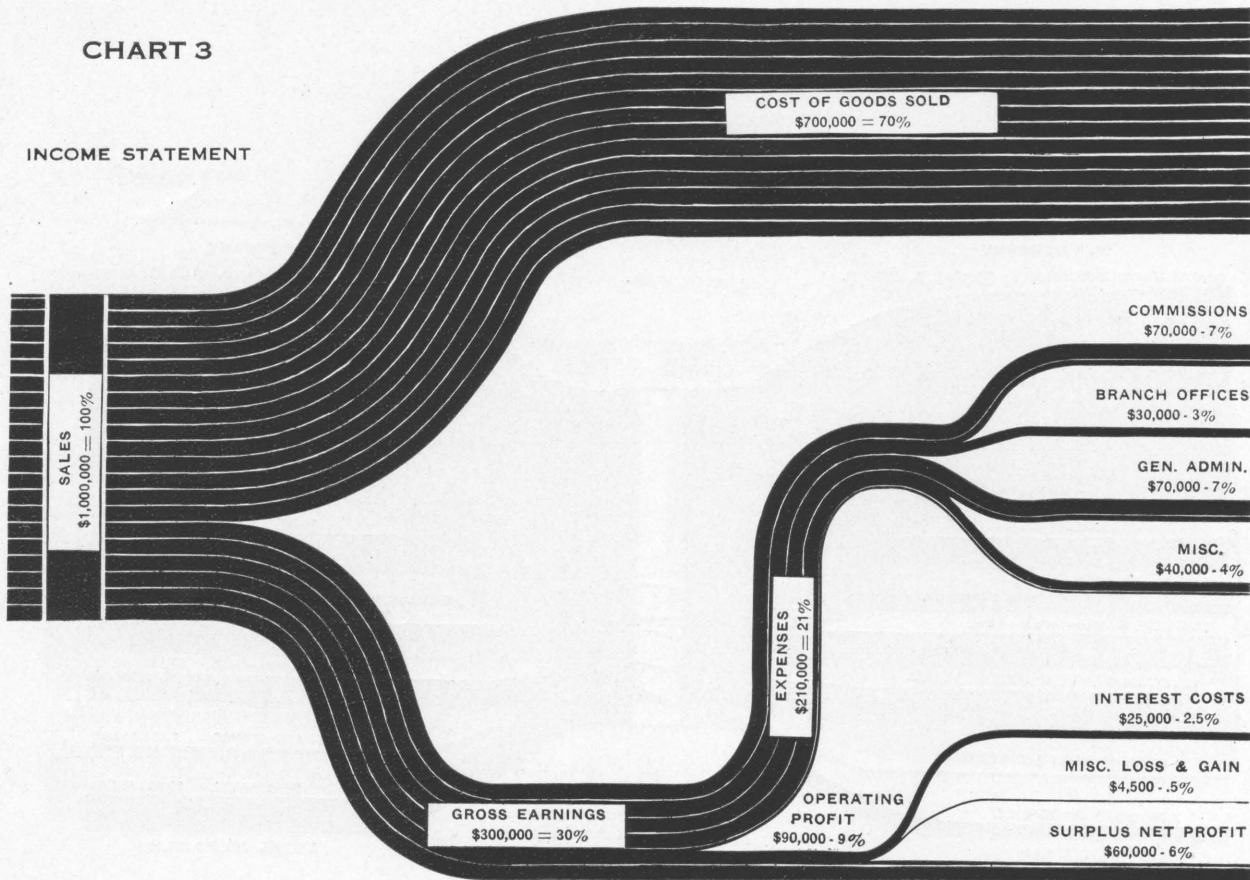


CHART 4
COMPARATIVE STATEMENT
OF ASSETS
OF
"A" COMPANY AND "B" COMPANY

DECEMBER 31, 1931

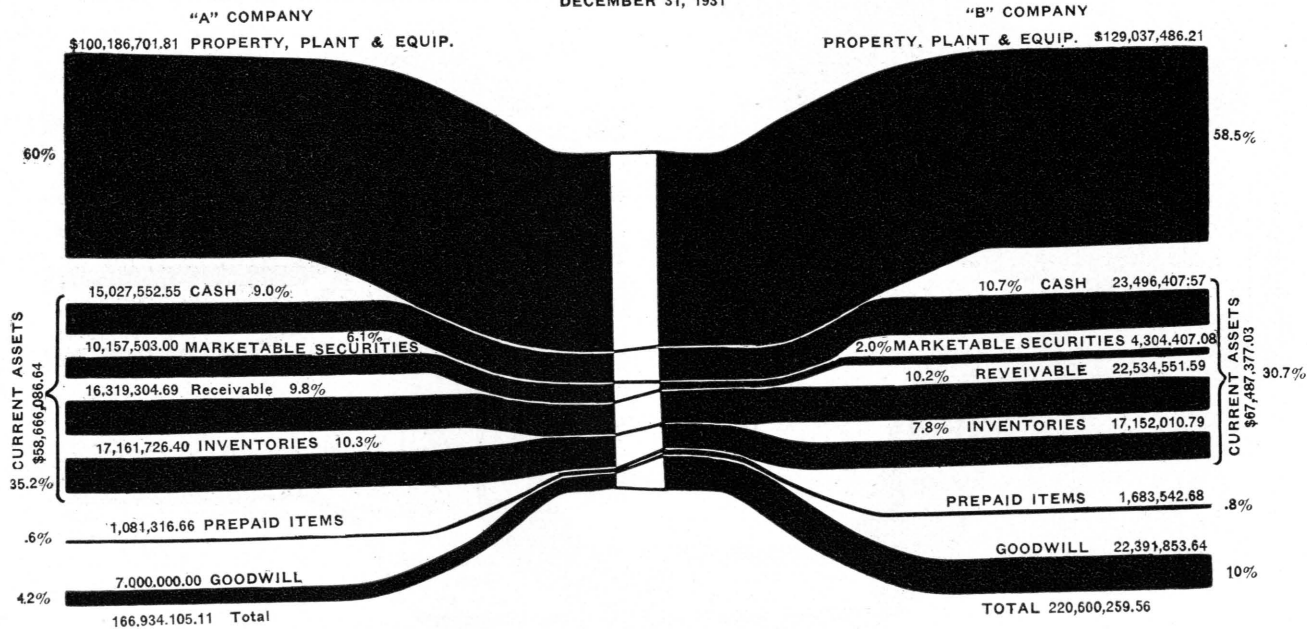
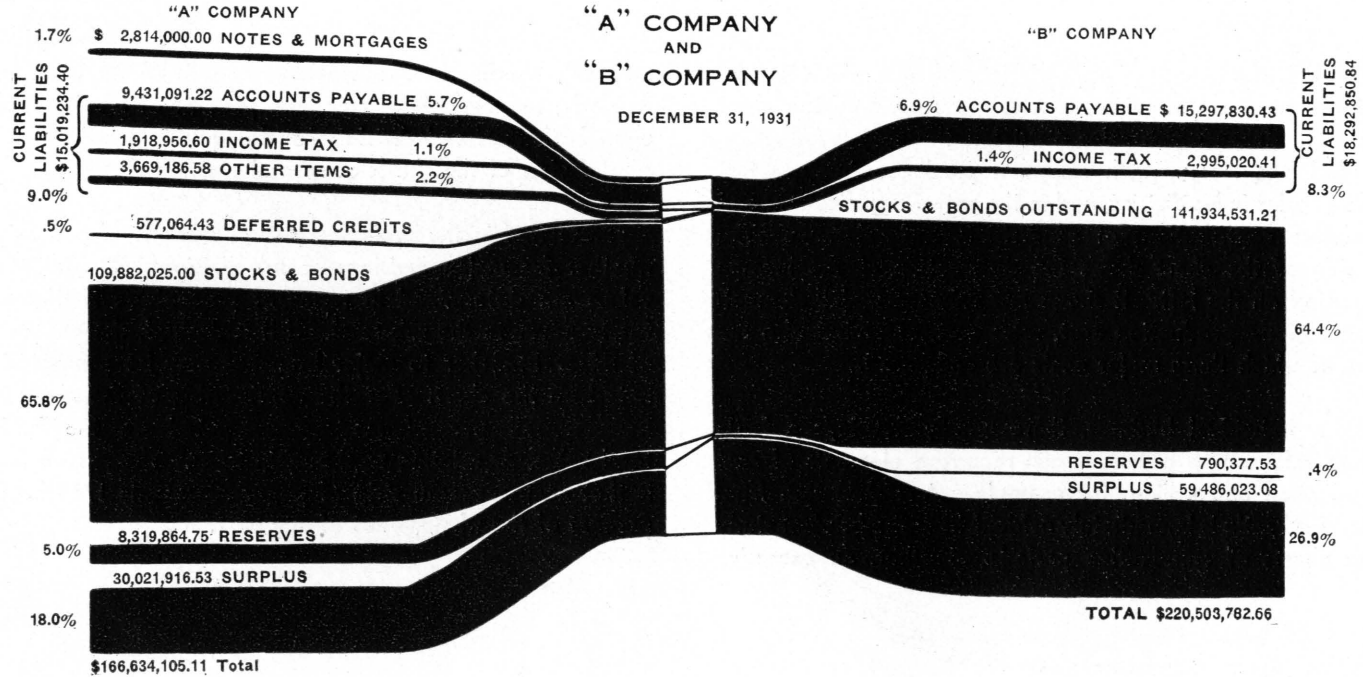


CHART 5

COMPARATIVE STATEMENT
OF LIABILITIES
OF

"A" COMPANY
AND
"B" COMPANY

DECEMBER 31, 1931



STUDY 6

The chart shown on the opposite page is one which is valuable to any business which has a sales organization. This chart shows at a glance which sales district is the most productive, and which the least; which salesman produced the greatest volume of sales in his district, and in the entire organization; and the relative contributions of all districts and salesmen. The right side of the chart shows the distribution of the income represented on the left. It shows not only the major channels of distribution—production cost, sales cost, etc.—but also the factors of which these major costs are composed.

In any individual business, there usually develops a fairly standard relationship between such recurring elements of cost as production and selling, for example. Any deviation from the standard ratio is immediately evident from the briefest study of the charts of consecutive periods. Further, an excessive

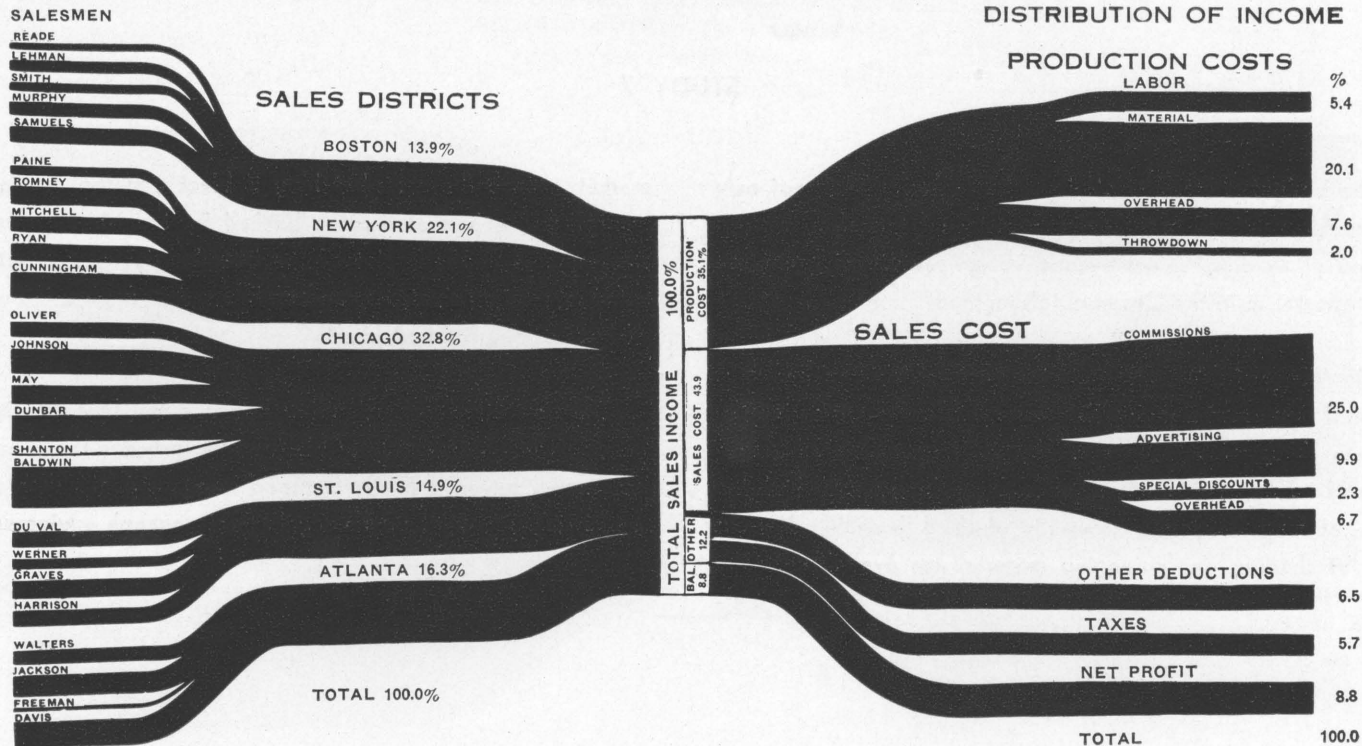
material, overhead or advertising cost is at once apparent. Similarly, the effect of a new sales plan, or of a selling contest upon both men and districts can be quickly ascertained from a brief view of the charts of several succeeding periods.

Note that in the preliminary computations of percentages, whether for major divisions or sub-divisions, all quantities or values are determined in terms of percentage to the grand total—never to the sub-total. If it is desired, the percentages of minor branches to major branches may be computed and noted on the chart. For the construction of the chart itself, however, all percentages are computed on the basis of total value, or relation to the main trunk. The reason for this is that each separate strip of paper represents 1/10th of one percent of the whole,—not of any part.

INCOME FROM SALES

CHART 6

DISTRIBUTION OF INCOME



STUDY 7

The budget chart illustrated on the opposite page not only proves the value of graphics in government but also, through the use of shading, shows a construction feature of great use and importance in the Cosmograph method.

On this particular chart the branch representing deficit is the most important item and is cross-hatched for emphasis. The cross-hatching effect is obtained by pasting or simply laying a piece of transparent material (such as celluloid) upon which the cross-hatching is drawn, over the desired branch. Various kinds of shading and screening material are available on the

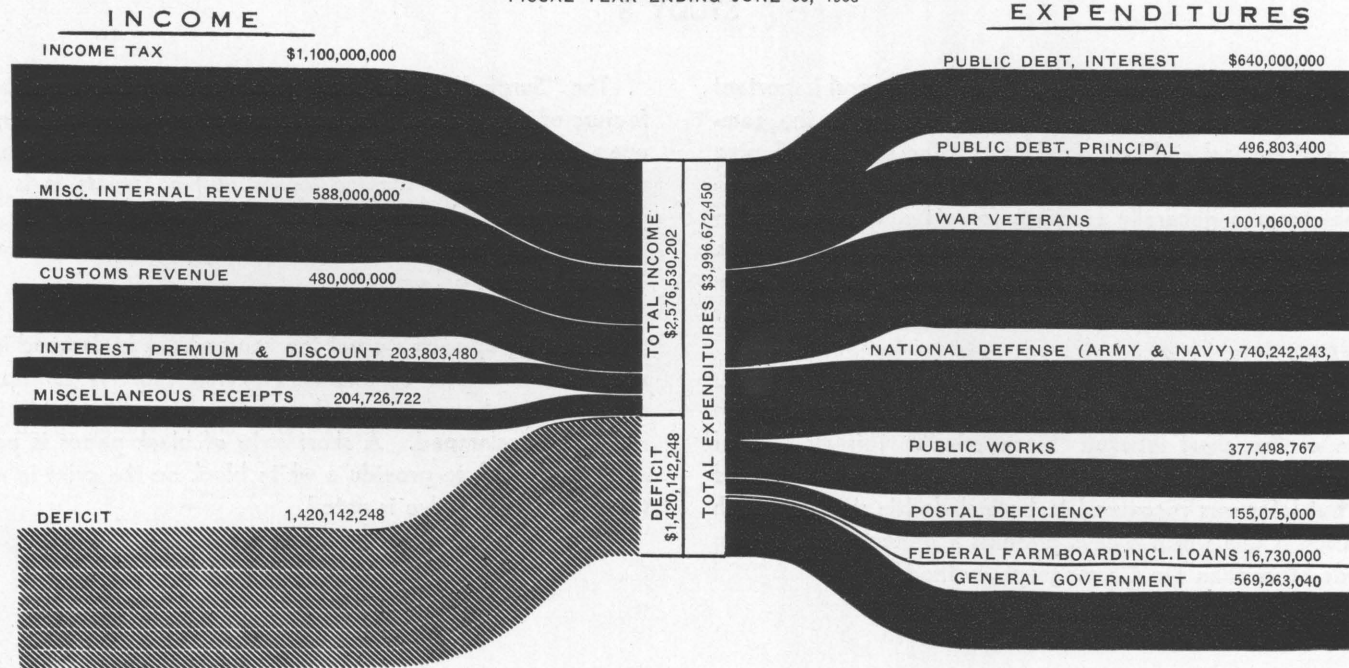
market. Since the cross-hatching is black and the celluloid is transparent, only that portion backed by the white strips will show on the finished print of the board. Using this method, many interesting shadings can be obtained to further the effectiveness of the finished chart.

The fine white line extending between the branches is obtained by inserting a strip of black paper between the branches before the set-up is finally clamped into position. Such strips are furnished as part of the regular Cosmograph equipment.

CHART 7

UNITED STATES GOVERNMENT BUDGET
AS SUBMITTED TO CONGRESS

FISCAL YEAR ENDING JUNE 30, 1933



STUDY 8

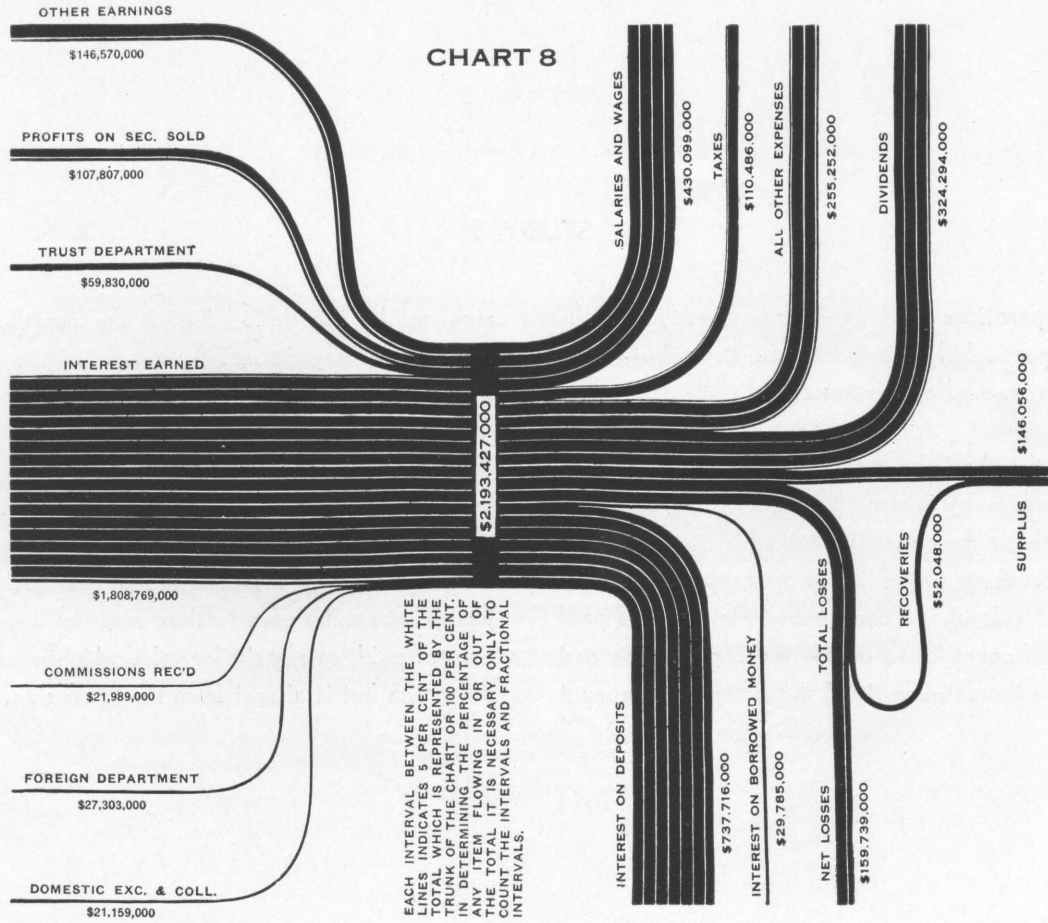
The chart on the opposite page illustrates several important construction features. The most striking feature is the combination of vertical and horizontal flows. The purpose of using this combination is to show graphically the fact that, although one main source generally accounts for a large proportion of income, expense, on the other hand, is usually distributed to two main channels. Such a chart is analogous to the well known inverted Y type of chart which is often used to picture a similar condition.

Another interesting and useful feature is the branch at the bottom of the chart labelled "Recoveries". This method of charting clearly illustrates an item which first was considered a loss but later was recovered to be included in surplus. Such a situation is one which always presents a difficulty in charting methods other than the Cosmograph method.

The "Surplus" in this chart points out another construction feature of importance. The usefulness of any chart is dependent upon its general simplicity and the manner in which it shows comparable items. Surplus means nothing unless it is compared to the total money involved. In this chart it can be compared readily because there is no change in the direction of this one section only.

In setting up such a chart the center trunk is clamped in the usual manner. The income side of the chart is set up and clamped, the board is turned and the expenditure side is arranged and clamped. A short strip of black paper is pasted across the trunk to provide a white block on the print in which the total money value is noted.

CHART 8



EACH INTERVAL BETWEEN THE WHITE LINES IS REPRESENTED BY THE TOTAL WHICH IS REPRESENTED BY THE TRUNK OF THE CHART OR 100 PER CENT. IN DETERMINING THE PERCENTAGE OF ANY ITEM FLOWING IN OR OUT OF THE TOTAL IT IS NECESSARY ONLY TO COUNT THE INTERVALS AND FRACTIONAL INTERVALS.

STUDY 9

This study of reparations paid by Germany, and their disposition, contains particularly interesting points in both subject matter and the method of construction.

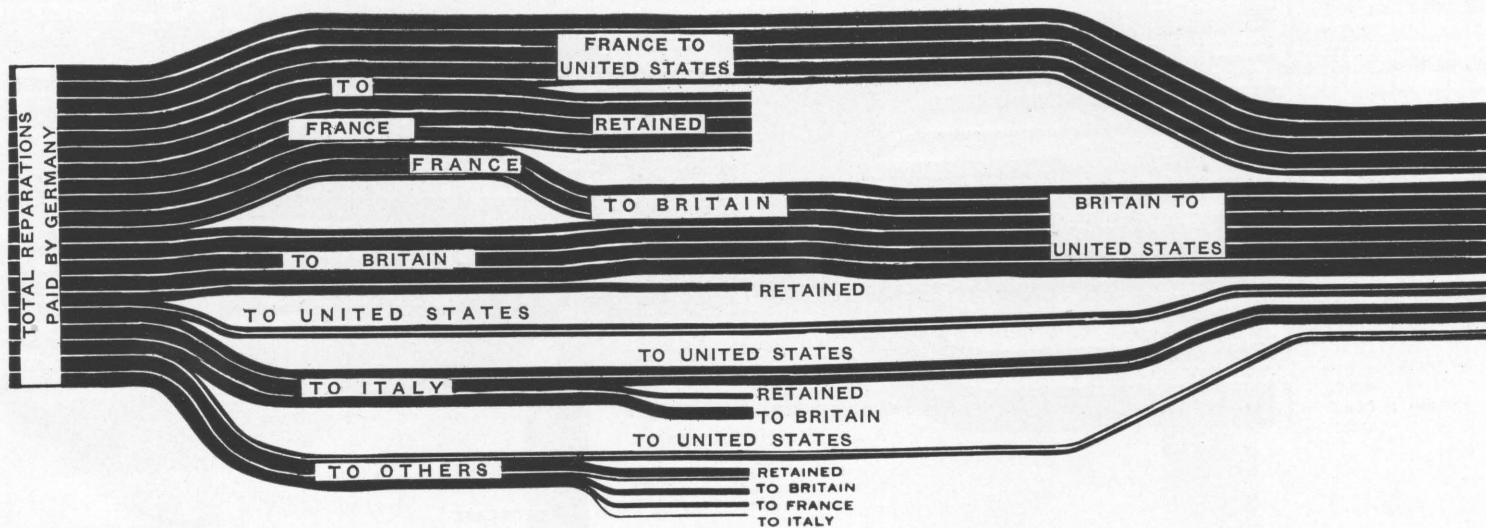
The left side of the chart shows the total amount of reparations, and the countries by whom they were received. The center of the chart shows the amounts retained by each country, indicated by the breaking off of the proper portions of the branches. The right side of the chart shows the amounts paid in turn by the several countries to the United States. The end of the main trunk (at the extreme right) shows the total amount

received by the United States, the contributing national sub-totals remaining distinct by means of the narrow white lines separating them.

The effect of the broken branches or butt-ends is obtained by sliding the paper strips backward until their ends lie at the center of the chart. The remaining strips are held in position at the center by the insertion of wedges. This construction possibility can be used to show reserves due some creditors but not yet paid, or any similar value which is a part of one side of the graph but is absent from the other side.

CHART 9

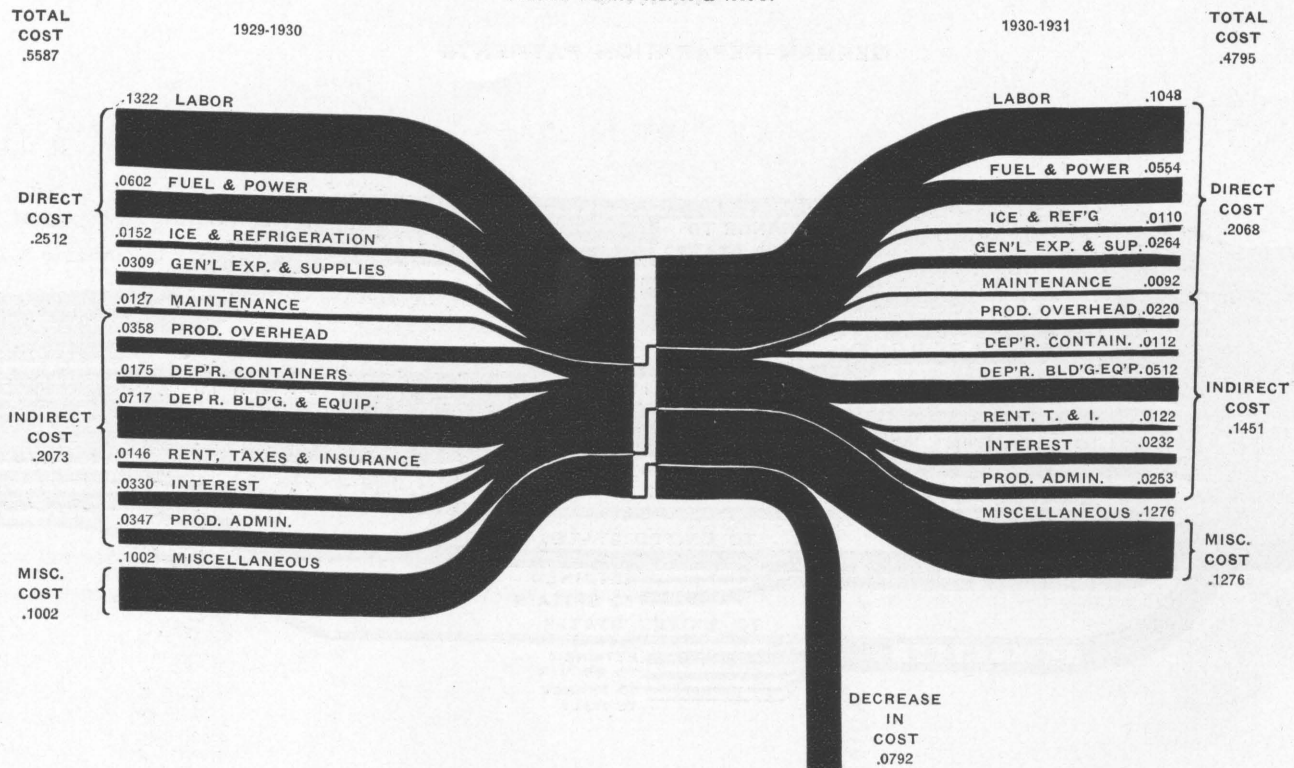
GERMAN REPARATION PAYMENTS



THE INTERNATIONAL COSMOGRAPH

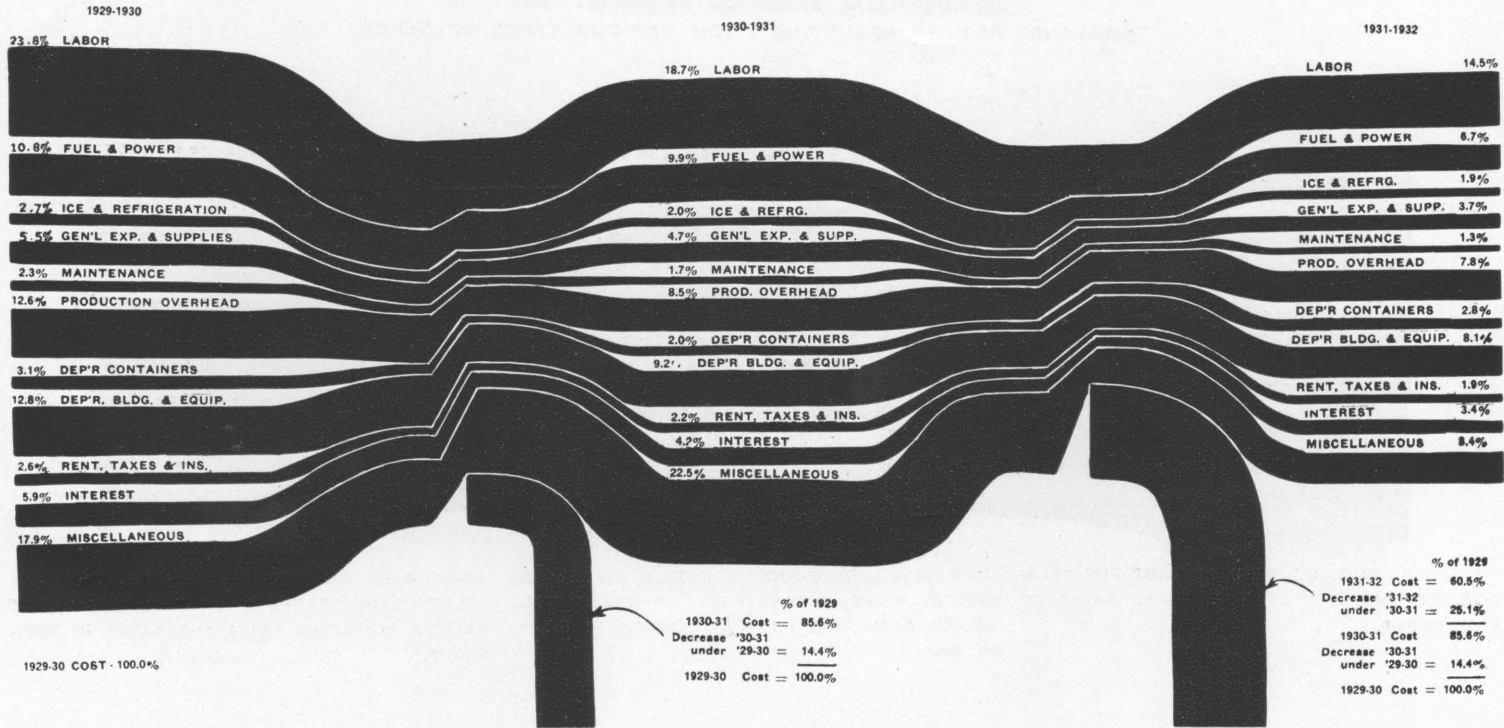
COMPARISON OF OPERATING EXPENSE

FISCAL YEARS 1929-30 & 1930-31

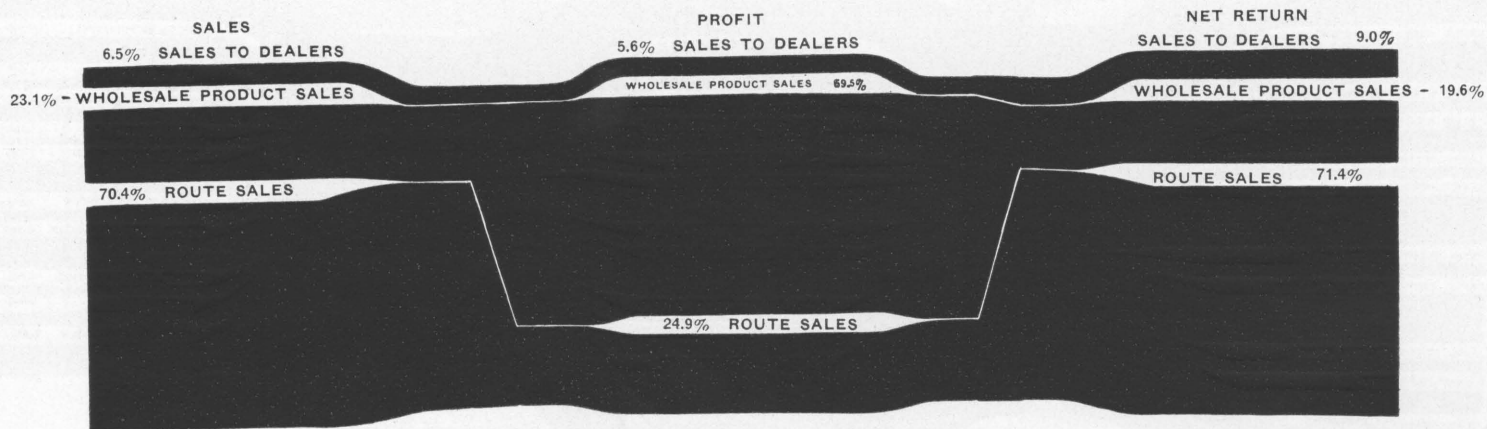


COMPARISON OF OPERATING EXPENSES

FISCAL YEAR 1931-1932 WITH 1930-31 AND 1929-30



COMPARISON OF THE RELATIVE PERCENTAGES
OF THE TOTAL SALES, TOTAL PROFIT AND
TOTAL NET RETURN RESULTING FROM VARIOUS TYPES OF SALES

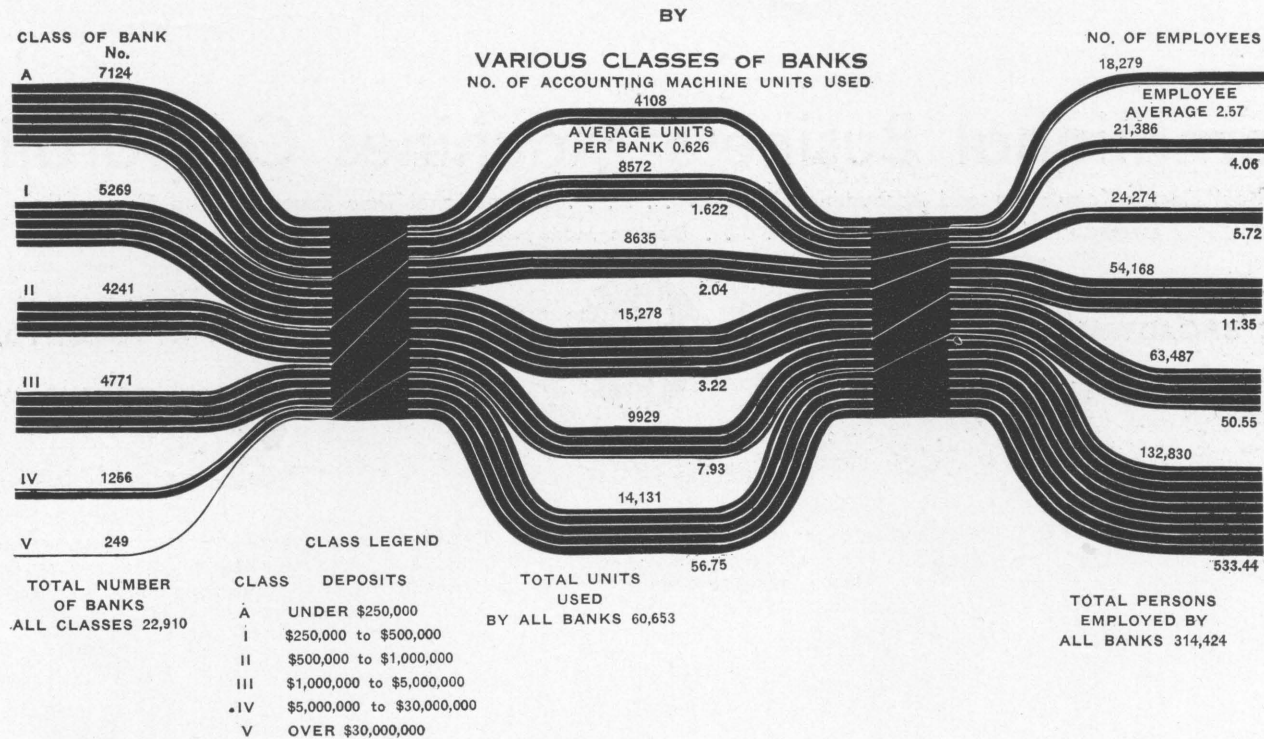


THE BARS ON THE LEFT REPRESENT THE RELATIVE PERCENTAGES OF THE TOTAL SALES IN EACH GROUP.

THE BARS IN THE MIDDLE SECTION REPRESENT THE RELATIVE PERCENTAGES OF THE TOTAL PROFIT RESULTING FROM THE SALES IN EACH GROUP.

THE BARS ON THE RIGHT REPRESENT THE RELATIVE PERCENTAGES OF THE TOTAL NET RETURN RESULTING FROM THE SALES IN EACH GROUP.

COSMOGRAPH OF
 THE NUMBER OF ACCOUNTING MACHINE UNITS
 AND THE
 NUMBER OF PEOPLE EMPLOYED



International Business Machines Corporation

International Electric Tabulating and Accounting Machines International Time Recorders and Electric Time Systems
International Industrial Scales Dayton Moneyweight Scales and Store Equipment

General Offices

270 BROADWAY, NEW YORK, N. Y.

OFFICES AND SERVICE STATIONS IN



Canadian Division

300 CAMPBELL AVE., W. TORONTO, ONT.

ALL PRINCIPAL CITIES OF THE WORLD



