REPORT
OF THE NATIONAL SURVEY OF POTENTIAL PRODUCT CAPACITY

POSSIBLE PRODUCTION & POSSIBLE CONSUMPTION

(PLANT CAPACITY) (BUDGET OF NEED)

MEASURED IN TERMS OF

ACCOMPLISHED PRODUCTION 1929

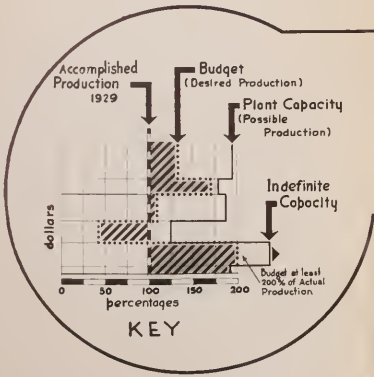
(EFFECTIVELY DEMANDED & SUPPLIED)

SCALE IN BILLIONS OF DOLLARS

104 102 94 92 88 86 84 82 80 78 76 74 72 70 68 66 64 62 60 58 56 54 52 50 48

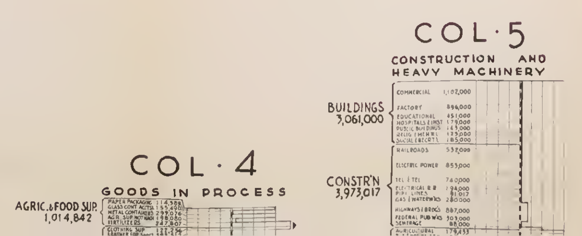
FLOW SHEET: SHOWING THE TRANSFORMATION OF RAW MATERIALS INTO GOODS AND SERVICES IN TERMS OF 1929 DOLLAR VALUES.

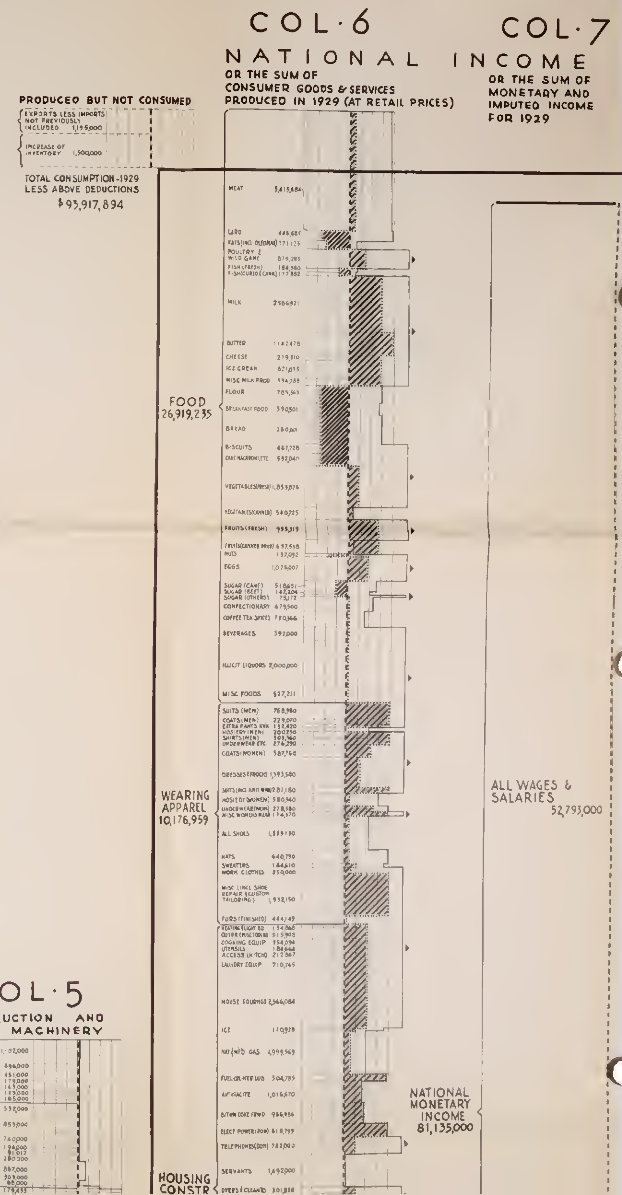
[$,000 OMITTED FROM ALL FIGURES]

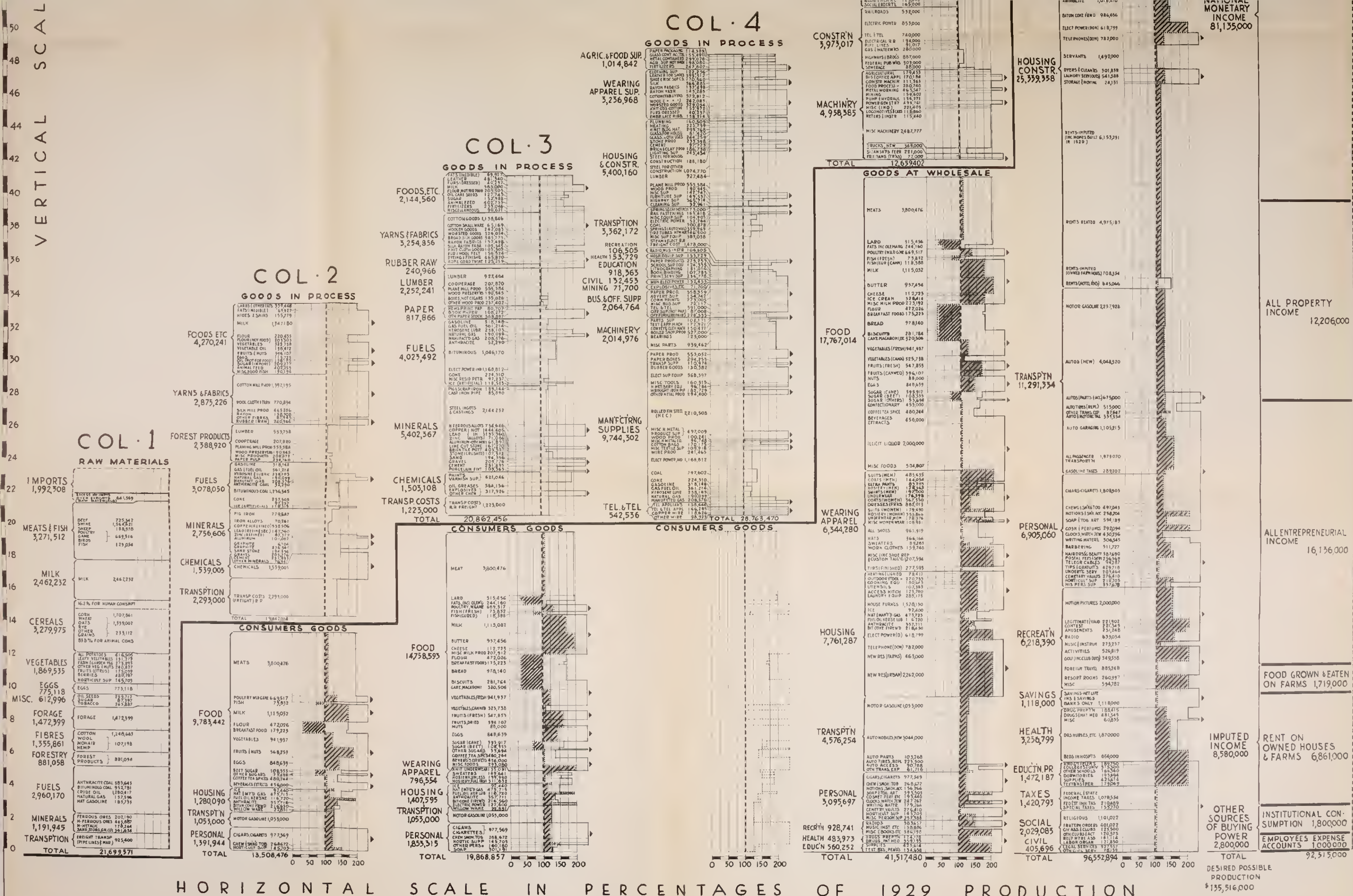


KEY

As the Line of Desired Possible Production swings to the Left of the Vertical Reference Line of Accomplished Production it denotes Actual Production in Excess of Domestic Budget Needs. As it swings to the Right it denotes Desired Production, unaccomplished although falling within the Limits of Present Plant Capacity or Possible Production.






VERTICAL SCALE
COL · 1
RAW MATERIALS
IMPORTS 1,992,308
MEATS & FISH 3,271,512
MILK 2,462,232
CEREALS 3,279,975
VEGETABLES 1,869,535
EGGS 775,118
MISC. 612,996
FORAGE 1,472,399
FIBRES 1,355,861
FORESTRY 881,058
FUELS 2,960,170
MINERALS 1,191,945
TRANSPTION
TOTAL 21,699,371
COL · 2
GOODS IN PROCESS
FOODS ETC 4,270,241
YARNS & FABRICS 2,875,226
FOREST PRODUCTS 2,388,920
FUELS 3,078,050
MINERALS 2,756,606
CHEMICALS 1,539,005
TRANSPTION 2,293,000
CONSUMERS GOODS
FOOD 9,783,442
HOUSING 1,280,090
TRANSPT'N 1,053,000
PERSONAL 1,391,944
TOTAL 13,508,476
COL · 3
GOODS IN PROCESS
FOODS, ETC. 2,144,560
YARNS & FABRICS 3,254,856
RUBBER RAW 240,966
LUMBER 2,252,241
PAPER 817,866
FUELS 4,023,492
MINERALS 5,402,367
CHEMICALS 1,503,108
TRANSP. COSTS 1,223,000
TOTAL 20,862,456
CONSUMERS GOODS
FOOD 14,758,593
WEARING APPAREL 796,354
HOUSING 1,407,595
TRANSPTION 1,053,000
PERSONAL 1,853,315
TOTAL 19,868,857
COL · 4
GOODS IN PROCESS
AGRIC. & FOOD SUP. 1,014,842
WEARING APPAREL SUP. 3,236,968
HOUSING & CONSTR. 5,400,160
TRANSPTION 3,362,172
RECREATION 106,505
HEALTH 153,729
EDUCATION 918,363
CIVIL 132,453
MINING 71,700
BUS. & OFF. SUPP 2,064,764
MACHINERY 2,014,976
MAN'FCT'RNG SUPPLIES 9,744,302
TEL. & TEL 542,536
TOTAL 28,763,470
CONSUMERS GOODS
CONSTR'N 3,973,017
MACHINERY 4,958,385
TOTAL 12,659,402
GOODS AT WHOLESALE
FOOD 17,767,014
WEARING APPAREL 6,344,280
HOUSING 7,761,287
TRANSPT'N 4,576,254
PERSONAL 3,095,697
RECR'TN 928,741
HEALTH 483,973
EDUC'N 560,252
TOTAL 41,517,480
HOUSING CONSTR. 25,339,358
TRANSP'TN 11,291,354
PERSONAL 6,905,060
RECREAT'N 6,218,390
SAVINGS 1,118,000
HEALTH 3,256,799
EDUCT'N PR 1,472,187
TAXES 1,420,793
SOCIAL 2,029,083
CIVIL 405,696
TOTAL 96,552,894
NATIONAL MONETARY INCOME 81,135,000
ALL PROPERTY INCOME 12,206,000
ALL ENTREPRENEURIAL INCOME 16,136,000
FOOD GROWN & EATEN ON FARMS 1,719,000
IMPUTED INCOME 8,580,000
RENT ON OWNED HOUSES & FARMS 6,861,000
OTHER SOURCES OF BUYING POWER 2,800,000
INSTITUTIONAL CONSUMPTION 1,800,000
EMPLOYEES EXPENSE ACCOUNTS 1,000,000
TOTAL 92,515,000
DESIRED POSSIBLE PRODUCTION $135,516,000
0 50 100 150 200
HORIZONTAL SCALE IN PERCENTAGES OF 1929 PRODUCTION

Miss Vivian Glenn
Sincerely Yours

REPORT

OF THE NATIONAL SURVEY OF POTENTIAL PRODUCT CAPACITY

REPORT
OF THE NATIONAL SURVEY OF POTENTIAL PRODUCT CAPACITY

PREPARED UNDER THE SPONSORSHIP OF

THE NEW YORK CITY HOUSING AUTHORITY

AND

WORKS DIVISION OF

THE EMERGENCY RELIEF BUREAU

CITY OF NEW YORK

William Hodson, Chairman, Emergency Relief Bureau
Langdon W. Post, Chairman, New York City Housing Authority

1935

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The final graphic presentation of the Chart on the Flow-Sheet was executed by Arthur Holden, Director of the Land Utilization Committee for the New York Building Congress, and the group of technicians associated with him.

HAROLD LOEB
Director

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FOREWORD

Interest in capacity operation is of comparatively recent growth. It used to be assumed that as a general rule something near full production was maintained except in the case of real glut. ("Real glut" is used here to describe a condition in which supplies are in excess of the consumption desires of the population.) This assumption is based on the central postulate of the "open-market" system, wherein the so-called law of supply and demand is presumed to operate. When the "effective demand" is unable to remove goods from the market, prices are supposed to be dropped until the effective demand can and does remove the goods for sale. In other words, the automatic operation of the open market is supposed to maintain an equilibrium between goods for sale and buying power.

According to this theory, technological improvements and other economies are inevitably reflected in lower prices, higher wages, or greater profits, and thus the total buying power of the people is at all times adequate to command the goods and services which better productive methods have put at their disposal.

Events, however, have cast doubt on the theory. Technological improvements have effected great economies in all branches of productive endeavor. These economies result in a disemployment of labor.

The classical theory assumes that a reduction in net buying power will be avoided by a drop in prices, a rise in individual wages, or an increase in profits, or by a combination of two or of all three.

In the aggregate, prices have not fallen to any appreciable extent in the past one hundred years—the price level is higher now than it was at times during the last century. Individual wages have not risen sufficiently to make up for the reduced number of workers, while profits, instead of increasing, tended to disappear after 1929 and have been maintained, artificially, on a reduced scale, since 1932.

It may be that this arrest of what is often assumed to be a "natural law" is due to the general practice of maintaining prices by restricting production. The very act of restricting production, even when financial considerations compel the restriction, precludes in many cases the possibility of profit. Fixed charges being what they are, any restriction on production must necessarily increase unit costs and thereby reduce unit profits. Thus technological improvements seem often, due to the disemployment of labor, to result in a reduced net buying power, a reduction which is not made up by lower prices, higher individual wages, or greater profits.

No matter how we interpret the phenomenon, the fact remains that there is a huge discrepancy between monetary income (token wealth) and the value at current prices of the goods and services which, in the light of our needs and desires, and taking into consideration our product capacity, might be produced. Despite the unsatisfied needs of a large part of our population, our productive plant, excepting only agriculture, has been operated during the last five years at a fraction of the rate at which it operated in 1929. Even in that year of maximum production, many needs were far from satisfied and yet the national *plant was then running only on a part-time basis.*

Today some twenty-three million people are on relief,[1] yet factories and men are idle while they could be turning out needed supplies. It is because of the discrepancy between what we actually *do* produce and what we potentially *could* produce—between "effective demand," which is expressed in *token* wealth (or monetary terms), and our needs and de-

[1] N. Y. *Times,* Feb. 17, 1935.

sires which can be satisfied only by *real* income (goods and services)—it is because of these discrepancies that excess, or unused, product capacity has become of such vital concern. Obviously, a knowledge of what *could* be done is important. In fact, such a knowledge is an essential preliminary step in any inquiry which seeks to discover why it is *not done.*

Purpose of the Survey. The National Survey of Potential Product Capacity was set up by the Federal Government solely to secure this information. Many guesses regarding our product capacity have been hazarded. The task of the Survey has been to assemble existing data, then to codify and collate it, and finally to interpret it.

The staff of the Survey (sixty-four individuals, at the peak of our work) was selected from engineers, technical men, and statisticians whose experience covered the full range of our national economy. The sources of their information are given in our bibliography, which lists over two hundred and fifty documents, including the Federal Census and trade reports of various industries. Many questionnaires were sent to various trade associations, plant executives, etc. We even covered some previously ignored fields, such as wild-game resources, in order to make as complete a picture as possible. Authorities in nearly all lines of production have been interviewed and our estimates were checked against their knowledge.

Capacity is frequently hard to determine. For example, the design of a fan might change the rated capacity of a blast furnace. Again, a redistribution between railroads and motor trucks of long-haul and short-haul freight—assigning the former to long hauls and the latter to short hauls—would greatly affect the rated capacity of both agencies.

But even when a satisfactory understanding of capacity has been reached, by which a given plant of industry could be rated, this capacity cannot be considered separately from the rest of the economy. Our national productive machine is an articulated mechanism. The functioning of one part largely determines the functioning of other parts. Increasing or decreasing the output of one industry must inevitably increase or decrease the output of sustaining or dependent industries.

Again, a large unused capacity in an industry which produces only capital goods, such as machinery, building materials, locomotives, and similar equipment, has no material bearing on our basic inquiry, unless it can be translated into consumer satisfactions. For in the existing economic system, utilization of at present unused capacity to manufacture machine tools can in no way effect an increase in the production of ultimate consumer goods unless the additional machine tools that might be produced can be put to work.

DEFINITIONS. Among the several points of view from which capacity may be considered are:

A. *The capacity of the existing plant with operation governed by existing customs and traditions.*

B. *The capacity of the existing plant if production were limited solely by physical factors and knowledge* (*i.e., resources, man-power, and technology*).

Still another point of view is admissible. It differs essentially from the two given in that it does not predicate the existing plant but substitutes for it a non-existent, yet possible, plant—one in which obsolete equipment is largely replaced and modern management methods are installed. The word "largely" is introduced because any economic system, whether it be that of the traditional open market, or some other system influenced in a greater or lesser degree by central regulation and planning, requires a certain amount of experimentation. Allowance must be made for the evolutionary process of selecting the best-equipped and the most efficiently managed plants. Aside from the impossibility of exactly determining obsolescence in equipment and management, a certain amount of it is both unavoidable and indispensable. Definition C was framed to apply to the sum total of all capacities.

C. *The capacity of the nation to produce goods and services if full advantage were taken of existing resources, manpower, and knowledge.*

Capacity under this definition is obviously not a definitely fixed quantity. Every new invention, every improved method, every advance in management technique, will increase the final quantitative estimate. A competent study of capacity from such a point of view would be a running inventory of our approach to perfection rather than a research into existing capacity as determined by production.

INADEQUACY OF DEFINITION. Definition A is the point of view accepted by the most thorough survey of capacity previously undertaken, namely, "America's Capacity to Produce."[1] But such a survey, following definition A, is not, strictly speaking, a study of capacity. It is rather an investigation of the extent of "unused capacity" under the capitalistic system. Traditional influences, such as "custom" and "seasonality," were given an equal footing with considerations of a purely engineering or managerial nature. In order to conform with current business practice, or "custom," the capacity of textile mills in the North was estimated on a one-shift basis, while mills in the South, turning out a similar product, were measured on a multiple-shift basis. Again "seasonality of demand," a non-physical factor in most industries (except those immediately affected by the weather and the seasons, as when fruits and vegetables are being processed) was accepted by the Brookings survey as a limitation on product capacity.

The Brookings Institution found that an average excess industrial capacity of some nineteen per cent existed in 1929

[1] The Brookings Institution, Washington, D. C., 1934.

and that a similar excess had existed in prior years. Therefore, they concluded that the extent of excess capacity has been fairly constant during the past twenty years. But, in arriving at this conclusion, they arbitrarily set their so-called normal line of production so that it joined to the production peaks of the years 1917, 1923, and 1929. These peaks rise successively *upward.* Had they, instead, made their normal line join the production troughs of the years 1907, 1921, and 1932, it would have shown, over the last decade, a sharp *downward* trend. Just as conclusive and as arbitrary an argument could be advanced in favor of considering as "normal" the trough line as that joining the peaks. In any case, it is debatable, in a scientific study, whether such a line is "normal" or merely an indication of a trend. If the curves of production and capacity are extended through 1934, the comparison, particularly in the past few years, will clearly indicate that the percentage of unused capacity, however it may be defined, has reached an unprecedented height.

Reasons for Definitions. An inquiry along the lines of A is of value to contemporary business entrepreneurs. It informs them whether or not the percentage of unused capacity in certain industries is greater or less than that prevailing in other industries. It gives them also a yardstick against which their own individual performances can be placed. It is of interest to individuals insofar as they are enterprisers in production, but it is of no direct interest to the people as consumers. All the people are consumers, while only a small percentage of them are enterpriser-producers.

We have felt that our status as a National Survey under Federal jurisdiction dedicated us to the larger interest, that of the consumers. We have sought to ascertain America's capacity to produce goods and services regardless of customary or institutional practices, which can be changed at will. The results of our Survey indicate what the American people might expect to have for consumption, given the existing equipment, if production were directed toward the satisfaction of the needs and wants of the population and limited only by our resources, man-power, and knowledge.

While A was studied, this part of the work was considered a preliminary to the major task, which has been to estimate capacity from the point of view of B. Even B was found at times to distort the objective. There is no reason to assume a "bottleneck" or an insufficiency in a product or process when an obvious and immediate remedy might easily be applied. In all cases, however, such assumptions were carefully noted and kept within very narrow limits.

A stickler for accuracy might object that we are including "custom" while pretending to exclude it; in other words, that we are accepting the customary hours of work. This objection would be correct but would have no force. To increase the hours of work, even to substitute a slave status for labor's present contract status, would not increase our product capacity. In fact, much evidence can be adduced to prove that shortening the hours of labor and rewarding the worker more generously would increase our product capacity. In any case, we have placed this social question outside of the scope of our inquiry.

Inquiry Following C Premature. Others may maintain that a study of capacity should follow definition C since it gives the only true picture of possibilities. For instance, there is no more reason to limit the carrying capacity of our railroads by the existing tractive power, when our locomotive builders are willing and ready to replace our obsolete tractive equipment in from three to four years, than there is to limit the estimated product capacity of an automobile plant by the fact that demand for automobiles today is seasonal.

The observations must nevertheless be qualified by the following considerations. First, a study of the potential product capacity of our nation if the best technological practices were universally used (Definition C), would be purely theoretical. It would indicate merely an ultimate perfection, towards which we should direct our efforts. Again, such a study would depend upon a multiplicity of ifs. *If* our farmers bred from the best bulls only, *if* they fed their cattle the ideal diet, *if* the steers were fattened before marketing, carefully tended in transit, slaughtered by the best methods, etc., etc., we might expect a specific quantity of meat of a certain high standard of excellence. Obviously, in real life, these conditions could not all be fulfilled. Finally, as previously noted, a study along these lines should not be undertaken until B had been covered. We should not attempt to estimate what we could produce with ideal equipment and management until we find out what we can produce with our present means.

New Problems. As the work of the N.S.P.P.C. progressed, many new problems were uncovered and many aspects of the study, previously obscure, came into clearer focus. For instance, it was found necessary to draw a sharp distinction between capital and consumer goods. From the viewpoint of the consumer, the former serve only as material and implements for the production of the latter. We do not turn iron ore into ingots and bolts for the sake of the ingots or the bolts. Furthermore, neither the investor nor the worker has any personal use for ingots or bolts. We process materials only to produce goods for the use and enjoyment of our people. All transmutations should be judged solely by this criterion. From this point of view, the production of both raw materials and capital goods becomes an instrumentality instead of an end. Thus our study is focused upon consumer goods and services.

This emphasis has been obscured in the financial-industrial world, where the major attention is concentrated upon the capital-goods and allied industries. Under the existing economic system, our purchasing power depends in large measure upon the capital-goods industry. But this industry cannot be expected to flourish when unused capacities exist in the consumer-goods industry. Industries are obviously disinclined to install more equipment when they cannot use what they already have.

Our Economy an Organic Entity. Averaging percentages of unused capacities throughout the range of industry, or even in allied industries, will therefore give us no definite information on what consumer goods might be expected if physical factors alone limited production.

As a corollary, it follows that estimates of a potential national monetary income arrived at by means of an averaging of unused capacities, are of limited utility. However, the possible production of specific goods and services can be discovered, and these can be translated into a possible standard or budget that will include all goods essential to life. But to make such a budget, every branch of industry had to be considered in its relation to every other branch. The economy had to be considered as an organic entity.

The necessity of surveying our economy as a whole brought to the surface a multitude of problems. Certain occupations such as farming possess no measurable "unused product capacity." Farmers as a rule produce all they can, and if the market will not carry off their stock at the asked price, they reduce their first price until the market value meets the "effective demand." The "unused capacity" which exists—demonstrated by the stepping-up of farm production during the war years—cannot be measured by estimating the theoretical capacity of the existing plant. Consequently, we were compelled, in order to give a total picture, to call upon proved and tested knowledge of production potentialities in this and similar cases. Whenever this has been done, the fact was noted and the alternative methods of increasing production were given with an estimate of the time required to make the change.

Utility of Budget. In a few cases existing production is more than ample to satisfy needs. In such cases, unused capacity in the production of materials or equipment was allocated to industries in which production was less satisfactory. Such necessary allocations were governed by budget requirements, and care was taken to base this budget on the habits or practices of the American people—on what the people actually consume when they have the means. As far as possible, we avoided presuming to say what people *ought* to consume.

In the case of food we adopted the "liberal diet" as budgeted by the Department of Agriculture.[1]

Our clothing budget is based on the actual expenditures of professional classes in the San Francisco area having a family income of about $5,000 to $6,000.[2]

The housing budget was formulated on the assumption that the average American family of four desires a six-room modern house or its reasonable equivalent in a multiple-dwelling unit, both to be fully equipped with labor-saving devices.

We were faced by the problem of allocation. Steel, for example, can be utilized in a multitude of different ways. In order to translate the unused capacity of the steel mills into consumer goods, many paths could be taken. Some steel could be allocated to housing, some to automobiles, some to implements, etc. Our care was to make certain that the total steel allocated should equal the total steel available.

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[1] Circular 296, "Diets at Four Levels of Nutritive Content and Cost." U. S. Department of Agriculture.

[2] See Report by the University of California's Heller Committee for Research in Social Economics.

Let us give an example. Today, a much greater number of automobiles could be built than we have been building. Before accepting this unused capacity and allotting to the people the additional automobiles, it was first necessary to determine whether the materials and labor for building them were available; then road space had to be considered. How many more automobiles could our roads carry? Finally, to build motor cars without supplying the fuel for running them would benefit no one. And it happens that if the use of automobiles in greater number were to be allowed and the use of gasoline as the energy source continued, the existing annual supply of gasoline would soon prove inadequate, unless a greater proportion of the available petroleum were "cracked." As a consequence, our unused capacity for fabricating motor cars could be enjoyed (accepting the limitation of Definition B), only if the new cars were of light weight and economical in their fuel requirements, and if the older, heavier cars were replaced by lighter and improved models.

In sum, by directing our survey towards consumer needs, and making the producer's problem of unused capacity definitely secondary, we let ourselves in for a host of complications which previous surveys did not face. The inquiry was soon seen to possess an unprecedented character. Ours was not the task of merely following a beaten path. We had to create the way upon which we desired to travel.

The problem was solved by the use of the flow-sheet described in Chapter I. By beginning with the raw materials and following each item through its various processings until it emerged as consumer goods, or was used in some instrumentality of production, we avoided the error of duplication by not assigning the same raw or processed material to different uses.

Low Appraisement Unavoidable. All estimates of capacity in this study, in particular the final conclusions, are low. This is due to several causes. In the first place, we have been deliberately conservative. In the second place, certain peculiarities of our present economy tend to make all estimates of capacity operation understatements.

For instance, ever since the Industrial Revolution, during which production for sale gradually superseded production for use, low price has been the prime market requirement. Even America is largely a "poor man's" market. Every penny saved in costs is likely to expedite sales. But scalping costs by using the cheapest possible materials is seldom true economy. The use of better materials is likely to add a small percentage to the cost of an item, but it also adds a large percentage to its life. The competition for cheapness is particularly keen in clothing, utensils, household furnishings, and speculative building, and is characteristic of nearly all quantity-production items. A very small addition to the cost of the cloth or of the plumbing, for example, would result in an article likely to withstand a great deal more wear and tear. Unfortunately, under the present system, the additional life that might be built into consumer goods, at so slight an additional cost, would in no way benefit the manufacturer. His pecuniary interest lies in selling a second article to replace the one that has been worn out.

It has not been feasible to include this possible economy in our calculations. We have been compelled to estimate the product capacity of goods *as they are made*. Yet if the production of our existing plant were limited solely by physical factors and artisanship, the quality of goods could be increased even as conspicuously as their quantity.

Furthermore, if physical factors and knowledge alone governed production methods, obsolete equipment would be replaced as fast as modern equipment could be provided. Much of the obsolete equipment could be replaced within a year or two. Consequently, on this count, our estimates based on the capacity of the existing equipment are again low.

Practicability of Capacity Production. It might be contended that higher speeds of operation would lead to breakdowns, of both plant and personnel. Fifty years ago this might have been true. Then much of the labor was purely physical, of a repetitive nature, hard on the worker and destructive to his morale and well-being. Today, as industrial electrification has progressed, controls are becoming simple, a matter of "push-button" manipulation or even entirely automatic; and labor, when it is not carried on along primitive lines such as digging, plastering, and similar occupations, has in many cases assumed a supervisory character. As a result, the attainment of higher speeds of output does not wear out the labor force, as once it did.

Also, many of the newer processes are of a continuous nature, and designed to operate at a fixed speed. Any departure from this designed speed, or any attempted reduction of output by slowing-up, is often impossible. The process ceases to function. Periodic shut-downs, no matter how carefully managed, are uneconomical because the depreciation of machinery in an idle plant is frequently greater than in an operating plant—to say nothing of the inevitable loss of trained personnel. Also, the semi-skilled workers suffer serious demoralization from psychological insecurity and physical disability during the lay-off periods.

Finally, in plants which do not operate continuously, we have made sufficient allowance in figuring capacity to allow ample time for repairs and general maintenance service.

Harold Loeb

REPORT

OF THE NATIONAL SURVEY OF POTENTIAL PRODUCT CAPACITY

CHAPTER I

THE FLOW-SHEET

What might the consumer expect in the way of goods and services if production were limited solely by physical factors and knowledge?

This question has been asked before, but it has never been answered. Previous studies of productive capacity, including the U. S. Census of 1921 and 1923, provided much useful information; but none performed the necessary operation of translating their findings into consumer satisfactions.

We had first to devise a method. A mere addition and average of certain, or even all, "unused capacities" throws no light on the problem. Something in the nature of a "flow-sheet," starting with the basic factors of resources, man-power, knowledge, and equipment, and ending with a consumer's budget, was required.

It was necessary to design a flow-sheet or chart on which (1) actual production, (2) capacity production, and (3) budget, or desirable production, would be graphically shown. Certain difficulties presented themselves. To give a picture of our economy as a whole, the various parts had to be made commensurable. A common denominator was required.

Many were considered, including weight, man-hours, and energy. While these and certain other measures are common to all material things, only man-hours is common to both goods and services, and all three were found, in many significant respects, to omit the description of many considerations which are essentially pertinent to these two categories as a whole, to one or the other, or to subdivisions of either or both. While market values (1929 retail) leave much to be desired as a yardstick, they nevertheless convey meaning to the average person. And while the rating of goods and services in these terms is largely arbitrary—dependent, upon so-called economic "laws"—we nevertheless felt justified in presenting our findings in dollar terms. In using them exclusively on our Flow-Sheet, or Master Chart, it must be remembered that physical quantities were our major concern, that we invariably considered the physical quantity as the significant background upon which our reports and estimates had to be based. The dollar merely served as the final descriptive technique, the least objectionable and most popularly understood yardstick in terms of which to present graphically our final picture.

Although these considerations prevent us from claiming scientific finality for the chart—despite the fact that the chart is based on scientific studies in which quantitative, i.e., scientific, measurements were utilized—yet they do not destroy the essential truth of the picture we have drawn. For market values should not be considered wholly arbitrary except in the case of goods intrinsically scarce. Precious stones, antique furniture, oil paintings, and so forth, carry dollar valuations which bear no relationship to anything in the physical world. But these commodities fall outside the scope of our capacity study. And the semi-scarce goods, such as "styled" house furnishings, amount to so small a proportion of the total production that they hardly show up in the final picture.

In the case of *non-scarce* goods, which can be manufactured by mass production and are therefore potentially plentiful, the market price, or dollar value, bears a very definite relationship to the real world of labor and materials. Although prices vary considerably and continually, the dollar value of an individual item tends to bear a constant relationship to the dollar value of all other items. When this relationship changes, it is usually due to a technological improvement in production, reflecting, therefore, a real happening in the real world.

The reason for this constant relationship between prices or market values is apparent. Goods are priced by adding to costs whatever profit the market will bear. But today, for all potentially plentiful goods, the market permits of but little profit. Consequently the market value of such goods represents *costs plus a small percentage*. The small percentage, or profit, is fairly constant in quantity-production industry.

This is true when such goods are *subject to competition.* When the competitive system by means of its own mechanism does not apply the necessary restraints—as in the case of monopoly goods—the state usually intervenes to keep profits within customary limits. Although the state is not conspicuously successful in this endeavor, it tends, on the whole, to prevent today any extraordinary variations in the rate of profit.

Since both interest and rents are included under costs, and are the most constant factors (in dollars) of our economy, we may assume that the total of market values bears a constant relationship to costs. Although market values are not the perfect measuring rod, they are, nevertheless, sufficiently constant to show not only the relationships existing among the innumerable items of our economy, but also the proportional importance of each separate item to the budget as a whole.

Unfortunately, the above statement must be slightly qualified. The market value of most items is slightly greater or less than the dollar costs of these items. In recent years farm produce has been consistently selling at or below dollar costs (if we include the farmer's time and fixed charges as cost factors). On the other hand, the products of our great corporations, both competitive and monopolistic, have obtained prices generally above dollar costs. Consequently, although our use of market values as a measuring rod enables us to give a true picture of the flow of goods through the industrial-economic system, the market dollar value of separate items is not always an accurate measure of their production dollar costs. But costs cannot be disentangled from market values when most cost factors are subject to market forces. We have therefore projected our final picture against the reference frame of market values. It has enabled us to present accurately the proportional importance (predicating an economic system which uses a variable as a unit of measurement), from the viewpoint of dollar costs, of every item to all other items.

Having decided upon the dollar as our "common denominator," we constructed a flow-sheet for 1929. This chart shows seven successive vertical columns. Each commodity or service, or group of commodities or services, is shown as a section of the column. The vertical dimension of the column or section of the column represents, as indicated by the scale, the 1929 dollar value of the goods and services shown therein.

Sections of columns above the continuous heavy black line which splits columns 2, 3, 4, and 5, into two main sections, contain lists of goods which must either undergo further fabrication or processing before they become finished consumer goods, or goods and services used *solely* for manufacture, transportation, storage, etc., and which are not paid for *directly* by the consumer. Sections *below* the heavy line contain lists of consumer goods and services. No producer goods appear anywhere below the line, and all items shown there are finished and ready for consumer use.

Three separate and distinct facts or estimates are given concerning each item charted. These are: (1) the actual market value of the 1929 production, (2) possible production, and (3) budgeted production. Inasmuch as (1) is an accomplished fact, while (2) and (3) are but engineering and economic estimates, we have shown (2) and (3) in terms of (1). In other words, for each and every item, (1) has been set down as the norm, or index, against which to measure (2) and (3).

The value of (1) is measured against the "dollar scale" which rises vertically from the 100%-mark on the horizontal "percentage scale" at the foot of each column. Thus the *vertical* dimensions of the item or composite item to which each specific section of the column pertains, represent *actual market value.* The capacity line, (2), appears as a heavy black line to the right of each column. Its distance from the central line represents the unused capacity, measured in percentage of the 1929 actual production, of the industry which supplies the item in question. But capacity is sometimes indefinite,[1] and sometimes it is greater than two hundred per cent of the 1929 production. For each item we have arbitrarily limited our graphic presentation to double the quantity actually produced in 1929. When the capacity line would swing out further than the vertical riser indicating two hundred per cent of 1929 production, we indicate this fact by placing an arrow opposite that segment.

Line (3) appears as the heavy dotted line and follows the same rules as the capacity line. It is the line of estimated need, or budget.[2] It occasionally, unlike (2), lies to the left of line (1). Whenever this happens, it indicates that we not only *could*, but actually *did* in 1929, produce more of the items in question than called for by our budget.

For example: In column 5, headed "Consumer Goods," in section representing Food; sub-section headed Lard. Here (1) is seen to be $315,456, "000" being always omitted on the chart. This figure is the market value, or $315,456,000, of the lard actually produced in 1929. Estimate (2) is shown to the left of the 200% vertical-percentage riser, for we found

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[1] See page xv.

[2] The year 1929 was used, since the maximum production of the American industrial plant occurred in this year. Needless to say, 1929 is *not* considered a typical year.

that we actually had the capacity to slaughter pigs and prepare twice as much lard as we actually did prepare in 1929. But, the heavy dotted line (3) is to the left of line (1) and just slightly to the right of the riser indicating 25% of 1929 production. This is evidence that we produced more lard in 1929 than we should have consumed had we heeded the advice of the diet experts in our Department of Agriculture.

In the Appendix, Columns 1, 2, 3, 4, 5, and 6 (tables) give not only the figures on which the chart is constructed but also the 1929 production and the capacity production in physical terms (weight, yardage, etc.) when these are pertinent. Obviously, when several kinds of machinery come under one head (as, e.g., watches and derricks) the weight of the total production has no meaning. Also under the heading "theoretical value" a figure is given showing what the capacity production would have been worth *if we assume* that 1929 market prices had been obtained for the presumptive capacity production. Of course such prices would *not* have been obtained, under the "open-market" system. The tables also give the numbers of the worksheet from which the statistics were taken. The worksheets also give the definition of capacity for each specific commodity.

The seven columns and the seven corresponding tables are headed: Col. 1, "Raw Materials," Col. 2, "Goods in Process," Col. 3, "Goods in Process," Col. 4, "Goods in Process," Col. 5, "Consumer Goods and Services—Wholesale Prices," Col. 6, "National Income—Retail Prices," and Col. 7, "National Monetary Income." Since the detailed statistical bases for the figures which appear in these columns are to be found in the monographs, worksheets, reports, and Appendix tables of this Survey, it will suffice here to outline the salient features of each column.

The first, "Raw Materials," records the monetary value of all goods produced in this category without giving budget or capacity figures. This omission does not mean that capacity studies were neglected in this field but simply that no effective limitations on consumer goods or supplies designed for further fabrication were found at this point in our economy. Moreover, the capacity to produce farm products, constituting some sixty-five per cent of the total, and other raw materials is fully treated in the monographs.

In the second column, commodities are first differentiated into two main classes: finished consumer goods[1] and materials for further fabrication, i.e., goods in process. It should be noted that the four columns representing Processes 1 to 4 are not intended to mark each separate step in the flow of goods from raw materials to finished products. For instance, whole milk as produced by farm or dairy is considered a raw material; that portion which is used as fluid milk is diverted to the consumer section in Column 2. Similarly, iron ore, after it has been mined, is listed as a raw material; its conversion into pig iron is regarded as Process 1. This method can be followed in detail by referring to specific items in the several columns. The groupings are somewhat arbitrary, but they permit a workable comparison between production, capacity, and a budgeted quantity for the items listed.

It is apparent from the character of the goods in Column 2, that the capacities involved in this "process" are crucial, for the list includes many products that are created by great basic industries which are relatively difficult to expand. It will be noted that all capacities dealing with finished consumer goods in this column are equal to or exceed budget requirements. In the other category, most capacities exceed 1929 production considerably, but these excesses are significant only when they are checked against budgeted quantities of finished goods which call upon these hitherto unused capacities. This check is provided in subsequent tables.

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[1] All finished consumer goods are carried at wholesale (producers') prices until Column 6 is reached, where the retail mark-up is applied to wholesale values.

The third column lists goods to the value of $40,731,-313,000. This is a relatively small (7.8 billion dollars) increase over the total in the preceding column. However, some 13.5 billion dollars represent consumer goods in final form which are carried unchanged to Column 6, and a part of the lumber, fuel, etc., in Column 2, which has not been consumed is also entered without a change in value.

Certain quite important new capacities appear in Column 3. These include the production of steel ingots, various mineral alloys, paper, and raw rubber. A few textiles (knit goods) appear in the consumer list. Practically all food has reached its ultimate form in this column.

From the unused capacities in items for further fabrication must come such important commodities as steel for housing and transportation (rails, bridges, locomotives, machinery, etc.), cement, sand, and gravel, etc., etc., which require expanded production to meet the Budget.

Column 4 is devoted entirely to goods for further fabrication, consumer goods being carried through this stage unchanged. Up to this point, goods in process of work have been classified with reference to the industrial *origin* of such materials. In a flow-sheet such as we have constructed, it was essential at some stage to shift our classification of goods for further fabrication from categories which are based on the *origin* of these commodities to categories which will show the *destination* of these supplies as they emerge in the form of finished goods. This transition was made in Column 4; therefore, the categories in Column 4 cannot be directly compared with those in the preceding table. Moreover, to avoid making Column 4 needlessly intricate, many similar commodities have been grouped under inclusive headings. The detailed data which furnished the basis for these groupings are given in the Appendix (Table II, Column 4, Allocation Table).

In establishing Column 4 capacities, it was necessary to allocate the products (for further fabrication) appearing in Column 3 and to correlate the Column 4 demands for Column 3 goods so that their individual totals in no case exceeded the various capacities given in Column 3. This was done in all instances. A single example will indicate the method we followed:

The unused capacity of structural steel in 1929 was 8.7 million tons (Column 3). In Column 4 (and subsequently in Column 5) we have allocated 5.7 million tons of this steel to housing construction; 1.7 million tons to automobile manufacture; 1.2 million tons to machinery, and 0.2 million tons to highway construction.[1] These amounts are additions to the quantities so used in 1929.

Column 5 presents the full inventory of finished goods produced in 1929. Capital goods appear in the upper section and represent that fraction of our "permanent" plant and equipment increase not included in the previous columns. The consumer section shows (1) our actual output in 1929, (2) capacities, and (3) a budget which may be said to depict the standard of living to which America is technically entitled.

From an engineering point of view, the Survey terminates with Column 5, since the production of all useful goods of whatever kind has been examined. However, we felt that a more complete picture of our economy would result if we also studied those less tangible elements coming under the general category of "services." These inclusions appear in Column 6, where "Goods at Wholesale," as listed in Column 5, are given 1929 retail values, and services are incorporated.

Thus, if national income be regarded as the total of goods and services produced in a year, Column 6 presents our national income for 1929 and a possible (budgeted) national income based upon the product capacity available in that year.

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[1] The total is 8.8 million tons, but steel-production capacity has increased some 5 million tons since 1929.

Since monetary and imputed income together make up the national purchasing power in any given year, Column 7 has been added to the chart for comparison with the two totals in Column 6.

It is obvious that this technique of study and presentation has enabled us to examine the production of commodities both as separate industrial processes and as interrelated components of our whole economy.

Furthermore, the technique developed in constructing the chart was of great assistance in setting our final budget. Our study shows that the track capacity of our railroads is adequate for carrying a load three times greater than that which was carried in 1929, the peak year. Consequently we need allocate only enough steel rails to our transportation system to maintain the existing trackage. Furthermore, by minor changes our steel plants can be rearranged to produce structural shapes for construction, or to produce steel for any other undertaking which the budget shows to be desirable.

The defects of the chart may be listed as follows:

The chart is deficient in that it is not accurate in the sense that accountancy is accurate. Census figures, for example, are subject to inevitable duplications and omissions.

Most materials go through a multiplicity of processes before they become consumer goods. By throwing together the less important, we arbitrarily grouped these processes under five headings. In certain cases—raw vegetables, for example—where fewer than five processes are needed, the commodity is carried unchanged from one column to another. The five columns are not intended, therefore, to represent a picture, complete in every detail, of the process of fabricating consumer goods.

The chart does not show with complete fidelity the flow of raw materials to consumer goods. For example, to produce raw materials, supplies are required—twine, lubricants, fuel, machinery, etc.—which are created in later processes. The return flow of such supplies could not be shown without making the chart undecipherable.

Some few unimportant items may have been left out, although we caught many generally neglected ones such as wild game, bulbs, flower seeds, and the like. The commodity lists of various census publications were checked, but none, even in their own fields, are all-inclusive. In the services, omissions probably amount to a considerable sum. Doubtless many recreations, which have market values, have not been included.

The market-price valuation was not equally serviceable in every case. For example, doctors' fees bear no ascertainable relationship to doctors' services.

Capacity estimates are shown only where the capacity figure affected our ability to produce *consumer goods*. For example, we have considerable unused capacity for fabricating hardware. This capacity is of no relevance unless the necessary materials, iron, steel, etc., are available. In other words, the limiting factor in the hardware industry is our capacity to smelt and refine iron ore and to roll steel. The capacity of our iron and steel plants has been carefully estimated, and the capacity of our hardware fabricators left indefinite. The same condition holds good in the textile trade. We can fabricate all the clothes for which we have materials. Therefore, fabricating capacities have been left indefinite whenever, after careful study, they were found to be adequate to meet the budget requirements.

The accomplishments of the chart may be set out as follows:

The chart exhibits a technique for determining the product capacity, in consumer goods and services, of American industry.

The chart shows the relation between production and plant capacity in all branches of productive work and compares it to the Budget, or to what our product requirements would be if the level of life of the less fortunate portion of our citizens were raised to the supposed "American" standard of comfort.

It shows the flow of commodities from raw materials to consumer goods and their relative market values during each process.

The sufficiences and deficiences of our materials and equipment are made clear. If "bottlenecks" had existed, the chart would have thrown them into relief.

HAROLD LOEB and FELIX J. FRAZER

CHAPTER II

AGRICULTURE

Food, shelter, and clothing are mankind's three primary necessities, and two are supplied from that oldest of all organized human activities, agriculture. It is no accident that any growth of a settled civilization has been paralleled by the establishment of a productive agriculture. But agriculture is more than a source of essential foods and fibers. It is a way of life, ingrown with tradition, its roots entwined deeply with the roots of all human action.

This tradition, more than any other one factor, has insulated agriculture from the full effects of the Industrial Revolution. Manufacturing has completely separated from its earlier aspects of handicraft. Power today is machine power, not the effort of man's muscles. Farming, coaxing the soil to yield its fruits for man's benefit, remains the plaything of sunshine and rain. Rational production, mechanization, scientific method, all have begun to affect agricultural production; but on the whole it is still uncontrolled and unpredictable. These facts must be, and in this study have been, considered in determining the adequacy of American farms to supply America's needs.

Until recently, it was believed that agriculture faced a limitless market. Less than a century ago the Malthusian doctrine[1] was accepted as economic law. Moreover, the long trend of prices was distinctly favorable to farmers. As the Industrial Revolution progressed, farm products were exchangeable for more and more industrial goods. In America,

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[1] Malthus declared that population tends to increase faster than man's ability to secure food. This theory predicates as a law of Nature the persistence of large groups subject to poverty and gradual starvation.

between 1815 and 1925, the relative prices of farm stuffs increased one hundred per cent over those of industry.

These facts combined to make farming a particularly individualistic enterprise. The world crisis, sharply curtailing trade and purchasing power, has exposed a number of very grave defects in the existing distributing system. Many governments seem to feel the necessity of regulating and even restricting the output of their farmers in order to provide them with a "fair" market.

American farmers are not exempt. The A.A.A. was enacted in an effort to apply some measure of coöperative control to our nearly six million agricultural entrepreneurs.

Let us examine why control is thought necessary and what difficulties stand in the way of achieving it.

Farm proprietors have never been inclined toward cooperation. Agriculture is the only basic industry which has taken no general steps to control production, to balance supply and effective demand. To the contrary, when falling prices lower farm incomes the tendency has been for individual producers to increase their output. Because of fixed costs, farmers are invariably compelled to maintain their operations on nearly the same scale year after year. They cannot materially curtail expenses by reducing labor charges, since the farmers themselves are the major source of farm labor. Under the existing economic system, this rigidity is a serious handicap.

Another peculiarity of present-day agriculture is its relatively backward technical position. Here and there farm units are employing modern methods and equipment, but in general production is carried on at a low level of efficiency.

Each of these factors must be weighed in any survey of agricultural resources.

MAGNITUDE. The United States is still the greatest of all agricultural countries. Today, agriculture utilizes 51.8% of the total land area of the country. Of this 986,771,000 acres, about 413,000,000 acres (or 42%) are used for crop production, while 109,000,000 acres (or 11%) are in plowable pasturage.

The 413 million-odd acres used for crops include nearly all the areas and soils best adapted for the purpose. The use of additional areas is justified only should the country's need for agricultural products increase far beyond anything now in view. The possibility of such an increase indicates a potential capacity much greater than has been considered in the Survey. To attain such capacity would require an output of labor and power per crop-unit vastly greater than is needed on the present acreage. Consequently, the existing unimproved but usable area, some 1,371,000,000 acres, is disregarded.

Just as agriculture constitutes the most important use of land in the United States, so is it the most important occupation of the people. In 1930, according to the U. S. Census, there were some 6,288,648 individual farms, on which worked some 10.5 million people. The average size of farms was 156.9 acres, but farms of 100 or more acres (some 2,555,174) comprised more than 80% of the total farm area. Farm buildings, including farm homes, were valued at 13 billion dollars. There was 183 million head of livestock and half a billion chickens. Crops and livestock were valued at 11,741 million dollars.

In addition to supplying food for 125,000,000 people, American farms raised great crops of cotton, wool, tobacco, and other products entering into the production of consumption goods.

Since land is capable of producing a wide variety of crops, it is obvious that any estimate of "capacity" for individual items has no real significance. Therefore, this Survey has approached the matter by adopting a national budget for food and clothing, one which fully meets all dietary requirements and assures an adequate wardrobe for winter and summer.

Table I

Utilization of the Total Crop Land in the United States*

Items	Acres	Per Cent of Total
Crop land, total	413,235,800	....
Idle or fallow land	41,287,216	10.0
Crop failure	12,706,583	3.1
Crop land harvested	359,242,091	86.9
Crops harvested		
Corn	97,740,740	23.7
Wheat	61,999,908	15.0
Oats	36,525,964	8.8
Barley	12,890,772	3.1
Rye	3,032,802	0.7
Flax	2,965,635	0.7
Emmer and spelt	344,324	0.1
Buckwheat	621,854	0.2
Rice	740,588	0.2
Annual Legumes		
Grown alone	6,387,591	1.5
Hay, total	67,827,899	16.4
Potatoes, Irish or white	2,944,082	0.7
Sweet Potatoes	649,847	0.2
Cotton	43,227,488	10.5
Tobacco	1,888,365	0.5
Sugar cane	291,447 †	0.1
Sugar beets	643,797	0.2
Sorghum for sirup	136,143	‡
Sorghum for grain	3,521,903	0.9
Broom corn	311,646	0.1
Hops	23,302	‡
Hemp	1,644	‡
Grass seed and millet	3,876,889	0.9
Vegetables	2,811,715	0.7
Small Fruits	386,664	0.1
Orchard and sub-tropical fruits, vineyards, and planted nut trees	6,086,176	1.5

* Source: "Types of Farming in the United States," Bureau of the Census, U. S. Department of Commerce.

† Not including the acreage of sugar cane for seed and other purposes not specified.

‡ Less than one-tenth of one per cent.

The Food Budget. Out of 359 million crop-acres harvested in 1929, all but 48 million were devoted to the pro-

TABLE II

"The Liberal Diet"

Item	Per Capita per Year Pounds	Total
Flour, cereals:		
Wheat flour	76	
Corn meal, prepared flour, oat breakfast foods, rice, macaroni, noodles, wheat breakfast foods, rye flour, corn breakfast foods, cornstarch	24	100
Milk:		
Fresh whole milk	636	
Evaporated	10	646
White potatoes	129	
Sweet potatoes	26	155
Dried beans, peas, nuts	7	7
Tomatoes, citrus fruits:		
Tomatoes, fresh	17	
Tomatoes, canned	38	
Oranges	35	
Grapefruit	11	
Lemons	9	110
Leafy, green, or yellow vegetables:		
Cabbage	68	
Lettuce	24	
Peas	15	
Snap beans	8	
Carrots	7	
Spinach, kale, collards, etc.	6	
Asparagus	4	
Peppers	3	135
Dried Fruits:		
Raisins 8, prunes 8, others 4	20	20
Other Vegetables, fruits:		
Apples	110	
Bananas	36	
Grapes	36	
Peaches	29	
Corn	26	
Onions, turnips, beets, etc.	20	
Watermelon	16	
Cantaloupe	13	
Pears	13	
Cucumbers	7	
Celery	7	
Strawberries	6	
Pineapples	6	325

TABLE II (*continued*)

Item	Per Capita per Year Pounds	Total
Fats:		
Butter	35	
Lard	7	
Vegetable oils and shortenings	7	
Bacon, salt pork	2	
Margarine	1	52
Sugar, molasses, other sweets:		
Sugar	45	
Molasses	10	
Other	5	60
Lean meat, poultry, fish:		
Beef	56	
Pork	65	
Lamb and mutton	5	
Veal	8	
Poultry	18	
Fish	13	165
Eggs	30 dozen	30 dozen

duction of human foods, either directly or in supplying rations for livestock and poultry. Crops failed on nearly 13 million acres and 41 million acres lay fallow.

Of our agricultural plant, about 86% was given over to supplying directly, or indirectly through animals, the nation's larder. How did the output compare with America's needs? Circular 296, U. S. Department of Agriculture, analyzes our food requirements with scientific thoroughness, as shown in Table II.

The "Liberal Diet" presented in this excellent study was "computed from diets adapted to the needs of individuals in different age, sex, and activity groups, and from the number of persons in each group as shown by the 1930 census." It fully covers the annual requirements for maintenance and growth and allows a margin of safety as well. Moreover, the items and quantities specified have been closely related to our past production. Correct food habits are basic to good health, and this fundamental requisite is assured by the "Liberal Diet." After multiplying these individual items by

125,000,000, Table III shows how they compare with 1929 production.

TABLE III

Comparison of 1929 Production with "Liberal Diet" Needs

000 Omitted

Item	Production (lbs.)	Budget (lbs.)	Budget Deficit (−) or Excess (+) (lbs.)
Flour, cereals	30,704,428	12,500,000	18,204,428+
Whole milk	98,698,000 *	176,375,000 *	77,677,000−
Butter	2,142,312	4,375,000	2,332,688−
All potatoes	20,405,670	19,375,000	1,030,670+
Dried beans, peas, nuts	2,167,070	875,000	1,282,070+
All other vegetables	23,840,388	30,750,000	6,909,612−
All fresh fruits †	24,293,862	45,125,000	20,831,000−
Fats (other than butter)	4,708,000	1,875,000	2,823,000+
Sugar and sugar products §	5,038,550	7,500,000	2,461,450−
Beef	4,849,410	7,000,000	2,150,590−
Pork ‡	8,669,620	8,375,000	294,620+
Lamb and mutton	681,530	750,000	68,470−
Veal	774,823	1,000,000	225,177−
Poultry ¶	1,574,079	2,250,000	675,920−
Fish	2,140,200	1,625,000	515,200+
Eggs (individual)	31,276,630	45,000,000	13,723,370−

* Including whole milk for butter.
† Including fresh grapes and plums for dried raisins and prunes.
‡ Including bacon and salt pork.
§ Not including imports.
¶ Wild game not included.

In addition to revealing both shortages and excesses, this comparison indicates quite clearly that the nation has relied far too much upon starches, sugars, and fat meats. This verdict is reinforced when sugar imports (9,761,778,000 pounds during 1929) are considered.

Custom and economic necessity take first place among the several factors influencing food habits. Cereals, fats, and sugars have dominated our diet because they were inexpensive and generally considered wholesome. Moreover, our cereal surplus, easily stored and shipped, was well adapted to foreign trade. Thus wheat, the leading "cash" grain, has always been allotted a large share of farm acreage, the area increasing from 20,470,000 acres in 1866-75 to 73,700,000 in 1919. Exports grew in even greater ratio, being 19,173,-

000 bushels in 1852-56 and 366,077,000 bushels in the peak year, 1921 (both figures include export flour calculated as wheat).

Corn, the chief "feed" grain, is the most productive cereal farmers can grow on an extended scale. This fact is reflected in the areas devoted to corn: an annual average of 37,216,000 acres during the period 1866-75, a peak of 116,730,000 acres in 1917, and 97,806,000 acres in 1929. Average annual yields have ranged between 20.4 and 30.2 bushels per acre. Very little of this huge production has served directly as human food. It was fed to livestock. By and large, swine make the most economical use of feed grains in producing edible meat. Therefore, it is not surprising to find pork now outranking all other meats in the American diet. This growing disproportion is well illustrated by the actual production figures, shown in Table IV.

Table IV

Meat Production—1929 *

	Yearly Average	Total Production Pounds †	Per Capita Consumption Pounds ‡
1910–1914	All meat (excluding lard)	13,776,000,000	139.2
"	Pork (excluding lard)	6,361,000,000	61.7
"	Beef	6,109,000,000	63.8
"	Veal	552,000,000	5.8
"	Mutton and lamb	711,000,000	7.4
1926–1930	All meat (excluding lard)	16,854,000,000	137.8
"	Pork (excluding lard)	8,798,000,000	69.8
"	Beef	6,501,000,000	55.0
"	Veal	858,000,000	7.2
"	Mutton and lamb	696,000,000	5.8

* Source: "Statistical Abstracts of the United States," 1933, U. S. Department of Commerce.

† Including estimated but uninspected slaughter.

‡ Balanced for exports and imports.

Lard production and consumption have followed the same course. The United States used 11.5 pounds per capita annually during 1910-1914 and 14.0 pounds as a 1926-1930 average. Moreover, lard exports increased from 519 million pounds annually for 1910-1914 to 758 million during the 1926-1930 period.

This digression has sketched, in very brief and broad outlines, the influence of custom and certain economic forces in determining land utilization for food crops and livestock, particularly those aspects of past production which underlie the chief disparities shown in Table III. The world depression, the steady growth of nationalism and tariff barriers, and the financial disability of American agriculture have finally destroyed the utility of farming precedents.

Therefore, in presenting a plan for a feasible and more adequate utilization of our agricultural plant, this survey neither violates tried and satisfactory working traditions nor imposes unnecessary changes upon our 6 million farmer-entrepreneurs.

Since "capacity" for any individual item of food is almost unlimited if it is considered separately, the sum of all food requirements must be known and correlated before a method of land utilization can be recommended. Also, the required acreage for the non-food crops—cotton, flax, tobacco, hemp, broom corn, etc.—must be taken into account.

Table V is a preliminary summation of acreage requirements under the budget.

The figures in this table are preliminary because they merely measure acreage in terms of 1929 average yields and compare the total area involved with current improved land resources. In other words, following closely the 1929 scheme of land utilization, and with that year's per-acre production, the unused but improved acreage alone was sufficient to meet the livestock and human food requirements of the liberal diet budget.

This is very far from the whole story however. It is even more important to know what additional changes in plant operations are necessary to increase efficiency, to lessen input

TABLE V

Preliminary Table of Land Utilization to Meet Budget *

Item	1929 Acres	"Budget" Acres	Acreage Increase over 1929 Requirement
All grains †	223,164,000	228,515,000 ¶	5,351,000
All hay	70,603,000 ‡	94,408,000	23,805,000
Annual legumes‖	6,360,000	5,087,000	1,273,000 (decrease)
Hops	25,000	25,000	
Peanuts	2,001,000	2,001,000	
Sugar cane and sugar beet, etc.	1,306,000	2,153,000	847,000
Cotton	45,793,000	54,633,000 §	8,840,000
Flax	3,047,000	3,047,000	
Tobacco	1,987,000	1,987,000	
All vegetables	7,998,000	8,736,000	738,000
Tree fruits and nuts	6,524,000	6,015,000	509,000 (decrease)
Grapes	674,000	1,202,000	528,000
Other fruits	850,000	866,000	16,000
Total	370,332,000	408,675,000	38,343,000
Grass seeds	3,877,000	4,500,000	623,000

* Source: Worksheet 220, N.S.P.P.C.
† Including sorghum and corn silage.
‡ Including cereals cut for hay.
‖ Cowpeas, field peas, dry beans, velvet beans, soy beans.
§ Based on 1928–32 average production per acre.
¶ Corn yield per acre based on 1919–28 average.

of labor and power. These increases per unit are another aspect of agriculture's potential capacity. The matter following will consider them in some detail under their individual headings.

MILK. Milk is first in importance, both by reason of the 77-billion-pound gap between peak production and current needs, and because milk excels all other foods as a basic nutrient. It is also the raw material of butter, cheeses, and other dairy products.

The milk supply depends directly upon three factors: the number of milking cows, their individual capacity to produce, and the kind and amount of stock feed available. Only the last item is provided for in Table V.

The national herd of 22,537,000 cows produced an average of 4,427 pounds of milk each, containing approximately 3.98% of butter fat. How nearly did this performance represent maximum production per cow? If adequate rations had been provided for every animal, what increase is indicated? There is no detailed record of the feeding methods of the 4,453,000 farmers reported as keeping cows or heifers for milk production on April 1, 1930. However, the production from cows kept in dairy herds of fifty or more may be taken as a safe maximum reflecting the result of good care and proper feeding. This average figure, 5,810 pounds, applied to the 22,537,000 cows "in milk" during 1929, gives a possible total of 130,939,970,000 pounds, but this "immediate potential" is nearly *46 billion pounds short of the nation's requirements.*

To meet the national requirements, the number of cows must be *increased* by 17,263,000 head if calculations are based on the actual (average) production per cow in 1929; by 13,294,000, if only the additional animals are considered as being kept in dairy herds and yielding 5,810 pounds of milk each; and by only 7,900,000, if the yield of *all* cows were raised to the productive level of the 1929 dairy herds.

In Table V, stock feeds (grain and forage) were calculated on the second assumption, that the increased plant was to operate at the 1929 level of efficiency of the dairy herds. Except in the case of wheat, it was furthermore assumed that the 1929 production of stock-feeds was utilized by that year's livestock, cattle, and other domestic animals. Thus, the required increases to meet the budget can be treated separately without having to readjust 1929 land utilization to each change. The feed needs of 13,294,000 additional dairy cows were calculated from the Food Administration formula given in Henry and Morrison, "Feeds and Feeding," where cows producing annually between 5,000 and 6,000 pounds of 4%-butter-fat milk were considered.

Disregarding the production possibilities of herd improvement through selection and breeding, how quickly could 13,-294,000 average milk cows be added to our dairy plants? The U. S. Census of April, 1920 reports 8,744,000 heifer calves "on farms and born during 1929." Of this number, 4,777,000 were estimated as being kept for milk cows on January 1, 1931. On the same date, 4,882,000 heifer calves less than one year old were being kept for milk cows. Thus, there is an indicated disappearance of approximately 4 million heifer calves annually. At least 75% might have been retained for milk production—an annual increase of nearly 3,000,000. So by this method six years[1] should be sufficient to meet the milk budget.

This involves a working herd of 35,841,000 average animals. Any discussion of dairy-products "potential" should include a survey of the results that can be achieved through proper selection and breeding. Records of more than 200,-000 cows compiled by the Bureau of Dairy Industry show that these animals, in dairy-improvement associations, averaged 7,464 pounds of milk and 295 pounds of butter fat annually. Many individual records exceed 20,000 pounds of milk, and butter production per cow has gone beyond 1,000 pounds. At present, only about 2.2% of our milk herd is on test. A sustained program of selection and breeding could lift the annual milk production to 8,000 pounds per cow within 15 years, and to 12,000 pounds per cow within 20 years. Table VI summarizes these findings.

Table VI

Cows Needed for an Annual Production of 176,325,000,000 Pounds of Milk *

Average Production per Cow (lbs.)	Total Needed Number	Time Required Years
4,427	39,000,000	5
5,810	30,437,000	8–10
8,000	22,168,000	15
12,000	14,700,000	20

* Source: Report No. 243, N.S.P.P.C.

[1] Four years to produce the total number and two years for the last calves to "freshen."

Beef and Veal Production. The 1929 production of beef animals was 11,690,155,000 pounds, or 5,020,845,000 pounds short of the live-weight needed to furnish the budget requirement of 56 pounds of "dressed retail cuts" per capita. The average weight of beef animals slaughtered in 1929 was 955 pounds. This would indicate a need for about 5,257,000 additional beef animals. However, in meeting the milk requirement by an increase of more than 13 million cows with an average milking life of 6 years, approximately 2,216,000 would be slaughtered annually. This number would decrease as the average productivity was raised.

Giving these over-age cows a slaughter weight of 725 pounds and taking the annual number as 2,216,000, there would still be a deficit of 3,410,000,000 pounds of live-weight. To supply this, about 3,789,000 beef steers weighing 900 pounds would be needed. Since approximately half of all calves "dropped" are bull calves, the expansion of the dairy herd as indicated above would provide this number. In a long-time correlation of beef and milk production, the entire beef supply above the amount contributed by over-age dairy cows should come from animals raised for food purposes and "finished off" at about 1,000 pounds live-weight.

The veal shortage, 456,201,000 pounds live-weight, requires 3,041,000 animals averaging 150 pounds each. Fed the recommended ration, whole milk, from birth to slaughter, these calves would consume the output of about 354,000 cows yielding 5,810 pounds each. This number is included in the total of 13,294,000 given above.

Since five years are required to expand the dairy herd, more immediate methods of increasing the beef and veal supply have been examined. These involve the better "finishing" of beef animals slaughtered (an average increase of 20 pounds for 12,241,000 heads) and a one-year decrease in the live-weight of slaughtered veal to the same amount, i.e., 1,400,000 head at 175 pounds each, these calves to be fed to 600 pounds and marketed the next year, thus providing an additional 840,000,000 pounds of beef. Increased breeding can add at least 1,418,750 head of veal within a two-year period. If half this number were carried to 600 pounds before slaughter (adding 635,628,000 pounds to the inventory) and the remainder slaughtered for veal (adding 123,140,000 pounds) this would add 758,768,000 pounds to our beef and veal inventory, which can be used to satisfy the demands of our budget.

These figures are summarized in Table VII.

Table VII

Beef and Veal Production *

	Total Number of Animals Slaughtered: Farms, Packing-Houses, etc.	Average Live-Weight per Head Pounds	Total Live-Weight Pounds
(1929 Production)			
Beef	12,241,000	955	11,577,223,000
Veal	8,313,000	176	1,563,799,000
(First-Year Potential, after Initiating Budget)			
Beef	12,241,000	975	12,172,875,000
Veal	7,060,000	176	1,242,650,000
(Second-Year Potential, after Initiating Budget)			
Beef	12,241,000	975	11,934,975,000
Beef	1,400,000 †	600	840,000,000
Beef	709,000 ‡	600	425,000,000
Veal	709,000 ‡	176	124,784,000
Veal	8,313,000	176	1,563,799,000

* Source: Report No. 314, N.S.P.P.C.
† Yearlings from first year's reduction in number of veal calves slaughtered.
‡ Half the increase due to breeding.

These annual gains—roughly 1,265,000,000 pounds of beef animals and 125,000,000 pounds of veal calves—would meet the budget for these items in 4 years.

Lamb and Mutton. Sheep and lambs slaughtered in 1929 totaled 1,490,223,000 pounds live-weight. The budget requirement is 1,650,000,000 pounds. Two years would suffice to reach this figure. The deficit, 159,777,000 pounds, could be met by an increase of 1,997,000 lambs killed at 80 pounds. By retaining 2 million for breeding purposes, the subsequent year's production from these ewes would bring this item of the budget into balance.

Swine. In 1929, a total of 16,415,343,000 pounds live-weight of hogs were killed for pork and lard. This was 2,150,590,000 pounds above our current dietary needs. A suggested method of reducing this surplus is by marketing hogs of lighter weight. The 72,512,000 head slaughtered in 1929 averaged 226 pounds. The same number "finished" at 200 pounds would not only be adequate but would represent a lowered input of feed-stuffs per pound of weight as well as a decrease in the percentage of lard.

Poultry and Eggs. The poultry flock has two functions: it must furnish both meat and eggs. Since the practical laying life of chickens is two years, one-half the egg producers will be killed and eaten annually. These two factors must be correlated in a survey of poultry requirements. Chickens are the great source of poultry supply, as 1929 figures, given in Table VIII, show.

How should this poultry supply be manipulated to produce

Table VIII

1929 Production of Poultry Meat *

	Total Number	Average Live-Weight Pounds	Total Weight Pounds	Edible Meat Pounds
Chickens raised	673,092,000	....	....	....
Chickens consumed on farms	161,650,000	5.0	808,250,000	491,577,556
Chickens sold alive or dressed	284,626,000	5.0	1,423,130,000	872,514,937
Ducks raised	11,237,000	5.0	56,185,000	31,408,000
Geese raised	3,990,000	10.0	39,990,000	26,931,000
Turkeys raised	16,794,485	11.5	193,137,000	146,784,000
Total			2,520,692,000	1,569,215,493

* Source: Report No. 390, N.S.P.P.C.

Table VIIIa

1929 Egg Production (Chickens only)†

		Average Eggs per Hen	Total Egg Production
Laying flock	378,878,000	85.2	32,276,630,000
Estimated number of eggs used for hatching			1,000,000,000
Available for consumption			31,276,630,000

† Source: Report No. 576, N.S.P.P.C.

annually the 45 billion eggs and 3,375,000,000 pounds live-weight of birds that are called for by the budget? Here, too, capacity must be expressed as a coördinated whole. Moreover, the productivity of laying hens varies widely; breed strain, general care, and feeding, all influence output. Neglecting the possibilities in selective breeding, 108 eggs per hen are taken as the immediate potential resulting from full feeding for maximum production. Thus, the basic laying flock should number 416,667,000 hens and pullets.

In order to follow as closely as possible the 1929 pattern while expanding the production of poultry meat, the additional live-weight needed (after calculating the supply from laying stock killed) is assigned to broilers, turkeys, ducks, and geese in direct proportion to the 1929 inventory. Table IX gives the figures.

Table IX

Two-Year Poultry Meat Potential *

	Total Number	Average Live-Weight Pounds	Total Weight Pounds
Over-age hens	208,333,500	5.0	1,041,667,000
Breeding flock (source of hatching eggs)	12,601,000	5.0	63,005,000
Broilers	780,584,000	2.5	1,951,460,000
Ducks	3,639,000	5.5	20,014,000
Geese	815,000	10.0	8,150,000
Turkeys	25,267,000	11.5	290,570,000
Total			3,374,866,000

* Source: Report No. 390, N.S.P.P.C.

This program presents no difficulties to poultry raisers beyond the necessity of hatching and brooding the additional birds, either by mechanical means or by permitting a larger number of broody hens to set. Obviously, too, the heavy emphasis upon "broilers" is somewhat arbitrary and any long-range schedule of production can easily be brought into direct line with public taste.

Finally, the fecundity of the laying flock can be increased by proven methods of breeding and selection. The Connecticut Egg Laying Contests, conducted annually since 1914, illustrate this possibility. Farmer contestants reached an average of 229 eggs per hen in 1933. General application of their poultry methods requires a maximum of twenty years and reduces the basic laying flock more than fifty per cent. The U. S. Department of Agriculture (Farmers' Bulletin 877) has calculated that the yield from one crop-acre of farm staples will produce 122.4 dozen eggs when fed to poultry. In other words, an average acre supports 13.6 hens laying at the rate of 108 eggs each, yearly. As ninety per cent of the food consumed goes to bodily maintenance, if our laying flock were reduced by 208,000,000 birds, between twelve and thirteen million crop-acres would be released for other use.

VEGETABLES. Though Table IV shows only a small increase in vegetable acreage needed to meet the budget, there is actually a considerable shift away from starchy and highly nitrogenous crops (potatoes, beans, and dried peas), and practically all truck crops require increases.[1]

[1] The U. S. Census does not report either the acreage or the pounds of vegetables produced in farm gardens for home use. Hence, the 1929 production and acreage figures include an estimate for farm gardens. This was made as follows: The Census (1930) gives the farm value of all truck crops harvested for sale in 1929 as $295,963,373. It also gives the total value of vegetables grown in farm gardens for home use only (not including white or sweet potatoes or yams) as $226,046,413. Combining both values ($522,009,786) and taking the percentage of this total representd by $226,-046,413, establishes an approximate figure of 43%. This was the basis for calculating farm-garden production, except in the case of celery, which is

Because commercial seed-houses figure closely in contracting for their anticipated needs, lack of seed appears as a limiting factor in first-year potential. This could be corrected in one crop season.

FRUITS AND TREE NUTS. The great bulk of the fruit crop (85%) is produced in orchards or vineyards, which do not reach bearing age for several years (the interval varies) after planting but remain productive for long periods. The U. S. Census of Agriculture does not report either the acreages in these several fruits or the age of trees or vines. Those of bearing age and those not yet bearing are reported separately by number. With this information, it is possible to assign approximate acreages by dividing the number of trees or vines grown commercially on an acre into the reported number of trees or vines.

In calculating the budget acreage needs as given in Table V and X, average yields per tree represent conservative estimates based upon L. H. Bailey's "Cyclopedia of American Horticulture," Samuel Fraser's "American Fruits," the horticultural experience of Mr. M. G. Kains, and publications of numerous experiment stations. Because citrus-fruit production is already highly commercialized, the actual 1929 yields have been taken as potential production per tree. The conservative nature of all these potentials is well illustrated by reference to these yields, which have been attained in large scale production: apples (Western N. Y.), 418 lbs. per tree average; apples (Washington), 350 lbs. per tree average; plums, 300 lbs. per tree average; grapes, 26 lbs. per vine average.

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a highly specialized crop—1929 production for sale being increased only 10% in this case.

Undoubtedly, such a method may be far from accurate in its picture of individual crop-acreages but it is felt that errors should more or less balance each other and that the estimate of 2,040,858 acres for the 4,360,652 farms reporting home gardens is an acceptable figure. Production per acre in these farm gardens is assumed to equal that of commercial growers, and the calculations for acreage changes were based upon reported 1929 yields.

TABLE X

Tree and Other Fruits

Comparison of 1929 Acreage with Budget Requirements *

Item	1929 Deficit	Estimated Deficit When Young Trees Reach Bearing Age	Additional Trees and Vines Required Number		Assumed Yield per Tree
	Lbs.	Lbs.	Trees or Vines	Acres	Lbs.
Apples	7,647,010,000	375,040,000	3,261,226	93,180	115
Pears	566,340,000	422,776,000 (excess)			96
Peaches	1,466,004,000	2,066,312,000 (excess)			72
Grapes †	4,340,000,000	3,731,015,000	287,001,000	527,570	13
Oranges	507,900,000	738,280,000 (excess)			160
Grapefruit	598,350,000	278,720,000 (excess)			152
Limes and lemons	433,344,000	402,284,000	1,764,400	20,750	228
Plums	1,401,500,000	58,205,000	808,400	8,084	72
Total	16,960,448,000	1,060,456,000			
Bananas	4,500,000,000	4,500,000,000			
Deficit	21,460,448,000	5,560,456,000		18,400 ‡	
Less apricots ‖	432,000,000	579,760,000			
Less cherries ‖	186,880,000	389,880,000			
Net deficit	20,841,568,000	4,590,816,000			
Other fresh fruits §	1,550,241,000	1,550,241,000		15,400 ‡	
Grand total	22,391,809,000	6,141,057,000		33,800	

* Source: Worksheet No. 220, N.S.P.P.C.
† Vines.
‡ Net figure, balanced for excess and assuming banana import (1/3 average in grapes, 1/3 in pears, 1/3 in apples).
‖ Not specified in diet, hence considered as "excess."
§ Includes bush berries, cantaloupes, watermelons, pineapples, etc.

The wide adaptability of apples and grapes, which represent the major indicated deficits, brings the fruit requirement within easy reach. Moreover, the immediate expansion of truck-fruit acreage (cantaloupes, berries, etc.) will take care of those temporary deficits that are now chargeable to young trees. As the latter reach bearing age, the production of annual and small fruits could be diminished.

Thus this essential category presents no real problem to American horticulture. Neither the acreage demands nor the new nursery stock required will tax our national resources. Incidentally, the present acreage in tree nuts will exceed the budget when young trees reach bearing age.

FARM MECHANIZATION AND ACREAGE DEMANDS. Before presenting a more adequate system of land utilization, it is essential to look at the effects which follow when trucks and tractors are used in farming. For a brief summation of past results, it will suffice to quote from page 18 of the report of former President Hoover's Committee on Recent Social Trends.

This committee found that the "use of the gas engine has reduced the number of horses and mules by 10 million during the past fourteen years, thereby releasing about 30 million plough acres and large areas of pasture." Yet the 1930 census figures indicate that 5,024,713 farms (80%) had either horses or mules totaling 19,699,000 head. Fewer than 900,000 farms possessed tractors and only 845,345 farmers drove trucks! Clearly, our agriculture is in the power age, but not of it.

Without considering the human labor released, what crop acreage can be freed for other purposes by added mechanization? Not all farms are adapted to tractors and trucks. Moreover, the replacement is not usually complete. A conservatively practical method of calculation has been followed in determining the horses or mules which should be eliminated.

In 1929, horses averaged roughly one to each fifty acres of farm land. The 2,555,174 farms (of 100 or more acres in extent) with a combined area of 832,137,000 acres, were 83.4% of the U. S. farm total. How much of this vast area may be worked with tractors? Table XI was used to determine this.

TABLE XI

Farms of All Types

Estimated % Adapted to Tractors, etc.	Size of Farms in Acres	Number of Farms	Total Acreage	Estimated Number of Horses, Total *	Estimated Horses or Mules Released by Mechanization
50	100 to 174	1,342,927	180,213,727	3,604,275	1,802,138
75	175 to 259	520,593	110,264,530	2,205,291	1,653,968
80	260 to 499	451,338	156,521,810	3,150,362	2,520,290
85	500 to 999	159,696	108,924,022	2,178,480	1,851,708
90	1000 and over	80,620	276,212,832	5,522,256	4,970,030
				16,660,664	12,798,134 (76.8%)

* Based on an average for the entire U. S. of 50 acres per horse or mule. (No reduction for acreage covered by 920,021 tractors.)

If horse-mule replacement by tractors and trucks were complete, in accordance with the estimated number of farms adapted to mechanization, the indicated number would be 12,798,134 head of horses or mules.

Estimated horses or mules released by mechanization (maximum)....	12,798,134
Assigning one team per farm to 1,529,277 farms having tractors but still requiring some horse or mule power........................	3,058,554
Indicated practical horse or mule replacement.....................	9,739,580
Indicated new tractor units needed..................................	1,529,277

Lacking data that would provide a basis for calculation, the number of draft animals replaceable by farm trucks has been assumed to be 110,420, to make a total round figure of 9,850,000.

An average maintenance ration for horses or mules at medium work[1] indicates that the accompanying figures can be safely used:

Annual Ration per Head			Total Savings for 9,850,000 Head
Food	*Pounds*	*Total Pounds*	*Acres* @ 1929 *Av. Yields*
Corn	2,408	23,718,800,000	15,000,000
Oats	800	7,880,000,000	8,074,000
Hay	2,000	19,700,000,000	7,137,000

CROP ROTATION—THE BASIS OF A SOUND AGRICULTURE. Even with this significant release of acreage, the ratio of so-called "cultivated" crops to forage is far from ideal. A permanent soil-building program must include a larger proportion of leguminous hay. Destructive soil erosion, leaching, and continued low yields per acre will penalize an ever-increasing number of farmers if they adhere to the old exploitative scheme of "soil mining."[2]

An obvious and desirable means of narrowing the crop ratio, without acreage expansion or a reduction in stock feeds, is suggested here. Only 16,674,000 acres of wheat are

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[1] Bulletin No. 1463, U. S. Dept. of Agriculture.

[2] The U. S. Bureau of Chemistry and Soils reported in 1930 that "something like 17,500,000 acres of land that were formerly cultivated in this country have been destroyed by gullying . . ." In addition, three or four million acres of rich bottom land have been buried under sand and gravel. The certain impoverishment of farmers in such stricken areas is recognized as a very serious challenge to American agriculture.

needed to supply human demands under the "Liberal Diet." In the preliminary table of land utilization, Table IV, 62,-671,000 acres are devoted to wheat, the apparent excess being assigned to livestock, chiefly dairy cows and poultry, which receive 7,258,000,000 pounds of wheat.

Careful feeding experiments show that alfalfa hay or meal will adequately replace wheat bran, pound for pound, where other concentrates are fed in the ration. This substitution, at 1929 per acre yields, would release 8,400,000 wheat acres for alfalfa production. Moreover, total stock-food would be increased. Where local conditions dictate the growth of other legumes, these, too, will meet the feeding requirements.

Table XII shows the allocation of improved land to meet our budget.

Table XII

Improved Land Utilization to Meet Budget

(Giving effect to increased mechanization and better stock rations)

(000 Omitted)

Item	1929 Acres	Table IV Acres	Recommended Acres
All Grains..............	223,164	228,515	197,041
All Hay................	70,603	94,408	124,382 *
Cotton.................	45,793	54,633	54,633
All Others..............	34,772	33,218	33,218
Grass Seeds............	3,877	4,500	6,000

* This utilization indicates an excess of hay. In actual practice much of this acreage could be used for semi-permanent pasture, thus reducing labor input for stall feeding of livestock, as well as permitting rapid soil improvement and increased use of green manure.

It is hardly necessary to point out the tremendous advantages inherent in such a method of land utilization. It is close to the ideal ratio, 3.2, which permits the farmer to keep his land in soil-building legumes two out of every five crop-years. Today, the returns from acreage so handled far exceed "average" production in the same locality. General fertility, drought resistance, workability and soil aëration are all enhanced enormously. Such a cropping system must underlie a healthy program for American agriculture. Moreover, it opens the way to the discussion of "potential" yields—yields which are within the reach of every farmer and will lift this all important occupation to a real parity with other productive elements in the national life.

Because this study has not introduced hitherto unknown and revolutionary practices—startling ways of suddenly stepping-up production—the question naturally arises as to why six million industrious farmers, anxious for maximum returns, have consistently chosen relatively inefficient methods. Inadequate purchasing power outside the farming population has undoubtedly restricted *total* production. A variety of economic factors have accentuated this restrictive tendency and prevented full and equitable exchange of goods between urban and rural producers. Yet these influences could not prompt a particular farmer to raise less grain *per acre*, or breed and keep scrub cows. Nor can the farm population as a whole be said to lack information on this subject. The U. S. Department of Agriculture, competent state experiment stations, and trained county agents have cooperated in pointing the way to better methods. Today, most farmers know what these methods are.[1]

The sharply limiting factor has been, and still is, the immediate necessity of quick cash crops or feed grains which can be converted readily to cash. Food habits and the export market have dictated what these money crops should be. Long-range plans for soil and livestock improvement have yielded to the daily demands of farm households. Moreover, good farming practices often involve considerable initial expense—outlays which a hard-pressed agriculture could not or dared not make in the face of uncertain prices and weather conditions. Finally, as the western prairies, vast and relatively fertile, were opened up, their exploitation presented no immediate problems in soil management. Eastern farms

[1] Witness the fact that agricultural production per worker increased 28% between 1919 and 1929 (largely due to a 100% increase in available power per worker) and the steady growth of herd-improvement, corn-growers', poultry-breeders', and other associations.

suffered under the pressure of this new competition, which left them still less margin for investment in better farming. Millions of abandoned acres in the East, and the drought-scourged great plains,[1] should signalize the end of *laissez-faire* farming in America.

Farming at Potential Capacity. It is not difficult to envisage a correctly functioning farm plant. Before submitting a blueprint, however, let us look more closely at the four main agronomy crops: corn, wheat, oats, and cotton. In 1929, they covered two out of every three acres harvested and required a tremendous input of labor and power. Potential yields per acre demand careful scrutiny and ample documentary support. The volume of material used for reference (data from state experiment stations, the U. S. Department of Agriculture, farm associations, authoritative literature, and varied private sources) is too extensive to list here.

The figure of potential corn yield, 64 bushels per acre, is based upon data covering ten states (Illinois, Missouri, Nebraska, Ohio, Indiana, North Carolina, Alabama, Kentucky, Michigan, and Mississippi). The average long-time yields (three to fifteen years) of many areas were averaged to reach this final figure. Good practical farming methods are assumed; crop rotation, return of manure (where available), and the use of 400 pounds per acre of 4-8-4 fertilizer[2] on those acres that are at present deficient in nitrogen, phosphorus, and potassium.

Comparison with the results achieved by many farmers shows that 64 bushels is a conservative estimate. The state

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[1] Eastern Montana, southwestern North Dakota, western South Dakota, Nebraska, and Kansas; eastern Wyoming, Colorado, and New Mexico, and a part of eastern Kansas and western Missouri.

[2] This analysis will vary with soil requirements, but fertilization is "economical" on quite productive lands. Thus nine Illinois soil groups making an average of 47 bushels per acre untreated, showed an average increase of 18.7 bushels from the use of 800 lbs. of lime, 400 lbs. of rock phosphate and 200 lbs. of Kainite.

average of the Indiana and the Iowa corn-growers' associations is 78 bushels per acre. Commercial hybrids have yielded as much as 156 bushels. The record corn yield is 256 bushels. With a corn requirement of 3,080,465,000 bushels, this amount could be grown on 48,132,000 acres, releasing 55,-771,000 low-yield acres.

In estimating the wheat "potential," data from ten states (Missouri, Kentucky, North Carolina, Nebraska, Kansas, Indiana, Illinois, Ohio, Montana, and Idaho), were combined in reaching the average, 27 bushels per acre. Four hundred pounds of 2-12-6 fertilizer is the assumed application. The average yield of the check (untreated) areas was 15 bushels per acre—the 1928-32 U. S. average being 14.4 bushels—an indication of the basic soundness of these long-time cropping tests. Thus, the average unit increase actually obtained (11.9 bu.) is clearly applicable to wheat areas of the United States in general. For better seed selection, 0.7 bushels has been added.[1]

Wheat yields of 43, 56, 64, 75 bushels are frequently obtained. The *average* production in Denmark is above 40 bushels. Idaho farms have exceeded 90 bushels, with yields known in excess of 120 bushels. The relatively low potential reflects the fact that much of our wheat is grown under semi-arid conditions, where available moisture is a limiting factor. The budget requirement, 41,496,380,000 pounds, can be produced on 25,615,000 acres, releasing 28,656,000 low-yield acres.

The potential capacity to produce oats is 51 bushels per acre.[2] Space limitations forbid even a brief discussion of this figure. The methods of calculation are substantially those outlined above. Thus, after deducting 8,074,000 acres (for

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[1] Indiana and Michigan "variety" tests give an average increase of more than 10% for the three best-yielding wheats over the average of all selected wheats.

[2] The Ohio Experiment Station, in a letter to the author dated April 13, 1934, estimates that good farming practice in that state would raise the average yield to 52.5 bushels per acre.

mechanization) the budget requirement is 17,156,000 acres —nearly 21 million under 1929.

THE COTTON POTENTIAL. Few monarchs have ruled with such an iron hand as King Cotton. The dominance of one cash crop, cotton, has prevented a balanced agriculture in the Southern States—only an immense supply of cheap labor, and relatively deep and fertile soils, could sustain an economy so devoted to a single "soil-mining" crop. Though the boll weevil must share the blame, it is a significant fact that average production has fallen from 184.9 pounds per acre in the decade 1890-1900, to 154.8 in the ten-year period ending in 1929.

Quite naturally, then, the cotton potential seems comparatively high, 400 pounds per acre. Yet no crop has been studied more carefully. Data covering six states were examined: Mississippi, Alabama, Kentucky, North and South Carolina, and Texas. Six hundred pounds per acre of 4-8-4 fertilizer are recommended. Tests of 22 Mississippi soil areas may be instanced as showing that this rate of application is highly practical. Eight soils (untreated), yielding within 25% of the state average, required 3.6 pounds of fertilizer to produce a pound increase of lint; 7 soil areas (untreated) yielding 25% less than the state average, required 3.7 pounds per pound of lint increase; 7 soil areas, exceeding the state average by 25% or more, required 3.3 pounds per pound increase.

In 1929, the average cost of fertilizer per pound applied to cotton was 1.5¢. The farm price of cotton lint was 16.4¢ per pound. Six hundred pounds of 4-8-4 fertilizer were applied in each instance. (In 1929, only 18,182,000 acres of cotton received any commercial fertilizer. The average application was 266 pounds per acre.)

By dropping 32,233,000 low-yield acres from the provisional allotment of 54,633,000 acres given in Table XII, the budget requirement of 8,959,800,000 pounds of lint can be produced on 22,400,000 acres.

THE HAY POTENTIAL. Without direct fertilization or other treatment beyond liming to correct soil acidity, the indicated hay yield is 2.1 tons per acre. The calculated increase (63%) is based on tests in five states where the check areas produced an average of 1.19 tons, which compares with the 1928-32 U. S. average of 1.28 tons.

Data are available which indicate that other crops (rye, sorghums, etc.) entering the suggested rotation would show large yield increases. These have not been calculated with sufficient accuracy to warrant setting a definite potential. The 1929 average yields are assumed in land-utilization figures given in Table XIII.

TABLE XIII

Land Utilization with Main Agronomy Crops Yielding at Potential Capacity

(000 Omitted)

Items	1929 Acres	Potential Acres
Grains		
Corn	97,806	48,132
Wheat	62,671	25,116
Oats	38,148	17,156
Others	24,539	23,793
Sub-Total	223,164	114,197
Hay	70,603	124,382*
Cotton	45,793	22,400
All Others	34,772	33,218
Grand Total	374,332	294,197
Grass Seeds	3,877	6,000

* Hay and semi-permanent pasture.

AGROBIOLOGY AND THE FARM PLANT. Recent findings of agrobiology are outside the scope of this survey, but the implications behind such research are too far-reaching to be neglected entirely. Very briefly, such studies present the productive capacities inherent in farm plants under optimum conditions for growth. By empirical methods it is calculated that 318 pounds of nitrogen may be taken (and usefully absorbed) from one soil acre by the most powerful plants[1] during a single growing season. Using this figure as a numerical constant for all plants, extreme limits of productivity are calculated—based upon the actual nitrogen content of each plant. Thus corn, containing about 1.2% nitrogen (dry weight) has an indicated yield maximum of 26,500 pounds, 42% representing clean grain, or approximately 225 bushels. Applying the same formulæ to other field crops establishes the ultimate yields. It is interesting to list the more important ones, together with the approximate acreages each would occupy in meeting the budget.

TABLE XIV

Land Utilization at Perultimate Yields

(Acres required for Grains and Cotton to meet Budget)

Item	1929 Acres	Perultimate Yield per Acre	Acres Required for Budget at Perultimate Yields
Corn	97,806,000	225 bu.	13,700,000
Wheat	62,671,000	171 bu.	4,045,000
Oats	38,148,000	395 bu.	2,208,000
Cotton	45,793,000	4.6 bales	3,800,000

Such calculations assume farm control of both moisture supply and fertility and in some cases assume a power of growth beyond the most prolific varieties which plant breeders have produced *so far*. Whether these maxima are ever fully reached is unimportant. The arresting fact is that American agriculture has operated at a very low level of efficiency, and that ample technical knowledge exists today for raising unit capacities enormously. This new technique is already being applied by many farmers and the long trend is unmistakably toward high-unit production.

Regional results, which bear this out, are obscured by

[1] The most "powerful" plants are those varieties of any given species which achieve the calculated maximum of growth—i.e., usefully absorb and retain in combination as part of their physical structure 318 pounds of nitrogen per acre.

nation-wide averages where the extensive methods of most western farming are reflected in low per-acre yields. New England potato culture affords an excellent example. Per-acre yields in this area have risen from 85 bushels in 1885-89 to 155 for the five-year period 1925-29, against an average for the entire country of 121 bushels.

High-unit yields mean decreased costs for labor, seed, and farm equipment, and in the absence of unexploited fertile areas, competition will inevitably force the adoption of more and more intensive methods. Paralleling this development enormous areas of marginal land must either be withdrawn from crop production or furnish hopelessly inadequate returns.

Thus, the entire question of farm capacity, no matter how considered, appears as a series of interrelated productive factors. There is no problem of under-capacity, either for individual items or *in toto*,[1] but a wide field of inquiry is open to those who would define the political steps which will lead to a balanced, functioning agriculture.

In summation, then, very definite conclusions may be drawn from this survey of our agricultural plant. We discover that past production has readily kept pace with national demands for food and the raw materials of clothing, as limited by effective purchasing power. When this production is compared with the per-capita requirements for a liberal diet, quite striking discrepancies are revealed. Cereals, sugars, and fats have been produced in excess, concealing—where they could not offset—shortages in the sup-

[1] Both lack of space and the absence of comprehensive data on farm labor prevent a full discussion of this phase. Suffice it to say that man-power is fully available to meet the Budget with 1929 unit yields prevailing. (Witness the opinion expressed in "Recent Social Trends" that an increase of 33% per worker in agricultural production "seems wholly possible.") Tremendous reduction in man-power requirements is implicit in farm mechanization and in operations carried on at potential-yield levels. Thus experiment-station data from five wheat-growing states indicate an average labor input of 15 man-hours per acre of wheat. At "potential capacity" 25,615,000 wheat acres represent a labor saving over 1929 of more than 43 million man-days. For corn, the equivalent figure is roughly 175 million man-days.

ply of milk products, green vegetables, poultry, and lean meat.

It is equally clear that this disproportion can be corrected without involving additional improved acreage or forcing American farmers to adopt uncongenial methods of production. Moreover, the time required to make these changes is certainly not greater than the interval which will be needed to guide our population to proper eating habits. As these are developed under an educational campaign and the demand for milk, butter, eggs, fruits, etc. expands, our farms will unquestionably maintain a supply which will prove ample.

In spite of relatively backward technical methods and uncoördinated production, our agricultural resources have always been more than adequate for a rapidly growing population. Today, with modern knowledge and equipment at hand, this vital activity opens wide the gateway to an era of genuine abundance.

William B. Smith

CHAPTER III

FOREST PRODUCTS

TIMBER. The wood, or forest-products, industries stand in a unique position in our national economy, since forest timber, the raw material, may be considered as both a recurrent and a non-recurrent resource.

Had the timber been scientifically cut and not recklessly wasted, the continental United States would have contained sufficient standing timber to supply many times the present annual national need for wood. As reasonable forest conservation and replacement procedures were not followed, we today find ourselves in a position where the 1929 rate of cut cannot be maintained.

The forests of the United States are estimated to have originally occupied 822,000,000 acres. In 1929, there remained[1] 138,000,000 acres of virgin forest; 250,000,000 acres bearing "culled," "second-growth," or trees too small to cut; and 81,000,000 acres of burned or "logged-off" land. This indicates that some 353,000,000 acres of the original forests have been removed from the forest category and presumably placed under cultivation, leaving 469,000,000 acres available for use as producing forest.

For any consideration of the future wood supply, the relation between the annual removal of timber from the forests and the annual growth of timber is complicated by the unpredictable effect of reforestation now under way. An estimate[2] of the present annual growth is presented in Table I.

Neglecting the effects of reforestation and improved forestry, the nation can, without ultimately destroying our pres-

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[1] Tariff Readjustment, 1929, "Hearings," Vol. XV, Washington, D. C.
[2] *Ibid.*

TABLE I

Area Available for Forestry Development in the United States

	Area Utilized (Acres)	Annual Growth (Cubic Feet)
Present Forests	250,000,000	6,039,000,000
Present Forests under crude development	331,000,000*	10,146,000,000
Present Forests, under crude development, ultimate (including virgin forests)	469,000,000	13,878,000,000
Present Forests, under intensive development (including virgin forests)	469,000,000	27,408,000,000
		Annual Cut
Virgin Forests	138,000,000	10,747,000,000

* "Crude development" includes the draining of swamps, etc., which at present renders certain acreage unavailable.

ent forests, count on an annual production of only 6,039,000,000 cubic feet of timber for lumber, paper pulp, cordwood, timber and all other wood products. This is only 35% of our present annual total timber disappearance (or requirements), and the remaining 65%, or 10,747,000,000 cubic feet, is now drawn from our dwindling supply of virgin timber, thereby reducing the possibilities of future timber supply. Obviously, *reforestation is a national necessity.*

The foregoing figures of annual growth of forests indicate that, if the uses of wood existing in 1929 are to be continued at the present rate—though not increased except as population increases—it will be necessary for the nation to place the whole cut-over and virgin-forest area remaining available (469,000,000 acres) under intensive development. Such development necessitates not only reforestation of the cut-over and burned-over land, and elsewhere as needed, but also demands application of the best forestry methods to the existing stands of timber.

Should the 1929 forest drain be continued without this intensive development, it can only result ultimately in the total destruction of our American forests. Considering saw timber only (other uses such as pulp, fuel, and chemical, can be supplied from the younger trees which are not suitable for saw timber), there remains a virgin stand of 1,346 billion board feet,[1] approximately equal to 366 billion cubic feet. The present drain of timber of saw timber quality approximates 10 billion cubic feet annually.

These figures indicate that, should saw timber be drawn wholly from virgin stands and not in part from second growth (as is actually the case at present), and should we continue using the same quantity of wood as we do now, the virgin timber of the United States would disappear in about forty years.

The possibilities of afforestation will not be considered here in detail. Undoubtedly, there will be considerable extension of the movement to retire marginal farm lands by planting them to forest. The ultimate result of this will be to add an indefinite but large area to the 469,000,000 acres of existing forest, which will make available an additional supply of timber some fifty to sixty years hence.

TABLE II

1929 Timber Drain on the Forests of the United States

Use	Production Cubic feet	Production Value
Timber used by sawmills	7,733,775,000	$459,622,223
Firewood	4,002,635,000	254,607,612
Posts, ties, masts, poles, hewn-timber ties, etc.	1,560,199,000	86,466,229
Pulp-wood	588,666,000	58,531,060
Veneer logs	230,607,000	5,520,732
Cooperage industry	302,699,000	7,246,614
Manufacturing industries	156,575,000	3,748,406
Shingle mills	138,558,000	3,317,079
Excelsior	20,943,000	501,375
Wood-Distillation industry	36,367,000	870,626
Tanning Extract industry	26,173,000	626,582
Total	14,797,197,000	$881,058,538
Imports (added)	63,800,000	17,708,000
Exports (subtracted)	138,645,000	15,287,000
Total used in United States	14,722,352,000	$883,479,538
Destroyed by fire, pests, etc.	1,810,899,000	
Total forest drain, 1929	16,533,251,000	

[1] Senate Document No. 12, "A National Plan for American Forestry," 1933, Washington, D. C. (In converting timber stands, which are estimated in cubic feet, into the equivalent board feet of lumber they would yield, the U. S. Forest Service uses a factor of 5.46 for soft-wood lumber and 4.13 for hard-wood lumber.)

During the period 1919-29, the timber removal from our forests, by use and waste, has averaged slightly over 16 billion cubic feet per annum. In 1929, this production and its value were as given in Table II.[1]

Manufactured Wood Products. The production of wood products and products for which wood is the raw material, such as pulp and tanning extract, cannot be rightly considered without notice of the increasing use of substitute materials. In twenty-five years the per-capita use of lumber has, roughly, been cut in half. This trend continues and should be borne in mind.

The 1929 production and value of the principal products made from wood, according to the reports of the Census of Manufacturers, is shown in Table III.

Table III

1929 Primary Output of Wood Manufactures

Product	Production	Value
Lumber	36,886,032 M ft. b. m.	$993,738,084
Lath	1,705,858 (1000 pieces)	5,905,524
Shingles	6,110,657 (1000 pieces)	18,018,588
Cooperage, Veneer		207,819,785*
Boxes (except cigar boxes)	370,878 M cu. ft.	135,025,675
Planing mill products	1,566,417 M cu. ft.	553,583,498
Baskets, rattan, and willow ware (not including furniture)	36,875 M cu. ft.	22,851,043
Cork products	201,000,000 lbs. cork	23,034,329
Total		$1,959,976,526

* Production quantities of cooperage and veneer, as given in the Census of Manufactures, cannot be separated.

The above table does not include products of the wood-distillation and tanning-extract industries, which are included in the study of chemicals; nor the products of the wood-preserving industry, which is a chemical treatment applied to poles, ties, and timbers (products of the wood-preserving

[1] Senate Document No. 12.

industry, valued at $190,000,000 in 1929); nor paper pulp.

In 1929, products made from the above partially finished materials (but not including furniture which is considered separately) had the values shown in Table IV.

TABLE IV

1929 Secondary Output of Wood Manufactures*

Product	Production	Value
Billiard Tables, Bowling Alleys, etc.	....	$8,821,363
Cigar Boxes	....	12,459,425
Lasts and Related Products	48,941 M ft. b. m.	7,689,555
Matches and Toothpicks	....	20,351,025
Mirror and Picture Frames	....	19,237,897
Models and Patterns (except paper)	30,188 M ft. b. m.	30,621,000
Ice Boxes and Accessories	127,553 M ft. b. m.	60,483,000
Papier Maché, Vulcanized Fiber, etc.	....	27,219,892
Window and Door Screens, etc.	....	24,451,700
Handles, other turned wood, etc.	97,257 M cu. ft.	69,619,900
Total	....	$280,954,757

* Source: Census of Manufactures, 1929.

Furniture production, which was valued at $948,000,000, in 1929, is increasingly less dependent upon lumber as a raw material. Hence, although the furniture industry has a capacity twice as great as the 1929 production, and though this capacity will be utilized if we undertake the new construction to meet the existing housing needs,[1] no great increase in the wood supply is needed for a full utilization of our furniture-manufacturing facilities. Steel, aluminum, alloys, plastics, and various combinations of materials are being increasingly used as wood substitutes. Any likely restriction of the supply of lumber will not prove to be a "bottleneck" to the furniture manufacturer.

The same remarks hold true for most other non-construction lumber uses. Cigar boxes can be made of tin plate or paper-board. Metal picture and mirror frames can be as decorative as wood, and have a longer life. Metal door and

[1] See Chapter X, "Construction."

window frames, screen frames, moldings, all are increasingly popular. Metal ice-boxes are superseding the old-time wooden box. The paper match is now general, and though made from wood-pulp, constitutes no serious drain on our high-grade timber. Past experience with a continually decreasing supply of wood has already prompted manufacturers to provide substitutes that assure against any restriction in consumer goods due to a lack of wood as a raw material.

Any consideration of American capacity to produce lumber and other manufactured wood products must be based on the strictly limited supply of timber available from the forests. As no one can accurately foresee the results of reforestation activities now under way, or the changes in demand caused by substitution trends at present evident, it is impossible to forecast with any accuracy what the timber supply may be a generation hence.

What we do know about capacity is that, all other considerations aside, we can continue the 1929 drain on our forests for another thirty-year period. As already cited, this drain averaged 16 billion cubic feet of timber each year, for the ten-year period 1920-29. Approximately 6 billion cubic feet of this total included the wood used by the paper and chemical industries, firewood, and the waste through fire and pest. The remainder, about 10 billion cubic feet, represents the timber that forms the raw material for the lumber mills and other wood-product plants. Hence, the consumption in 1929 of 9,886,000,000 cubic feet by the lumber and other wood-products industries, would indicate that these industries were operating at 98.8 per cent of the capacity possible for the next thirty years.

From a machinery standpoint, trends in this industry indicate that wood-products plants operated at close to machine capacity on the single-shift basis in 1929. The total machine capacity of the industry has been decreasing for some time. In 1919 there were some 33,000 lumber and sawmill establishments, while in 1929 this number had decreased to 19,000 (of which about 57% were obsolete). There was a trend toward larger units, but this in no way compensated for the loss in machine capacity. This was accompanied by a reduction of 75,000 wage earners.

On a two-shift basis (the highest level of operation safe to assume while still providing amply for maintenance and other unavoidable non-operating time) the capacity is twice the 1929 production. However, any such figure has little meaning, since the only way in which we could obtain raw material for such a continuous output would be to import from Russia or from one of the few other heavily forested regions. Importation of timber in large quantities is not feasible because of the bulk and relatively low value of the material. Imports of wood products will necessarily continue, as at present, but will be largely confined to rare woods such as mahogany and teak from the tropics, or to finished or semi-finished products such as wood-pulp from Sweden.

No attempt has been made to estimate our requirements for wood if we are to supply an adequate standard of living to the population. This is because our supply is strictly limited, and because we can depend for expansion upon the use of substitute materials.

For necessary lumber for residential construction, the budget requirement is 12,200,000,000 feet board measure. As 36,000,000,000 feet board measure was the production for 1929, there is evidently ample wood for this purpose, if steel and other substitute materials are used to satisfy other fields—such as heavy construction, concrete-form work, and boat building—now dependent upon lumber.

GRAHAM L. MONTGOMERY

CHAPTER IV

MINERALS AND MINERAL PRODUCTS

It needs no extensive acquaintance with the rise of civilization to recognize the essential part the minerals have played in man's history. No one knows now whether husbandry or stone working was developed first, but together they made possible a settled community life and such social progress as has been achieved.

Of these two, mineral development is perhaps the more important to civilization. It is conceivable that man could have made some progress in agriculture without rising much above the primitive level, but his distinguishing characteristic, that of being a tool user, probably rests on the recovery of metals.

But, in all likelihood, the stage of stone working existed for millenniums before the first metals were utilized. Man since then has made progress at a relatively accelerated pace, until about 150 years ago, when the Industrial Revolution initiated the "machine age," which is totally dependent upon the mineral products—iron, copper, zinc, and the like—for the essential materials of machine construction.

Minerals can be considered as falling into two broad general classes: *A*, metals and *B*, non-metals (including fuels, which are, however, treated separately in Chapter V). Table I gives the production, production value, production capacity, and reserves of the important items of both classes.

The deposits of raw material for the mineral industry are, for the most part, ample for all present needs. However, it should be kept in mind that ore bodies are wasting assets. Once mined, they are irreplaceable. Conservation of these

TABLE I

Minerals—1929

(000 Omitted)

			Production*	Value at Mine	Capacity*	Reserves
REP†	45	Iron ore	73,028	$197,334	80,000	2.3 billion long tons (Lake Superior only)
WS‡	53	Molybdenum	1,952	2,259	2,000	Ample
WS	53	Titanium	No published figures			Mainly import
WS	53	Vanadium	No published figures			Mainly import
WS	53	Chromium	None mined in 1929			Import
REP	131A	High-grade manganese	60	1,612	300	Limited—mainly import
WS	45	Copper	1,006	283,517	1,030	Ample
REP	43	Lead	672	67,561	700	Limited—29% of consumption is "secondary," or reclaimed from scrap
WS	61	Zinc	725	44,866	800	Ample
REP	38	Gold (oz.)	2,208	26,107	......	Limited — much is by-product of other metals
WS	47	Silver (oz.)	61,327	32,497	......	82% is by-product of other metals
WS	49	Mercury (flasks)	24,000	2,820	26,000	Limited—38% imported
REP	117	Aluminum	112	31,000	200	14% of consumption imported—27% "secondary"
REP	67	Bauxite	366	2,455	400	Limited—50% imported
REP	129	Antimony	3	548	......	By-product of lead—14,435 tons imported, 11,131 tons "secondary"
REP	109	Nickel	None	....	......	All imported
WS	76	Platinum (oz.)	47,977	3,064	......	Domestic production is all "secondary" and equals 25% of consumption
WS	74	Tin	None			Imported
WS	78	Arsenic	14,546			By-product of Lead. Reserves are ample and quickly expansible
WS	76	Cadmium	1.4	2,509		Limited

* Long tons, unless otherwise noted.
† "REP" means N.S.P.P.C. report. ‡ "WS" means N.S.P.P.C. worksheet.

reserves, and economy in the use of metals, are precautions necessary to the protection of future generations.

Reserves of ores of the grades at present being mined are limited, but ore that was not considered worth mining twenty years ago has since been found valuable because the methods of ore treatment have been improved. Some forty years from now, when iron-ore bodies now being mined become exhausted, it is certain that other methods for economical extraction of iron from the huge deposits of low-grade ores will have been perfected. In other cases, substitutes for metals now used will have been developed and adopted long before scarcity becomes apparent.

Another factor to be considered in connection with the

TABLE IA

Minerals—1929

(000 Omitted)

			Production*	Value at Mine	Capacity*	Reserves
WS‡	40	Limestone	100,686			
WS	40	Granite	10,827			
WS	40	Basalt	14,872			
WS	40	Marble	554			
WS	40	Sandstone	5,790			
WS	40	Misc. stone	8,380			
WS	69	Slate	670	$11,245	779	Ample
WS	73	Clay (for sale only)	4,347	14,851	4,770	Ample. Some imports of kaolin
WS	41	Sand	99,253	60,801	—	Ample
WS	41	Gravel	123,319	72,035	—	Ample
WS	63	Gypsum	5,016	5,740	5,950	Ample
WS	54	Abrasives	145	3,381	165	Adequate
WS	58	Asbestos	3	350	4.7	99% imported
WS	57	Asphalt (natural)	804	5,467	1,022	Adequate, with residuum asphalt
WS	59	Barytes	276	1,840	296	Limited
WS	60	Feldspar	198	1,277	228	Ample
		Fluorspar	146	2,791	176	Ample
WS	64	Fuller's earth	316	4,310	—	Unlimited
WS	42	Magnesite	188	1,501	218	Ample; considerable import
WS	43	Mica	7	404	9	Ample
WS	68	Phosphate rock (long tons)	3,822	13,376	4,075	Ample
WS	70	Silica	428	4,645	462	Ample
WS	67	Sulphur	2,362	42,042	2,600	Ample
REP†	127A	Pyrites	333	1,250		By-product
WS	72	Salt	8,544	27,335	—	Ample
WS	75	Talc (sales)	220	2,629	236	Ample
WS WS	66 71	Miscellaneous		34,354		

* Short tons, unless otherwise noted.
† "REP" means N.S.P.P.C. report.
‡ "WS" means N.S.P.P.C. worksheet.

supply of mineral raw materials is that certain of these, such as nickel, tin, and cobalt, at present necessary in our economy, are totally or partially lacking in the United States. Ample reserves of these products exist elsewhere in the Americas and in Asia. At present, imports supply all our needs.

In addition to the mineral reserves of the United States and those of other countries upon which the United States can draw, "secondary" metal, reclaimed from scrap, provides a large and constantly increasing reservoir of many metals. In a like manner, second-hand building stone and similar mineral products can be used for many purposes.

Metallic iron is destroyed by rust, and zinc and lead in the form of paint cannot be reclaimed; but the total quantity of articles in use—such as machinery, lead-covered cables, lead batteries, and copper wire—has steadily increased, giving us a constantly greater tonnage of equipment that has become obsolete and therefore available for remelting for

Table II

Influence of Scrap Metal

Production of Metals from Domestic Ores. Total Net Import and Consumption of Scrap.

(Short tons—000 Omitted)

	Metallic Aluminum				Metallic Copper			
Year	Domestic	Net Imports	"Secondary"	Ratio of "Secondary" to Domestic	Domestic	Net Imports	"Secondary"	Ratio of "Secondary" to Domestic
1926	72*	22	44	.61	870	93†	480	.56
1927	80	24	46	.57	842	139‡	490	.58
1928	105	11	48	.45	913	189†	536	.59
1929	112	14	48	.43	1001	12†	627	.61
1930	114	3	38	.33	697	32	467	.67
1931	89	4	30	.34	521	14	347	.67
1932	42	5	24	.57	272	31	248	.91

(Long tons—000 Omitted)

	Metallic Lead				Metallic Tin			
Year	Domestic	Net Imports	"Secondary"	Ratio of "Secondary" to Domestic	Domestic	Net Imports	"Secondary"	Ratio of "Secondary" to Domestic
1926	680	76‡	277	.41	0	78	43	
1927	668	36	276	.41	0	72	46	
1928	626	39	309	.49	0	80	36	
1929	672	49	311	.46	0	89	31	
1930	574	30	256	.45	0	80	16	
1931	390	31	235	.60	0	65	9	
1932	255	9	198	.78	0	35	6	

* More than 50% of domestic production is from imported ore.
† Export exceeded import.
‡ Department of Commerce figures.

Year	Iron Ore Used per ton of Pig Iron (Long tons)	Scrap Used per ton of Pig Iron (Short tons)	Scrap Used per ton of Steel Produced (Short tons)
1926	1.763	0.165	0.185
1927	1.765	0.179	0.187
1928	1.747	0.180	0.282
1929	1.750	0.178	0.243
1930	1.730	0.203	0.194
1931	1.652	0.210	0.289
1932	1.496	0.256	0.359

Production

(Short tons—000 Omitted)

Year	Steel	Pig Iron	Steel from Scrap
1926	48,294	39,373	8,921
1927	44,935	36,566	8,375
1928	51,544	38,156	13,388
1929	56,433	42,614	13,719
1930	40,699	31,752	7,947
1931	25,945	18,426	7,515
1932	13,681	8,781	4,900

Note: In 1929, The Bureau of the Census showed a consumption of 41,462,214 tons of pig iron and 37,127,848 tons of scrap in the steel industry, including the pig iron industry.

the reclamation of the contained metals. The importance of this "secondary" metal as an addition to the supply can be seen from Table II.

Even more striking are the published figures of The Bureau of the Census for 1929, which show that, in the blast-furnace and steel industry (exclusive of iron and steel manufactured by automobile makers) 41,000,000 tons of pig iron and 37,000,000 tons of scrap were consumed. It is likely that, if a sudden expansion of metal production becomes necessary, the supply of scrap now on hand could take care of the increase until mines and plants were enlarged and developed.

Labor supply is a possible limiting factor in mineral production and must be considered along with reserves of ore and the necessary mining plant. While minerals that can be extracted mainly by mechanical means constitute a large percentage of the total, many important minerals exist only in underground deposits and must be worked by underground operations. In this underground work, the tonnage per miner has materially increased through the use of machines, and additional mechanization is to be expected. However, any material increase in the output of metals could only be had by increasing the number of men employed.

In this matter of labor, the soft-coal industry is at present over-manned. Experience shows, unfortunately, that these surplus workers could not be transferred *en masse* to "hard-rock" mines because most of them do not make good hard-rock miners. The supply of foreign miners which has furnished the majority of miners in many districts, notably the Lake Superior iron ranges, is not now available as it was in the past.

A miner's work is hard and, unless he is carefully trained, dangerous. New men cannot be trained in a short time and it can be definitely stated that the output of underground mines is limited by the available labor supply. This limitation is not effective in the case of stone quarrying, nor for ores mined by quarrying or "open-pit" work, nor for other operations where the use of large equipment will yield an increase of output with the same or less labor.

Obsolescence is not an important factor in the supply of ores and other raw-material products. The majority of large mines and quarries use modern equipment, for which replacements to any great extent are not at present needed. The tendency has been steadily towards a consolidation of the control and ownership of mining properties. As a result, it has been possible to install the most efficient machinery, and to replace equipment promptly as new processes or machinery have been perfected.

Each mineral has individual characteristics of occurrence, treatment, and use which affect its availability. Therefore, the most important are here considered individually, particularly the metal-smelting and refining industries.

Iron and Steel. Major production of iron ore is now, and for several years to come will be, from the Lake Superior region in Minnesota, Wisconsin, and Michigan. The reserves of ore of the grade now being used are fairly well known and the end of these ores can be rather definitely forecast. These reserves are estimated to be around 2.3 billion long tons and will last from thirty to forty years.

The generally unknown and interesting factor in the Lake Superior district is the possible utilization of the reserves of ore containing about thirty-five per cent iron (more than the present European ores) but in a condition that, under methods known at present, does not permit its use.

The ore at present shipped from the Lake Superior region is steadily decreasing in grade, and an increasing amount of it must now be "concentrated" before shipping. The magnetite deposits of the eastern Mesaba Range have been developed and constitute a large reserve for future exploitation. There are no large reserves of magnetite ores in the eastern United States. There are, however, large reserves in Alabama. In the West, notably in Utah, are considerable reserves, not yet exploited to any marked degree. From the standpoint of reserves of ore, there is no limit on the production of iron and steel.

From the practical standpoint of ability to operate the mines, the Lake Superior district is limited by shipping facilities; the southern mines by the increased depth of workings, and the eastern magnetites by the size of the ore body. It seems that our practical capacity to produce iron ore at the present time, taking into account the impracticability of all-year shipping from the Lake Superior district, is not over 80,000,000 long tons per year. At 1.5 tons of ore per ton of pig iron, this would give us 53,330,000 tons of pig iron.

The capacity of blast-furnace and steel plants is carefully determined each year by the American Iron & Steel Institute. This estimate does not include the capacity of plants long idle; nor, on the other hand, does it allow for the unavoidable shut-down for repairs nor for the necessary relining of furnaces each year.

Some long-idle plants are capable of being used and therefore it is possible to maintain a production of pig iron close to capacity estimates. On account of the dismantling of blast-furnace plants during the last four years, capacity to produce pig iron is over one million tons less than it was in 1929, but our capacity to produce steel has increased by some five million tons. There is, however, little likelihood of a serious "bottleneck" to steel production from a lack of pig iron, since the scrap-iron market as well as the long-idle (but not dismantled) plants could be drawn upon temporarily in case of need. The production figures for pig iron and steel are sure measures of activity in the steel industry.

According to census figures, of the 56 million tons of iron and steel ingots produced in 1929, only some 7 million tons of semi-finished and 40 million tons of rolled-steel products were sold, the balance representing remelted scrap consumed by the steel plants.

With regard to plants utilizing rolled steel, available figures on capacities are inadequate. Many plants producing one article could quickly be converted to make some other article. Some steel-product plants, which worked but one shift in 1929, could adopt a double shift and double their production.

The annual report of the Steel Founders Society of America for 1930 contains the statement that "one of the great disturbing factors is the existence of huge excess capacity. Operations during 1929 only filled foundries to two-thirds noted capacity." The same condition is quite usual in most of the industries manufacturing finished goods from steel and iron.

It is therefore conservative to assume that the 1929 ratio of steel production to capacity could be applied to the steel-products industries, and that the ratio of pig-iron production to capacity could be applied to the industries using mainly pig iron. This means that since there is ample capacity to mine, smelt, and refine iron ore, sufficient iron and steel products could be manufactured to meet the requirements of the American people.

The most important secondary materials used in making steel and other alloys are manganese, silicon, chromium, nickel, beryllium, tungsten, vanadium, and molybdenum. Reserves of most of those materials are small or entirely lacking in the United States. However, this situation does not put any undue limitations upon the supply of alloy steels, for only small quantities of these metals are needed and these quantities can readily be supplied by importation.

COPPER. The capacity to produce copper from the ore depends mainly on the milling capacity. During 1929, while only one per cent of the mines worked less than 300 days, the majority of the mills worked three shifts per day. The production of ore in 1929 was close to mine capacity although there are other copper deposits where mines could be opened, if needed. Additional milling capacity can be quickly secured by temporarily overloading the existing mills.

The United States formerly exported much copper. Owing to the development of the large and rich South African ore bodies and the construction of refineries abroad, this export demand is a thing of the past. Hence the existing capacity to mine and refine copper in the United States has become more than ample to meet any prospective domestic demands.

Copper-smelter output in the United States approximates domestic mine output. The "output of refined copper," which is generally quoted, refers to "electrolytic copper" only and does not include the fire-refined product (mainly from Michigan ore), nor the large quantity of copper scrap that does not pass through the refineries. Estimates given here of practical capacity include 1,200,000 tons of electrolytic copper plus 250,000 tons of scrap, plus 200,000 tons of fire-refined —a total of 1,650,000 tons.[1]

LEAD. The reserves of lead ore in the United States are limited and domestic production will probably lessen in the near future. Although production could be increased temporarily, this increased production could not be maintained. Lead production is also affected by the production of the ores of copper, zinc, and silver, in which lead is a minor constituent. This by-product lead may play a larger part in total production, particularly if silver mining increases.

Our capacity to smelt lead is based on an analysis made by Mr. W. R. Ingalls and does not include secondary lead,

[1] American Bureau of Metal Statistics.

which does not pass through the refineries. This capacity, given as 850,000 tons, contrasts with 1,239,000 tons as of December 31, 1932, a figure published by the American Bureau of Metal Statistics and based on the number of furnaces reported by operating companies.

ZINC. Reserves of zinc are ample. The recent introduction of "selective flotation" in complex ores, which permits the separation of zinc as a zinc concentrate, has converted what was a liability into an asset, and has enormously increased the workable reserves. About twenty per cent of the total zinc is mined and consumed as zinc oxide and does not appear in the figures of metallic zinc. Like lead, a great deal of zinc comes from mixed ores, and hence the total production of this metal is somewhat dependent upon the production of silver, lead, and copper.

Capacity to refine zinc is usually given in terms of retorts, but all retorts cannot be used continuously, and many are reported obsolete. The introduction, in 1929-30, of continuous distillation plants will, in all likelihood, make all the older retorts obsolete. The present theoretical annual capacity is 932,000 tons of metallic zinc. The probable effective capacity, according to Ingalls, is 850,000 tons. Secondary zinc is of much less importance in the total supply of this metal than are secondary iron, copper, or lead, since much zinc is used in forms that do not permit of recovery.

ALUMINUM. Production and capacity figures are not available in the statistical records, since nearly all American aluminum production is the monopoly of a single company, and the census does not publish figures disclosing the status of a single company. Low electric-power costs are necessary for present methods of aluminum production from bauxite, the aluminum ore used in present processes of refining. This fact has taken the American industry largely into Canada, and retarded its growth in the United States. The United States capacity of 200,000 tons per year, given in the table, is largely an estimated figure.

Aluminum is rapidly finding wider uses and the prospective demand is increasing as new alloys are developed. However, the refining capacity of the world is sufficient to permit the importation of all that may be needed. Also, though bauxite reserves are distinctly limited, aluminum is a major constituent of common clay, and, with the imminent perfection of a method of extracting aluminum from clay, unlimited supplies will become available.

Borax. Deposits of borax are ample but the capacity to reclaim this mineral is limited. The only difficulty in exploiting the borax deposits of the United States rests in their remoteness from consuming centers. Because of this, much borax is imported. No difficulties, however, need be anticipated with the borax supply.

Abrasives. Oil stones, whetstones, emery, garnet, pumice, and flint are the natural abrasives quarried in the United States. There are ample deposits, and the capacity of the plants meets all demands, which are decreasing, as the artificial abrasives of the silicon-carbide and aluminum-oxide types come more into use.

Asbestos. Very little asbestos occurs in the United States, the present supply coming largely from Canada. The world supply is limited, but fortunately substitute materials have recently been developed, and so the future supply of asbestos is not of great importance.

Graphite. The reserves of graphite are ample for future needs. At present, because of lower price, the domestic demand for graphite is supplied from foreign sources. New processes, lately developed, now enable the American deposits to compete with imported graphite.

Building Stone, Sand, Gravel. Ample supplies of a great variety of mineral building products, including stone, gypsum, lime, magnesite, sand, brick- and fire-clays, and gravel are available throughout the United States, and no possibility of shortage need be considered. At present the existing plant is ample to meet all foreseeable demand.

For the future, the most important trend that at all affects the demand for mineral products is the increasing importance of synthetic organic chemical substitutes. Already many small articles, formerly made of metal, are made from "plastics," the artificial resin-like product so familiar in fountain pens and electrical appliances.

Another trend is toward the substitution of one mineral product for another. Concrete supersedes brick and building stone. Light, strong alloys of aluminum and copper supplant iron and steel.

These trends do not, however, indicate any shortage of mineral products, nor any need for an increase in capacity to produce minerals. Ample supplies of both crude and refined mineral products are available in the United States, or can readily be imported to permit the American people to realize an adequate standard of living.

Pomeroy C. Merrill

CHAPTER V

FUELS AND ENERGY

The use of energy from sources other than the human body is an outstanding characteristic of our day. For long ages man depended upon his muscles. Even when augmented by the domesticated animals and the energy of winds and falling water, his supply of energy was not sufficient to provide the requirements of an industrial civilization in the modern sense. In fact, such a civilization did not appear until some one hundred and fifty years ago, when a practical steam engine and larger and faster machines were introduced.

The stored energy of fuels converted into mechanical energy through the steam boiler and steam engine, supplemented by the energy of falling water, sufficed for the early days of the machine age. Some fifty years ago the electric dynamo and the electric motor made electricity available. Gasoline and oil engines, developed about the same time as the electric motor, are supplying an increasing portion of our present-day power requirements.

The growth of the energy supply of our nation is depicted on the accompanying chart, Fig. I. Fuels and electrical energy are considered separately.

THE FUELS

A dependable fuel supply is essential to any modern industrial society. The consumer depends upon it for his domestic heating and cooking. The producer depends upon it as a main source of the power that turns the wheels of industry.

The five forms in which fuel is generally used are (1)

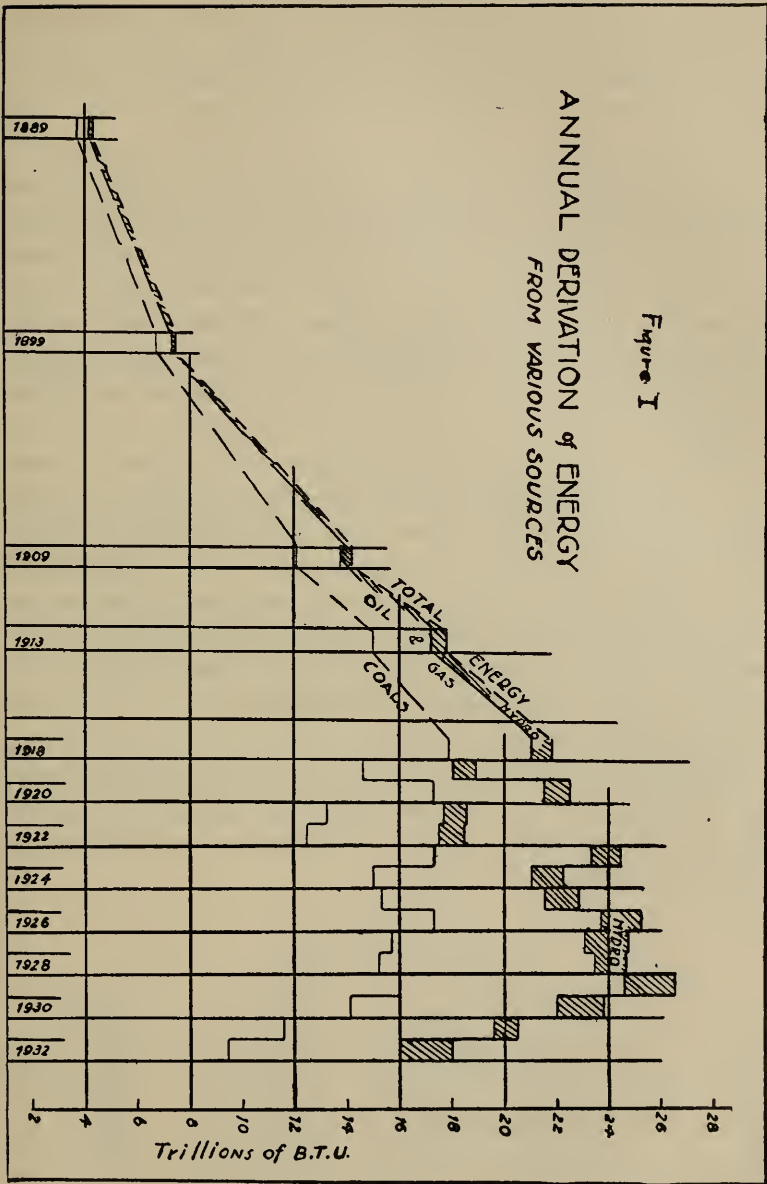

Figure I

ANNUAL DERIVATION of ENERGY FROM VARIOUS SOURCES wood, (2) peat, (3) coal and its products, (4) natural gas, and (5) petroleum products. In this section, only coal, gas, and petroleum will be treated, since they are the only important fuels now utilized in the United States.

COAL. Coal is a fuel which is basic in its social significance, though subject to extremely wide variations in demand. These variations are, in large part, traceable to peculiarities innate to commercial competition. Into this unstable situation, the almost unceasing industrial warfare between miners and operators interjects a disturbing force, of uncertain and unpredictable magnitude, which continually disturbs the equilibrium of society.

But even were the most intelligent management in control, and all controversy over wage rates entirely avoided, the equilibrium of the industry would be constantly threatened by the year-to-year improvement in technology. The constantly lessening amounts of coal required to perform a unit of work create a situation which demands the most intelligent study, involving, as it does, the future security of upwards of half a million wage earners even in such a poor coal-mining year as 1932.

Many other factors, some of which will be touched upon later, enter into this set-up, making it one from which, under our present type of economic organization, there seems no equitable nor reasonable exit.

TABLE I

Production and Value of Coal*

Year	Anthracite (tons)	Value at Mine	Bituminous (tons)	Value at Mine
1927	80,095,564	$420,492,000	517,763,352	$1,029,657,000
1928	75,348,069	393,638,000	500,744,390	933,774,000
1929	73,828,195	385,643,000	534,988,593	952,781,000
1930	69,384,837	354,574,000	467,526,299	795,483,000
1931	59,645,652	296,355,000	382,089,396	588,895,000
1932	49,855,221	222,375,000	309,709,872	406,677,000
1933	49,399,000	....	327,940,000	....

* Source: Worksheet No. 18, N.S.P.P.C.

The marked drop in the production of both bituminous and anthracite coal since 1929 can be gathered from Table I. This drop should not be taken merely as a measure of the industrial inactivity characteristic of the current depression. This downward tendency in coal production can be traced as far back as 1926, or even to 1918, when the all-time production high was attained; but since 1918, the curve representing production has shown a tendency to level off, and the curve representing capacity has steadily dropped since 1923. It would seem that the mining of coal, as it is now conducted, approaches its senescence. But, barring the unexpected development of hitherto unsuspected uses for coal, and assuming that there will be no increase in the demand for coal to heat human dwellings, it is possible that no future demands will ever surpass or even equal the 1929 production.

In that year, 718,537 miners were engaged in the actual production of 609,658,000 tons of coal, while in 1932 only 360,019,000 tons were mined by 527,621 workers. It seems fair to assume that the use of raw coal as a source of heat (or energy) has passed its peak, and that from now on we may anticipate a gradual fall in the rate at which coal need be mined in order to keep the members of our society in comfort—at least insofar as extraneous heat for the body is concerned, or in respect to those needs to which we have become accustomed.

TABLE II

Capacity of Coal Mines*

Year	Anthracite (tons)	Bituminous (tons)	Number of Active Mines†
1927	108,000,000	847,000,000	
1928	105,000,000	760,000,000	
1929	100,000,000	752,000,000	6,057
1930	101,000,000	770,000,000	5,891
1931	100,000,000	736,000,000	5,642
1932	94,000,000	653,000,000	
1933	94,000,000	653,000,000	

* Source: Worksheet No. 18, N.S.P.P.C.

† Exclusive of "wagon mines" producing less than 10,000 tons per year.

A partial exhibit of the number of our coal mines as well as their ability to produce coal is shown in Table II. The lower capacities, shown for years subsequent to 1930, is due to the abandonment, or "flooding," of mines because no profitable market exists for coal during a depression.

In this connection it seems apposite to point out that the Bureau of Mines says, in its mimeographed sheets covering the coal-mining industry for 1933, that "the capacity of mines is given as with the existing labor forces working 308 days a year. . . ." The complete adoption of mechanical mining might affect these estimates favorably, while the institution of a shorter work-year or work-day would affect them adversely. But in any case, and under any economic system, there seems no reason to fear a coal shortage.

The only limit of our national ability to supply our needs for coal is to be looked for in the willingness of men to work at this dangerous and disagreeable task. Our national coal reserves were originally in excess of 1,378 billion tons, of which we have consumed to date less than 28 billion, indicating that if our present rate of consumption were to continue, we need expect no shortage until about A.D. 5700. Some new and totally unexpected demand for carboniferous material may be discovered, but we would still have almost unlimited deposits of lignite, as yet untouched.

Many other factors favorable to the situation exist. Among these are: (1) the increased efficiency in the conversion of raw coal in the ground to usable energy; (2) the better insulation of dwellings, and (3) the utilization of other sources of heat, many of which possess greater flexibility and, in some cases, even greater efficiency. We will consider these separately.

(1) In 1919 we were forced to consume 3.20 pounds of coal to produce one kilowatt-hour of electric energy, while by 1929 this figure had been reduced to 1.62. An almost equal gain in efficiency has been shown by other industrial uses of

coal, as is instanced by the railroads, which in 1927 consumed (for Class-I roads only) 115,183,000 tons, but in 1929, the year in which railroad transportation was at the peak, consumed only 113,894,000 tons, and by 1931 demanded but 81,725,000 tons. This increase in efficiency is clearly illustrated on the graphs, Fig. 2, which are taken from "Coal in 1931,"[1] pp. 455, 456. At the same time, the introduction of coal-undercutting and coal-loading machines has reached a point from which the final complete adoption of such mechanical methods can be envisioned.

(2) Increasing technical proficiency and the resulting surplus of labor make it possible to stop constructing the jerry-built homes which characterized the preceding era. Many of the houses that were built from the end of the Civil War until today were scarcely fit to be called homes for human beings. Constructed hastily of unseasoned lumber, they offered only an ineffectual bar to the heat set free in their clumsy heating-stoves or open grates. Modern technology has pointed out the lack of economy in this practice, and has made detailed studies of the savings that would result if houses were adequately insulated and provided with properly designed central heating plants.

(3) If and when a better era of home building sets in, undoubtedly we as a people will call for the greater convenience, and will demand the by-then-greater economies, of other fuels than lump coal. Already, for heating dwellings fuel oil has made great inroads upon the demand for coal. The use of anthracite small sizes employed in mechanical domestic stokers, and the wider employment of fuel "briquettes," which are made now mainly from culm-bank wastes, mark the drift away from the "commercial" higher-cost sizes of both anthracite and bituminous coal. At present full advantage of this tendency can be taken only by people having the higher

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[1] An annual compilation of coal-mining statistics gathered by the United States Geological Survey, U. S. Department of Commerce.

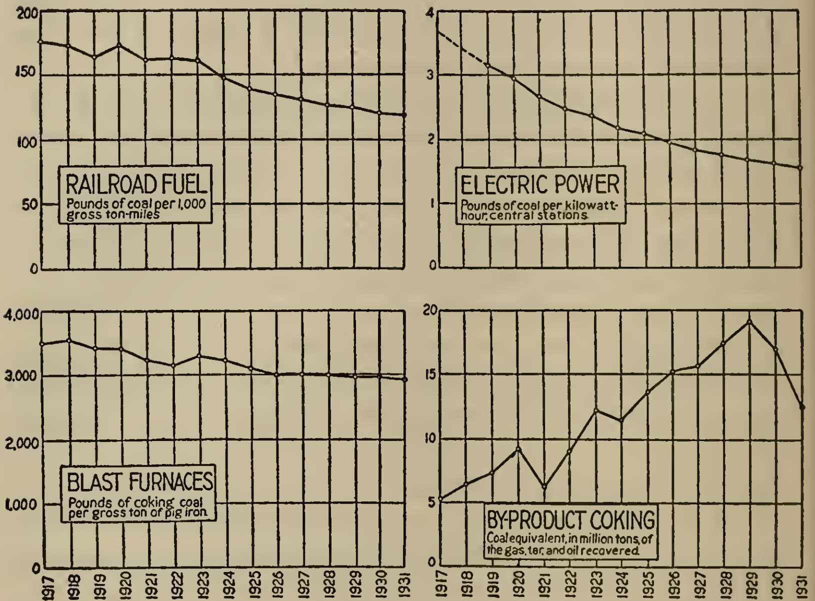

FIGURE 2
Trends in Fuel Efficiency in the United States, 1917-1931

incomes, but ultimately, the adoption of these modern technological improvements should become general.

Even the adoption of electric heating may be looked for, if house insulation is perfected and adequate central station capacity is built.

The crude method of shoveling lump coal onto the grates of a boiler has given way to the utilization in steam generators of pulverized coal, and this present method will undoubtedly yield to even more scientific methods as the technique of using coal develops. The Diesel type of internal-combustion engine develops power at about thirty-four per cent thermal efficiency, which is ten points above the best attainment of a steam-generator-prime-mover combination. Experiments have been run on a "Rupa" motor of the Diesel type, employing pulverized coal. Should these prove successful and the type become generally adopted, it will result in a straight cut of upwards of twenty-five per cent in the amount of coal required for energy purposes. Hydrogenated coal and "colloidal" coal-powder suspended in fuel oil also present an improvement in efficiency whose extent cannot as yet be foretold.

Each of these new methods promises results that may lie far in the future. But in the interim, we can count on several factors which favorably affect the coal situation. Among these are:

(a) Once a balanced industrial economy is adopted, coal mining can be put on a rational schedule, and adequate storage facilities may be supplied to take care of seasonal fluctuations in demand.

(b) Improved methods of mining will eliminate many of its hardships and dangers. Table III, taken in part from the *World Almanac* for 1934, shows the number of men killed or injured in coal-mining operations.

In practically every industry coal is being consumed with increasing economy (or in ways that produce improved results, whether measured in ton-miles of freight hauled, or in kilowatt-hours of electric energy generated per ton of coal). This is no more than is to be expected. As an added instance, however, of the greater economy provided by modern technology, iron manufacture may be cited. In this industry, furnaces have shown a steady increase in size coupled with a constant gain in the economy of operation. As in the case of steam generation, every precaution is taken to utilize all the heat in the fuel. The improvement has been particularly noticeable during the past five years.

Table III

Coal-Mining Accidents*

Year	Total Men Employed	Men Killed	Temporarily Injured	Permanently Injured	Tons Coal Mined per Death
1927........	759,177	2,231			267,078
1928........	682,831	2,176			264,749
1929........	654,494	2,187			278,380
1930........	644,006	2,063	101,093	2,728	260,257
1931........	589,705	1,463	78,871	1,871	301,949
1932........	540,000	1,168			304,000

* The above table indicates a (practically) regularly lessening accident rate through the period covered by this Survey. Complete data, for other than fatal accidents, cannot be obtained.

Table IV

Blast Furnace Consumption of Coke

Year	Pounds of Coke per Ton of Pig Iron
1927..................................	2,122*
1928..................................	2,089*
1929..................................	2,059*
1930..................................	2,047*
1931 (December)......................	1,474†

* Yearly averages published in the Annual Statistical Report of the American Iron & Steel Institute, 1933.

† From a paper presented in 1932 by R. M. McClurkin before the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers.

The *cost* of fuel enters, directly or otherwise, into the production cost of every article manufactured and consumed. The *price* of fuel is, in many cases, the determining factor in all decisions as to whether any industry shall be established, and whether it will succeed financially. If steel furnished the sinews of our modern age, certainly the underlying nervous and physical energy is now to be looked for in coal. Whether society gets what it wants or needs is mainly decided, under our present economic system, by the price at which adequate supplies of coal can be obtained.

By-Products of Coal. Raw coal cannot be used to reduce iron ore to pure iron. It must first be "coked" in order to drive off the volatile constituents. The coke industry is, then, the basis of the iron industry.

In the beginning these by-products were not saved, nor even sought. The cheapness with which coal could be bought in the open market, together with the relatively high prices at which iron could be sold, made concern over these important wastes seem unimportant. But more recently a changing price-structure brought the necessity for technological improvements to the attention of coke users. They discovered a fact that had been known for a long time, that they were wasting products that were fully as valuable as the coke they were producing.

On the basis of this technological discovery (for scientifically the fact of the potential value of the volatile constituents of coal has long been known) an entirely modern industry has sprung up.

The 1929 production and capacity of the products from the coal coked in by-product ovens appear in Table V.

Among the many commodities with which coal by-products supply society are explosives, fertilizers, plastics (such as bakelite, etc.), drugs, paints, dyes, perfumes, and electric insulators. And last, but only for purpose of emphasis, should be mentioned benzol, one of the most important by-products of coal distillation. Millions of barrels of this substance are used to improve the quality of gasoline intended as motor

TABLE V

Coke By-Products

	Production	Capacity
Coke, by-product (tons)	53,411,826	58,701,000
Gas (M. cu. ft.)	843,148,000	926,536,000
Ammonium sulphate or equivalent (lbs.)	1,712,427,835	1,881,788,000
Crude light oil (gal.)	200,594,027	230,323,000
Naphthalene (lbs.)	19,761,382	21,715,000
Tar (gal.)	680,846,366	748,202,600
Creosote (gal.)	26,730,126	29,373,000

Source: Worksheet No. 18, N.S.P.P.C.

fuel, giving it valuable anti-knock qualities. (See section of this chapter on petroleum.) It is difficult to conceive of a modern industrial society existing without any one of the above list.

The process of producing coke and its by-products has not yet been perfected. The results hoped for from low-temperature distillation of coal did not warrant the money spent upon experimentation, but that does not mean that low-temperature distillation holds no promises, especially in the utilization of the lower-grade coals.

CONCLUSIONS. In many sections of the country, natural gas, a by-product of the petroleum industry, seems to have taken the place of manufactured gas as a source of heat, not only for domestic cooking and heating, but as a substitute for coal in firing sheet-steel heating furnaces and in many other industrial operations.

While it is possible to estimate with reasonable certainty the amount of coal that is still in the ground, the extent of our natural-gas supply is highly problematical. If and when our national supply of natural gaseous fuels becomes exhausted, we shall be forced to fall back upon manufactured gas as a source for certain types of "great-flexibility" fuels. However certain it may seem that science will supply us with new materials from other sources to supplement those whose supply has failed, at no time, even if our reservoirs of natural gas prove inexhaustible, can we neglect the mining and proc-

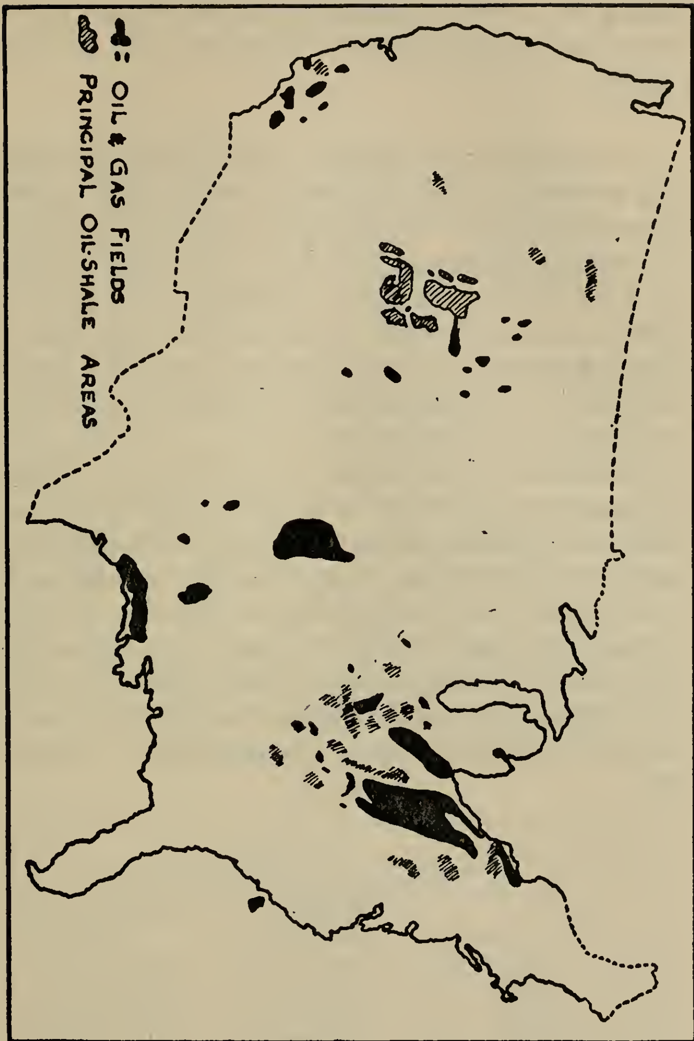

FIGURE 3
Distribution of Oil Fields

essing of a certain amount of coal, for from it are obtained the many highly important industrial materials mentioned above.

PETROLEUM AND NATURAL GAS. The petroleum-producing areas of the United States are both smaller and less widespread than the coal-producing areas, as is indicated by the accompanying map, which shows the oil-producing regions and also the oil-shale areas which are as yet unexploited. Petroleum and its liquid products, such as gasoline, are relatively easy to transport, the system in use being largely based on pipeline transportation of the crude petroleum and its refining in central locations.

Petroleum is most important as the source of lubricating oil necessary to the operation of all machinery and as the source of gasoline used as fuel by automotive equipment and airplanes. In addition, it supplies large quantities of boiler fuel oil, kerosene for lighting and heating, gas oil for enriching water-gas, paraffin wax, and almost innumerable other products in the drug, cosmetic, and chemical categories.

The production in the United States of petroleum and the capacity of refineries to handle petroleum is given in Table VI.

TABLE VI

Petroleum Production and Capacity*

Year	Production (bbls.)	Refinery Capacity† (bbls.)
1927	901,129,000	1,074,976,830
1928	901,474,000	1,185,405,390
1929	1,007,323,000	1,249,215,000
1930	898,011,000	1,385,321,962
1931	851,081,000	1,320,710,890
1932	781,845,000	1,468,514,720
1933	898,874,000	1,520,500,000

* Source: Report No. 8, N.S.P.P.C.
† "Capacity" fluctuates with the end-products desired.

As can be seen from Table VII, there is a considerable ex-

Table VII

Petroleum Imports and Exports*

Year	Imports (bbls.)	Exports (bbls.)	Balance Imports − Exports (bbls.)
1927	58,383,000	15,844,000	−42,539,000
1928	79,767,000	18,966,000	−60,801,000
1929	78,933,000	26,401,000	−52,532,000
1930	62,129,000	23,704,000	−38,425,000
1931	47,250,000	25,535,000	−21,715,000
1932	44,688,000	27,393,000	−17,295,000
1933	32,773,000	36,703,000	+ 3,930,000

* Source: Worksheets Nos. 228 and 229, N.S.P.P.C.

port and import of petroleum which is governed by commercial rather than economic considerations.

Any estimate of the extent of the unexploited deposits of petroleum is beyond the scope of this report. Opinions as to the quantity of oil remaining underground vary greatly. Fifteen years ago it was expected that we would face a severe shortage of petroleum in the present decade. The proponents of the "limited oil fields" hypothesis have now "postponed" the day of oil shortage some fifty years. No one, however, knows how much oil can still be produced. At any time, new methods may be utilized. (In place of flowing and pumping the liquid oil, for example, oil sands may be "mined" and then treated to recover the contained oil.)

The oil-shale deposits of the Rocky Mountain States are estimated to contain in excess of 12,000 billion gallons of oil, a supply that would last between 300 and 400 years at the present rate of production. In any case, the exhaustion of the petroleum supply in the United States is too far off to warrant its consideration in this report. We can assume that the petroleum production, even if demand exceeds the supply, can be readily augmented by the motor fuel produced by the liquefaction of coal.

Considered from the standpoint of the capacity of petroleum refineries to handle crude oil, we find the Table VIII figures pertinent. They show a fairly steady increase.

Table VIII

Refinery Capacity *

Year	Capacity (bbls.)
1927	1,074,976,830
1928	1,185,405,390
1929	1,249,215,000
1930	1,385,321,962
1931	1,320,710,890
1932	1,468,514,720
1933	1,520,500,000

* Source: Report No. 22, N.S.P.P.C.

The rated capacity of refineries fluctuates as to the amount of crude oil that can be handled in accordance with the end-products produced. The capacity of a plant engaged only in "skimming," that is, removing the gasoline from the crude, is much greater than if lubricating oils are being produced.

Another factor that should be considered is the large storage capacity in so-called "tank farms" built up to accommodate the "flush" production that always accompanies the discovery of a new oil field, when, for a period of days, weeks, or perhaps months before the rock-pressure fails and pumping must begin, the new wells spout oil often in uncontrollable profusion.

On May 1, 1931, the capacity[1] for oil storage at "tank farms" and refineries, was 1,002,724,000 barrels, considerably more than an average year's production. Seventy per cent of this was crude-oil storage capacity.

Natural Gas. Natural gas comes either from wells producing oil, or from wells producing gas alone. Table IX shows the production of natural gas in recent years.

This gas was entirely consumed except for relatively small losses. The amount of natural gas used in 1929 for heating and cooking was somewhat greater than the manufactured gas used for the same purpose. Natural gas is transported in pipe lines to consuming areas as far as 1000 miles from

[1] U. S. Bureau of Mines, "Mineral Resources," 1931, Part II, p. 674.

TABLE IX

Natural Gas Production *

Year	Production (cu. ft.)
1927	1,445,428,000,000
1928	1,540,000,000,000
1929	1,917,693,000,000
1930	1,943,421,000,000
1931	1,686,436,000,000
1932	1,555,990,000,000

* Source: Report No. 15, N.S.P.P.C.

the gas field. Considerable natural gas is used for the production of carbon black—a pigment used for paints and which is also used in the manufacture of automobile tires and other rubber products—and in the manufacture of methanol and other chemicals.

Natural gas, as it comes from the wells, contains gasoline vapor, which is condensed out and used as a valuable enricher for distilled or "cracked" gasoline, increasing the volatility and anti-knock properties of the resultant motor fuel. Natural gasoline production and the capacity of refineries to treat natural gasoline are given in Table X.

TABLE X

Natural Gasoline *

Year	Production (bbls.)	Refinery Capacity (bbls.)
1927	38,657,000	67,559,000
1928	42,326,000	88,695,000
1929	52,271,000	86,031,000
1930	52,631,000	91,396,000
1931	43,617,000	98,955,000
1932	35,772,000	103,600,000
1933	33,610,000	106,000,000

* Source: Report No. 22, N.S.P.P.C.

Gasoline is produced either by "skimming" and "topping" petroleum (straight distilling), or by distilling at elevated temperature and pressure ("cracking") various crude oils and petroleum residues. Gasoline produced by ordinary distillation runs from twenty per cent to thirty per cent of the crude oil run to the stills. By the use of cracking stills, gaso-

TABLE XI

Motor-Fuel Production*

Year	Gasoline Distilled from Crude Oil (bbls.)	Natural Gasoline Run through Refineries ‡ (bbls.)	Total Motor Fuel (excluding Benzol) (bbls.)
1927	305,604,000	31,744,000	337,348,000
1928	350,555,000	34,358,000	384,913,000
1929	396,259,000	5,545,000	401,804,000†
1930	398,532,000	43,170,000	441,702,000
1931	404,895,000	35,116,000	440,011,000
1932			402,063,000
1933			406,811,000

*Source: Report No. 8, N.S.P.P.C.
† About 105,000,000 gallons of benzol were used in motor gasoline in 1929.
‡ These figures represent the difference between total motor-fuel and distilled gasoline.

line production can be raised to over seventy per cent of the oil treated.

Table XI shows the figures on gasoline production, on natural gasoline sold as such, and for "total motor fuel"—excluding benzol, a coal by-product mixed with gasoline as an "anti-knock."

Fuel oil and gas oil, being rather similar products of petroleum refining, are classed together in this chapter. In recent years, the production and consumption of these oils in the United States has been as shown in Table XII.

TABLE XII

Fuel Oil and Gas Oil*

Year	Production (bbls.)	Indicated Consumption (bbls.)
1927	393,066,000	339,265,000
1928	427,237,000	383,974,000
1929	448,949,000	420,493,000
1930	372,498,000	365,582,000
1931	336,967,000	336,698,000
1932	294,287,000	307,666,000
1933	313,811,000	321,395,000

* Source: Report No. 10, N.S.P.P.C.

Kerosene is used for heating, cooking, and lighting in rural districts where manufactured or natural gas cannot be obtained. Kerosene is also exported in quantities relatively larger than the exports of most petroleum production. Table XIII gives the production, consumption, and exports of this product.

TABLE XIII

Kerosene*

Year	Production† (bbls.)	Indicated Consumption (bbls.)	Exports (bbls.)
1927	56,113,000	37,491,000	19,537,000
1928	59,353,000	36,235,000	22,034,000
1929	55,940,000	36,032,000	20,022,000
1930	49,208,000	34,736,000	16,884,000
1931	42,446,000	31,296,000	12,712,000
1932	43,836,000	33,221,000	10,956,000
1933	48,921,000	38,840,000	

* Source: Report No. 12, N.S.P.P.C.
† Production data do not represent an addition of Consumption and Exports.

The most necessary, technologically, of all petroleum products—lubricating oils for which no suitable substitutes have been developed—are also exported in considerable quantities. The imports, however, are insignificant.

TABLE XIV

Lubricating Oil*

Year	Production (bbls.)	Consumption (bbls.)	Exports (bbls.)
1927	31,721,000	21,669,000	9,776,000
1928	34,658,000	23,168,000	11,023,000
1929	34,359,000	23,609,000	10,860,000
1930	34,201,000	21,589,000	9,935,000
1931	26,704,000	20,094,000	8,128,000
1932	22,433,000	16,614,000	6,857,000
1933	23,806,000	17,066,000	

* Source: Report No. 11, N.S.P.P.C.

Production of other petroleum products in 1929 attained, according to "Refinery Statistics" of the Bureau of Mines, a total quantity of 40,744,000 barrels. Of these, petroleum coke is most important, being the best material available for the manufacture of electric-furnace electrodes and dry-cells. Only part of this coke is needed for these purposes, the remainder being used as domestic and industrial fuel.

In 1929, the oil derived from petroleum was used as shown in Table XV.

TABLE XV

Petroleum Uses

Use	Barrels
Steamships	92,042,365
Railroads	75,965,760
Electric central stations	10,125,216
Gas utilities	21,306,907
Building heating	24,883,407
At refineries	51,544,000

Gasoline consumption in 1929, according to the same authority, was 372,944,000 barrels, divided as in Table XVI.

TABLE XVI

Gasoline Uses

Use	Barrels
Automotive fuel	299,460,000
Airplane fuel	717,000
Motorboat fuel	18,606,000
Stationary engines, etc.	18,000,000

Much gasoline was also used by agricultural machinery, but no statistics are available.

For the year 1929, the value at the refinery of the petroleum products discussed above is given in Table XVII.

TABLE XVII

Petroleum Products*

Product	Production (bbls.)	Value†
Crude	1,007,323,000	$1,280,417,000
Gasoline (incl. Natural)	441,804,000	1,555,294,000
Gas and fuel oils	428,219,000	381,115,000
Kerosene	55,940,000	173,973,000
Lubricants	34,359,000	275,636,000
Other	40,744,000	86,478,000

* Source: "Refinery Statistics," United States Bureau of Mines, Department of Commerce.

† It is noteworthy that the consumers of gasoline are subsidizing the competitive war with coal by paying high prices per gallon, thus permitting the sale of fuel oil at much lower prices than would be possible otherwise.

The use of petroleum and petroleum products as fuels has grown so fast that it is not possible to make any determination as to requirements for these products, but new refineries can be built in two or three years, as soon as the need for them becomes apparent.

ELECTRICAL ENERGY

The primary energy of fuels is partly used without change of form and partly converted to electrical energy. This electrical energy is reconverted to heat in the electric furnace or the incandescent lamp, or to mechanical energy in the electric motor. Electrical energy thus serves as a convenient form for energy-transmission purposes, but it is seldom used until it is converted to other forms.[1]

Prior to 1900, most industrial plants received their power from steam engines and water-wheels. But from a small beginning in 1887 of 175 million kilowatt-hours, sold mostly for lighting purposes, the central station or electric public-

TABLE XVIII

Installed Capacity and Electricity Generated*

Year	Installed Capacity kw.	Generated kw.-hr.	Generated by Water Power† per cent
1902		2,507,051,000	
1912		11,569,110,000	
1922		47,659,000,000	36.1
1927	25,811,305	80,205,000,000	37.2
1929	28,389,000	97,352,385,000	35.6
1931	32,563,000	92,225,000,000	
1933	33,593,000		

* Source: Report No. 497, N.S.P.P.C.
† United States Geological Survey.

[1] The units in which energy and power and designated are: The power of a steam engine, motor, or water-wheel, in "horsepower"; of an electric generator, in "kilowatts." One horsepower is equivalent to 0.746 kilowatts, one kilowatt to 1.34 horsepower. The energy generated by an engine or water-wheel is expressed in "horsepower-hours" (hp.-hr.), the energy generated by an electric generator is expressed in "kilowatt-hours" (kw.-hr.). Thus the power of water-wheels is given in horsepower, while the power of the generators connected to them is given in kilowatts and the output of these generators is given in kilowatt-hours.

utility industry has grown at an astounding pace, as evidenced in the accompanying Table XVII, which shows for recent years the kilowatt hours distributed by central stations as well as the installed capacity. A small part of this total is from industry-owned plants.

Of developed water-power sites, some offer a nearly continuous flow of water and are classed as capable of producing power ninety per cent of the time. Others can furnish power only fifty per cent of the time, unless larger reservoirs are built. In this latter class, however, generating equipment totaling only sixteen per cent of capacity is installed, while in the first class the installed generating capacity equals forty-two per cent of the possible capacity of the sites.

According to the Geological Survey, installed capacity of water-power plants in 1929 was 13,808,000 horsepower. In 1930 it was 14,885,000 horsepower, and several Federal projects now under way will add considerably more. (It is interesting to note that George A. Orrok, formerly consulting engineer of the New York Edison Company, has estimated that the maximum possible output from the water-power sites of the United States is 123 billion kw.-hr.)

During 1934, new steam-electric central station capacity of 169,450 kw. was completed. The Federal Government expects soon to add 2,500,000 kw. from water-power plants, and new municipal and other projects will add 821,450 kw. Completion of all these projects would make a national electric generating capacity in excess of 37,084,000 kw.

The installed capacity of the generating equipment can be utilized much more fully than at present by securing a more economical utilization of power and light, a better distribution of peak loads, and an improved power-factor.[1]

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[1] "Power-factor" is the ratio between the usable energy produced by an electric generator and the apparent energy produced, as indicated by the current and voltage of the electric circuit. A low power-factor can be corrected by the proper design of circuits and the use of auxiliary equipment in the circuit. "Load-factor" is the per cent of full utilization of installed capacity.

The output capacity for 1929 of the installed generating equipment, allowing ten per cent of the machine time for maintenance work, would have been 224 billion kilowatt-hours. Obviously, this potential output cannot be produced when some industries only run eight hours per day, when the lighting load is at a peak only during the dark hours, and when a certain amount of the capacity is installed in anticipation of future demands but remains idle under present conditions.

In 1931, the load-factor was 33.4% in the United States, while the Soviet Union was obtaining a load-factor of 42 per cent. Our country could undoubtedly make an improvement along this line.

In addition to the 1929 supply by central stations of 97 billion kw.-hrs., over 1 billion kw.-hrs. were imported from Canada. Table XIX shows how this total is in part accounted for.

Table XIX

Electricity Uses*

	Million kw.-hr.	Per cent
Domestic	9,773	13.0
Commercial	6,553	8.7
Industrial	50,879	67.6
Municipal	2,450	3.3
Railway	5,640	7.4
Total	75,295	100.0

* Source: *Electrical World*, Jan. 6, 1934.

In 1929, the installed capacity of motors and prime movers in industrial plants was about 42,900,000 horsepower, of which 22,800,000 horsepower was driven by electricity from central stations, 12,400,000 horsepower was driven by electricity generated in the industrial plant, and about 7,700,000 horsepower was non-electric. It seems reasonable to assume that the probable generation of electric power by industry is somewhere between 34 and 35 billion kw.-hrs.

Therefore, the total consumption of energy from all sources by industry can be estimated at approximately 85 billion kw.-hrs., made up of 50,879,000,000 kw.-hrs. of purchased energy plus 35,000,000,000 kw.-hrs. generated by industry. In addition, there is about 7,700,000 horsepower of steam engines and water-wheels directly connected to machinery which, when operated as at present, would represent an additional supply of 17 billion kw.-hrs. per year. This would bring the total energy consumption of industry to about 102,000,000,000 kw.-hrs. per year.

Industry will continue to furnish much of its own electrical requirements because of its need for steam for processing and the possibility of generating electric power as a by-product from this steam.

The housing program, an important factor in estimating electric energy requirements, will take time to accomplish—a maximum of ten years, according to our calculations. Therefore the following estimates represent requirements only after the completion of the housing program. These estimates, however, are largely hypothetical, for technology would move rapidly under the stimulus of unrestricted production, and the consequent changes in this ten-year period are therefore unpredictable.

The budget adopted by the Survey represents only consumer requirements, and not necessarily a full use of all existing productive facilities. The possible and desirable increase over 1929 in the output of consumer goods is estimated, at a minimum, to be 50%. But the electrical energy required for this increase and for the needs (at the end of ten years) of the proposed new houses, would not necessarily mean a corresponding 50% increase in electrical energy consumption.

Improved load factor with fuller operations, improvements in motor design and transmissions, and the greater efficiency of other electrical apparatus will, in all probability, result in but a 25% increase in industrial consumption of electrical energy.

Since the 1929 industrial consumption was between 95 and 102 billion kw.-hrs. (including sources of power other than central stations, which amounted to 51 billion kw.-hrs.) we can expect an additional electric consumption of 25 billion kw.-hrs. or a total at the end of the ten-year period of 125 billion kw.-hrs.

Farm electrification in 1929 was in an incipient stage, differently reported as between 8 and 11.7%. Assuming that by the end of the ten-year period four million farms will be electrified,[1] their annual consumption will vary, because of irrigation demands and differing agricultural activities, between 800 kw.-hrs. on the farms east of the 100th meridian and up to 6,000 kw.-hrs. on farms west thereof.

If all of the 4 million farms are fully electrified, the rural electric consumption will reach 10.4 billion kw.-hrs. per year. But in view of the inaccessibility of many farms and the sparsity of settlements it is not likely that more than 75% of these farms will use such service, thus bringing the total of rural consumption at the end of the ten-year period to an estimated 7.8 billion kw.-hrs.

Domestic use of electric energy in 1929 was 9.77 billion kw.-hrs., which increased by 1933 to 11.94 billion kw.-hrs., or 542 million kw.-hrs. per year. Since these were the depression years we may assume that the growth was only half as rapid as it would be under the conditions postulated by this Survey. Therefore we estimate that at the end of the ten-year period the domestic use of electricity will increase by 1.1 billion kw.-hrs. per year, thus reaching a total of 13 billion kw.-hrs. This estimate, however, presupposes no new homes and no removal of the restrictions imposed by high rates and expensive appliances. A more rational estimate can be predicated on the basis of assumed full satisfaction of

[1] Edison Electric Institute, Bulletin 9.

domestic requirements for electricity, averaging Canadian and Western United States rates of consumption.

Consumption per household of 600 kw.-hrs. (a conservative estimate) gives a figure of 24 billion kw.-hrs. in existing residences. An additional 1.55 million homes per year over a period of ten years builds up the load another 9.3 billion kw.-hrs. resulting in a total domestic consumption of 33 billion kw.-hrs. at the end of the ten-year period.

Commercial uses of electric energy are not expected to increase at a rapid rate except for places of entertainment, resorts, etc. Since 1929, annual commercial consumption approximated 6.5 billion kw.-hrs. This type of consumption at the end of the ten-year period is not likely to exceed 10 billion kw.-hrs.

Municipal consumption of electricity for street and road lighting, institutions, and administrative buildings, while bound to increase, is not likely to require more energy, because of the introduction of sodium-vapor lamps which use but a fifth of the energy required by the tungsten filaments. Since 1929, municipal consumption of electricity was 2.45 billion kw.-hrs. With a trebling of the area of streets and rural roads, and unusually extended other municipal services, the consumption, at the end of the ten-year period, may be approximated at 4.5 billion kw.-hrs.

Railroad use of electric energy has been very low, and the electrification of traction so slow that at present its trend is seemingly overtaken by the rapid adoption of Diesel-electric trains (streamlined and other), gasoline motor vehicles, aviation, etc. The probable growth of trackless trolleys and urban subways will be largely offset by the improved efficiency of transmission, motors, bearing and journal design, and reduction of air resistance. On the other hand the greater leisure assumed in this Survey and the consequent increase of travel for recreational and educational purposes will undoubtedly add to the density of electrified travel. Since in 1929 railroad consumption was 5.64 billion kw.-hrs., and in 1933 dropped to 2.9 billion kw.-hrs., it is estimated that at the end of the ten-year period the consumption of this class will be about 3.7 billion kw.-hrs.

The total requirements in electric energy supply to be met at the end of the ten-year period in order to provide for the postulations of our budget (not considering the changes in population and its redistribution) are estimated in Table XX.

Table XX

Total Electrical Requirements at End of Ten-Year Period

Industrial	125,000,000,000	kw.hrs.
Rural	7,800,000,000	" "
Domestic	33,300,000,000	" "
Commercial	10,000,000,000	" "
Municipal	4,500,000,000	" "
Transportation	3,700,000,000	" "
	184,300,000,000	" "
Transmission and distribution losses and central-station use	14,700,000,000	" "
	199,000,000,000	" "

Capacity at present (after completion of projects under way) has been shown to be 37,665,000 kw. If this capacity is utilized more efficiently than it is at present, if the load-factor is improved to 60%, and if the industrial power installations are utilized to the full, we may expect to generate approximately 200 billion kw.-hr. of energy.

The immediate satisfaction of American budget requirements can, apparently, be met from the installed electrical capacity, but an increase in this capacity of some 25% will be needed over a ten-year period, as homes are fully electrified. The present rate of increase in capacity is ample.

In spite of this, an increase in generating capacity will still be required, but it may be achieved along different, less costly, and more quickly realized lines than would be the case if present designs of generating equipment were used. In the following summary of the prospects for national energy supply some of the most probable innovations are considered.

SUMMARY

As stated in the beginning of this chapter, the total energy supply of the country reached a peak in 1929, when 26,534 trillion B.T.U. of energy were consumed; but it would be optimistic to estimate that as much as twenty-five per cent of this quantity did any useful work. Automobile engines run at about five per cent overall efficiency. House heating wastes as much as eighty per cent of the heat in coal or oil. Steam-power plants do well to put twenty per cent of their heat supply to work.

Outside of the field of central stations, two developments promise favorably to affect the energy supply in the immediate future: (1) house heating will be made much less wasteful by a switch in fuel from raw coal to oil or gas and by the wholesale use of house insulation; (2) railroads are adopting Diesel-driven locomotives, which conserve energy and also cut down the waste that arises from hauling coal for railroad use.

In steam-electric central stations, the fuel efficiency will probably be increased. Greater energy economies are to be expected, however, from the development of power stations in conjunction with coal mines and coal processing plants, utilizing fuels that would be otherwise wasted.

Water-power plants can yield more energy if more extensive reservoirs are built. This will reduce the amount of electric energy that must be supplied from other sources.

These possibilities would indicate that our present energy supply can be made to serve greatly expanded needs before the necessity arises to mine more coal per year.

Additional sources of energy seem to be just emerging on the horizon. A full-scale experiment is under way with the

Flettner type of wind-driven rotor applied to electric-energy production. Some success is being achieved in recovering energy via the temperature differences obtaining between the surface and depths of the sea. Experiments are under way to derive energy directly from the heat of the sun. Finally, the photo-electric cell is already beginning to be used as a minor source of power. Among some of the factors affecting the future energy supply are:

(1) The actual demand for fuels, per unit of product made, will continue to decrease.

(2) The total consumption of fuels, even with greatly increased industrial output, is not likely to exceed past peaks.

(3) The gasification and liquefaction of solid fuels will make possible their transport through pipelines, thus relieving the railways of much tonnage.

(4) Hydro-electric resources will be more fully utilized.

(5) Sodium and other vapor lamps will supplant the present tungsten lamps for lighting purposes with a corresponding saving of four-fifths the amount of energy required for a given amount of light.

(6) Central stations will undoubtedly become more closely connected with energy sources, such as coal mines, and will be more fully inter-connected with high-tension transmission lines—resulting in a universal, coördinated energy supply for the nation.

(7) Heating of buildings will require less fuel if air conditioning is extended and the possible development of new methods of heating, such as wall-heating by electricity and body-heating by means of radio frequency waves are utilized.

(8) Power transmission without wires may soon be perfected. On a large scale this will drastically cut down transmission losses.

(9) New supplies of energy from bacteria and ferments may be tapped.

In concluding, it may safely be said that the present and prospective supplies of energy for the American nation are sufficient to more than satisfy any practicable requirements of the people.

WALTER N. POLAKOV

CHAPTER VI

THE CHEMICAL INDUSTRY

Among modern industries, chemical manufacture furnishes the best example of mass production and the elimination of the human element. It exhibited these features long before any other branch of industry, because they are inherent in its processes and necessary to its successful conduct. Although chemicals were all originally made in batches, the advantages of continuous processing were early evident, particularly in cases where the materials are in a liquid state. Production methods were influenced by the continuous delivery of materials from the pumps.

The development of continuous processing led directly to automatic control, which also had the advantage of insuring against human errors in producing chemicals that must not be allowed to vary from a predetermined formula. Automatic control and continuous production made for reduction in labor requirements.

With production problems in the chemical industry early reaching a state of advanced technology, engineers and chemists have devoted more time to experiment and research than has been the case in any other field. This has served to develop many ways of making almost any chemical product, the choice of method at any given time or place depending upon availability and price of raw materials, power, or other needs of the process.

One example out of many will serve to illustrate. Nitrogen, generally in the form of an oxide or a nitrogen containing salt, is needed in quantity, particularly as an ingredient of fertilizers and explosives. A large part of this demand, particularly in Japan and certain European countries, is met by the importation of natural nitrate from Chile, a product that needs only mechanical preparation and concentration. In Sweden and Norway, where water power is available in large quantities, nitrogen from the air, of which it constitutes approximately four-fifths, is recovered by an electrical process. In the United States much of the nitrogen requirement is available from ammonia sulphate and liquid ammonia—by-products of the manufacture of coke and coal gas.[1] Another large supply comes from the synthetic ammonia process, in which fuel gas and air are the raw materials.

This matter of alternative manufacturing methods and alternative raw materials should be kept in mind in any consideration of chemical production. It makes the matter of production capacity indeterminate, for if the plant capacity to produce some chemical by one method is insufficient it can be made by some other method, and generally, with existing equipment. The vast possibilities of substitution of one chemical for another by the user should also be remembered, along with the fact that various chemicals can be utilized as raw material for other chemicals. All these factors render any attempt to define or limit the capacity of the chemical industry utterly meaningless.

Because of its extreme flexibility, chemical manufacturing has become an exceedingly versatile servant of the consuming public and of most other industries. An ever-increasing flood of chemical products, of almost infinite variety, is turned out for all sorts of purposes. In the category of synthetic dyes, drugs, perfumes and flavors, all made from coal tar, or some alternative hydrocarbon, there are literally tens of thousands of products for every imaginable use.

In its manipulation, combination, and recombination of the ninety-two elements, chemical manufacturing promises

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[1] The 1929 production was 750,000 tons, or three times the peace-time requirements.

to supplant every natural material—perhaps even foods—with the products of the laboratory. Consider, for instance, the "plastic" Bakelite, now widely used where wood, metal, and ivory were formerly called for—even supplanting cork as a closure for whisky bottles—and there are at least a dozen other competing synthetic resins.

The same considerations that make any attempt to fix the capacity to produce a given chemical meaningless, also apply to a large extent to the matter of raw materials. In the manufacture of chemicals, there are no raw material limitations. Chemical raw materials are the elements that go to make up the air, water, and the earth's crust. These elements and their natural combined forms are amply abundant for all purposes. For example, if cellulose from wood is scarce, we can use the waste products of agriculture, such as straw. In regions where coal, a raw material for organic chemicals, is scarce, other hydrocarbons can take its place.

Without extending the discussion further it is evident that the capacity to manufacture any single chemical product has no bearing on our larger inquiry.

For the purpose of our survey, the production of chemicals for the peak year, 1929, is noted by principal groups in Table I, with the comment that the industry has grown rapidly during the last quarter century and, since the World War, has met every demand of the nation and exported an increasing amount in the face of the competition of the older and better established chemical industry of Europe.

It should be noted in connection with the above table that much duplication occurs. For instance, a considerable part of the acids (sulphuric) is used to make salts and fertilizers. Sulphur goes in part to make sulphuric acid. Alkalis are used in soap manufacture.

Capacity of plant equipment is available for certain products of the chemical industry that go to consumer consumption, such as soap, explosives used for hunting and target

TABLE I

Chemicals in 1929

Product Group	Quantity Produced (tons)	Value
Principal acids	7,332,599	$154,869,000
Principal alkalis	8,158,819	209,678,000
Principal salts	1,191,150	80,458,000
Principal organic products	140,617	27,057,000
Fertilizers, chemical	9,230,000	219,674,000
Explosives	264,932	72,591,000
Sulphur	2,363,000*	42,534,000
Carbon black	174,425	17,791,000
Blacking and stains	51,100	24,684,000
Bluing	1,950	1,365,000
Paints and varnishes	2,486,725	566,973,000
Naval stores	—	36,282,000
Soaps	1,654,000	301,191,000
Gases (compressed or liquid)	544,682	52,190,000
Other chemicals and chemical industry products	—	1,476,952,000
Total		$3,284,289,000

* Long ton.

practice, perfumes, drugs and blacking. In all cases, this capacity was greater than the 1929 production, and also greater than our budget requirements. For instance, soap capacity, in 1929, was 2,113,000 tons, compared to a production of 1,654,000 tons. This excess of capacity over production is ample to supply all additional soap needed to give an adequate per-capita consumption.

In the matter of drugs, the other important direct consumption of chemical products, capacity is far beyond present needs. Any approximate realization of a full "American" standard of living for the whole population would only result in a decreased demand for drugs. Better housing, better food, better sanitation, adequate clothing would result, inevitably, in decreasing the amount of illness occurring among the present low-income groups. Adequate provision of health service would undoubtedly increase the effectiveness and range of preventive medicine, thus balancing, by a decrease in the amount of illness, the fact that people who now go without treatment would, with adequate purchasing power, command the use of medicines for their ills.

The only conclusion that can be reached concerning the chemical industry is that, from all standpoints, it has ample capacity to meet any demand that can be foreseen at the present time.

The future trend in chemical manufacture is toward an increase in the production of synthetic products, particularly those based on the combination of carbon and hydrogen. Within the past year, the newspapers carried stories of the successful production of automobile tires from a synthetic rubber-like substance. Organic, non-breakable glass is in the process of development. The vitamins, so valuable in foods, are one by one being made in the laboratory. New paints and varnishes, based on synthetic resins and oils, show superior qualities.

The outlook for the chemical industry, then, is that, unless men hamper its growth by continued economic stupidities, an increasing number of useful materials, in quantity to supply all demands, will be made for the service and comfort of humanity.

Graham L. Montgomery
Felix J. Frazer

CHAPTER VII

MANUFACTURING

Modern manufacturing industries naturally divide into a number of great groups. Raw materials from farm and forest are processed into foods, wood products, textiles, and clothing. Raw materials from mines are processed into metals or converted into energy. Raw materials from many sources are used by the chemical industry. Metals are fabricated into machines or into parts and accessories that are used as production and distribution equipment for industry, or sold direct to consumers. Finally, there is a group of industries of much importance that do not come under any of the above headings, including leather products, rubber products, hardware tools and implements, electrical appliances, household utensils and appliances, telegraph and telephone equipment, radio, optical goods, ceramics, toys, notions, jewelry, and personal articles.

Food, wood products, textiles, paper, chemicals, metals, and energy are considered in other chapters. Here the manufacture of machinery, and the group of important miscellaneous industries will be considered.

MACHINERY. In any modern industrial nation, an adequate supply of machinery must be assured at all times. In this, the United States is, and long has been, in an unusually fortunate position. Not only does this country have facilities for making all the machinery which by any stretch of the imagination might be needed, but it also has engineers and designers skilled in devising new machines to meet new needs as fast as these arise.

The raw materials of machinery manufacture are iron, steel, and non-ferrous metals. These are available in ample quantity. In 1929, the steel used by this industry was 1,500,000 tons, amounting to three per cent of the total. This supply will take care of future needs, unless exports of machinery mount to unprecedented heights.

Machinery manufacture is at once a highly unified and an extremely diverse activity. Basically, the industry manufactures machine tools with machine tools, and then manufactures all sorts of other machinery with these machine tools.

If the machine tools are classified as metal-working machines, machinery can be broadly separated into twelve great groups, each with a production amounting to well over $100,000,000 in 1929. These are agricultural machinery; business machines and appliances; construction machinery; food-processing equipment; metal-working machinery; mining, quarrying, and petroleum machinery; textile- and apparel-manufacturing machinery; power-generating and -transmitting equipment; pumps and hydraulic machinery; and machines and parts not elsewhere classified, including boilers, chemical-plant equipment, gearing, bearings, shafting, conveying equipment, and over one billion dollars' worth of machinery not allocated to any particular industry.

Each of these general classes has from two to a dozen subdivisions, there being seventy-three of these subdivisions in all. Again, the subdivisions are further divided as, for instance, bottling machinery, which includes bottle washers and sterilizers, filling machines, capping machines, and labelers; or printing machinery, which includes presses, typesetting equipment, stereotyping equipment, and so on.

According to the U. S. Census of Manufactures for 1929, the main divisions of machinery manufacture produced the values shown in Table I.

It should be noted that these groupings are not those used by the Census of Manufactures, but were selected by this Survey. The total value of machinery made, however, agrees

TABLE I

Machinery Production, 1929*

Class	Value (1929 dollars) Production (Factory Value)	Capacity (Theoretical Value)
Agricultural	$179,432,616	$360,346,000
Business	170,187,769	340,376,000
Construction	111,362,659	224,678,000
Food-processing	280,739,868	573,460,000
Household	131,814,511	266,914,000
Metal-Working	463,546,963	927,438,000
Mining, quarrying and petroleum	159,602,380	329,204,000
Textile	172,921,339	307,824,000
Pumping and hydraulic	156,270,654	313,302,000
Power	493,760,449	989,431,000
Other manufacturing industries	221,402,552	462,755,000
Not elsewhere classified	4,501,958,240	8,990,272,000
Total	$7,043,000,000	$14,086,000,000

*Figures in this table taken from Report No. 614, N.S.P.P.C.

with that found by the Census, and the groups are made up of subdivisions in which value agrees with the Census.

The capacity figures given in the table are based on a compromise between, on the one hand, the fact that average hours of plant operation can be greatly increased and, on the other hand, the fact of the shortage of skilled machinists if the plant were run at or near capacity.

The machine industries operated, in 1929, an average of fifty-one hours per week, being on a one-shift basis (48 hours) with some overtime at periods of peak operation. Experience during the World War and at other peak periods indicates that somewhat over two-and-one-half-shift operation is feasible and still allows sufficient time for maintenance, cleaning, and repairs. Consequently, a two-and-one-half-shift basis can be assumed as a conservative operating time for the industry as a whole. However, there has been some abandonment of equipment in recent years, tending to decrease the total capacity.

Also, there is a definite "bottleneck" in this industry in the supply of skilled machinists. This is not as serious as might appear on the surface. Under the classification of machinists, the great majority are engaged in work of a repetitive nature which can be mastered by any intelligent worker in a few months. The critical shortage exists in such skilled occupations as tool-making, die-sinking, and the operations of job machine shops. Workers in these categories require at least several years of training to become skilled.

But this skilled group comprises less than ten per cent of the total workers employed in the machine-making industries. Also, most of these industries can reach capacity without the necessity for training more of these skilled workers, because the proportion of such workers in the total of employed can be safely reduced.

Because of these limitations caused by abandonment of plants and shortage of skilled workers, we have limited the working time for the full industry to two full shifts instead of two and one-half shifts. This figure is felt to be conservative.

In some of the branches of the industry, the table shows a capacity somewhat greater or less than would be obtained on the above basis. These variations from the mean cancel out, so that the total capacity appears as exactly twice the 1929 production.

Requirements for new machinery in the machine-using industries are based on two factors: (1) the need for replacing worn out and obsolete machines and (2) the need for expanding certain industries in order to bring their capacity production up to the amount required to meet the needs of a decent "American" standard of living.

Obsolescence rates vary from five to twenty per cent per year, ten per cent being as near an average figure as can be estimated without the aid of detailed industry studies, which have never been made. On this ten per cent basis, it has been estimated by the *American Machinist* that in 1929 approximately forty-eight per cent of all American metal-working machinery was obsolete. Certainly this obsolete machinery should be replaced; and as additional machinery becomes obsolete, it should also be replaced.

The matter of expanding the capacity of machinery manufacturing in order to expand the production of machine-using industries can safely be neglected for the next few years. In the studies of production capacity compared to our consumer budget the capacity of the machine equipment of industry has, on the whole, been adequate to meet the immediate needs of our budget, provided normal replacement of obsolete machines is carried out.

Such a general statement, of course, does not hold true for every case. For instance, additional machinery is required in some parts of the textile industry. The construction industry will need considerably more equipment if the increased housing called for in our consumer budget is to be built. However, it must be kept in mind that the machinery industry can put out about twice the machinery turned out in 1929.

It must be assumed, also, that with a resumption of normal production in the United States, the machine-tool industry would once again supply the machinery manufacturing industry with additional tools, thereby increasing capacity. This machine-tool industry is the heart of all machinery manufacture. Upon the ability of this industry to supply machine tools rests the ability of the remainder of the machine industry to turn out equipment. With about half its capacity unused in 1929, a peak year, it is obvious that an adequate supply of machine tools will be forthcoming when needed.

The conclusion is inescapable that the machinery-manufacturing industry is capable of providing the tools needed to produce the supplies necessary to assure a decent standard of living to the whole American people.

It would be a mistake to leave in the reader's mind the impression that machine manufacturing has remained static or gone backward in the five years that have elapsed since October, 1929. This period has seen as great an advance—and in many cases a greater—as any other five-year period in history. Engineers and inventors have worked along four lines to make really tremendous advances, which, unfortunately, have as yet not been widely translated into increased production.

The greatest advances made have been in the speed of production of machinery. This had its inception in production of alloys that would stand up under harder service when used as metal-cutting tools, allowing deeper cuts and faster operation. As a result, much metal-working machinery and many machine tools have been completely redesigned to operate at higher production rates. One large concern has developed metal-cutting machines operating five times as fast as its older designs.

Another advance has been registered in the perfection of welding apparatus and methods. It is now possible to perform many operations with gas or electric welding with great savings in time, cost, and equipment. The Ford automobile, with its extended use of welding, and welded oil-refinery and power-plant equipment in place of riveted equipment, are developments of this period.

A third advance has been in the development of automatically controlled machinery, with a consequent reduction in man-power requirements. Outstanding along these lines is the great automobile-frame plant of the A. O. Smith Corporation, where fully automatic operation has reduced the labor requirement some nine-tenths. Another notable example is the even greater reduction in labor requirement made by automatic incandescent-lamp-making machinery.

Growing out of this advance in automatic machinery is a reduction in the need for skilled labor. This is very important to the machinery-manufacturing industry, for, as has been shown, the only possible "bottleneck" to capacity operation of the machinery-manufacturing industry lies in a shortage of skilled labor.

Over a ten-year period, the net result of these advances and their natural extension will be a considerable increase in the capacity of this industry.

MISCELLANEOUS. Under this head are included a great group of industries that have no definite relation to one another, but that, on the other hand, cannot be included in any of the industrial groups so far discussed. The 1929 produc-

TABLE II

Miscellaneous Manufacturing, 1929

Source*	Item	Value (1929 dollars) Production	Capacity (Theoretical)
WS 2	Shoes	$965,924,000	$1,468,500,000
Reps. 680–648–625; WS 38	Leather products	158,890,000	Indefinite
WS 6A	Rubber products	1,147,000,000	1,868,000,000
WS 17	Paper	903,301,000	1,111,202,000
WS 89–90–98–99–100	Hardware, tools and implements, and plumbing	614,723,000	Indefinite
WS 121–554	Electrical appliances and radio	2,021,654,000	Indefinite
Rep. 407	Household utensils and appliances	225,342,000	Indefinite
WS 147	Telegraph equipment	7,649,000	Indefinite
WS 39	Telephone equipment	158,644,000	Indefinite
WS 171	Optical goods	40,562,000	Indefinite
WS 118	Ceramics (brick and pottery)	408,069,000	453,410,000
WS 5	Glass	299,717,000	776,000,000
Rep. 647	Jewelry, lapidary work	11,942,000	Indefinite
WS 126	Jewelry, precious stones	177,387,000	Indefinite
WS 185	Notions	116,659,000	Indefinite
WS 183	Business supplies	164,761,000	Indefinite
Rep. 677	Personal articles: Pipes	5,538,000	11,176,000
Rep. 395	Personal articles: Art	10,045,000	Indefinite
WS 15	Personal articles: Umbrellas	16,500,000	Indefinite
WS 187	Musical instruments	72,346,000	Indefinite
WS 186	Recreational supplies and toys	167,441,000	Indefinite
WS 111	Clocks and watches	90,957,000	Indefinite
WS 119	Stone products	192,163,000	222,400,000
Rep. 394	Minerals, ground and treated	17,409,000	34,818,000
Rep. 411–490	Needles, pins, and buttons	51,009,000	Indefinite
	Total	$8,045,632,000	

* The symbols "WS" and "Rep." refer to worksheets and reports of the N.S.P.P.C

tion and capacity of these branches of manufacturing is shown in Table II.

Of this group, shoes, leather products, rubber, paper, hardware, electrical appliances, household utensils, telephone and telegraph equipment, optical goods, ceramics, and business supplies are of first importance. Fortunately, there is sufficient existing machine capacity to fill the needs of the consumer budget in all cases where the capacity can be estimated. In the industries where the capacity is given as "indefinite," considerable unused capacity existed in 1929 and additional capacity can be made available by drawing on the machine-manufacturing industry for a relatively small additional supply of machines.

Shoes were produced in 1929 at the rate of 361 million pairs per year, the capacity being 550,000,000 pairs per year with full use of the shoe machinery in plants, while, by the rental of additional existing machinery from the United Shoe Machinery Company (which owns and rents nearly all of the machinery in this industry), production could be considerably increased. As a production of 550 million pairs would allow more than four pairs for every person in the United States (a figure greater than the consumer budget), production capacity in this industry is obviously ample.

In the rubber industry, the critical figure is the number of tires that can be produced. Capacity in tires was 110,000,000 in 1929, i.e., one full set for each of 27,500,000 automobiles. While this is somewhat more than the number of cars operated, it is not a very large allowance. It would seem advisable to equip this industry with more machines. However, with existing machines production can be increased to 150,000,000 tires when operation is put on a three-shift basis, and this extra capacity would carry the industry over the brief period required to manufacture and install such additional machinery as might be needed.

In paper manufacture, the margin between production and capacity was only about nineteen per cent in 1929. Any appreciable increase in paper requirements over 1929 consumption would demand either an increase in plant or in importation of paper, because allowance must be made for repairs and other unavoidable stoppages. Also, if we refer back to the chapter on forest products, it is evident that wood-pulp consumption cannot be increased greatly over the 1929 figures until reforestation begins to make its effect evident. Fortunately, ample supplies of paper can be imported from Canada and the Scandinavian countries during any period of adjustment.

Hardware, tools, plumbing supplies, and electrical appliances appear in the table with indefinite capacities. This does not mean a prospective shortage of these products. The metals of which they are made are available in sufficient quantity to allow for any probable increase in production. However, the design of products in these industries changes so rapidly that no capacities can be assigned.

Household-utensils production was close to capacity in 1929. Provision of an adequate standard of living for the American people will call for an increase in the capacity of this industry, but this can be readily achieved, for the metals that form the raw materials are available and the excess capacity of the machinery industry can easily supply the machines for such an expansion.

From the standpoint of equipment manufacture, it is impossible to determine the capacity of the telephone and telegraph industries because of the monopolistic character of these industries. It is known, however, that considerable unused supplies of such equipment are on hand and that the industry has manufacturing capacity to turn out telephones, switchboards, and other equipment needed for any prospective three-year expansion.

Ceramics exhibit a possible "bottleneck" in the narrow margin between brick production and capacity in 1929. However, increased demand in the brick industry can readily be met by the increased use of the old hand methods of brick manufacture and firing, in which practically no machines are needed and the sole desideratum is a supply of semi-skilled labor and the requisite fuel.

No others of this group of miscellaneous industries show any danger of shortages developing should the requirements of the consumer budget be met, with the possible exception of cut stone. But stone is not an essential building material, since cement and other materials can be used in its place.

Considering this group of miscellaneous industries as a whole, they exhibit no "bottlenecks" that can prevent the supply of an adequate standard of living to the American people.

Graham L. Montgomery

CHAPTER VIII

TEXTILES AND CLOTHING

Fibers—cotton, wool, silk, and rayon—are the basis of one of the most important groups of consumer goods, woven fabrics. Beginning as a household craft, the spinning of yarn and weaving of cloth were, after mining, the first industries to emerge from the handicraft stage into large-scale machine production, and were the very first industries to become fully mechanized. This was not an entirely fortunate occurrence, because the textile industry was fixed along its present lines so early in the development of machinery that it has benefited less than other industries from the modern trend toward automatic, continuous production. As a result, fabric production, in part, and garment production entirely, have remained in the semi-developed stage, where machines are used throughout, but where output per worker is low. Consequently, while raw fibers can be produced (on a world-wide basis) in practically unlimited quantity, fabric and garment production are still handicapped by obsolescent equipment.

Of the raw materials for textile manufacture, cotton is the most important. This product of agriculture can be produced in the United States in ample quantities; in fact, about half of the production is normally exported, and much more can be grown if desired. An annual supply of about 9,000,000,000 pounds (18,000,000 bales) of cotton would be needed to run existing textile plants at capacity.[1]

Wool is not at present produced in this country in sufficient quantity to allow capacity operation of wool-textile

[1] We do not require this quantity of cotton for budgeted clothing, since we do not need to operate our textile plants at capacity to turn out budgeted cotton goods, as will be shown later.

equipment, which would require 1,600,000,000 pounds of wool. In 1929 one-quarter of the 617,000,000 pounds of wool used was imported. However, the reason for this was not any inability of American agriculture to raise sufficient sheep, but rather the relatively low world price of wool. Our flocks could not be immediately increased to meet the full need, but this could be done in two or three years' time.[1]

All silk used by the American textile industry is imported and probably will continue to be in the future. Attempts to raise the silkworm in this country have never been successful. However, we can obtain ample silk for our needs in the world markets and should importation cease for any reason, rayon could be substituted.

The raw materials for rayon are wood pulp or cotton linters and common chemicals, such as acids and alkalis. Ample supplies of all these substances are available.

Summing up the textile raw-material situation,[2] it is evident that the supply required to fill all American needs could be easily provided if physical factors were the only limitations.

Yarns and Fabrics. The steps from raw material to finished garment or other fabric product are about the same

Table I

Raw Fibers

Rep. No.	Fiber	Used for 1929 Production Pounds	Required for Capacity Production	Ratios, Capacity to Production
759	Wool*	617,300,000	1,616,000,000	2.62
	Cotton†	3,780,700,000	8,959,800,000	2.37
	Silk	78,000,000	172,270,000	2.20
	Total	4,476,000,000	10,748,070,000	

* Carpets used 100,300,000 pounds of this wool in 1929 and 260,000,000 pounds are allocated at capacity for this use.

† Carpets and cordage used 72,700,000 pounds of this cotton in 1929. 83,700,000 pounds are allocated at capacity for this use.

[1] Imports can be expanded to cover all needs during this period. This problem is presented in Chapter XVI, "Foreign Trade."

[2] See Table I.

Table II

Yarns and Fabrics

Rep. No.	Kind of Fiber	Used for 1929 Production Pounds	Capacity Production	Ratios, Capacity to Production
759–760	Yarn and Felt (lbs.)†			
	Wool and worsteds.	142,520,000	342,700,000	2.40
	Cotton...........	462,760,000	1,069,900,000	2.24
	Silk..............	32,220,000	41,700,000	1.30
	Rayon*..........	65,760,000	104,000,000	1.55
	Total........	703,260,000	1,558,300,000	
	Fabrics (in sq. yds.)			
762	Wool and worsteds..	513,900,000	1,499,900,000	2.92
	Cotton.............	8,541,500,000	20,740,000,000	2.43
	Silk................	456,000,000	1,142,200,000	2.50
	Rayon and mixtures‡..........	385,960,000	578,880,000	1.50
	Sub-Total....	9,897,360,000	23,960,980,000	
	Wool carpets........	73,400,000	168,000,000	
	Total........	9,970,760,000	24,128,980,000	

* Rayon fibers are made from wood pulp (or linters) and common chemicals. Hence, quantities are not listed under raw fibers.

† Exclusive of yarns used for manufacture of fabrics.

‡ Rayon production figures are covered in reports of several branches of the textile industry. It is therefore impossible to obtain an accurate total. The figure used here represents the rayon fabric used for garment manufacture. Since no capacity was calculable, the ratio of capacity to production was assumed to be the same as for rayon yarn.

for any textile. The raw material is first cleaned and otherwise prepared, and then spun into a yarn. This yarn is then woven into cloth or knitted. After bleaching, dyeing, and various finishing operations, garments or other consumer goods are made from the fabric. These operations fall into two groups: (a) the production of cloth or fabric from the raw fibers, and (b) the manufacture of garments and other goods from the fabric. It is (a) that must be examined in order to determine whether or not any limitations exist that will prevent the realization of an adequate living standard. We shall see later that (b) offers no limitations, except as style enters.

Table II gives the 1929 production and the possible, or capacity, production of fabrics, yarns and felts.

Capacities shown in this table are based on the full practicable use of textile mill equipment existing in 1927, 1929, or 1931, under the limitations of the technical knowledge and the skill of management and workers that then prevailed. Assuming these conditions, conservative estimates of capacities are obtained. The woolen industry, for example, is calculated on the customary one-shift basis, the cotton industry on a two- and three-shift basis, since this is customary during rush periods in the South. In all cases ample idle time was allowed for adjustments and repairs.

Since 1927, there has been an abandonment of textile-mill capacity in all branches of the industry except rayon. For instance, cotton fabric capacity fell off from 20,700,000,000 square yards in 1927 to 16,500,000,000 square yards in 1933. This fact does not, however, prevent the realization of the capacities given in Table I, since the abandoned equipment could readily be repaired and reinstated, or replaced by modern textile machinery which operates at a higher rate of output than did the abandoned equipment.[1]

Since the volume of cotton fabric production is far larger

TABLE III

Breakdown of Cotton Fabrics

Item	Square Yards: Production (1929)	Square Yards: Capacity Highest Year	Per Cent of Item for Total Production and Total Capacity
1. Cotton fabrics used chiefly for garments	2,200,000,000	5,400,000,000	26
2. Cotton fabrics used chiefly for household goods	1,500,000,000	3,600,000,000	18
3. Cotton fabrics used for either of above	1,100,000,000	2,700,000,000	12
4. Cotton fabrics used chiefly for other purposes	3,700,000,000	9,000,000,000	44
Total	8,500,000,000	20,700,000,000	100

[1] It should be noted that the capacities given in the above paragraph and table differ slightly from those used on the Flow-Sheet. The figures there used were 1929 or later capacities in order to make textiles comparable with other commodities.

than that for any other textile, and since its uses are the most varied, a breakdown of its production capacity and uses is given in Table III.

We may assume that any required quantity of cloth in Item 3 and some from Item 4 could be diverted to garment manufacture. In distributing the excess capacity such a diversion is here resorted to. Allocating 1,300,000,000 square yards of Item 3 (capacity) plus 1,800,000,000 square yards of Item 4 (capacity) to Item 1 (capacity), gives 8,500,000,000 square yards (or forty-one per cent of the total) which can be considered as available for garment manufacture. Table IV shows the result of this allocation.

TABLE IV

Allocation of Cotton Cloth to Garment Manufacture—Item I of Table III

(square yards)

	Production (1929)	Capacity (1929)	Per Cent of Capacity Production
Men's clothing	1,180,000,000	2,850,000,000	33
Women's clothing	820,000,000	2,000,000,000	23
Remainder, yard goods	Indeterminate	3,650,000,000	44
Cotton fabrics available for clothing	Indeterminate	8,500,000,000	100
(For uses other than clothing)		(12,200,000,000)	
Total (same as in Table III)		20,700,000,000	

The yard goods remainder is the surplus quantity available for clothing at capacity operation. The other figures represent quantities actually entering into the 1929 production of men's and women's clothing and the capacity amounts allocated to these uses. In the latter items, the percentages of the total capacity were allowed to remain the same as for 1929. This method of distributing the capacity for fabrics and yarns has been followed throughout.

This assumption is the soundest basis for study which can be used in the absence of detailed statistics for the various types of cloth. Any more arbitrary distribution of the surplus capacity to produce fabrics would result in more of one sort of garment and less of another. Should this be desired, it can be done within established mechanical limits. Looms can be converted from the production of one fabric to another, and other fabrics substituted for those used in 1929 production of any type of garment.

FINISHED-PRODUCTS CAPACITY. Restating the above analysis in more exact terms, it is obvious that the capacity calculation here employed is based on the assumption that: *For each type of garment the fraction of the total fabric available for its capacity production is identical with the fraction actually employed in 1929 for garment manufacture.* Thus, the ratio (capacity to 1929 production) for any material is the same for each fraction as is the ratio for the total of that fabric. Since the number of any particular garment made is in direct proportion to the square yards available for its fabrication, all calculations can be, and have been, based on the following equations.

Number of wool and worsted garments made in 1929 × 2.92[1] = capacity number.

Number of cotton garments made in 1929 × 2.43[2] = capacity number.

Number of silk garments made in 1929 × 2.50 = capacity number.

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[1] Most of the garment totals are made up of garments of various fabrics. Therefore, the ratio between the number made in 1929 and capacity is a composite of the production to capacity ratios for the different fabrics, weighted by the relative number of each kind. Thus, for women's dresses, which are made from all four fabrics, a ratio of 2.35 is obtained and the equation becomes: Number of dresses (made in 1929) × 2.35 equals capacity or 206,460,000 × 2.35 equals 485,000,000.

[2] In the same way, the production and capacity figures for yarn can be used to calculate the capacity for manufacturing knitwear. Such calculations, however, give capacities in excess of the estimates of knitting-mill capacity. For example, hosiery-mill capacity is about 180,000,000 dozen pairs, compared to the 234,000,000 dozen pairs capacity obtained by a calculation based on yarn capacity of textile mills. These figures compare with a total of 117,000,000 dozen pairs actually made in 1929. Accordingly, the capacities for making hosiery, sweaters, and other knit garments were determined by the capacities of the various types of knitting mills.

Table V

Disposition of Yarns, Felt and Fabrics of Table II

Rep. No.	Used for	Used for 1929 Production	Allocation of Capacity Production
		Yarn and Felt (lbs.)	
758	Outerwear	53,560,000	115,820,000
	Underwear	81,600,000	182,100,000
757	Hosiery	123,130,000	256,420,000
760	Felt Goods	85,100,000	253,100,000
	Yarn for Other Uses	359,870,000	770,860,000
		703,260,000	1,578,300,000
		Fabrics (sq. yds.)	
730–757	Underwear, Sleeping Garments, etc.	1,019,310,000	2,208,400,000
757–761	Coats, Suits, Outerwear, etc.	663,020,000	1,795,100,000
757	Dresses	746,650,000	1,761,000,000
757	Men's Shirts and Work Clothes	884,960,000	2,156,500,000
762	Carpets	73,400,000	168,000,000
	Yardage Goods (for Garments)	1,550,000,000	3,670,000,000
	Yardage Goods (Household Industry)	5,033,430,000	12,369,980,000
	Total	9,970,770,000	24,128,980,000

Number of rayon and mixed garments made in 1929 $\times$ 1.50 = capacity number.

Unfortunately, no exact figures for capacity to manufacture garments can be given, because of the flexible nature of the industry and the fact that an indeterminate quantity of garments can be made in the home. Incomplete data indicate that the capacity to manufacture garments is at least *twice* the 1929 production, and probably greater.

Since, in 1929, the production of men's and boys' suits was 29,000,000, then in accordance with the foregoing statement of capacity to produce, the garment-manufacturing capacity was about 58,000,000. The figure obtained by use of the equations is 83,000,000 which is based on the *quantity* of fabric available for this purpose at capacity operation. It is a safe assumption, however, that the figure of 83,000,000[1] suits could be quickly reached, as the machinery

[1] The full list of the various kinds of garments, including the quantity of each produced in 1929 and the quantity at capacity operation, is covered in the "Wearing Apparel Budget," Table VI.

TABLE VI

Comparison of Production, Capacity, Budget for Major Items of Clothing

(All Figures in Millions—Retail Values in 1929 Dollars)

Item	Sex	1929 Production		Capacity		Budget		Ratios	
		Quantity	Retail Value	Quantity	Retail Value	Quantity	Retail Value	Budget—1929 Production	Capacity—Budget
Suits	Male	29.09	768.98	84.20	2,215.86	67.00	1,777.80	2.30	1.26
	Female	14.50	281.18	38.11	732.09	34.41	881.72	2.37	1.11
Coats	Male	9.27	229.02	26.60	657.03	22.91	682.96	3.00	.95
	Female	23.04	587.76	63.30	1,614.15	36.25	924.39	1.57	1.75
Hosiery (pairs)	Male	719.64	200.25	955.08	276.97	759.50	216.93	1.05	1.26
	Female	614.52	580.34	1,069.20	1,052.78	681.50	554.05	1.11	1.57
Underwear	Male	286.35	217.53	495.00	376.20	330.25	251.56	1.15	1.50
	Female	258.95	278.58	510.88	551.75	427.00	461.16	1.65	1.20
Sleeping apparel and bath-robes	Male	49.52	58.76	105.90	129.20	140.75	162.72	2.82	.75
	Female	20.03	51.83	40.06	103.35	155.25	356.43	7.75	.26
Shoes (pairs)	Male, Female	361.40	1,555.13	550.00	2,365.00	209.75	901.93	1.09	1.39
						184.75	793.35		
Hats	Male	120.30	229.09	507.02	1,281.58	131.50	248.90	1.10	1.80
	Female	133.21	411.70			150.00	463.51	1.13	
Sweaters	Male, Female	57.49	144.61	108.00	271.08	34.75	87.45	1.27	1.48
						38.25	95.60		
Shirts	Male	173.06	303.36	424.00	742.00	363.87	636.13	2.10	1.17
Extra trousers and knickers	Male	37.19	132.42	106.80	380.58	68.06	250.34	1.83	1.57
Work clothes	Male	172.91	254.00	345.82	508.00	196.33	269.39	1.14	1.76
Dresses and frocks	Female	206.46	1,393.58	485.00	3,273.75	275.50	1,858.03	1.33	1.76
Brassieres	Female	24.68	31.00	49.36	62.19	64.25	80.96	2.60	.77
Corsets, girdles, etc.	Female	28.69	91.34	57.38	183.04	75.50	240.94	2.63	.76
Total value, major items			7,800.46		16,776.60		12,196.25	1.56	1.38
All other (misc.)			1,932.15		3,864.30		6,000.00	3.10	.64
Grand Total			9,732.61		20,640.90		18,196.25	1.87	1.13

used in garment production is simple and can be manufactured rapidly in large quantities.

The same general conclusions apply to the women's garment industry, much of which is conducted in small manufacturing units. Here the important limiting physical factor is the labor supply, since the supply of sewing and cutting machinery is ample. Capacity estimates show that 500,000,000 dresses and blouses could have been made, compared to actual 1929 production of 210,000,000. Furthermore, there could have been produced some 3,650,000,000 additional square yards of cotton cloth (Table IV) from which such garments might have been made. This capacity yardage provides sufficient cloth for over 400,000,000 additional dresses, if it were all allocated to this use.

THE FUTURE. The studies upon which this chapter is based were confined, from the technical standpoint, wholly to "things as they are." It must not be thought that the textile industry has necessarily reached the apex of its development.

Yarn production is wholly automatic, but there still remain possibilities for faster operation. Fabric production is relatively backward. Many improvements in weaving machinery are possible, and some, already developed, are probably held off the market for business reasons. The days of the fully automatic, continuous production of cloth cannot be held off much longer. Such a development promises a four- or five-fold increase in the output of cloth for each loom, and a corresponding or even greater reduction in the man-power required. It also promises a drastic simplification of the whole process of cloth production.

In knit-goods machinery, a high level of development has been reached. The near future seems to hold only the possibility of increased speed of operation, as no drastic changes in design of equipment seem imminent.

In garment manufacture, the controlling element, the "whim of fashion," is likely to remain as it is at present. A good guess would have it that garments made of knit fabrics will increase in popularity. Possible shortages from the fashion standpoint may always crop up, but fashion is just as likely as not suddenly to reverse its trend.

The use of fabrics made from synthetic yarns, such as rayon, is rapidly increasing and will undoubtedly cause great changes in the textile field. Rayon-like yarns that have the warmth of wool have already been made by Snia-Viscosa, of Italy, and other manufacturers. New and improved synthetic fibers have developed so fast that it now appears possible that they will eventually largely supplant all natural fibers except cotton, which would seem to be secure as a textile fiber on the basis of its abundance.

James L. Hollings
Charles Steele

CHAPTER IX

FOOD PROCESSING

Food processing is a necessary part of any modern economy. Goods produced from land and sea are often seasonal products, while consumer needs for food are relatively constant throughout the year. Consequently, the perishable foods must be preserved in some way if the diet is not to be restricted at some seasons, particularly in winter. Also, many foods that can be stored without much deterioration, such as grains, must be processed to reach the form in which they are consumed. Finally, processing of foods in the factory has released women from many hours of grueling toil in kitchens, and has become an integral part of modern living conditions. We would not return to former conditions if we could—and we couldn't, even if we would!

In the days of a strictly agricultural economy, when industry was of the "household," each family unit carried on its own food processing, or relied on the aid of strictly local facilities. Meat was slaughtered, cured, and smoked on the farm. Grain was ground to meal or flour in the home or in the local mill. Every summer the housewife put by what she could of preserved and dried fruits and vegetables. Bread, cake, and similar products were all prepared in the home.

With the growth of industry and the resulting change in living conditions, such home activities became inconvenient and unnecessary. Today, the great majority of the American people are so separated from the land that food processing may be said to have become a necessary part of the national economy.

With the exception of dairy products, the raw materials for processed foods are all available in sufficient quantity within the national borders, or can be readily imported. (See Chapter II, "Agriculture.")

Food processing should be considered as an intermediate step, carried out for the purpose of food preservation or for convenience or to satisfy consumer tastes and preferences, but not as a means of changing food values. While this viewpoint is not strictly true in all cases (for instance, dried prunes are not the exact equivalent of fresh prunes), it is the only general ground upon which a consideration of diet can be based. Otherwise, the statistical study of foods would be buried under a mass of detail having little bearing on the broad picture of the national food supply.

Production of many processed foods is more closely related to momentary effective demand than is the case with most manufactured goods. For instance, consider woolen textiles. The fabric may be woven a full year before its eventual use by a consumer, and even the suit of clothes may be made six or nine months before it is sold. Compare this with ice cream or bread, made the day it is eaten. This difference also applies to such foods as fresh meats, butter, confectionery, and fish. By contrast, flour, cheese, canned foods, preserves, pickles, macaroni, and cured meats will keep for long periods, and are often produced in quantities far exceeding immediate sales possibilities. This difference should be kept in mind in connection with production figures.

With foods produced for immediate use, such as bread, production is likely to have some relation to consumer requirements, particularly when the product is low in price and is a staple. In the case of other foods of relatively high price, such as meats, this relation is evident only in times when consumers have sufficient buying power to purchase freely. With foods that keep over long periods—canned peaches, for example—production gives no clue as to what consumption should be.

The figures for "production" and "production value" that were used in this survey of food processing have mostly been derived from the 1929 Census of Manufactures. In certain cases, however, figures from other sources have been used. The cane sugar refinery production given is that reported by the Sugar Institute. Figures for mayonnaise and salad dressings are as reported by the publication, *The Spice Mill.* Carbonated beverage figures were supplied by the American Bottlers of Carbonated Beverages, a trade association. Alcoholic beverage figures are taken from reports of the Bureau of Industrial Alcohol and the Department of Internal Revenue. Oleomargarine, lard substitutes, vegetable oils, and animal fats are given as reported by the Bureau of Agricultural Economics.

Slight modifications have been made in a number of cases (in which the census figures have been, in the main, adhered to) as a result of special information obtained from associations, publications, individuals, and government agencies.

Obsolescence of food-processing equipment varies greatly in the various branches of the industry. According to a study made by the *American Machinist*,[1] the machine equipment of the industry was forty-six per cent obsolete, or over ten years old, in 1929. This is the only general figure available for the food-processing group, but obviously it gives no dependable picture of obsolescence of the actual food processing equipment. In certain branches of the industry, estimates of the percentage of equipment over ten years old have been obtained directly from the users. In other branches, no such estimate can be given.

The important obsolescence figures obtained, as of 1929, are given in the table shown on pp. 125 and 126. These estimates of obsolescence indicate that much old equipment exists in food-processing plants and is used continually. In

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[1] *American Machinist,* 1930—Inventory of Metal Working Equipment.

many cases this fact does not limit production greatly. In flour mills, for example, to set a limit of a ten-year life for equipment would mean little, because equipment made ten years ago will produce at practically the same rate as if it were of the most modern design. This is also true in the meat-packing industry.

In any case, in view of the ample capacity of the country to manufacture machinery, it would require but a few years to replace all equipment that was obsolete, should the need for modern equipment arise. But the actual capacity of food-processing plants is at present ample to supply the American population with processed foods as these requirements are set forth in the Department of Agriculture's "Liberal Diet" estimates.

In this diet, processed grain foods such as flour, meal, breakfast foods, and macaroni are called for in a total amount of 100 pounds per capita per year. In 1929, we produced over 32 billion pounds of these foods, exported less than 3 billion pounds, while we required for the "Liberal Diet" but 12½ billion pounds. The apparent great excess of production over the "Liberal Diet" requirement is perhaps due to the fact that, from the dietitian's point of view, the American population consumes a far greater quantity of starchy food than is necessary or healthful.

Somewhat the same situation exists as to sugar. In 1929 American production of sugar and other sweets, such as molasses and syrup, was approximately 15 billion pounds. The requirement, according to the "Liberal Diet," is 7½ billion pounds, or just half the amount.

The "Liberal Diet" calls for ten pounds of evaporated milk per capita, but the industry actually produced twenty pounds per capita. However, the total milk production of the nation falls short of requirements (see Chapter II, "Agriculture"), which should be kept in mind while reading this chapter on food processing. This figure on canned-milk production merely means that we process more of the total supply than the "Liberal Diet" calls for, the two forms of milk, fresh and canned, being interchangeable for dietary purposes.

The production figure reported for dried fruits is over 900 million pounds (the quantity of dried vegetables included in this figure is relatively small). The "Liberal Diet" estimate for dried fruits calls for more than twice this quantity to supply national needs. However, aside from citrus fruits, the *total* fruit grown in the country is only about sixty per cent of the requirement of the diet, so that the deficiency in dried fruit production is only a reflection of a deficiency in the national fruit supply. This deficiency is, in turn, probably a result of a divergence between popular taste and the requirements of the "Liberal Diet"—as people consume *more* starchy products than the diet calls for, so they consume *less* fruit.

Meat and fish production is close to the diet requirement of less than 21 billion pounds. Whether there is a shortage or not depends upon how much waste and trimming there is in cutting up carcasses. Allowances made for waste have been extremely liberal, and American practice is at present being greatly improved. Fats, because of the large production of lard, are available in quantities exceeding the budget requirements, although our studies of agriculture indicate a deficiency of one of the fats, butter. Packing-house (machine) capacity is able to double the meat "through-put" if establishments should go on a two-shift basis.

When capacity to process foods is viewed strictly from the standpoint of what the machinery can produce if limited solely by physical factors, and raw material supply is not taken into account, it is evident that the needs of our population for processed foods can be fully satisfied by the capacity of the food-processing plants. The only product capacity estimate that proves to be less than the requirements is that for dried fruits. The excess capacity to produce canned fruits, which can be substituted for dried fruit in the diet, makes this deficiency of little importance.

No trustworthy estimates of machine capacity could be obtained for some of the branches of food processing, but it is evident from the following brief review that no important machine limitations on diet requirements existed in 1929.

Bakery products showed an unused capacity for bread baking of 43%; for cake, nearly 90%; and for cracker products, 56%.

Carbonated and *other non-alcoholic beverages* utilized only 33% of plant capacity.

Canned fruits and *vegetables* could have been turned out in quantities four times as great as those actually produced if raw materials had been available to keep the machines busy throughout the year. This industry is essentially seasonal, and, for the season's duration, ran in 1929 at 90% of machine capacity. Additional cold storage would increase this capacity by lessening the seasonal effect.

Candy factories ran at 72% of capacity.

Chocolate and *cocoa* could have been produced in 18½% greater quantity.

Flour production used only 57% of plant capacity.

Meat-packing plants, if operated at capacity for two shifts, could have turned out at least twice their output.

Ice cream plants only turned out 37% of their capacity.

Cane sugar refineries operated at 60% of capacity, while *beet-sugar* factories were at a 66% level.

Fish, solely on the basis of the size of the American fishing fleet, could be caught in much greater quantities; but in any given year the factor of abundance of fish at the fishing grounds must be considered. On the basis of fleet size, the "catch" was 85% of capacity, but the boats themselves are being rapidly modernized.

The above are the important manufactured goods for which no substitutes are available, or for which there is a definite need in the diet. Capacity to produce vegetable fats cannot be considered of importance in view of the great excess of lard production. However, cottonseed oil, corn oil, peanut oil, and the imported oils such as cocoanut, can be produced, in the aggregate, at about 60% above 1929 production.

Coffee-roasting equipment could turn out about 28% more of this popular beverage ingredient should such an increase be desired. In the year 1934 much up-to-date equipment was replacing obsolete roasters.

The immediate future of the food-processing industry holds no promise of any startling developments, but rather indicates that present trends will be continued, with consequent increases in production capacity. The most important of these trends is the elimination of obsolete equipment. This activity goes on continually, but has been stimulated in recent months by the development of new methods and equipment that lower costs and improve the product. Improved heat economy of bakery ovens has been followed by a rapid replacement of obsolete bakery equipment. In 1934 approximately one-half of the obsolete equipment of the industry, which totaled 40%, was replaced.

Improved ice-cream-freezing equipment that saves much time and turns out a better product, is being rapidly installed. New processes for turning cacao beans into cocoa and chocolate are being introduced. These are indications of what appears to be a general trend.

Another trend is the increasing substitution of quick-freezing for other methods of food preservation. More efficient methods have made possible an improvement in quality and flavor, as compared to the old methods of cold storage and "chilling." Quick-frozen foods tend to supplant canned foods, as they are nearer in taste and quality to the fresh product. Even such delicate foods as raspberries and sweet corn can now be preserved by this method.

Another trend that affects food processing is the improvement in transportation that permits an ever-widening distribution of southern-grown fresh products during the winter and spring. This increases the use of fresh foods and reduces our dependence upon canned fruits and vegetables.

It is also evident that, in food processing, the tendency is to use larger units, more power, and more automatic methods, thus increasing the output per man-hour of work.

To sum up: It should be apparent that the existing food-processing equipment is adequate to meet the requirements of a liberal diet for the American people, and that factors at work within the industry are tending to increase the productive facilities of this industry.

Graham L. Montgomery

Processed Foods—1929

Product	Production (000 omitted) Quantity	Value	Per Cent of Equipment Over 10 Years Old
Biscuits, crackers, pretzels, etc....	1,394,000 lbs.	$ 281,764	10
Bread, cake, other baked goods...	12,465,000 "	1,251,621	
Macaroni, noodles, etc...........	555,620 "	47,074	
Beverages, non-alcoholic.........	406,438 gals.	270,323	5
Beverages, alcoholic (tax paid)...	214,000 "	56,733	
Canned vegetables, soup, and fruits	5,915,000 lbs.		
Pickles, sauces, jams, and preserves......................	1,737,000 "	722,000	20
Dried fruits and vegetables.......	942,000 "		
Canned fish....................	623,000 "		
Cured fish.....................	102,000 "	101,000	
Confectionery...................	1,407,000 "	393,000	50
Chewing gum....................	105,000 "	60,000	
Chocolate and cocoa products....	552,000 "	119,541	50
Flour (wheat)..................	122,798 bbls.	1,060,000	
Flour (rye, corn, etc.)..........	13,075 "		
Feeds, animal (grain)	7,667 tons	403,000	
Breakfast cereals...............	3,110,000 lbs.	175,000	
Malt.........................	1,174,000 "	24,000	
Rice and by-products...........	1,420,000 "	48,796	
Ice, manufactured..............	44,477 tons	210,952	

Processed Foods—1929 (*Continued*)

Product	Production (000 omitted) Quantity	Value	Per Cent of Equipment Over 10 Years Old
Fresh and cured meat (except sausage)	16,803,000 lbs.	5,150,000	
Lard	2,598,000 "		
Poultry, fresh and canned by packing houses*	381,000 "	130,000	
Sausage	435,000 "	108,000	
Ice cream and other frozen sweets	280,000 gals.	328,000	75
Canned milk	2,317,000 lbs.	220,000	
Powdered milk	289,000 "		
Ice cream mix	137,000 "		
Casein	58,000 "		
Other milk products	7,000 "		
Mayonnaise, sandwich spread	12,805 gals.	22,067	
Salad dressings	3,118 "	5,200	
Vegetable shortenings and cooking oils	1,754,000 lbs.	154,553	40
Oleomargarine, butter substitutes	356,000 lbs.	60,415	
Sugar (cane and beet)	13,002,366 "	634,267	95
Molasses	2,643,044 "	18,482	
Syrups (cane, maple, sorghum)	311,660 "	32,513	
Yeast and baking powder	541,145 "	52,337	
Coffee, tea and spices	1,321,000 "	450,245	50
Corn products (oil, starch, syrup, etc.)	3,432,000 "	166,000	
Cottonseed oil	1,584,000 "	298,376	60
Flavors, extracts, colors, gelatins, fruit syrups	855,423 "	136,601	
Nuts (processed, shelled, salted)	667,000 "	67,600	
Fish, fresh (as caught)	3,567,000 "	123,054	60
Miscellaneous, including cider, vinegar, prepared desserts, health and infant foods	(Total weight cannot be given)	179,662	
Total value†		$13,562,176	

* This poultry includes only that slaughtered at packing houses. The total poultry "kill" was 1,208,066,000 lbs., valued at $411,928,000.

† Total value of processed foods given is either the value at plant, or, when these figures are obtainable, the cost to wholesalers. This figure does not represent cost to consumers. It also contains duplication, as, for instance, much of the chocolate and cocoa products are used by the confectionery and bakery products manufacturers and enter into the value of the finished candy and baked goods.

CHAPTER X

CONSTRUCTION

That department of the construction industry which has to do with residences or human shelter is conspicuous for its backwardness. William James, quoting H. G. Wells, pointed out some twenty-six years ago that "a house today is still almost as ill-ventilated, badly heated by wasteful fires, clumsily arranged and furnished as the house of 1858. Houses a couple of hundred years old are still satisfactory places of residence, so little have our standards risen." In contrast, society's technique for making war goes forward at a rate so rapid that the "rifle or battleship of fifty years ago was beyond all comparison inferior to those we possess; in power or speed, in convenience alike. No one has any use now for such superannuated things!"[1]

This difference between the rate of progress in home-building and in war-waging has increased since the above was written—and is still increasing. Yet this condition can hardly be blamed on the fact that home-building is a private enterprise whereas war-making is a social function, since other private enterprises can be cited which are not conspicuously backward.

This backwardness, however, has a direct bearing on our study of capacities. "Excess capacity" cannot be estimated in the building industry under Definition *B* (see Foreword), since the "existing plant" is, in no sense, a limiting factor on society's ability to construct. Like farming, fishing, lumbering, and other enterprises which are also *relatively* unaffected by the industrial or technological revolution of the last century and a half, capacity to build homes will have to be esti-

[1] William James, "The Moral Equivalent of War"; p. 294.

mated from the availability of supplies and man-power instead of from the designed operating rate of existing equipment.

Before considering the statistical evidence relating to the problem of shelter, the relationship of shelter to other human needs should be noted.

(a) The living standard in the United States is low, only some fractional percentage of what American custom considers comfortable. Its inadequacy is due neither to a lack of food nor to a deficiency of clothing. The 1929 diet, though badly proportioned and lacking in vitamins, was nevertheless quite the most generous ever enjoyed by a whole people, and ample to sustain a high physical standard of life. The clothing provided by our underworked looms and spindles was sufficient to conserve bodily warmth. The miserable life standard of the American people was due (excluding congenital and psychical factors as outside the scope of this Survey) to the inadequate, unaesthetic—even degrading—shelters in which a large part of our population was forced to live.

Therefore, any attempt to raise the standard of life by creating a more favorable environment must be initiated by a wholesale remodeling of the living quarters of the population. In other words, it would be useless or nearly useless to provide a better diet, warmer and more decorative clothes, or adequate educational and sanitary services, unless houses fit to live in had first been put at the disposal of the population. Silk stockings, savory cooking, thought-provoking reading matter—even good manners—are difficult or useless in squalid hovels.

Consequently, although the conclusions of the rest of the Survey are soundly based upon empirical evidence, it will be possible to take advantage of the "unused capacities," which promise a comfortable standard of life for the whole people, only when homes fit for decent living shall have been constructed.

(b) Sixty per cent of the people are not financially able to live in a proper house. Most of them exist in cast-off, discarded rich men's shelters or in jerry-built houses or shacks. Except for the forty per cent of the population who have an annual income of two thousand dollars or more per family, most of the city people are compelled to live in buildings which have outlived the purpose for which they were built.

Frederick L. Ackerman stated in a recent paper: "A large percentage of our population, between one-half and two-thirds, cannot occupy any of the habitations produced by the industrial system in which this half to two-thirds function, until sufficient time has elapsed to bring the structures into the requisite degree of obsolescence and physical decay." An annual income of less than two thousand dollars is insufficient to allow, under our present institutional arrangements, for the deduction of rent on a modern home, so the sixty per cent must wait until a house become dilapidated has been "marked down."

This situation is novel and unprecedented. It did not exist in pioneer days nor does it exist on the frontier today. Men still build new houses for themselves in the Peace River Valley. But in the settled country it is only rarely—and then due to exceptional circumstances—that new homes for the great majority of the population can, under our economic system, be constructed.

The result is the distinguishing ugliness which marks most modern communities. This is probably not due to a lack of taste but rather to the fact that so many buildings were built for one purpose and have come to be used for another. The effect is much the same as though a community had to clothe itself in ragmen's bargains. Former finery, whether in silk or stone, is seldom becoming even to a destitute person.

TABLE I

Construction Industry*

(000,000 Omitted)

	1927	1928	1929	1930	1931	1932	1933
BUILDING							
Commercial	$ 1,101	$ 1,015	$ 1,102	$ 870	$ 377	$ 158	$ 145
Factory	583	728	896	315	141	55	187
Educational	448	458	451	460	277	105	59
Hospitals and institutions	191	189	179	198	147	62	54
Public buildings	93	87	143	171	219	152	75
Religious and memorial	184	147	125	114	64	35	26
Social and recreational	308	245	165	138	120	50	45
Farm construction	473	463	463	367	258	125	135
Sub-total	$ 3,381	$ 3,332	$ 3,524	$ 2,633	$1603,	$ 742	$ 726
Residential	3,035	3,199	2,262	1,349	981	359	364
Sub-total	6,416	6,531	5,786	3,982	2,584	1,101	1,090
CONSTRUCTION							
Railroads	600	452	532	544	289	131	88
Electric power	794	754	853	919	597	285	200
Telephone and telegraph	466	530	740	736	482	294	201
Electric railroad	205	194	194	189	155	98	100
Gas and water works	—	—	280	269	200	120	120
Highways and bridges	798	888	887	1,071	1,047	1,000	1,100
Federal Public Works	256	274	308	325	474	567	500
Sewerage	118	101	88	82	73	25	22
Sub-total	$ 9,653	$ 9,724	$ 9,668	$ 8,117	$5,901	$3,621	$3,421
MAINTENANCE							
Buildings†	2,750	2,750	2,250	1,625	1,250	1,250	1,500
Railroads	895	861	877	723	544	361	322
Electric power	100	100	100	100	100	80	80
Highways and bridges	377	419	434	476	423	450	450
Telephone and telegraph	191	210	243	248	221	208	207
Sub-total	$ 4,313	$ 4,340	$ 3,904	$ 3,172	$2,538	$2,349	$2,559
GRAND TOTAL	$13,966	$14,064	$13,572	$11,289	$8,439	$5,970	$5,980

* Sources: F. W. Dodge Corporation, *Engineering News-Record*, *Commercial and Financial Chronicle*, Bureau of Labor Statistics, I.C.C. Reports, Federal Employment Stabilization Board, and other government publications.
† Estimated.

Table I gives the total construction expenditures of the nation for the past seven years. The amounts are given in dollar values current in each year. It is noteworthy that residential buildings, with which the preceding remarks were concerned, vary in amount between a minimum in 1933 of six per cent and a maximum in 1928 of twenty-two per cent of the total annual construction.

Our Survey dealt with "product capacity" in its bearing on consumer satisfaction. The various industries studied have been exhibiting, with few exceptions, an adequacy to satisfy vastly increased needs, and promise a veritable abundance to the people of this nation, if physical factors were the only limitations on production. A portion of the building industry caters to the people as consumers. It supplies a very necessary and desirable "consumer satisfaction." Therefore, in seeking to discover what the building industry could accomplish, it would seem reasonable to consign whatever capacity is left, after general industrial maintenance, replacements, and improvements have been taken care of, to home building and such supplementary structures as schools, waterworks, highways, etc., which would be required if new residential districts were opened, or old districts rebuilt to modern standards.

Table I indicates that over eight billion dollars' worth of effort could now be diverted to residential construction and maintenance, even though other building continued at the 1932 and 1933 level, if we tentatively assume that the 1928 total of 14 billion is the "building capacity" of this nation.

However, the above rough estimate is unsatisfactory because the ability to construct water-works, railroads, etc., does not necessarily indicate the ability to erect homes and because the production of 1928, the maximum year, may be far short of our capacity to construct.

In order to come to closer grips with the problem, Tables II, III, IV, and V have been prepared.[1]

Table II gives the total dwelling units constructed from 1920 to 1932. Over 600,000 were built in 1928; only 110,723 in 1932. The average number of dwelling units built each year, from 1920 to 1932, is 389,440 which, if we accept the Census figure of 28 million dwelling units in existence in 1929, gives a replacement rate of 1.34%, a low rate even were the American people properly housed, but an utterly absurd rate when only a small fraction of the people are decently sheltered.

Table III shows the breakdown of the existing American homes according to value. More than 33% of the total non-

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[1] For Tables IV and V see Appendix.

Table II

Dwellings Built by Contract

Year	Number of Contracts	Total United States Units Built Under Contract‡	Total Dwelling Units§
1920*.........	28,966	108,909	170,007
1921*.........	49,421	161,957	252,815
1922*.........	72,996	246,478	384,752
1923*.........	71,536	280,381	437,674
1924*.........	77,713	293,839	458,683
1925†.........	127,678	396,914	619,582
1926†.........	120,473	369,653	577,028
1927†.........	128,436	350,858	547,690
1928†.........	139,133	403,214	629,417
1929†.........	110,998	275,049	429,352
Sub-total....	927,350	2,887,252	4,507,000
1930†.........	74,713	149,791	233,824
1931†.........	63,834	135,278	211,169
1932†.........	38,057	70,931	110,723
Total	1,103,954	3,243,252	5,062,716

* 27 States, F. W. Dodge.
† 37 States, F. W. Dodge.
‡ Assuming each dwelling is 1550 sq. ft. and that reports from 27 States equal 81.5% of total and those from 37 States equal 91%.
§ Contract dwellings (private and farm dwellings were added to obtain an agreement with the totals of the Census figures, 4,507,000, 1920 to 1929).

farm homes are worth less than $2500, and would rent, assuming the annual rental to be 10% of the value, at $250 per year or less. This amounts to $4 per room per month or less. Obviously, this entire category, amounting to 7 million homes, is a part of that class described above as "not adequate." No builder can erect urban houses to rent for less than $4 per room. No owner can or does run up modern urban homes for $500 per room. With the exception of a few million frame shacks built usually in the vicinity of factories to house the labor force, the ten million are old houses that have been allowed to run down, eventually becoming either multiple houses (tenements) or shabby relics of past days.

Probably many non-farm, or urban, houses in the $3500 owned class and the $3100 rented class, as well as the majority of the farm homes (whose average value is only

TABLE III

Value of Average Home—1929*

	Number	Unit Value	Total Value	Repairs†
			Owned, Non-Farm	
	794,724	$ 750	$ 596,043,000	$ 11,920,860
	570,047	1,250	712,559,000	14,251,175
	531,277	1,750	929,735,000	18,594,700
	1,167,325	2,500	2,918,312,000	58,366,240
	2,343,769	3,500	8,203,191,000	164,063,820
	2,297,029	6,250	14,356,431,000	287,128,620
	989,468	8,750	8,657,845,000	173,156,900
	1,600,429	15,000	24,006,435,000	480,128,700
	209,318	5,500	1,151,249,000	23,024,980
Total	10,503,386		$ 61,531,800,000§	$1,230,635,995
Average		$5,853		$117
			Rented, Non-Farm‡	
	1,563,952	$ 900	$ 1,407,557,000	$ 28,151,140
	1,330,927	1,440	1,916,535,000	38,330,700
	1,302,387	2,100	2,735,012,000	54,700,240
	2,545,208	3,100	7,890,145,000	157,802,900
	3,191,435	4,800	15,318,888,000	306,377,760
	1,503,401	7,500	11,275,507,000	225,510,140
	343,071	10,500	3,602,245,000	72,044,900
	255,339	18,000	4,596,102,000	91,922,040
	315,829¶	4,000	1,263,316,000	22,108,020
Total	12,351,549		$ 50,005,307,000	$1,000,106,140
Average		$4,048		$80
			Total Non-Farm Homes	
Total	22,854,935	$4,880	$111,537,107,000	$2,230,742,135
Average				$98
			Total Farm Homes	
Total	6,288,648		$ 7,083,500,000‖	$ 141,670,000
Average		$1,126		$23
Total All Homes	29,143,583			

*Source: Fifteenth Census, "Construction Industry."
† On basis that repair equals 2% of value.
‡ On basis that rent equals 10% of value.
§ Rental—$6,153,000,000 (Imputed income owned Non-Farm Homes)
‖ Rental—$708,350,000 (Imputed income Farm Homes)
¶ Value not given in Census. Average value of all houses has been taken.

$1,126), are also in need of renovation or replacement. However, the ten million non-farm homes valued at $2500 or less, are obviously the point of attack since there is no question that rooms which rent for less than $4 per month in the American town of average size do not afford decent living conditions.

A picture of housing conditions taken from another angle was recently revealed by the Bureau of Foreign and Domestic Commerce's Real Property Inventory. This dwelling-to-dwelling survey, which was taken in 64 urban districts and which, it is believed, was a fair sampling of our 28 million dwelling units, indicates that in the entire country, we have:

556,900 units unfit for human habitation
1,715,700 units in need of *structural* repair
1,821,200 units without inside running water
3,900,500 units without indoor toilets
5,315,700 units without bath facilities, either shower or tub
6,049,400 units in which cooking is done by fuels other than gas or electricity
13,748,900 structures that are built of wood.

Our farm homes are no better equipped than our urban dwellings, but their improving is less imperative not only because isolated houses can do without certain modern conveniences with less hardship than city homes, but because farmers are in a better position to renovate their own homes, once their general economic condition has been straightened out.

Our study of product capacity in the construction division was therefore directed to answer the question whether men and supplies are available to do the following:

(1) Build each year 1,000,000 homes in which to rehouse the population and thereby replace with modern residences the ten million homes in which an American standard of life cannot be maintained

(2) Build each year the 450,000 urban homes needed to house the normal growth of the town and city population

(3) Build each year the 100,000 (estimated) new farm

homes necessary to take care of the increasing rural population

(4) Provide each year the equivalent of 200,000 homes needed to keep the existing homes in repair. (These homes, of course, will not be built. Only the labor and materials which they represent are considered.)

(5) Construct the highways, water systems, sewerage, telephones, etc., needed to service these homes. And finally, can we at the same time

(6) Renew non-residential construction at the rate set in 1929?

Tables IV and V[1] summarize the results of this inquiry. They are not satisfactory from the engineer's point of view, owing to the limitations of our capacity Definition B, which precludes the use of hitherto unused materials or new techniques, and the employment of plants or resources that were not included in our capacity figures.

However, despite these limitations, the practicability of constructing 1,550,000 homes a year is clearly shown. The only deficiencies which appear are in brick and gypsum, both of which materials we could, without difficulty, supply in desired quantities, since:

(a) Many towns have their idle pressed-brick plants, which could be operated in case brick were needed. Existing equipment of this character could take up much of the slack until more modern plants were erected. Modern stiff-mud brick plants of capacities adequate to meet all needs could be erected and equipped within a year or so to produce this needed building material from the practically unlimited deposits of plastic clays which occur almost everywhere in the United States.

(b) Sand-lime brick, cement brick, or stone can be substituted for clay brick in case a temporary shortage should develop.

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[1] See Appendix.

(c) There are almost unlimited deposits of gypsum that could be recovered and processed if an effective demand should develop.

The apparent shortage of labor is of the same nature. 1,505,800 men are needed, using traditional, obsolete building methods. On April 1, 1930, 2,574,968 men reported themselves as part of the building industry labor forces.[1]

Although there might be a shortage of certain skilled craftsmen, this could quickly be remedied. The evolution of technology employed in building follows the general line. The more advanced the methods, the fewer skilled men are required and the fewer man-hours required for each unit of value of the finished product. Consequently, any shortage would soon be nullified by using more advanced technological methods.

The matter of furnishing these homes has been taken into account on the Flow-Sheet and is shown in detail in Tables XV, XVI, and XVII.[2] There is no problem with regard to the heavy fixtures. Our capacity to produce plumbing, lighting, and heating fixtures has never, in the years studied, been approached. Two-shift operation of manufacturing plants would not only permit equipping the new homes with modern fixtures but would also permit the gradual installation of modern equipment in the better of the existing homes.

The 1929 rate of highway construction is adequate to provide road communication for the new homes. Public and private utility construction would not be taxed by the additional burden, since the rate of construction, set in 1928, seems ample to keep pace with any home-building program for which materials and skilled labor can be found.

Lastly, the possibility of using old building materials in *new* houses provides a safety margin which precludes the

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[1] U. S. Census, 1930, Volume V, pp. 424-426.

[2] See Appendix.

possibility of being held up for supplies. Certain materials such as stone are often more suitable when weathered or "softened." Others, such as plumbing fixtures, can be sent back to the furnaces to emerge as new steel, brass, or lead. Old furniture and rugs, even of no particular historical period, are often preferred to new.

So it seems reasonable to conclude, if physical factors were the only limitation on our ability to construct, that:

(a) The homes of America could be replaced at the rate of 1,550,000 a year.

(b) The new homes could be of modern design, well-equipped, and constructed of materials which would outlast the present century.

(c) This building program could be continued without let-up until the American people were housed in a fashion which would permit them to enjoy the comfortable standard of life sometimes known as "American," and that

(d) This rate of home building could be obtained without causing any restriction of necessary construction in other lines.

HAROLD LOEB

DERIVATION OF CONSTRUCTION TABLES

TABLE I. Cost estimates for the building industry were obtained from (a), the F. W. Dodge Corporation reports on contracts awarded in 37 states, and from (b), the reports of the *Commercial & Financial Chronicle* for the eleven western states not covered by the Dodge reports. This total cost was then proportionally raised to cover the entire country. To the figures obtained in this manner was added an amount representing farm construction, obtained from data published by the Federal Employment Stabilization Board.

This method may be considered arbitrary, but the lack of any set of complete statistics has made some such procedure unavoidable. It does not seem possible that independently compiled figures on building costs could be within five per cent of one another. Still, no divergence of this order could be important to a picture that purports to represent only the volume and trend of the industry. However, we checked our results against every available source and found a satisfactory correspondence.

In the division of heavy construction, the figures covering railroad construction and maintenance were obtained from "A Review of Railway Operation in 1933," which is No. 62 of a series of reviews issued by the Bureau of Railway Economics.

The Edison Electric Institute furnished figures to cover new construction and maintenance in the electric power and light industry.

The sources of the figures covering telephone and telegraph were the American Telephone & Telegraph Co., the Western Union Telegraph Co., and the Postal Telegraph Co.

Statistics covering electric railways were obtained from the Federal Employment Stabilization Board.

Gas and water-works construction costs were compiled from statistics furnished by the American Gas Association and the *Engineering News-Record*, which publication also gave us data on the cost of sewerage.

The expenditures for highways and bridges were compiled from "An Economic Survey of Motor Vehicle Transportation," which is No. 60 of a series of reviews issued by the Bureau of Railway Economics. We estimated cost data for 1932 and 1933, but we followed our rule of choosing the most conservative amount.

Federal Public Works costs were taken from the statistics of the Federal Employment Stabilization Board as published in the *Journal* of the American Statistical Association for March, 1933.

Records may exist from which some reasonable estimate of the cost of building maintenance, *not requiring official inspection,* may be obtained, but none is available in statistical form. Still, the total amount must be so large that it should not be neglected. No claim of precision is made for the figures we adopted but they are, in any case, conservative.

In brief, our figures were arrived at by adopting an estimate of 25 million[1] dwelling units, each containing five rooms. We assumed that \$5 per room would be spent annually in painting, papering, and the like, under the conditions of "least expenditure." (For prosperous years, such as was 1929, this unit cost would probably have to be doubled.) For the average year, this \$5 per room would give us a total of \$625,000,000 as the cost of maintenance, checking reasonably with the information obtained from the Russell Sage Foundation on projects of the New York State Housing Board which indicates an amount of \$10 to \$13 as the cost of construction maintenance, and with the estimate of Mr. E. L. Gilbert, writing in the *American Builder* for February, 1934, who states that the repairs needed for residential properties varied from \$2,581,000,000 in 1927 to \$2,953,000,000 in 1934.

TABLE II. The published figures of the F. W. Dodge Corporation (covering 27 states for the years 1920 to 1928, and 37 states for the years 1925 to 1932) were taken as the basis of Table II. The contract figures, as reported by the same authority, which are the most complete figures available, are broken down into: (1) the number of housing developments; (2) the number of dwellings built by owners; (3) two-family houses; (4) apartments, and (5) hotels. We then assumed that the average cost of an apartment, dwelling unit, or the dwelling units in a two-family

[1] Eliminating 4 million homes as too run-down to paint, paper, etc.

home, was the same as the average cost of a detached home built by its owner. This assumption made possible an estimate of the number of dwelling units, represented by the total of housing contracts.

We also assumed that the floor area of each dwelling unit was 1550 square feet, and divided by this unit area the total square feet in the dwellings constructed, thus obtaining the number of dwelling units constructed each year.

When this was done, we had the figure 2,888,059, which represented the total dwelling units "built under contract" in the years from 1920 to 1929. But the Bureau of the Census reports 4,507,762 as the increase in the number of dwellings built in these years. So, if we multiply the annual number of contracts by the ratio of the figures given (4,507,762 divided by 2,888,059), we arrive at a figure representing the dwelling units built each year.

These results are given in Table II. (The Census figures count tents, boats, and shacks as dwellings, but since an apartment is counted only as a *single* dwelling, it would seem reasonable to assume that their estimate of the increase in dwellings is at least a rough measure of the increase in dwelling units.)

Table III. A minimum of 450,000 dwelling units will be necessary to house the normal annual growth of the urban population, and 100,000 farm homes for the rural population. At least 200,000 urban dwelling units would be required as the construction equivalent to the maintenance and repair of the existing houses. The normal growth of the population and maintenance will then account for the construction of about 750,000 dwelling units per year—houses absolutely necessary before any real reconstruction of our national housing plant can be considered.

Out of the 29,243,000 existing dwelling units, about 7,257,000 (owned non-farm homes below $2500 in value, and rented non-farm homes below $2100 in value) fall below a decent "American" standard and should be replaced. If we should outline a ten-year program of construction, it would mean the building of about 1,000,000 housing units per year. Thus, our program must provide for the building of a minimum of 1,550,000 family units per year, in order ultimately to house our population properly and decently.

TABLES IV AND V (Appendix). Our calculations of the labor requirements for carrying out the building program outlined above have been based upon the labor scheduled for the construction of the several family units listed in Table V. This same study was also the basis for calculating the materials required for completing the building program.

POMEROY C. MERRILL

HOUSING BUDGET

We have estimated that we can build 1,550,000 new dwelling units per year at a cost of $6,000 per unit. (We have allowed for maintenance the equivalent, in labor and materials, of 200,000 additional homes.) Only 1,000,000 of these new structures are considered as replacement dwellings. The remaining 550,000 homes, 450,000 urban and 100,000 rural, will be needed to house the normal increase in population.

When considered from the angle of monetary national income, it is necessary to express the housing budget in terms of rent. Ten per cent of the 1929 value of our dwellings has been taken as their rental value. In 1929, the rental value of existing urban homes totaled 11,128 million dollars, and that of farm homes 708 million dollars—a total of 11,836 million dollars.

To compute the rental value per unit of the proposed new buildings, we must add to the $6,000 per unit given above a sum which will represent the value of the land. This is so dependent on speculative factors, location, etc., that accurate figures cannot be obtained. Therefore, we have arbitrarily assumed that the land will cost $2,000 for an urban home, $1,000 per apartment for an apartment dwelling, and $200 per unit for a farm home. The computed average comes to $1,500 per structure which amount we have added to the above value of the building. This gives us a total value of $7,500 per dwelling. The average rent per unit for these dwellings is therefore $750.

Since, under these proposals, 1,000,000 sub-standard buildings are to be replaced each year with new structures, it is assumed that these old buildings will be demolished. The rent paid for them must therefore be deducted from the 1929 rent bill, 11,836 million dollars, given above. By dividing into different classifications, according to value, all 1929 dwellings, both urban and rural, and then arbitrarily setting aside a group of 10,000,000 buildings culled from the lower value classifications, we arrive at a total value of approximately twenty billion dollars for these ten million sub-standard homes. The value of 1,000,000 such homes (the number we propose to replace each year) is therefore two billion dollars. Hence the rental value, or 10% of this amount, is $200,000,000. This sum, then, is the yearly amount which must be deducted from the 1929 rent bill of 11,836 million dollars before it can be included as an item in the proposed housing budget. Therefore, this sum now becomes 11,636 million dollars and can now be included in our budget.

This sum, plus 10% of the value of the buildings we propose to build, becomes (for the first year of our budget proposal) the total expenditure for housing. The accompanying table itemizes and sums up this first year budget:

Housing Budget, First Year

Adjusted 1929 rent bill	$11,636,000,000
Rental at 10% on 1,000,000 replacement homes @ $7,500	750,000,000
Rental at 10% on 450,000 new urban homes @ $7,500	337,000,000
Rental at 10% on 100,000 new farm homes @ $3,200	32,000,000
Total	$12,755,000,000

To arrive at the total rent figure for each succeeding year of the proposed ten-year period, we need only subtract the 200 million dollars resulting from the demolition program from the first item, and then add to each preceding year's total the annual rent increases which result from the proposed building program, or the sum of the last three items in the above table, which equals 919 million dollars.

Felix J. Frazer

CHAPTER XI

PRINTING, PUBLISHING, AND ALLIED INDUSTRIES

Printing and publishing, together with the trades that are allied with them, constitute a great industry which in 1929 employed nearly a half-million people at salaries and wages and attained a total production value of more than two and one-half billion dollars. To the number of those directly employed in these industries should perhaps be added the large number of persons who, without direct contractual relations, prepared free-lance copy from which type was set, or who made drawings from which printing plates were produced.

These industries are engaged in furnishing essential tools to two of the main emprises of civilized society, education and recreation.

The epistemological contents of the printed page does not affect the mechanical means of production, whereas the equipment suitable for one class of work (books) is distinct from that best adapted to another (periodicals). This study, taking into primary consideration the physical factors of technical procedure, has therefore classified these industries into three main divisions: (a) Newspapers and periodicals, (b) Books and pamphlets, (c) Commercial and job printing.

Allied industries include bookbinding, blank-book making, engraving, chasing, etching, die-sinking, plate printing, lithography, stereotyping, electrotyping, type-founding, and the manufacture of engraver's and printer's materials.

Newspaper presses are very generally run on a double-shift basis, except in a few of the large metropolitan dailies where three shifts are often scheduled. This also applies to linotype machines and other contributing equipment. Hours worked per shift per week have averaged during the last few years between 40 and 45. Book and pamphlet presses and job-printing presses, together with their contributing equipment, are generally run on a one-shift basis because of lack of a steady effective demand for their products. In their case, therefore, the single shift is the direct outgrowth of a limited effective demand.

No exact figures to express the ratio of production to capacity can be given. Many authoritative studies, however, seem to agree that the production of newspapers and periodicals is probably not far from the actual physical capacity of the equipment, but that the production of books and pamphlets, and also job printing, could be enormously expanded with little, if any, additional equipment.

These general conclusions were reached after a compilation and collation of data from some twenty different sources. A very thorough check-up on plants supplying the printing industry with equipment supplemented this research. Virtually all such plants were found to be running at a very low production rate. A small sampling of representative printing establishments was also taken in order to estimate the factor of obsolescence in equipment. In several instances this was found to be appreciable. The conclusion was, therefore, inescapable that there are few physical limitations to the output of the printing and publishing industry. Potential capacity has certainly no limitations and must consequently be studied from the angle of needs and desires—in other words, from some estimate of "reading capacity" of the population. To estimate this reading capacity as well as to measure production, some yardstick had to be adopted. The annual production of newspapers and periodicals was measured in terms of circulation figures, and the production of books and pamphlets by the total number of copies printed per year. (It was found that the measurement of commercial and job printing—items having no discoverable common denominator—was best expressed by the dollar value of products.)

By comparing, in the first two classifications, computed production against total population, some idea of consumer "reading capacity" was offered. N. W. Ayer's "Directory of Newspapers and Periodicals," *Editor and Publisher*, "Standard Rate and Data Service," and similar sources were studied to arrive at newspaper and periodical production figures—but it was soon apparent that differing categories, classifications, and percentages made the figures difficult to resolve. The Bureau of the Census figures finally proved the most practical.

It was computed that more than 19,985,000,000 copies of newspapers and periodicals were distributed in the year 1929. (In reality, the actual production probably exceeded the twenty billion mark, since the first figure, following the customary practice of compiling circulation statistics, does not include leftovers, unsold copies, advertisers' exchange, or file copies.) There were, in addition, 113 other publications in the newspaper and periodical class for which no yearly output could be determined because their frequency of publication was not disclosed by the Bureau of the Census. These had an average circulation per issue of 19,000 copies.

Newspapers have already attained a wide coverage. Circulation now current shows an output averaging one and one-sixteenth newspapers for every family[1] in the country each day of the week, and all but 6,000,000 families are buying Sunday papers. "There is," says *Editor and Publisher*, "no wider circulation of any article of commerce, except the actual necessities of life."

Distribution was even more general in 1925. In that year, there was one daily paper for every three inhabitants, a Sunday paper for every four, and a weekly paper for every seven.[2]

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[1] Figuring four persons to a family.

[2] "Productivity of Labor in Newspaper Printing," a Department of Labor Bulletin.

In books and periodicals, however, the pendulum swings in the other direction. True, the industry produces a wealth of volumes and magazines, judging by the vast array of subject matter, but in these two categories distribution is, nevertheless, far from thorough. Only a few books in history have ever attained the million mark in number of copies produced, while only a couple of dozen have reached 500,000. Considering our population, it is evident that only a small portion of our people ever read any one book or magazine.

In this classification, it was found that 235,360,032 books and 199,835,801 pamphlets were produced in 1929, a total of 435,195,833. In 1927, the total was even higher: 470,374,947 books and pamphlets having been released from the presses in that year. Any estimate of our capacity to produce books and pamphlets would involve too many factors of uncertain magnitude. In any case, in 1929, our capacity to produce printing equipment was not less than twice our actual production. The "bottleneck," if one exists, would be found in the paper industry, but that difficulty could be avoided by imports of paper in the event that a substitute for domestic wood pulp was not developed.

Printing and Publishing Industry, 1929

Production		Approximate Production Values	Capacity Production
Newspapers and periodicals...	19,985,000,000*	$1,480,000,000†	(See text)
Books and pamphlets.........	435,000,000	190,000,000	At least double
Commercial and job printing‡.	—	930,000,000	—
Total value of industry.......	—	$2,600,000,000	—
Allied industries.............	(included in above total)	453,000,000	—

* Total number of copies distributed during year according to circulation statistics.

† Includes newspaper and periodical advertising.

‡ Includes sheet music, books of music, and paper patterns.

Summary. No single measure of unit production for the entire industry has been found by either this or any previous study. Circulation figures for newspapers and periodicals, numbers of books and pamphlets printed, and value of production for job printing, are the units of measure adopted by this Survey.

In 1929 the entire printing and publishing industry (exclusive of firms with less than $5,000 income) attained a total production value, inclusive of newspaper and periodical advertising of $2,600,000,000. Newspapers and periodicals accounted, in round figures, for $1,480,000,000 of this amount, while books and pamphlets came to $190,000,000. The output, therefore, of our third and last classification, commercial and job printing, is measured by the remainder, or $930,000,000.

Newspapers are generally produced in publisher-owned plants. Seventy-five per cent of magazine printing is contracted out to the commercial printing plants.[1] Ninety-seven per cent of book production is contracted to commercial houses.[2]

There were, census statistics revealed, 24,360 establishments in the printing and publishing industry in the year in question, with 484,784 persons gainfully employed, of whom 281,119 were wage earners.

Except in the case of newspapers, existing capacity has been found ample to meet a great increase in demand for reading matter of all kinds. Newspapers are at present so well distributed that, despite low national purchasing power, probably the saturation point has been approached. Potential capacity in books, pamphlets, and job printing is virtually unlimited; and books and pamphlets have by no means reached the saturation point in national distribution. A great increase is both desirable and physically possible.

FELIX J. FRAZER

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[1] S. R. Latshaw, Chairman, Code Committee, Periodical Publishers' Institute.

[2] Book Manufacturers Institute.

CHAPTER XII

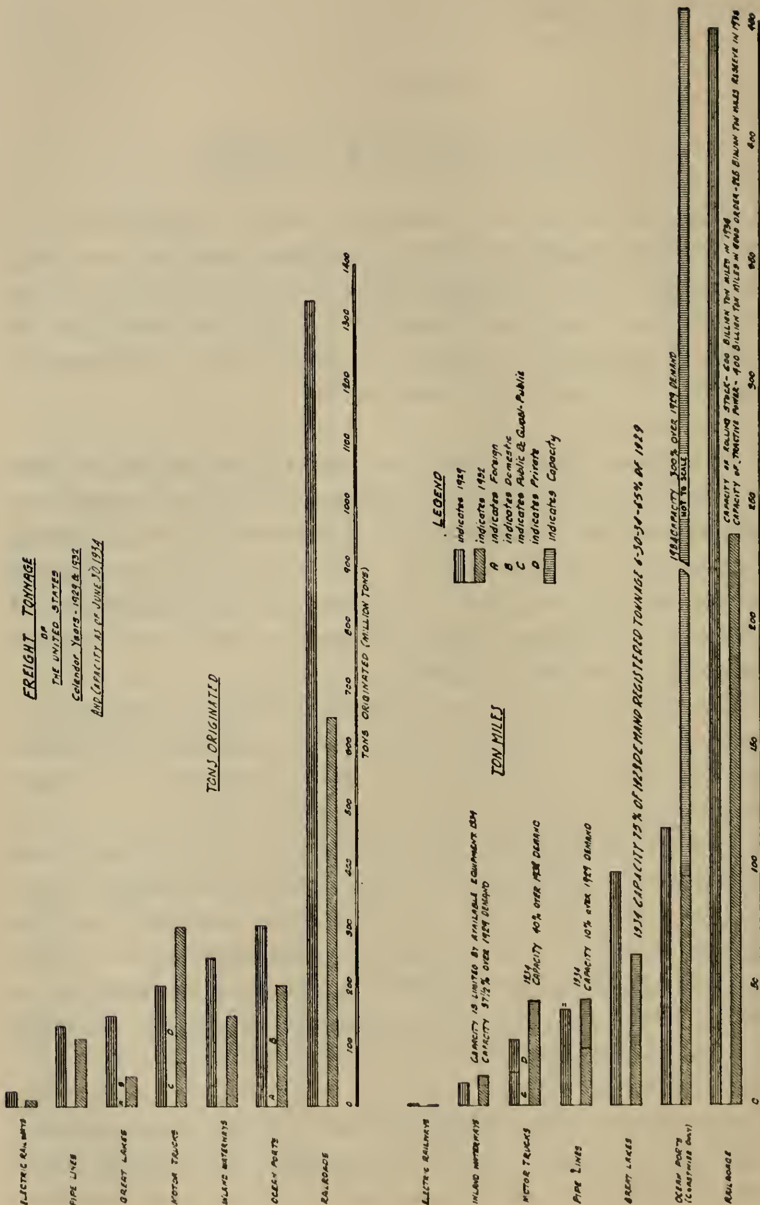
TRANSPORTATION

Without freight and passenger traffic, no functioning of our modern economy would be possible. Unrelated and self-directing as most industries have been, transportation has tended to act as a coördinating agency. Any study of existing or potential productive capacity must therefore be bound to the study of transportation.

General. All systems of transportation, except our natural waterways, have been developed to serve the needs of commerce. They follow the logical routes of trade and travel. Raw materials and production centers fix the places of origination, and the needs of consumers fix the destination of products. Passenger travel is largely parallel and complementary to the flow of goods.

The development of transportation has been largely governed by the needs of industry. It is assumed, therefore, that the systems of transport as now constituted will largely comprise the facilities of the immediate future.

Agencies listed in this chart make up the major factors of transportation. The year of peak demand on freight capacity was 1929; 1932 was chosen as the year indicating the present weights of the respective passenger agencies. But 1932 is not the year of greatest demand on passenger capacity. About sixty-five billion passenger-miles were recorded in each of the several years preceding 1920, of which 75% was carried on steam railways, 5% on coastwise shipping, 7% on Great Lakes shipping, and 13% by other agencies. This total, however, is not comparable with existing or recent passenger travel because the weights of the respective


FREIGHT TONNAGE
OF
THE UNITED STATES
Calendar Years - 1929 & 1932
AND CAPACITY AS OF JUNE 30, 1934
TONS ORIGINATED
ELECTRIC RAILWAYS
PIPE LINES
GREAT LAKES
MOTOR TRUCKS
INLAND WATERWAYS
OCEAN PORTS
RAILROADS
TONS ORIGINATED (MILLION TONS)
TON MILES
LEGEND
indicates 1929
indicates 1932
A indicates Foreign
B indicates Domestic
C indicates Public & Quasi-Public
D indicates Private
indicates Capacity
ELECTRIC RAILWAYS
INLAND WATERWAYS
MOTOR TRUCKS
PIPE LINES
GREAT LAKES
OCEAN PORTS (COASTWISE ONLY)
RAILROADS
CAPACITY IS LIMITED BY AVAILABLE EQUIPMENT 1934
CAPACITY 37½% OVER 1929 DEMAND
1934 CAPACITY 40% OVER 1929 DEMAND
1934 CAPACITY 10% OVER 1929 DEMAND
1934 CAPACITY 75% OF 1929 DEMAND AND REGISTERED TONNAGE 6-30-34-65% OF 1929
1934 CAPACITY 300% OVER 1929 DEMAND
NOT TO SCALE
BILLION TON MILES

agencies have materially changed in the past decade. For instance, in 1928-9, some sixty-five billion passenger-miles were traveled between centers in privately owned automobiles, motor busses made about 20% of the aggregate (1932) passenger mileage, while electric inter-urban railways have abandoned 30% of their trackage in the last twelve years.

Any system of transportation has three essential physical components: (a) ways (roadway and track, waterways, highways, and airways); (b) transport equipment; and (c) tractive power. To these three might be added personnel, perhaps the most important component of all. But since this may be said of all industry, it will only be mentioned here in passing. In the several systems, these components are found in different combinations.

Air transport, because of its speed, is a unique service for passengers and valuable goods of small bulk; but because of its low economy it is a very limited one, accounting for less than 0.4% of the total 1932 passenger-miles. Waterways are now used only for bulk cargoes of low unit value. Motor trucks facilitate deliveries between near-by points, having replaced railroads for many short hauls, and now are almost the exclusive agency for the transport of perishables within a radius of one hundred miles. Excluding air transport, the remaining agencies are competitive and complementary.

Public Highways. Our public highways carry but 3.5% of our public and quasi-public transport tonnage, yet they have become so crowded that several states have passed laws prohibiting or limiting their use by common carriers. Now, if so small a fraction of the total tonnage has aroused such action, it seems reasonable to assume that no great increase in truck transportation can be accommodated by our present highway system.

A study of the reports of the highway commissions of the forty-eight states indicates that more than forty thousand miles of new highways are needed exactly paralleling existing routes; and that entirely new routes, embracing one hundred and thirty-five thousand miles, are required to meet the immediate demand for short-haul inter-city traffic.

Three and one-quarter million motor trucks are in operation today, and registration has been near this figure for seven years; but there are only six hundred thousand trucks of about one and one-half tons capacity. Only two hundred thousand are engaged as common carriers. Motor trucks should not, however, be considered as components of the basic transportation system but as extensions of the mechanism of production. It should be kept in mind that they could not be mobilized in an emergency without paralyzing industry and agriculture.

Only about 20% of the motor busses are engaged in common-carrier inter-city service, but they account for 17% of the total passenger-miles made by all common carriers in 1932. School busses and busses in similar services carried almost a billion passengers in 1932. Inter-city bus travel has been integrated in a remarkable fashion. While this can hardly be rated as an important transportation agency, the established lines do constitute the nuclei for the development of a reasonably important factor in passenger transportation. However, the present load-factor is very low, and the 1932 depreciation rate was about 27%; so it seems unlikely that motor busses will become a formidable factor until these deficiencies shall have been corrected.

In this study, electric inter-urban railways are not considered to be an important factor of the national transportation system. Thirty per cent of the 1932 electric railways' track mileage has since been abandoned. In 1930, only 9,683 miles—less than 4% of the steam-railroad mileage—of track were in service. Only 4% of the total passenger-miles were traveled on this media in the same year.

Oil pipe lines serve a single industry in highly localized areas. The railroads transport a greater portion of petroleum products than do the pipe lines, and coastwise vessels transported petroleum products equivalent to 50% of the pipeline tonnage in 1932. Existing pipe lines have an annual capacity of about eight hundred million barrels.

Ton-miles carried by oil pipe lines approximate 5% of the aggregate work done by all transport factors in 1929 and 1932. In 1929, natural-gas pipe lines delivered energy equivalent to eighty million tons of coal. Had this coal been transported by railway, it would have required work amounting to twenty billion ton-miles and would have required an addition of three and one-half per cent to the aggregate of all carrier capacity.

Less than 2% of our traffic moves over inland waterways. Seasonal closure of canals and rivers, and other uncertainties, make it impossible to depend upon inland waterways as an important factor of transportation. In 1932, 80% of all tonnage on rivers was comprised of four commodities: petroleum products, coal and coke, sand and gravel, and products of the forests.

Coastwise shipping originates 11% of all freight tonnage and accounts for almost 16% of the total ton-miles. Great Lakes carriers transported 7% of the tonnage carried by all agencies during that year and approximated 13% of the total ton-miles. The tonnage of registered bottoms on the Great Lakes on June 30, 1934, was only 65% of that of 1929.

Railroads. The three major components of the railway transportation system have been mentioned. Let us restate them: (a) ways (density capacity of roadway and track); (b) transport equipment (carrying capacity); and (c) tractive power.

(a) *Ways.* The maximum "density capacity" may be defined as the greatest number of trains of all types of service that can be run over a given division of track in a given time. High-speed train service is a factor only in so far as it must be coördinated by the dispatcher with the slower movement of freight and short-haul passenger service. Increasing train speed will have little effect on the total tonnage capacity, as only one day in each fourteen is spent, by the average freight car, in motion. The remaining time is taken in loading and unloading, waiting for load, and other delays.

The diversity of function of the three components precludes the use of past performance as a basis for estimating integrated capacity operation; but past performance of the various components, considered singly, may be interpreted as supporting an estimate of capacity.

(b) *Transport Equipment.* The work done by class-1 railroads in 1929 aggregated 489 billion ton-miles. Tonnage volumes for the calendar years of 1927 and 1928 were within 5% of the 1929 value.

In 1934, rolling stock existing in good order was adequate to move about 600 billion ton-miles of freight annually, under the present utilization factor.

(c) *Tractive Power.* Tractive power available and now in good order could handle about 400 billion ton-miles. Stored locomotives, if actually serviceable, give a reserve power of 50 billion ton-miles. Unserviceable locomotives, if reconditioned, could deliver an additional 175 billion ton-miles annually.

Morale, always high in the railroad personnel, has suffered during the late depression less than in any other industry. Dr. Julius H. Parmalee, Director of the Bureau of Railway Economics, says in his review of the calendar year of 1933: "Carriers maintained throughout the four-year period much the same high level of operating efficiency that characterized their performance during earlier years."

For the reason that 16% of tractive power is always awaiting repairs, we have chosen to estimate annual capacity, after full rehabilitation, at 500 billion ton-miles. This estimate of capacity is based on the best past performance plus full utilization of all advancements in the arts. The figure of 500 billion ton-miles for existing freight capacity is conservative.

CARRIER CAPACITY, FREIGHT. Freight-capacity estimates of our national transport system might be based on the assumption that our carrier agencies be integrated. No such assumption has been made, estimates of available capacity being based on the existing capacity of the various carriers. However, if the various systems are considered as integrated, estimates of capacity are of interest. For instance, in 1932, 20% of all inter-city freight originated with trucks, while 7% of the total ton-miles of all agencies was carried by trucks. Were railroads and trucks to be integrated, utilizing the railroads for long freight hauls exclusively, the ton-mile capacity of all systems would be increased by 100 billion ton-miles, or 15% of the aggregate demand of 1929.

Capacity in freight haulage must also be considered from the angle of the type of freight hauled. Thus, coastwise shipping now makes an effective contribution to the transportation capacity of only two commodities: Petroleum products and coal. Its capacity for these items is probably about 40% greater than the 1929 demand.

Four-hundred-per-cent increase over the 1929 demand in merchandise and manufactured tonnage could be carried by our present coastwise vessels.

The present capacity of the Great Lakes bottoms for all types of freight is estimated at above 75% of the 1929 demand but no intelligent estimate can be made of the time required to rehabilitate vessels that have not maintained their registry.

The 1934 capacity of motor trucks (43 billion ton-miles) is about 40% greater than the maximum demand which they met in 1932, but only 15% of this capacity is available for public or quasi-public use.

The chart at the head of this chapter gives the estimated existing ton-mile capacity of the several agencies.

Carrier Capacity, Passenger. The 1933 passenger-miles of steam railroads were only 40% of the 1920 peak. The decline in passenger travel on the railroads approximated 33 billion passenger-miles during the past 12 years, and the increase in private automobile travel was two times greater than the loss to the railroads. Railroad passenger capacity is now 100% greater than the demand (50 billion passenger-miles) at the peak in 1920. Private automobiles are not considered as components of a national transportation system, but they provide an effective reserve.

Of the 36 billion passenger-miles made by common carriers in 1932, about 47% was made on railroads, 30% being made by commuters.

Previous to 1920, when the decline in railroad passenger travel began, there were in use about 63,000 passenger cars of all kinds, including baggage and dining cars. On January 1, 1934, 56,000 passenger cars were available. Practically all of the 7,000 cars discarded were abandoned day coaches of obsolete design. During that time, more than 17,000 modern steel coaches and other cars had been delivered. It is estimated that the total passenger capacity of equipment is about 5% greater than in 1920.

In the years of greatest demand, railroad cars with average capacity of 50 passengers, carried only 20 passengers per car. The average in 1933 was about 8 passengers per car. Since peak loads have been weighted in the averages, it may be tentatively assumed that present railroad equipment, roadway, and tractive power are ample to meet a demand

100% greater than the previous peak of travel (1920) and five times greater than in 1933.

The yearly capacity of all domestic water-craft is estimated at about 24 million passengers on the routes now traveled, and for the distance usually traveled. This is approximately four times the recorded travel for 1932.

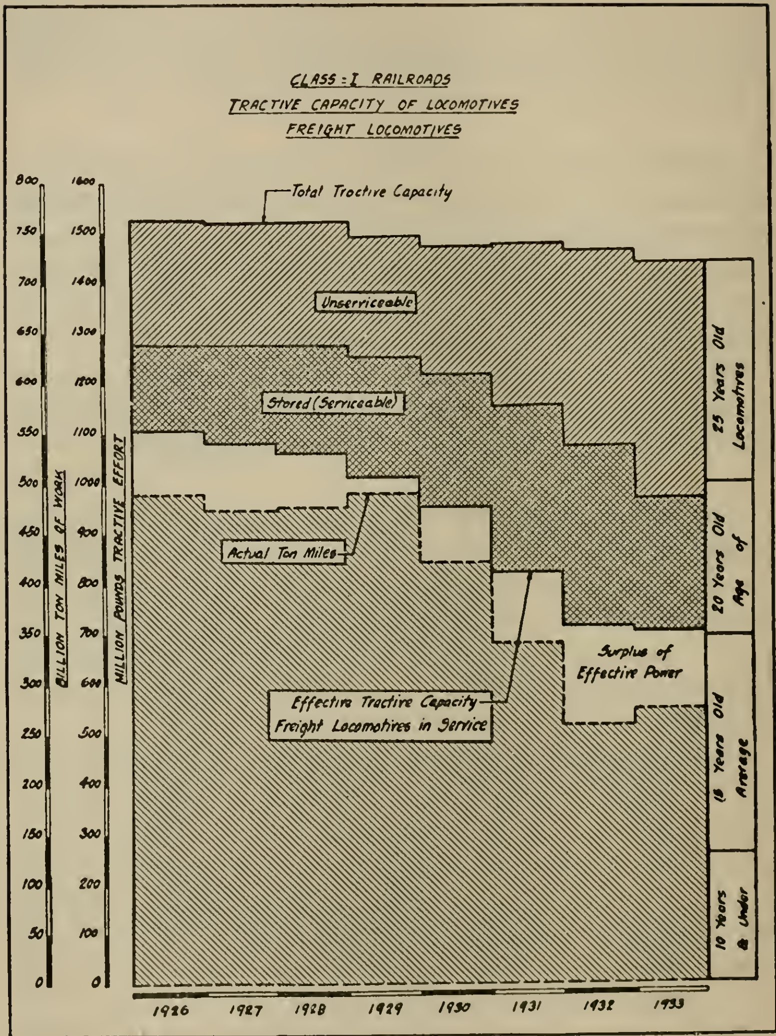
Carrier Capacity, Other. About 800,000 passengers were carried over the Great Lakes, and 900,000 over inland waterways. About 2,750,000 were embarked on the Atlantic coast and about 2,000,000 on the Pacific. Approximately 694,300 passengers were carried in foreign travel and 79,590 foreign excursionists visited our shores.

In 1932, twenty-five million passengers went on water excursion trips and over three hundred million persons used the ferry boats at New York and San Francisco.

Potential Capacity. The present capacity of our rolling stock is 50% greater than the greatest previous demand; and the productive capacity of makers of equipment is sufficient to replace 20% of the existing rolling stock in one year. These capacities are so far ahead of any conceivable demand that any estimate of potential capacity would be mere speculation.

Tractive power apparently available must be increased if the demand increases beyond the 1929 tonnage volume.[1] Sixteen per cent of the total tractive effort has become unserviceable in the intervening years, and considering that many units have been five years "in lead," it seems impossible to consider the reserve tractive power as of full value. But, if it were made 100% available, the reserve units would

[1] The Report of the Coördinator of Transportation, April 24, 1934, estimates capacity at 43.5% above peak demand of October, 1929, after a sixty-day repair period and after withdrawing all units from storage.


CLASS - I RAILROADS
TRACTIVE CAPACITY OF LOCOMOTIVES
FREIGHT LOCOMOTIVES
Total Tractive Capacity
Unserviceable
Stored (Serviceable)
Actual Ton Miles
Effective Tractive Capacity
Freight Locomotives in Service
Surplus of Effective Power
BILLION TON MILES OF WORK
MILLION POUNDS TRACTIVE EFFORT
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
25 Years Old
Locomotives
20 Years Old
Age of
18 Years Old
Average
10 Years
& Under
1926
1927
1928
1929
1930
1931
1932
1933

not meet the requirements forecast for the immediate future, i.e., 122 miles per day per locomotive as against 94 miles in 1929.

The locomotive plants now in operation have, in one year, produced 3600 units of all types. At this rate, production of units of average tractive effort would increase available power by 20% annually. Since advancements in the art make possible the production of units with much greater efficiency, and since less repairs would be required on the new units, actual effective power could probably be increased by 25% per annum.

About two billion tons of freight was annually originated in the continental United States during the years of greatest industrial activity. Foreign commerce and our territorial possessions delivered annually an additional quarter of a billion tons. The weighted average haul of all classes of freight was 192 miles. Thus, the production of work of all factors was 731 billion ton miles.

No estimate of the potential capacity of an integrated system, based only on the knowledge developed by the several bureaus of the government, can be conclusive.

But we have assumed that proper integration would somewhat reduce cross-haul and that scheduled "through transit" would reduce delays in unloading and waiting for load, thus releasing equipment for additional service.

On the assumption that the points of origination and destination are unchanged, capacity of existing agencies, integrated and coördinated, is estimated as 100% greater than previous peak demand for practically all commodities except bituminous coal,[1] and wheat and corn destined for export.

DOUGLAS L. CULLISON

[1] Probably about a 40% increased demand could be met in the Appalachian fields.

CHAPTER XIII

HEALTH

The problem of mental and physical health enters into every aspect of individual and social life. Life extension, happier social adjustment, epidemic prevention, pain relief, home, shop and school sanitation—all come within the domain of medical care, the ultimate aim of it being health.

The health of a community depends on the interplay of many factors, such as biological research, colloidal studies, educational and recreational programs, religious and political doctrines, national diet, industrial sanitation and safety, *mores,* clothing and housing provisions, etc.

Under the existing economic conditions, there is a definite relation between income and death rate, between income and the use of medical aid. Sociologists and statesmen, in the broader sense, therefore, are directly concerned with the problem.

Death Rate. The average annual death rate for all ages of the population of the United States is 11.4 per thousand. However, the mortality rate of the different economic groups varies considerably, the general rule being the smaller the income, the higher the death rate. Thus, death rate distributed by occupations appears in Table I.

Agricultural workers, having some imputed income in kind, form a group apart, and have a low annual death rate of 623.2 per 100,000.

Medical Care. Similarly, the groups with lower income can pay for less medical aid for health maintenance. Thus, the families in the lower-income group ($1200 a year and

TABLE I

Death Rates—1930*

(per 100,000 gainfully employed males)

Group	All Causes (Standardized)
Unskilled workers	1,447.7
Semi-skilled workers	1,009.3
Skilled workers	828.9
Managers and officials	792.5
Clerks and office workers	775.2
Professional men	670.5

* Source: S. Whitney, "Death Rates by Occupations," National Tuberculosis Association, 1934.

less) are able to pay for only *one-sixth* of the nursing, *one-fourth* of the eye care, *one-third* of the dental care, and *two-thirds* of surgical and hospital care that families in the higher-income brackets can afford. While the families in the upper income brackets spent $2,765,000,000 on their health, the great majority of families spent but $735,000,000, obviously a sum which did not provide for even the essential health requirements.

Thus, for a typical 12 months, 8,639 white families of various incomes incurred the following medical expenses:

TABLE II

Cost of Medical Care*

(8,639 white families)

Family Income	Average Total Charges
Under $1200	$ 49.17
$1200–$ 2000	66.81
2000– 3000	94.84
3000– 5000	137.92
5000–10,000	249.35
Over 10,000	503.19

* Source: Reports of the Committee on Cost of Medical Care.

As a result, the existing medical plant and personnel are not fully utilized at present because of the limitations of income, while the estimated need for medical services considerably exceeds the available means.

The number of sick people varies considerably, with the peak occurring during the winter. This condition throws an extra load on hospitals at one time and leaves unoccupied beds at another; hence, the average idle-bed capacity of 21.2% (in 1933) is misleading. The total confinement in hospitals varies with the nature of illness.

TABLE III

Confinement in Hospitals, 1933, various illnesses

Class of Hospital	Average Duration of Illness in Days per Patient
Nervous and mental	1014.7
Tuberculosis	264.1
Maternity	21.5
General	13.9
All hospitals combined	41.9

The confinement in bed at home is unequally distributed among different age groups, as is indicated in Table IV.

TABLE IV

Days at Home in Bed

Age	Confinement
15–20	Less than 2 days
35–55	3.5 days
55–70	3.5 to 9 days

The total time during which all forms of sickness disable persons of all ages is 8.5 days per year, causing a proportionate loss of productive hours.

Obviously, the *existing* demand for medical care is limited by what the sick can pay and therefore the *true* demand must be much larger. However, the difference between the lowest ($50) and highest ($500) family expenditure for medical care paid by poorest and richest is not an indication that the true demand is ten times as great as at present. The true demand is estimated at about forty per cent above the present average level. Furthermore, the present economic limitations of income create a demand for "cheap" substitutes for medical care, such as patent medicines, home remedies, and a resorting to quacks, charlatans, untrained midwives, cultists, etc.

Nature of Illness. Among the illnesses possessing the highest mortality rates (double and triple the international death rate) are several, as shown in Table V, which are still on the increase in the U. S. A.

Table V

Mortality Rates—Various Diseases

Disease	Deaths per 100,000
Heart disease	266.4
Cancer	117.3
Diabetes	24.1

More serious still, from the social point of view, is the effect of economic strain resulting, in the period 1880-1931, in the increase in the number of inmates (from 63.7 to 236.1[1] per 100,000 population) of the institutions for the so-called "insane." A further insight into the state of national mental health may be comprehended from the fact that out of every ten persons now applying for medical care, four are suffering from some form of "psychosis."[2]

So far as frequency of minor impairments is concerned, the leading causes requiring attention are shown in Table VI.

Table VI

Nature of Minor Impairments

Impairment	Rate per 1000 cases
Eye cases	85.9
Tonsils	43.0
Constipation	33.7
Heart	23.5
Infected gums	17.9

Table VII

Medical Attention Without Illness

Case	Percentage
Dental	61.1
Health examinations	16.0
Immunizations	13.1
Eye care	9.8
Total	100.0

[1] Bulletin of Public Health, U. S. Treasury Department.
[2] American Psychiatric Association.

Table VII shows the distribution of medical attention unaccompanied by illness.

Preventive medicine receives far from adequate attention, representing but 1.4% of the total national medical bill.

Existing Facilities. The total medical bill for 1929, amounting to about $3,282,000,000, was distributed as shown in Table VIII.

Table VIII

Breakdown of Medical Costs

Services and fees	$1,930,000,000
Hospitals	656,000,000
Medicines and drugs	696,000,000
Goods and appliances	60,000,000
Gross Total	$3,342,000,000
Less duplications	60,000,000
Net total	$3,282,000,000

This represents a per capita medical cost of about $26 in 1929, which was provided from the various sources listed below, and was expended for the purposes shown in Table IX.

Table IX

Sources and Disposition of 1929 Medical Dollar

Source		Disposition	
Received from	Per Cent	Spent for	Per Cent
Patients	79	Illness	78.5
Government	14	Dental care	17.4
Philanthropy	5	Eye care	2.7
Industry	2	Prevention	1.4
Total	100	Total	100.0

In 1932, the admission to all hospitals was 7,228,151 patients, which overtaxed the facilities of the hospitals for nervous and mental ailments and for tuberculosis and, at times, the facilities of other hospitals. The total number of beds in all hospitals was 1,014,354, which were served by 113,730 members of the staff who took care of an average of 808,445 patients per day. However, in different types

TABLE X

Confinement to Hospitals of Various Types

Type	Turnover
General	26.2
Maternity	16.90
Tuberculosis	1.39
Nervous and mental	0.36*
Average, all cases, all hospitals	8.6

* Between 1927 and 1933, the population of hospitals for nervous and mental diseases increased 35.8%.

of hospitals the load factor and the "turnover" of patients are dissimilar.

Since the depression began, the duration of confinement has increased, probably because, among other reasons, only the more severe cases seek hospitalization. Between 1927 and 1933, the demand for medical care on the part of out-patients increased by 41% and the number of visits increased by 137%, reaching a total of 32,822,077 out-patients in 1933.

Even so, the services of the medical personnel are not fully utilized. Only one out of seven physicians and one out of eleven dentists are connected with institutions, and the remaining doctors and dentists cannot sell their full time to the population.

"The extent of unemployment among physicians is so large that even in 1929, the services which they rendered could have been supplied by little more than 50% of those in active practice if each of these had had a reasonably complete quota of patients to provide full utilization of working time."[1]

Nurses, similarly, are employed on the average less than half of the time and could render more than double the service which the population was able to purchase in 1933. In that year, dentists, together with their helpers, could have rendered 40% more service than the people of the United States could have bought.

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[1] I. S. Falk, Milbank Memorial Fund.

ESTIMATED REQUIREMENTS. The Committee on the Cost of Medical Care has estimated the shortage among the members of the medical profession. Comparing its estimate with the available spare time (above mentioned) we get the data exhibited in Table XI.

TABLE XI

Shortage and Idle Time of Medical Personnel

Class	Estimated Shortage	Idle Time Translated into Equivalent Personnel
Physicians	29,848	48,000
Dentists	53,081	53,000
Nurses (graduate)	133,000	134,000

In other words, if the idle time of the medical personnel had been made use of, the unsatisfied real need for medical care could be satisfied with the existing personnel. The same Committee also determined the shortage in hospital facilities as compared with the 956,350 beds available in 1930.

TABLE XII

Bed Shortage in Various Classes of Hospitals

Class	Shortage (Beds)
General	180,120
Mental	186,785
Tuberculosis	98,745

Other requirements are inadequately provided for, as: Preventive medicine, research, eyeglasses and the like, medical goods and appliances, and especially mental hygiene and psychiatric education—the latter affecting not only the general medical practitioner but, decidedly, the educator (including radio, church, cinema, and the press).

SUMMARY. The appended Table XIII indicates the possibility of materially improving the medical care of our population. It indicates also the need of providing additional hospital facilities. The total medical bill of the country would become about $5,136,000,000 a year if the health needs were satisfied. The average annual per-capita charge would then amount to about $42.00, a sum which would supply not only an adequate income for the physicians, dentists, and nurses (now only partly employed), but would also extend work in research, preventive medicine, and mental hygiene. This would be likely to reduce progressively the curative expenses of the population.

In fact, competent estimates have been made showing that with the elimination of quacks, with the reduced use of ill-advised "patent" drugs and self-prescribed remedies (made unnecessary when ample competent medical advice is financially available), and with the preventive effect of periodic health examinations, the annual cost of adequate care would in all likelihood eventually be even below the present figure of $26 per capita shown in Table XIII.

This is postulated on the basis of ample care and prevention made available through socialized medicine, i.e., without financial restrictions on the translation of needs into services.

WALTER N. POLAKOV

TABLE XIII

HEALTH PROVISIONS AND REQUIREMENTS

	Performance 1929		Capacity		Requirement	
	Personnel	Fees (millions)	Personnel	Fees (millions)	Personnel	Fees (millions)
Physicians (practicing)	142,000	$1,090 [10]	190,000	$1,458 [10]	171,848 [2]	$1,526 [10]
Dentists	62,400	445	118,400	806	121,081	623
Nurses (graduate and public health)	293,800	142	427,800	207	270,150	338
Nurses (practical)	150,000	60	300,000	120	250,000 [3]	
Pharmacists	132,000		[8]		150,000 [3]	
Optometrists and Refractory	20,200	50	[12]	50	30,000 [3]	100
Lay Persons (hospital)	196,000		[9]		255,000	
Midwives	47,000	3	47,000	3	30,000 [13]	2
Non-Professional Practitioners	41,100	140	41,100	140	28,250	133
TOTAL—less duplications	1,084,500	$1,930		$2,784		$2,722
		− 60		− 85		—
		$1,870		$2,699		
Graduates, Internes, Licentiates	12,170 [1]		10,312 [11]		14,000	
Beds in Hospitals—	Beds		Beds		Beds	
General	234,009 [5]		386,713 [4]		566,833 [2]	

Mental	395,407[5]		498,955[4]		685,740[2]	
Other Hospitals and Tuberculosis Hospitals	50,707[5]		70,682[4]		169,427[2]	
TOTAL ALL HOSPITALS	726,766[5 7]	$656[2]	1,027,046[4 7]	$991	1,422,000	$1,313
Medicines and Drugs		$669[6]		$1,339		$876
Goods and Appliances		60		200		200
Preventive Medical Research		61		86		25
TOTAL		$3,316		$5,315		$5,136
PER CAPITA MEDICAL COST		$26		$43		$42

[1] 1929.
[2] Estimated 1930 by the Committee on the Cost of Medical Care.
[3] Approximation.
[4] Installed by 1933.
[5] Average day census of occupied beds, 1929.
[6] Worksheet 182—Rep. 657.
[7] Includes other hospitals not registered by the Medical Association.
[8] Included in costs of drugs and hospital payrolls, *Journal American Medical Association*, hospital issue.
[9] Included in cost of hospital operation, *Journal American Medical Association*, hospital issue.
[10] Physicians receive part income from hospitals, dentists, etc.
[11] Licenses in 1933. Total addition to medical profession 7180.
[12] Partly included in goods and appliances.
[13] Rough estimate. Service to be gradually replaced by qualified medical care.

CHAPTER XIV

EDUCATION

In colonial days, "schooling" was largely private, being conducted by tutors hired by wealthy families or groups of families; or else it was a religious enterprise, carried on in order to make sure that children received the proper doctrine. In 1785, Congress set aside part of each township in the Ohio territory for the support of education, and certain state constitutions made similar provisions. These were only partially carried out, but about the middle of the nineteenth century public education began to be accepted as a major responsibility of the community.

PRESENT STATUS. In 1930 the United States Office of Education estimated a total of 29,909,000 pupils enrolled in educational institutions, of whom some 28,388,000 were in elementary and secondary schools. Over a million teachers were employed, and over half a million more were in training. Seven out of every ten Americans between five and twenty years of age, and ninety-five per cent of those between the ages of seven and thirteen years were in school. Some 250,000 school buildings were in use, valued at six billion dollars. In 1930, the total expenditure for public and private education of all kinds in the United States was $3,235,-000,000. Of this sum, $2,823,000,000 was spent for public education.

Table I shows the increase in pupil enrollment, number of teachers, teachers' salaries, and total expenditures for public education.

The most striking advance has been made in high school enrollment. In 1880, this was only 110,000; by 1929, it had

TABLE I

Growth in Attendance, Teachers, Expenditures*

Year	Pupils Enrolled	No. of Teachers	Salaries	Total Expenditures
1880	9,868,000	287,000	$55,943,000	$78,094,687
1900	12,723,000	364,000	91,836,000	140,507,000
1905	16,468,000	460,000	177,462,000	291,617,000
1910	17,814,000	523,000	253,915,000	426,250,000
1915	19,693,000	604,000	345,006,000	605,461,000
1920	21,578,000	679,000	613,405,000	1,036,151,000
1925	24,650,000	780,000	1,006,409,000	1,946,097,000
1930	25,678,000	854,000	1,250,427,000	2,316,790,000

* Source: United States Office of Education, Department of the Interior.

grown to 4,741,000. The average period of education for the whole country is seven years, the figure varying from four years in Alabama to nine years in Massachusetts.

Curricula have been enriched during each decade. Natural science, manual training, art, music, special science, industrial arts, dramatics, business courses, agriculture, household arts, health, camping, and an untold variety of other courses, have been added in recent years. Although there exists a tendency to designate some of these as "fads and frills," actually the movement has been steadily in the direction of a closer contact between life in the school and the function of youth in community life.

ADULT EDUCATION. Education, once thought of as confined to childhood and largely preparatory in its nature, is now being recognized as a way of enriching all life, the adult years as well as those of youth.

In 1920, only about 345,000 persons over 21 were in school. Ten years later, we find nearly a three hundred per cent increase; more than 1,304,000 adults attending school. About 262,000 of these were in classes for illiterates and for foreign born adults.

Private business schools numbered 651 in 1929, with 4,000 instructors and 180,000 pupils.[1]

[1] Report No. 795.

By Congressional provision, agricultural experiment stations have been established in each state, and county agents have carried on institutes, conferences, individual counseling, and have helped in other ways. This program now reaches over a million adults. Emergency relief educational activities in cities are now serving thousands of workers and unemployed adults.

Training for the Handicapped. Has been established in special institutions. During 1926-7 about 18,000 pupils were enrolled in schools for the deaf. The special schools for the feeble-minded and subnormal had an enrollment of 104,000. Industrial schools for delinquents enrolled 84,000. In addition, special classes for thousands of handicapped children are established as part of the public school system.

Effect of Economic Crisis. Everything indicated that there would be smaller budgets in 1934-5 than there were in any year for the past five. Nevertheless, the number of pupils has continued to increase, largely in the secondary schools, while both the number of teachers and their salaries have fallen. In the secondary schools, we found an increase of twenty-five per cent in pupils, and a decrease of twenty-five per cent in teachers' pay.[1]

One teacher in three was working for less than $750 a year. According to Leaflet No. 44, 25,000 teachers have been dropped, and 200,000 certified teachers are unemployed.

The exact amount of the shortening of the school terms is not easy to determine. In city schools, between 1929-30 and 1931-2, there was an average decrease of three days in the school term.

Table II shows the services that have been reduced or eliminated.

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[1] See Leaflet No. 44 (1933) and Circular No. 124 (1933), United States Office of Education, Department of the Interior.

Table II

Schools in Operation

From September 1930 to June 1933*

Service	Per Cent of Cities Reducing	Per Cent of Cities Eliminating
Americanization	11†	23
Continuation schools	11†	21
Classes for physically handicapped	3	9
Classes for mentally handicapped	7†	8
Kindergartens	8†	12
Night school, adult classes	15†	28
Summer school	13†	28
Post-graduate high school	4	3
Playgrounds and recreation	17†	4
Free textbooks	18†	1
Other books	32†	1
Supplies	41†	0
Transportation of pupils	11†	2
Health service	14†	3
Length of school term	38†	0

* Source: "A Study of Reduction of Educational Service in 667 Cities," Circular No. 129 (Oct. 1933), United States Office of Education.

† A further reduction was estimated for 1933–4.

The best picture of the disaster in education is shown by the report (March 1933) of the Joint Commission on the Emergency in Education of the National Education Association. The commission commented on the fact that (a) public school enrollment was nearly a million larger than in 1930, (b) 15,000 teachers had been dropped, (c) the expenditure per child per school day had fallen from sixty-three cents to forty-nine cents, and that (d) building expenditures amounting to $400,000,000 in 1930 had dropped to $154,000,000 in 1933. Of the 450,000 rural teachers of the country, half received less than $750, and 90,000 received less than $450 per year. A report of the National Educational Association showed schools closed for 290,000 children as of April 1, 1933.

In April 1934, 20,300 schools were closed, cutting off the educational opportunities of 1,025,000 children. In 1931-2 only eighteen per cent of the cities of the country reported night schools. Only nine per cent of the cities reporting to the Office of Education carried on summer-school work.

Requirements of Elementary Education. To serve the elementary and secondary public-school enrollment of today at least as well as pre-depression pupils were served would require: (a) 901,000 teachers; (b) $2,340,000,000 for current expenses. This, however, only begins to satisfy the needs. To meet the generally accepted standard for school nurses, we would have to double the present 6000 nurses, even if no pupils were added.

To meet the standard for school clerks, the present force of 16,800 should be increased to 67,000.

To meet the standard for janitor service, the present 84,000 should be increased to 104,000.

Standard attendance-officer service calls for raising the existing 3360 to about 9000.

The greatest shortage is in psychological counselors and visiting teachers. A White House Conference report recommended that one of each be assigned to every 500 pupils. The present school population would need 50,000 of each.

All of the above figures have been based upon the present school population and the present type of educational service. However, in estimating requirements, we should accept the standards set by educators as the goal which they believe would best serve the educational welfare of the country.

If all of the population from the ages of three to eighteen were in some kind of school, the registration for all public schools below college would then be forty million instead of the present twenty-six million. According to our studies, such a school system would call for the staffing indicated in Table III.

Suppose, then, that all the population of school age spent at least part of the time in school, some teaching would undoubtedly have to be carried on, not in existing school buildings, but in camps, of which very few are now operated by public school systems. Much would be done in coöperation with the work of agriculture, industry, commerce and the professions.

Requirements in Nurseries and Kindergartens. From the point of view of mental hygiene and positive health,

Table III

Personnel Requirements*

Classification	On Basis of 40 million Pupils**	On Basis of Present Enrollment (26.3 million pupils)	Actual Present Fulfillment (26.3 million pupils)§
Teachers, elementary- and high-school‡	2,095,000†	1,757,000†	840,000§‖
Principals	200,000	56,000	56,000
School nurses	30,000	12,000	6,000
Clerks	130,000	67,000	16,800
Janitor-engineers	200,000	104,000	84,000
Attendance officers	15,000	9,000	3,960
Supervisors	33,000	20,000	33,000
Superintendents and other administrative officers	33,000	33,000	33,000
Psychological counsellors and visiting teachers	160,000	100,000	400¶
Total engaged	2,896,000	2,158,000	1,073,160

* Source: Report No. 795.
† Computed on basis of one teacher to every 15 pupils.
‡ Does not include kindergartens or nursery schools.
§ Res. Bulletin National Education Association, Sept. 1933.
¶ Estimate of writer, based on applications and placements of the Bureau of Educational Service of Teachers College, Columbia University, New York City. U. S. Bureau of Education reported 230 visiting teachers in 1930.
‖ 31.4 pupils to every teacher.
** Includes elementary and high-school but not nursery and kindergarten pupils which would add about 9 million more pupils.

the quality and the educational standard of the teachers in the pre-school grades should be of the highest. They should possess a thorough familiarity with the problem of mental hygiene. They would have to take care of 4,720,000 pupils in nursery schools. This would mean erecting or remodeling some 900,000 buildings, each capable of caring for not more than fifty to sixty pupils. Nursery schools must be small neighborhood affairs.

Another 4,870,000[1] pupils (ages four and six) will come into kindergartens. Existing kindergarten facilities are more nearly adequate in quality, but not in quantity. Adequate personality development requires that not more than fifteen pupils should be assigned to one teacher. Therefore, 640,000 teachers will be required, a figure very close to the number employed in *all* elementary schools in 1930.

The 19,723,000[2] elementary school pupils between six and thirteen years of age, inclusive, is that section of the school population for which at present the most adequate provision is made. While there are many unfit buildings still in use, the seating capacity is adequate to care for this group.

However, the teaching staff is not adequate. The progressive private schools which do not have to consider questions of expense favor groups of about twelve to fifteen pupils per teacher. If we use an average of fifteen pupils per teacher, 1,315,000 teachers would be needed. Undoubtedly, it will be difficult to supply this number in the near future.

Secondary Schools. The secondary-school population, ages fourteen to eighteen, has been poorly served. High schools have been notoriously slow to meet the life needs of adolescents. Less than half of the 11,700,000[3] children are enrolled in secondary schools. Class size for some activities can be large, but this tends to be offset by a demand for specialization in certain fields. To cover the many fields of the modern curriculum, a high school of five hundred students can hardly do good work with less than thirty-five teachers. This is our familiar ratio of 1 to 15, and shows a demand for 780,000 secondary-school teachers, or about four times the present number.

Using the standards mentioned before, it is possible to calculate the non-teaching personnel required to care for

[1] United States Bureau of the Census, 1930.
[2] United States Bureau of the Census, 1930.
[3] United States Bureau of the Census, 1930.

the contemplated population of about forty million children and nearly three million teachers. This is shown in Table IV.

We have thus far ignored the educational requirements of those over eighteen years of age. The 971,000 students now

TABLE IV

Non-teaching Personnel

Principals	200,000
School nurses	30,000
Clerks	130,000
Janitor-engineers	200,000
Attendance officers	15,000
Supervisors	33,000
School superintendents	33,000
Psychological counselors and visiting teachers	160,000
Total	801,000

in our colleges and universities are only about ten per cent of the total population in the age group nineteen to twenty-two, inclusive. Probably the proportion who would profit by a college or university education is not larger than this, although the ablest students are not now very well selected for advanced study. Economic considerations play a large role.[1] It is estimated that the average freshman must have a minimum of $630 to meet expenses. However, if pupils were selected for capacity and interest, our present institutions of higher education, with some 25,000 or 30,000 professors, would probably be adequate.

ENGINEERING EDUCATION. There is a well substantiated opinion among industrial executives and engineering educators that "four years from now there will not be enough engineering graduates to meet even the technical demands of the profession, to say nothing of all the other opportunities for constructive leadership that lie ahead."[2]

General R. I. Rees, of the American Telephone & Telegraph Company, showed that the number of engineering

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[1] Greenleaf Bulletin, United States Office of Education, 1934.

[2] Harvey Davis, Stevens Institute of Technology, speaking in May 1934.

graduates is decidedly below normal for the years 1935, 1936, and 1937, and that by 1937 these schools will be graduating about two-thirds of the men needed in the technical professions. J. A. Farrell, Chairman of the United States Steel Corporation, states that American industry will soon find itself facing a very disastrous shortage of technically trained men.

The American Society of Mechanical Engineers finds the same situation and the Society for the Promotion of Engineering Education has data indicating the inadequacy of present preparation.

Apprenticeship. This sort of training in industry includes the following: (a) trade apprenticeship, (b) executive and foreman training, (c) job training, (d) sales training, (e) servicing training, and (f) apprenticeship for college graduates.

Apprenticeship courses for college graduates dropped, from 1929 to 1932, from the index of 150 to 50. Job Training rose during this period from 110 to 122, but the stoppage of European immigration of highly skilled mechanics makes it apparent that American industry will soon have to face the problem of inadequate leadership.

Requirements for Adult Education. What shall we consider an adequate educational provision for the remaining 8,000,000 young people who group with the 62,000,000 adults between twenty-five and sixty-five years of age?

This is the most speculative problem we have confronted. Undoubtedly, when economic conditions permit, there will be people in each community able to serve as leaders of forum and discussion groups, and some who can act as counselors in matters of home management, agriculture, vocational readjustment, and the like. Also, physicians, psychiatrists, and clinical psychologists may serve to educate adult constituencies. Libraries, books, magazines, newspapers, the movies, theaters, the radio—these are all agencies of adult education, as are the 1400 museums of the United States.

But let us consider adult education here in the narrower sense of persons professionally concerned with helping adults through lecture courses, forums, study classes, etc. If we assume that two such workers can serve a community of one thousand adults satisfactorily, we will then need an adult-education personnel of 140,000 workers.

Other Requirements. The increased number of persons served through education, and the increase in personnel from less than a million to about 3,700,000 will call for a corresponding increase in expenditures for supplies. Salaries of instructors (seventy-two per cent of total expenditures) make up the bulk of all educational budgets. It should be possible to insist that no teacher receive less than the average employed worker. Able men and women *must be drawn into the work of expanding the vision of the citizen of tomorrow!*

Except for a few hours each day, the school plant is not being utilized at maximum capacity. Recent years have shown, in some city schools, a great increase in the number of activities carried on during late afternoons and evenings, but on the average, the buildings are in use only about six hours a day, five days a week, 36 weeks in the year. The average child is in school only 942 hours a year, which, if we allow ten hours a day for sleep, is only eighteen per cent of his waking time. The development of summer and vacation schools has progressed very slowly, less than ten per cent of cities attempting any such program. The development of a supplementary "camp" program is likely to be one important development. We may expect that only part of the city school population will use the buildings at any one time, the rest being on excursions or in camp.

Table V

Cost of Education

Private Education	1929 Cost	Requirements (1929 Dollars)
Kindergarten and nurseries....	$ 189,750,000[1]	
Higher schools...............	78,660,000[3]	
Institutions for the deaf.......	250,000[3]	
Institutions for feeble-minded..	1,490,000[3]	
Correspondence schools........	30,150,000[6]	
Business and vocational.......	44,775,000[7]	$ 420,000,000[19]
Adult educational societies.....	2,940,000[8]	
Adult education..............	2,678,000[9]	
Chautauquas, etc.............	5,617,000[10]	10,712,000[20]
Total.................	$356,310,000	$430,712,000
Less: Public support........	12,363,000	
Net expenditures......	$343,947,000	
Supplies..............	425,614,000[11]	1,700,000,000[21]
Colleges, universities, dormitories, fees, etc...............	511,194,000[5, 12]	2,566,900,000[18, 22]
Textbooks and periodicals.....	179,069,000[13]	646,262,000[23]
Total Private Education...	$1,459,824,000	$5,373,874,000
Public Education.....	2,251,000,000[2]	9,489,500,000[14, 15, 16, 17]
Total Education........	$3,710,824,000	$14,863,374,000
Less public education cost...		2,251,000,000[2]
Budgeted requirement for education................		$12,612,374,000

[1] U. S. Department of Interior, Office of Education, Biennial Survey of Education. Figures include income from tuition only.

[2] Teachers College, Columbia University, Prof. G. Watson. Cost of existing public education is already included in Col. 6 total, although it does not appear as such. Most of it comes out of real-estate taxes and therefore appears as "rent" in the column.

[3] Includes private normal schools ($5,200,000), teachers' colleges ($1,460,000), and academies and high schools ($72,000,000). Office of Education Biennial Survey of Education.

[5] Income from tuition. Department of Interior, Office of Education.

[6] Estimated from National Education Association.

[7] U. S. Department of Interior, Office of Education, Biennial Report.

[8] Estimated by R. Doane on basis of membership dues.

[9] National Education Association.

[10] Internal Lyceum and Chautauqua Assn., Chicago.

[11] "Marketing Our Educational Supplies," by R. Doane. *Geyer's Stationer*, Vol. 86, No. 2.

[12] Estimated on basis of $200 per year per student.

[13] N.S.P.P.C. See "Printing and Publishing." Wholesale prices marked up 20% in $1000.

It is estimated that camp properties covering five million acres could profitably be utilized in this program. If there should be no increase in the working hours of the personnel, the development of an all-day, all-week, and all-year-round program would call for an increase of approximately eighty per cent in the personnel estimate given above, and a similar increase in the expenditures.

The total present cost of education as well as the requirements covered in the National Survey of Potential Product Capacity budget are shown in Table V.

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[14] Elementary-school teachers (according to G. Watson) required, 1,315,000 @ $2,500 per year	$ 3,287,500,000
[15] Secondary-school teachers required (according to G. W.), 780,000 @ $3,000 per year	2,340,000,000
[16] Non-teaching school personnel, 801,000 @ $2,000 per year	1,602,000,000
[17] Operating expense, elementary and secondary schools on basis of double the expenses of 1929 ($630,000,000)	1,260,000,000
[17A] Additional supplies	1,000,000,000
[18] College and university professors, 30,000 @ $5,000 per year	150,000,000
[19] Adult-education teachers, 140,000 @ $3,000 per year	420,000,000
[20] Adult-education expenses quadrupled (2,678,000 x 4)	10,712,000
[21] Supplies (according to G. W.), 4 times the present 1929 ($425,000,000)	1,700,000,000
[22] Dormitories, fees, etc., 971,000 students x 4- 3,884,000 @ 630 per student	2,446,900,000
[23] Books (text) and periodicals (at wholesale prices—20% markup) quadrupled, $134,638,000	646,262,000
Total	$14,863,374,000

CHAPTER XV

RECREATION

FOREWORD. To estimate the cost of recreation in any specific year is difficult since the border between recreational and other activities tends to be obscure.

To estimate American capacity to provide recreation and to formulate a budget for recreational pursuits depends largely upon judgment, and only partially upon measurements or recorded observations. For one thing, the fact that ten million men and their families, who are now on indefinite leave without pay, would, if the N.S.P.P.C. budget of production were adopted, be replaced by ten million families entitled to definite vacations and enjoying adequate spending power, makes any conclusions in regard to prospective recreational activities open to debate. Undoubtedly habit or custom would be subject to alteration if our production were released. The resulting economic security and material plenty would transform more than the external appearance of life.

Consequently in the following notes we have broken with the procedure followed elsewhere and instead of concentrating on the presentation of statistical facts, we have weighed briefly certain humanistic considerations perhaps somewhat irrelevant to a factual survey.

Recreation, like other phases of life, has been radically affected by the Industrial Revolution. On the one hand, the technology developed by this revolution has enormously expanded the possible audience for most aesthetic and emotional appeals; on the other hand, the standards of the market place, which the revolution has made prevail, have changed the spring or driving force, the character and the purpose of artistic and recreational expression.

The introduction of printing from type in the 15th century permitted the mass production of reading matter and the democratization of literacy. Photography in the 19th century revolutionized pictorial delineation. Finally, the recent inventions of the phonograph, the cinema, and the radio have brought music and the theater to the whole population and particularly into private homes.

The results of these technological innovations are twofold: (a) people have acquired an awareness of the world utterly inconceivable in previous epochs; (b) art and recreation have been cheapened, diluted, or at least appreciably affected, by commercialization. Formerly, aesthetic and decorative expressions—those of church, aristocracy, and peasantry—were consciously directed toward perfection always, of course, within the limits of the contemporary ideologies. Today, such expressions are largely governed by the factor of vendibility. This is either disguised, as is all but a small percentage of so-called art, or it is frank and unashamed, like advertising, the popular theater, and story-telling. This change in direction has probably altered the *mores* of modern peoples as drastically as the more obvious industrial transformations.

In the economic and aesthetic fields the results of the Industrial Revolution are strikingly analogous.

Technology, as our survey of the American economy shows, could abolish poverty and economic insecurity. It has *not* abolished the first and it *has* intensified the second. Technology could give every individual in the nation the same opportunity for aesthetic, emotional, and intellectual development which formerly only the more fortunate members of society enjoyed. Instead, the artistic appreciation of the favored few has been perverted and the play of the multitudes cheapened.

In both the economic and aesthetic fields, the first impact of the Industrial Revolution has tended to demoralize society. Although one man can produce today four times as much as his grandfather, the people of this country have been living little better during the past three years than they lived in 1890.[1]

Although some ninety per cent of our people today read and write adequately and although the entire population, through the cinema and the radio, are in touch with reflections, at least, of the great aesthetic expressions of all time, the general cultural level does not seem to have been raised. On the contrary, a fairly credible case can be argued for the cultural values of the older isolated rural village as against those of the contemporary urban slum.

The values which evoked these reflections are qualitative. They cannot be measured and, moreover, lie outside the scope of this Survey. However, recreation can be measured in time and dollars. Adequate records have been kept of the latter.

THE CINEMA. In 1929, according to the *Motion Picture Almanac*, about 2 billion dollars were spent by the American people in the cinema. This is much the largest item in the recreational field if automobile touring, which is covered herein under "Transportation," be excluded. In 1930, the maximum year, 5,200 million people paid admissions to cinema theaters, an average of 42 performances a year per person, including even babies, invalids, cripples, etc. Since the seating capacity of the existing theaters is 13 billion annually (at 3 performances daily) no physical limitation prevents the American people from going to the cinema twice a week. Furthermore, the 1929 personnel, numbering 350,000 and receiving $235,000,000 for their services, and the production equipment (cameras, studios, films, etc.) are ample to

[1] *See* Table IV, *Appendix*.

provide new pictures weekly for the theaters. Consequently, if physical factors were the only limitation on photoplay attendance, the cinema would be freely available to the American people as often as desired.[1]

If this fact of plenty should be accepted, and if attendance were made independent of the individual's ability to pay, the nature of the enterprise would be radically altered. Producers would no longer have to depend entirely for their continuance on mass appeal, which will of necessity, for some time to come, cater to an undeveloped grade of intelligence. Instead, their success would probably depend in large part on prestige and on the approval of informed opinion.

Such a shift of emphasis would doubtless tend to introduce a greater quota of intelligence into the content of the performances. If the development of the intellectual faculties of the population is desirable, it would seem that the releasing of the whole or a part of the photoplay business from the necessity of making profits should further the race's development. The diversion of a fraction of the mental energy exerted in producing pictures to searching for more profound values need not cause a shortage of films devoted solely to relaxation or amusement. Capacity is ample for satisfying these various needs and for assisting as well in the field of education. The United States has many audiences on different levels of intelligence. The present system starves all but the largest, which is surfeited.

THE LEGITIMATE THEATER. The theater has been declining for many years. Between 1910 and 1925 the number of theaters known as "legitimate" fell from 1520 to 634.[2] Two hundred and eighty-six shows were produced in 1929, about forty of which were financially successful. Two hundred and

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[1] If the demand for viewing pictures should greatly increase, the number of performances per day could be doubled or more theaters be built.

[2] "Footlights Across America," by Kenneth MacGowan, p. 71.

twelve shows were produced in 1930, of which only thirty-four were financially successful.[1]

From the above, it would seem as if the professional legitimate theater were doomed as a national institution. It may, as it has before, continue to thrive in certain limited centers and eventually to revive. However, it no longer possesses a functional importance except as a training school. The photoplay could enable the whole people to see the best production and the most celebrated actors during their uniquely finest performance. The legitimate theater cannot compete on these grounds. In its heyday, only a limited audience ever enjoyed its masterpieces of conception and execution. And the necessity for indefinite repetition enervated in time all but the most exhibitionistic performers.

However, the profession of acting has a peculiar appeal to a fraction of humanity. It may be that the amateur theaters will continue to grow and thereby to satisfy this subjective need and serve at the same time as a training school and experimental laboratory for the great photoplay undertakings.

COMMERCIALIZED CONTESTS. Contests, as listed on the Flow-Sheet, cost the people $221,545,000 in 1929. Although the pleasure of vicarious competition would seem, from the philosophic point of view, somewhat sophomoric, yet athletic contests probably serve society effectively in giving outlet to the so-called martial or pugnacious instinct. William James went so far as to recommend such contests as "The Moral Equivalent of War."

The two chief entertainers, professional baseball and college football, have been little corrupted by the standards of the market place. Although the former is frankly a money-making proposition, yet a high standard of integrity has been maintained among the players and the umpires during

[1] *Billboard,* Sept. 6, 1930.

the past years. The few scandals, by the uproar they evoked, have emphasized this prevailing honesty.

Football, although the financial mainstay of a section of the college budget and important to college prestige, has also been notably clear of double dealing. Some few athletic dullards acquire, by its intercession, a speaking and useless acquaintance with geophysics and genetic psychology, but this minor waste is not very serious. Even boxers, hockey players, and the minor-sport professionals seem to be shamed, to an extent rare among business men, when the normal tricks of their trade are exposed. No doubt this phenomenon is due to the fact that sport inherits its code from feudalism by way of the English public schools. Commerce has a less illustrious descent.

The effects of the Industrial Revolution can be noted in the world of sport. The tourney of knights, and the bowling and rounders on the village green, have been transformed into great spectacles attended by millions. The old codes which rewarded the winner with an intangible prestige—a ribbon, a badge, or a wreath of parsley—have succumbed to the new code which rates the value of effort by the amount of money gained.

Music and Radio. In 1929, musical instruments, sheet music, records, etc., were valued at $262,161,000, and concerts at $11,095,000. The latter do not seem to have been displaced by the radio to any great extent. Probably as many new concert-goers are gained by their discovery of a liking for music from selections delivered over the air, as are lost by the substitution of home listening for concert attendance. The radio, costing $633,034,000 in 1929, was the big item under the head of music.

Radio manufacturing is conspicuous for being one of the industries whose product capacity not only exceeds market requirements but also human desires. The manufacturing plants in Philadelphia alone could fill the total annual demand of the country. The industry could produce 40,000,000 receiving sets a year. In 1929, 4,300,000 sets were sold.

Evidently, the American family could possess several receiving sets in the home, one in the automobile, and as many more as desired in trains, hotel lobbies, and other public places. There is no physical reason why anyone could not, very shortly, if physical limitations alone restrained production, hear music, lectures, news, etc., at any time and place he liked. This extension of the range of hearing has enormous potentialities for human life. At present, they cannot be surmised, since the American people have handed this extraordinary instrument over to business. And business is condemned by its nature to—do business. Consequently, the radio has been assigned to an odd task. Daily, for eighteen hours, it pleads and argues for people to buy this and that: things that exist in profusion, things everyone wants, things many would work for, things most of the listeners cannot possess without going hungry. No one seems to note the paradoxical character of this suasion.

People need not be persuaded to possess things. Most people are naturally acquisitive, having inherited a long tradition of scarcity, and fearing it. What people want to know is how to obtain possession. The goods exist in profusion. Desire for the goods is also ubiquitous. But the radio does not suggest how to connect the two. The old traditional way, work (for pay), has been closed to one quarter or one fifth of the population, and most of the rest of us in order to obtain some new thing, must go without some other to which we are accustomed.

Fortunately, the above description is not complete. In order to persuade those who *desire to possess* but cannot, to listen to those who *desire to give up possession* but cannot, musicians, teachers, poets, singers, great orchestras, humorists—even song birds and antarctic gropers—are enlisted and subsidized to say or sing or play their stunt into the microphone. And so good comes out of an absurdity, and life is made more bearable by an anomaly. Perhaps Samson put it accurately in his riddle: "Out of the eater came forth meat, and out of the strong came forth sweetness."

"ACTIVITIES." In 1929, $876,397,000 was spent for the items listed under "Activities." This is only a partial bill since food and drink (consumed in cabarets, hotel rooms, etc.), motor gasoline, and many other items covered elsewhere, were subtracted from this total in order to prevent duplication. Golf, costing $249,588,000, is the conspicuous item. Probably this curious introspective game supplies some kind of a psychic compensation to the routine of business. The golfer must train himself to relax and to act simultaneously. Doubtless, the game has definite therapeutic value.

Obviously, general recreational activities would enormously expand if the goods and services which would be available to the American people (if physical factors alone limited production) were produced and distributed. The resulting certainty of a comfortable living would probably turn most Americans out into the open during vacation time. This effect was conspicuous even during the hit-or-miss prosperity of 1929. Consequently, an enormous expansion of open-air life may be expected.

The existing and more or less renowned resorts could not provide for a greatly increased influx of visitors, even if their administrators desired it. It is probable that a new influx would be handled by the development of the recreational farm (known in the West as the "dude ranch"). East of the Mississippi, and in the neighborhood of the Rockies and the Pacific Coast, the countryside is dotted with camps, tourist homes, parks, and resorts. These could easily be equipped to care for multitudes. In many ways, they tend to be superior to the European spa or watering place. In Europe, people go to the country to breathe the fresh air and re-create the city. In America, the city people seem to make a serious attempt to live country lives during vacation periods.

Unused Capacity. In estimating the unused capacity of the recreation items, a certain arbitrariness was unavoidable. All the services are subject to indefinite expansion. Millions of individuals desire to train themselves for teaching, doctoring, nursing, acting, baseball playing and many other endeavors. The question before society is: How many individuals can be spared from the production of primary goods, supplied with food, clothing, shelter, etc., and encouraged to serve?

The survey of physical goods shows that no additional men beyond the percentage employed in 1929 need be drawn from the general population in order to supply a comfortable living for every one. This leaves 85 million people more or less from whom to draw those most fit for the specialized and unspecialized services. Consequently, our only limitation in estimating product capacity of the services was "training time." For example, a doctor needs about ten years' schooling. Therefore, no immediate expansion in medical care can be looked for beyond that which the existing staff could provide, if permitted to give full time to their profession.

In recreation, on the other hand, a plethora of talent is on call—guides, boatmen, actors, musicians and a host of others. Consequently, our estimates were only limited by our preference for understatement.

Table I lists the 1929 value of consumption, capacity (when capacity figures are calculable), and budget. The total bill for recreation is low owing to the fact that many items of a recreational nature are included in other categories. The most important of these are motor upkeep, gasoline, railroad

TABLE I

Recreation—1929*

(000 Omitted)

Source	Item	Value (1929 dollars) Consumption	Capacity	Budget
Rep. 361	Theaters:			
	Motion-picture	$2,000,000	$5,000,000	$2,500,000
	Legitimate and vaudeville	221,902		500,000
	Sub-total	2,221,902		3,000,000
	Contests:			
	Baseball	40,678		
	Football	71,725		
	Basketball, hockey	4,362		
	Boxing, wrestling	12,401		660,000
	Motor races, polo matches	12,590		
	Field days	10,314		
	Horse racing	69,475		
	Sub-total	221,545		
	Amusements:			
	Circuses, carnivals	29,584		50,000
	Fairs, state and county	33,282		40,000
	Pageants, celebrations	10,462		20,000
	Resorts, amusements, parks	177,920		351,000
	Sub-total	251,248		461,000
	Music:			
Rep. 554	Radio	633,034	1,899,102	1,000,000
" 664 & 665	Musical instruments, sheet music, records, etc.	262,162	296,243	296,243
	Concerts and opera	11,095		16,000
	Sub-total	906,291		1,312,243
	Activities:			
	Golf, including dues	349,558		1,000,000
	Boating, outboard sailing	18,751		25,000
	Riding horses	13,462		15,000
	Hunting, fishing	94,485		94,485
	Bowling, billiards	102,948		102,948
	Minor sports	167,890		200,000
	Playing cards	20,000		30,000
	Theater, amateur	11,062		40,000
	Athletic clubs	41,072		60,000
	Aviation, flying, gliding	11,910		20,000
	Fireworks	5,342		5,000
	Dancing, supper, night clubs (excluding food and drink)	39,897		100,000
	Sub-total	876,377		1,692,433
	Miscellaneous:			
	Pets, dogs, cats, birds	15,485		20,100
Rep.† 685	Books, games, athletic supplies	579,297	1,158,594	1,158,594
	Travel:			
	Foreign travel	885,248		885,000
WS† 223	Resort rooms:			
	Camping, recreation farms, dude ranches	260,997		3,000,000
	GRAND TOTAL	6,218,390		12,189,370

* Source: Except where otherwise noted, all data taken from "American Consumer Market," various issues, *Business Week*, 1932

† "Rep." and "WS" stand for "Report" and "Worksheet," respectively, of the N.S.P.P.C.

travel, hotel rooms, delicacies, sport clothes, tobacco and drink. Consequently, the recreation section should be considered a listing of only such recreational items as do not belong to some more fundamental category.

SUMMARY. Since recreation, like the other services, could be indefinitely expanded if a sufficiency of the necessary material goods was available for all the people, and since the Survey indicates that such a sufficiency would be available if physical factors alone limited production, the recreation requirements on the chart are the equivalent of the capacity estimates of the physical commodities. If production were released, not only could recreational facilities be rapidly expanded until our budget was fulfilled, but the budget estimate could be easily and vastly surpassed.

Should the fundamental economic problem be solved, and plenty and security be provided to the people as a normal, natural right, the particular problem in the recreational field would not be how to increase recreation, but rather how to determine the nature of recreation. It is not certain that society has yet discovered how to re-create the individual, nor the individual how to create a society.

HAROLD LOEB

CHAPTER XVI

FOREIGN TRADE

Since the United States is not a wholly self-contained economy, a volume of important goods appearing in the budget is of foreign origin. So it is necessary to discuss the subject of imports and exports as they relate to our product capacity.

Our "favorable"[1] balance of trade, persisting over many years, has had certain definite and very troublesome results. Foreign countries owe the United States probably as much as ten billion dollars on net balance and we hold close to half the world's supply of monetary gold; also, exchange (payment) difficulties are restraining our international trade; and, finally, we have huge stocks of various commodities held as "surpluses" but destined for export. At the same time, foreign producers are eager to supply those goods which we may lack—always provided that the exigencies of "profitable" business are met.

In such circumstances it may seem unnecessary to study foreign trade. However, when our budgeted needs for several items are considered and compared with our 1929 production, apparent surpluses disappear, and greatly expanded imports for certain other commodities are needed. Thus a new balance of exports and imports is clearly indicated—a new balance in which imports will include not only those goods we actually obtained from abroad in 1929, but additional quantities required to bridge the gaps between our product capacity and the budget. With exports so selected from the list of our excess capacities these goods may

[1] The classical definition of a "favorable" balance of trade, peculiarly enough, counts as favorable an excess of exports over imports—i.e., a net loss of real wealth.

be shipped abroad without reducing our budgeted quantities.

Tables I and II considered together present such a new balance between exports and imports.

TABLE I

Imports, Actual and Needed*

Item	Actual, 1929‡	Needed
Hides and skins	$ 137,281,000	$ 192,206,000†
Rubber	240,966,000	250,084,000
Silk	427,126,000	846,000,000
Wool	87,344,000	381,000,000
All other	3,506,644,000	4,006,644,000
Total	$4,399,361,000	$5,675,934,000
Actual imports		4,399,361,000
Additional imports required for budget		$1,276,573,000

* Sources: Statistical Abstract of the United States, 1931. Needed Imports are the differences between budget and capacity as shown in Column VI (table). Appendix.

† This figure was calculated by totaling the value of hides and skins produced in the United States, the value of hides and skins imported and the value of leather imported (leather value was reduced 33⅓% for comparability with hides and skins). The budgeted increase for leather boots and shoes, 10%, was applied to the total so obtained.

‡ In 1929 the money spent by Americans in foreign travel amounted to $638,000,000, according to the "Balance of Payments of the United States," an annual publication of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce. This figure does not appear in our statement of actual imports since it is probably balanced by remittances to foreigners, interest on the Foreign Debt, and other similar exports.

In Table I, the specified increases represent those major items needed to meet the clothing and transportation budgets. The figure for rubber is based upon actual consumption in 1929 corrected for the twenty-five-per-cent enlarged automotive budget. In 1929 rubber imports were considerably greater than actual consumption.

"All other" imports are increased by 500 million dollars, a blanket sum ample to cover the possible requirements for such items as the rarer minerals, furs, coffee and tea, cocoa, flax, cane sugar, and similar raw materials not found or grown in this country in sufficient abundance. Any attempt to fix definite quantities for this long and varied list would be largely guesswork. The importation of many items will fluctuate with advances in technology, with changes in the volume of our industrial production, and with shifts in public taste. For instance, dietitians recommend that we eat far less sugar and drink much more milk, so if our food habits are thus altered, our sugar imports will be cut sharply. The expansion of our dairy herds (see Chapter II, Agriculture) will increase our annual supply of not only milk but leather as well.

For these reasons we have consciously set what we consider a high figure on "needed" importations. Let us turn now to the goods which our 1929 product capacity could supply for export while still furnishing the quantities our own budget demands. Table II shows these items together with our actual exports in 1929.

In these tables the export total is some 1,158 million dollars greater than the figure for imports, thus affording either a margin of expansion for imports (i.e., foreign trade, travel, and similar expenditures), or substantial curtailment of any export item should the need arise.

Some factors guiding this selection of possible exports deserve mention. Since the potential volume of any agricultural crop depends almost entirely upon the fraction of the total acreage planted to it, and since the budget requirements involve the full use of our present crop acreage, we have been forced to eliminate cotton, meat products, fruits and nuts, and the like, as possible exports. Furthermore, our reserves of forest products and copper are relatively small, and, necessarily, we must import rubber. Moreover, these goods demand a relatively greater expenditure of labor than those industrial products which are recommended for export. In other words, in determining which products should be exported, we referred always to the peculiarities of our economy, to the labor entailed, and to our national resources as a whole.

TABLE II

Actual and Possible Exports—1929*

Actual Exports		Possible Exports	
Petroleum products	$ 561,191,000	Petroleum products	$ 561,191,000
Tobacco, raw	146,083,000	Tobacco, raw	146,083,000
Coal and coke	106,151,000	Coal and coke	106,151,000
Naval stores (gums and resin)	30,998,000	Naval stores (gums and resin)	30,998,000
Meat products	78,756,000	Lard and fats	375,808,000
Animal fats and oils	124,066,000	Business and office appliances	170,188,000
Cotton, raw and manufactured	905,945,000	Construction machinery	112,476,000
Fruits and nuts	137,467,000	Food processing machinery	291,969,000
Rye and wheat (including flour)	195,990,000	Metal-working machinery	463,547,000
Oil cake and meal	28,414,000	Mining machinery	169,178,000
Leather	42,943,000	Pump and hydraulic machinery	156,271,000
Automobiles (including engine parts)	541,396,000	Power generators and transformers	493,761,000
Saw-mill products	110,637,000	Misc. industrial machinery	241,329,000
Other wood manufactures	40,938,000	Locomotives and cars	58,241,000
Machinery, all classes	492,697,000	Meters and instruments	113,131,000
Iron and steel-mill products	200,143,000	Miscellaneous machinery	1,219,010,000
Copper and manufactures	183,404,000	Misc. tools	40,078,000
Rubber manufactures	76,953,000	Misc. metal products	124,252,000
Other exports	1,038,819,000	Misc. non-metal equipment	24,187,000
		Boiler-shop castings	131,750,000
	$5,157,083,000	Bearings	30,750,000
		Misc. machine parts	234,866,000
		Misc. chemicals	150,000,000
		Paints and varnishes	200,000,000
		Soap	50,000,000
		Allied products (chemicals)	100,000,000
		Other exports	1,038,819,000
			$6,834,034,000
		Needed imports (Table I)	5,675,934,000
		Excess, exports minus imports	$1,158,100,000

*Sources: Statistical Abstract of the United States, 1931. Appendix, Cols. IV, V and VI (tables).

Although the figures of Table II demonstrate our ability to maintain an even balance of trade while importing more than five billion dollars' worth of foreign goods, it may be well to discuss certain aspects of our foreign trade in more detail.

Machinery of one sort or another accounts for 53.6% of possible exports. How does this volume, $3,665,726,000 worth, compare with our 1929 capacity to produce such goods? In that year, machinery actually turned out was valued at $7,043,000,000 (exclusive of transportation equipment). This amount was 50% of our existing capacity. So this major demand can be met by calling upon slightly more than half the unused capacity to produce such goods. Capacity as defined in Chapter VII, "Manufacturing," involves two-shift operation throughout this industry. Skilled labor is not now available. However, if budgeted production were adopted, two or three years would suffice to train the additional labor force of 393,000 workers[1] for capacity operations.

It should be borne in mind that this study of foreign trade is tentative in the sense that it does not seek to specify accurately those goods which would be produced for export, but merely suggests a general scheme of production demonstrably within our product capacity.

Though such an approach neglects the very real problems that beset international trade today, this is unavoidable. The procedure suggested above posits a trade based upon the satisfaction of mutual needs, a much simpler proposition than contemporary trade practices, which are directed toward selling goods and make no provision for the *exchange* of products. The result is that nations, or rather the entrepreneurs within nations, compete in pressing goods on the market, while the return flow of goods is hampered by tariffs, etc. The inevitable result is to restrict the exchange of goods and consequently to limit consumer satisfactions.

If we assume that the desirability of producing the budget quota is accepted and acted upon, trade practices would of necessity undergo radical alteration. There would be nothing unprecedented about such a change of direction. Several countries already have adopted centralized control of international barter.

This very brief digression does not purport to offer solutions to the intricate problems of commerce between nations. Any attempt to do so would carry us far afield. We do, however, feel warranted in asserting that none of these

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[1] Neither this number nor those additional workers needed to produce the other items (in excess of the 1929 export total) are included in Appendix Table XXIII or in Table III, Chapter XVII, Labor. These workers were omitted because "possible exports" are tentative, would require negotiation with foreign governments and would probably be deferred one or more years. Thus the estimated annual increase in available labor (703,000 persons) should cover this need.

problems would be aggravated should the United States adopt a system of budgeted production; that the drift of national policies is toward some such procedure; and, finally, that our own product capacity would enable us to acquire the large volume of goods we need from abroad without curtailing our enjoyment of domestic consumer goods or maintaining our unwholesome status as a creditor nation.

William B. Smith

CHAPTER XVII

LABOR

In considering the working force which would be required to produce the items listed in our budget, it is obvious that one of two demands must be met. Either longer or more intensive effort by individuals is needed, or an increased percentage of our population must be called upon for service in individual pursuits.

More than ten millions of our customary labor force were unable in 1934 to obtain employment under any conditions of hours or wages. This distressing phenomenon must distort any estimate of effective personnel. Enforced unemployment with its demoralizing concomitants, want, misery, and fear, and the psychologically damaging features of such palliatives as the dole and "work relief" at inadequate pay, have undoubtedly undermined our working force to a very serious degree. However, lacking any basis for statistical measurements, we have disregarded these imponderable factors. Since humanity readily adapts itself to altered external conditions, it is perhaps justifiable to assume that a general return to active employment would quickly offset the damaging effects of this depression period.

Before presenting a detailed work schedule, it may be well to attempt some broad delineation of our potential working force and thus establish an upper limit to our labor supply which we may compare with the number actually at work during 1929 and the total required for operations at budget rates in various industries and services.

In Table I every person whose age is between twenty and sixty years is considered as a potential worker. So regarded, the number indicates a huge reserve of hitherto un-

TABLE I

Labor Resources and Utilization

(Potential) Total Persons 20 to 60 Years of Age	(Actual) Total Persons Gainfully Employed in 1929	Required for Budget Operations†
65,241,000*	45,857,000	51,429,000

* Figure from the estimate based on 1930 Census. It is here assumed that the number of persons ill or incapacitated in this age group will be balanced by those in the age groups "under twenty and over sixty years of age" who are able to work and would desire to do so.

† Number represents full-time employment at hours customary in 1929.

used capacity. However, it will be more informative to limit the working force to that number which may legitimately be called "available" for work today, i.e., those whom custom or necessity urges into the ranks of the gainfully employed. The Census lists 48,830,000 as the number of gainfully employed workers on April 1, 1930. If to this total is added the annual increase in employables, 703,000,[1] the present figure (February 1, 1935) may be taken as 52,345,000.

Accepting this figure as the total labor supply, let us see how these millions were dispersed throughout the various occupations in 1929 and what changes in personnel the budget stipulates.

The calculations for this breakdown are based upon current production techniques and trade practices. They do not reflect the possibilities inherent in improved management, nor in the modernization of equipment and kindred methods of increasing output per worker. Thus it is clear that the budget makes no demands which lie beyond the already demonstrated capabilities of those accustomed to work.[2]

[1] Senate Document No. 124, p. 18, 73rd Congress, Second Session; U. S. Government Printing Office, Washington, D. C.

[2] Appendix Table XXIII shows some 11,567,000 persons as the labor requirement in manufacturing. This figure expresses our estimate of the effects of technical improvements introduced since 1929. While we believe this estimate to be a fair one, in order to be conservative the labor requirement for manufacturing industry as discussed in this chapter has been increased by 867,000 persons.

TABLE II

Breakdown of Labor by Industries

	1929*	Required
Farming	9,225,000†	9,604,000†
Mining and quarrying	1,070,000	984,000
Electric light and power	336,000	352,000
Manufacturing	10,023,000	12,434,000‡
Construction	1,528,000	2,437,000
Transportation	3,073,000	2,825,000
Communication	533,000	519,000
Trade	7,163,000	7,163,000
Finance	1,422,000	1,422,000
Civil	3,003,000	4,830,000
Recreation and amusement	455,000	500,000
Professional	1,304,000	1,451,000
Personal service	1,112,000	1,296,000
Domestic service	2,309,000	2,311,000
Business service	62,000	62,000
Misc. service	291,000	291,000
Misc. industries	2,948,000	2,948,000
Grand total	45,857,000§	51,429,000§‖

* Senate Document No. 124, 73rd Congress, Second Session; U. S. Government Printing Office, Washington, D. C.

† Including 1,633,000 unpaid farm laborers, not reduced to full-time equivalent.

‡ For discussion of this figure, which does not include 393,000 workers required for capacity machinery production, see notes to Chapter XVI, "Foreign Trade."

§ Figures include all entrepreneurs, 5,565,000 farmers, and 3,455,000 of all other occupations.

‖ This total is undoubtedly high, owing to technological improvements in many lines of industry. Although the savings in man-hours can be estimated for specific factories and processes, no satisfactory summation of these savings is available.

However, it is important to know the hours of labor which are involved in such a budget and so gauge, at least roughly, the human effort entailed. The figures in Table II represent the full-time equivalent wherever it was possible to estimate partial employment and reduce the number so engaged to a full-time basis. This is notably true of agriculture where 6,029,000 farmers (owners and tenants) and 2,694,000 wage earners (1929) are considered as representing the full-time work of 5,495,000 and 2,027,000 persons,[1] respectively.

In the professional services, doctors, dentists, nurses, and

[1] Figures from Senate Document No. 124. Full-time equivalent as used here is determined from the total time worked by persons employed part time and a calculation of the number that would be required on a full-time basis.

others were not reduced to the full-time equivalent for 1929 but these persons are assumed to be fully occupied in the calculations for required labor. In trade (retail and wholesale), the full-time equivalent is used, also in manufacturing and construction. The last is defined institutionally. In other words, the figure excludes construction work performed by industrial or governmental organizations with the help of their own forces. The full-time equivalent is used in transportation, but taxicab drivers (about 153,000) are excluded, being classified under miscellaneous industries. Finance, which includes banking, insurance and real estate, largely represents the average number employed (without correction for idle or part time employees). Civil employments embrace federal, state, city, and county occupations. The 1929 figure includes a large number of temporary workers (reduced to full-time equivalent) in the construction field.

TABLE III

Full-Time Hours of Work by Industries

	Hours per Week	Weeks per Year
Agriculture	60*	26–52
Mining and quarrying	48	50.8
Electric light and power	48	52
Manufacturing	{49† 51‡	52
Construction	48	52
Transportation	48	52
Trade	48–60	40–52
Finance	44	50
Civil	36–48§	36–52
Recreation and amusement	44–48	50–52
Professional	‖	
Domestic service	48–60	52
Business service	44–48	50–52
Misc. service	‖	
Misc. industries	48–54	50–52

* Including care of livestock, repairs on machinery and similar tasks.

† Estimate by the National Industrial Conference Board, as quoted by the American Paper and Pulp Association in the public hearing on the Paper and Pulp Code, September 14, 1933.

‡ "America's Capacity to Consume," page 129, The Brookings Institution.

§ Includes teachers; hence, wide variation in hours.

‖ Character of work makes estimate impossible.

Detailed data regarding average hours of work are not available for all occupational groups, but the figures presented in Table III may serve as a rough index of the maximum productive effort our working force should exert in meeting our budget with the 1929 conditions of equipment, managerial skill, competitive trade, and similar factors prevailing.

Aside from small professional groups and those farmers specializing in a single crop, grain, fruit, etc., the requisite hours of labor are rather long—far too long to allow much leisure or that measure of recreational and educational activity which should be enjoyed, as a natural right, by all.

However, several favorable factors influencing the productivity of labor deserve at least passing mention, and justify the prediction that our economic system can supply goods and services to the value of 135 billion dollars under a work schedule far less onerous than the above figures suggest.

Nearly thirteen million persons are occupied in the manufacturing industries. The index of productivity per worker in this group has risen markedly since 1869.[1] From a low of $1485 in that year, the total value of output per wage earner rose to a peak of $4949 in 1932, both amounts being expressed in 1913 dollars.[2]

This indicates a production increase of about 8.5% during each five-year period. Moreover, this rate appears to have accelerated in the decade from 1919 to 1929, during which time the value added by each worker in manufacturing grew from $2754 to $3607. Reducing both figures to the

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[1] Appendix, Table V.

[2] Although the total value per worker is a useful index establishing the trend, it should be remembered that such figures include a great deal of duplication and do not represent the net value of each worker's output. "Value added by manufacture" (as reported by the U. S. Census of Manufactures) since 1919 largely eliminates duplications for materials, etc., and may be taken as a fair basis for determining the actual dollar value of output per worker. Thus the projected labor force in manufacturing alone would create some forty-seven billion dollars net of new values annually. See Appendix Charts V a and V b.

1913 dollar basis, the increase is 26.6%. Many recent reports from various industrial enterprises suggest that productivity per worker has gained steadily since 1929.

The same tendency is apparent in agriculture. The Brookings Institution[1] estimates that agricultural production has expanded more than 40% since 1900 while the labor units have increased less than 7%. Even with this significant development, farming operations are still carried on at a relatively low level of efficiency and there seems good reason shortly to expect a further and more rapid increase in productivity per worker. Not only wider mechanization but other improvements in farming methods promise great savings in labor hours. These possibilities are considered in Chapter II, "Agriculture."

Thus these two industries (agriculture and manufacturing), which engage more than 40% of the working force, may reasonably be expected either to operate with a steadily diminishing personnel or to afford those occupied an ever-increasing amount of leisure.

Transportation, the extractive industries, construction, and light and power, though less spectacular in their recent gains, show the same trend toward greater productivity per worker. So we may conclude that to supply the goods making up our budget will not unduly burden the more than twenty-two million men and women who are called upon for such service.

In the past, competitive trade with its incalculable waste through duplication of facilities and the like, has employed an ever larger proportion of the total labor force.[2] Today, business—each unit fighting for a share of the consumer's

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[1] "America's Capacity to Produce," p. 36.

[2] "The total volume of output per worker in distribution in general, therefore, increased but very little during this [1918-1928] decade . . . something more than the blind workings of competition and the self-interest of individual business men may be needed to develop real efficiency in this field."—"The Economic Bases for The Agricultural Adjustment Act," p. 24, U. S. Department of Agriculture, Dec. 1933.

dollar—engages over seven million persons to distribute or "sell" the products of farm and factory. Retail trade especially is notorious for demanding long hours of service from its workers. It hardly seems necessary to observe that a more rational method of distribution would effect startling and highly desirable economies in this field.

In the service professions, quite a different set of conditions obtains. Here, output per worker is more difficult to gauge. Aside from the gains implicit in the use of better equipment (modern schools and hospitals, the various media of mass communication, and the like), production per worker shows no tendency to increase. Therefore these occupations are expanded notably under the budget. Our estimates provide more teachers per hundred pupils, more dentists per hundred inhabitants, more recreational attendants, and so on. The medical and nursing staff is discussed in Chapter XIII.

Since the production and distribution of ample consumer goods, together with a considerable replacement of plant equipment, is provided for in the labor budget, an increase in the service personnel appears both practical and desirable. Neglecting the spiritual values inherent in such a program, better education, better health, and a generally higher intellectual level must inevitably enhance the productivity of our labor force.

Viewing the subject of labor as a whole, then, certain definite conclusions may be drawn:

(a) Our *potential* working force exceeds by some thirteen million the number required to provide those goods and services which total $135,000,000,000 in the budget.

(b) Our *customary* working force, if subject to 1929 conditions, exceeds the budget requirement by almost a million.

(c) The trend of productive capacity promises shorter hours of labor and/or a greater volume of output, with no *physical* limit to this tendency as yet discernible.

(d) Our current growth in population adds some 703,000[1] employables each year above the number who pass beyond the working age, while medical science is extending the upper age limit of man's productive capability.

These facts are of deep social significance. They show clearly that our American society is equipped to provide a comfortable living for all its members. Any utilization of our resources which fails to achieve such a result (which in dollar value is almost 50% above the 1929 output) inflicts a wholly unnecessary burden of want and deprivation upon those families (more than 85% in 1929[2]) whose monetary income falls below $4,000.

It lies beyond the scope of this Survey to outline the pattern of a correctly functioning society; however, certain suggestions may be in order where they relate to the better employment of men and material.

Any labor surplus should be directed *first* toward full modernization of existing equipment. When this is accomplished and the resultant increases in worker productivity are determined, labor should be "spread" to provide some leisure for every citizen. How much leisure we require and how much effort should be devoted to "useful" production are question upon which an *informed* public should pass.

In summation, then, America's labor force is more than adequate to its immediate task: the full production of needed consumer goods and services, together with a rapid replacement of plant and equipment.

WILLIAM B. SMITH

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[1] Senate Document No. 124, 73rd Congress, 2nd Session.

[2] "America's Capacity to Consume," The Brookings Institution, Washington, D. C.

CHAPTER XVIII

SUMMARY

To discover the accomplished production in a given industry is one matter. The problem of estimating either the possible production (capacity) or the desirable possible production (budget) is quite another. The first problem is solely one of statistical calculation. The second is one of estimation.

Little need be said about the N.S.P.P.C.'s work in recording the actual production achieved, in the years studied, by American industry. It was a straight statistical job of factual compilation. Only authoritative sources, for the most part governmental, were drawn upon. The results obtained represent only the observed facts. Industry did this and that, and in so doing produced such and such items in observed quantities.

The *reasons* for industry having done thus and so instead of something else which might have been done—namely, the operation of our productive equipment at higher output rates—are inextricably bound up in our institutions and habits. Furthermore, the premises from which capacity estimates are drawn are only in part made up of scientifically measurable factors. The output of a given machine operating twenty-four hours a day for three hundred and sixty-five days a year can be expressed by a fixed quantity. But machines seldom if ever run that way. Allowing needed time for repairs and maintenance, they nevertheless, are dependent upon the operation of subsidiary or contributing industries which supply the fuel they convert into energy, and the material they fabricate. This material may be physically seasonal, as in much of the canning industry, or it may be the product or by-product of other industries, as in the chemical and tanning industries. In most cases, it must be transported by haulage agencies. Thus it is seen that the possible production of a given industrial mechanism is dependent not only upon its own physical characteristics, but, upon the operation of other mechanisms and the availability of supplies as well.

Events and happenings exterior to the machine itself influence its rate of production. It may be attended and managed in one manner or in another manner. Not only equipment but also management affects production, and, consequently, capacity. Change in management *alone* has been known to double and triple production. Again, identical machines may be put to a number of differing uses. For each item turned out, a different capacity rating must be given.

Let us set ourselves, for instance, the problem of estimating, in ton-miles, our freight-haulage capacity. In this case capacity depends, in part, upon method. If we dispatched all long-distance freight by rail—that is, such part as is habitually not carried by water, pipe line, etc.—and relegated the short hauls to motor trucks, the ton-mile capacity of all systems would be increased by some 100 billion ton-miles, or 15% of the 1929 haulage.

But machines are not the only productive agencies. Agriculture, animal husbandry, horticulture, labor, the professions, services, etc.—these, too, are productive agencies. How many pigs can we raise and how many teeth can we pull? In the case of pigs, we must consider corn acreage and yield, meat-packing facilities, transportation, refrigeration, storage, and similar factors. Obviously, it would not do to cover the country with pigs beyond our handling means and consumption needs. Having estimated the various handling capacities and having discovered that no "bottlenecks" or difficulties exist, the question is found to need restating. What quantity of pork and pork products do we need? A budget and not a capacity estimate is now required. The same applies to pulling teeth, for nobody wants a sound tooth pulled. Training facilities for dentists having first been found to be adequate, we can obviously accept just as many candidates for the profession of dentistry as the proper care of our teeth dictates and as our material living supplies can support.

With these considerations, and many others, in mind, capacity estimates, based upon authoritative and carefully worked-out definitions, were made wherever possible. Guided by our Definition *b* (Foreword), we first studied "capacity" in all departments of our economy. When raw materials began to approach their finished form, and the question of choice, or allocation, became crucial, budget studies were made and eventually extended to include the entire list of goods and services. In order to avoid the impertinence of suggesting what the American people ought to consume, we based our budgets upon the actual expenditures of persons who had attained an income status sufficiently high to release them from critical concern over pecuniary considerations. The United States Census classifications then gave us the number of persons by age, sex, and occupation, and we thus obtained the information with which to build a national budget.

This technique enabled us to allocate unused capacities to such uses as would round out the consumer-goods budget. Thus, for instance, our unused steel capacity could be allocated to housing and other construction, machinery, and such other departments of the national economy as would best, according to our budget estimates, promote consumer satisfaction.

Our studies revealed, almost at the outset, that capacity operation even under Definition *b* would sometimes, especially in the capital-goods industries, result in both unneeded and unwanted commodities. On the other hand, capacity operation of all equipment could not be conducted simultaneously, owing to inadequacies of supplies or labor or both. Consequently our ultimate research resolved itself into discovering if an output consonant with the budget (estimated needs and reasonable wants of the American people as at present constituted and conditioned) was feasible.

We will consider food first.[1]

FOOD. This industry may be divided into two sections, raw food production (agriculture, horticulture, animal husbandry, etc.) and the food-processing industry (flour mills, canning, packing, etc.).

Raw-food production is probably the least coördinated and the least mechanized of all productive enterprises. This is due largely to the fact that, as well as being an industry, farming is a "way of life." In many sections of our country, it is also an isolated way of life.

Due to traditional habits, isolation, and a general lack of coördination, the restriction of production in order to maintain profits, which prevails in other industries, has—until recent (1933) government action—not been widely exerted. The practice of restricting production in agriculture has largely come *after* rather than *before* the disappearance of profits.

While agro-biological and allied sciences have made great strides in recent years, our agricultural performance, due to a manifold of the conditions mentioned in the preceding paragraph, has fallen far short of what our knowledge makes possible. Between the rank and file of farms and those most up to date, the difference in production efficiency is probably greater than a similar comparison in most other enterprises. Nevertheless, encouraging progress has been noted. Agri-

[1] Attention must be called to the basic conceptual difference between the National Survey of Potential Product Capacity's study and most previous and contemporary studies. In all cases we considered actual physical production as the foundation of our work. Dollars were used only to provide a frame or common denominator by which diverse items could be made comparable.

cultural production per worker increased 28% between 1919 and 1929, largely due to a 100% increase in available power and the steady growth of associations for herd improvement, corn growing, poultry breeding and the like.

No capacities for farm produce—nor for other raw materials—have been given on our Flow-Sheet. The problem was surveyed in Chapter II. Capacities were found for the most part to be indefinite—that is, expansible at will—which, in our economy, means whenever demand for an increased production becomes effective. No limitations need be set as to size, breed, or care of herds and flocks—no limiting restrictions on acreage or climate exist which could affect budgeted production. In this country we can accomplish whatever effective demand may require. The accuracy of our conclusions is evidenced by the fact that between 1923 and 1928 the American farmer, without increasing acreage and with an actual decrease in man-power, stepped up production some 27%. Subsequent agro-biological advances make it apparent that under the stimulus of an aggressive demand, he could surpass this record.

Limited buying power has forced many families to fall back upon the cheap starchy foods, such as potatoes, bread, macaroni, etc., in lieu of the more expensive legumes, fruits, dairy products, and meat. Our research shows, however, that these valuable dietary items are non-produced in desirable quantities not because of any deficiency in the means of their production, but solely because effective demand for them is lacking.

We arrived at our food budget by assuming that the entire population would eat the "liberal diet" as given by the Department of Agriculture. To this statistical list of foodstuffs, we added the scarcity items (caviar, etc.) and the alcoholic beverages, in such quantities as were consumed in 1929. No quantitative deductions were made for the lessened consumption of some ten million children and infants under five years of age. Therefore a waste by spoilage somewhat greater than allowed for in our calculations would not derange the budget.

Should buying power be increased until it gave effective expression to the population's desire for food, society might begin to revise its eating habits in closer conformity to the ideal diet laid down by the Department of Agriculture. However, to effect such an alteration in dietary habits would, in all probability, require more time than to effect the necessary changes in production, as estimated in Chapter II. Such deficiencies as exist present no quantitative difficulties. All the physical requirements for their correction are present in the national economy. Rate of growth, and not a physical quantity such as *acres* or *man hours*, is the limiting factor. Therefore the food budget, *while attainable,* differs from the other budgeted productions in that it could not be fulfilled immediately.

Nearly all foodstuffs require some degree of handling, processing, storage, transportation, etc., before they become available to the ultimate consumer. In the food sections of our Flow-Sheet, capacities refer exclusively to processing, storage, and similar handling. In estimating these capacities, seasonality was duly considered. Canning plants for fruit, berries, fish, etc., due to lack of the necessary raw material, can frequently be run only a few months, and sometimes weeks, per year.

Despite the obsoleteness of much of the equipment (*The American Machinist* estimates 46%), the capacities of the food-processing industries are nevertheless ample and far exceed not only our present available raw-material supply to feed these machines, but also our budget needs. Bakery products, in 1929, showed an unused capacity of 43% for bread, 90% for cake, and 56% for crackers. Carbonated and other non-alcoholic beverages utilized only 33% of plant capacity. Had raw materials been available, canned fruits and vegetables could have been turned out in quantities four times as great as the amount actually produced. Candy production utilized 72% of plant capacity, chocolate and cocoa but 18½%, flour 57%. In 1929, meat-packing plants, operating two shifts, could have processed twice as much as they did. Ice-cream plants ran at only 37% of their rated capacity, cane-sugar and beet-sugar refineries at 60% and 66%, respectively. On the basis of fleet utilization, the 1929 catch of fish was 85% of capacity. As we go down through the list of minor items (see Chapter IX, "Food Processing"), the same story of ample unutilized processing capacities is unfolded.

With respect to bulk and calories, an individual's food consumption tends to remain at or near a certain level if life is to be sustained and the energy needed for daily physical activities is to be supplied. Due to the size of the stomach and the functioning of the digestive processes, this is true regardless of whether we be millionaires or paupers. Low-income families spending as little as $350 to $500 annually for food are not two-thirds or half starved. Nevertheless the mere adequacy of "bulk" and "calories" in a given cheap ration can be very deceptive from the point of view of health. Such measurements neglect the vital question of balanced nutrition. Not only are the cheap diets, which our low-income families habitually consume, less tasty and palatable, but they usually fail to supply vitamins and basic nutrients in quantities necessary for healthy child growth or the maintenance of adult well-being.

Even when measured by the imperfect yardstick of the 1929 retail dollar, the disparity between the statistical record of what we actually *did* eat and the budget estimate of what we *should* eat, is found to be small. The total deficit of some three billion dollars for 1929 does not, however, gauge our unfilled dietary needs in that year. Nor can the most detailed comparison of budget and production more than suggest the grave inadequacy of our existing food supply. This deplorable lack is more truly reflected in the findings of medical surveys, army tests, and other studies which scrutinize our national health.

To arrive at the total retail value of all dietary items actually produced, the "imputed" monetary value of foods produced and eaten on farms must be added to the values of items in the procurement of which money actually changes hands. Some billion and a half dollars' worth of foods and beverages are annually home-produced and consumed on our farms. While these products are not bought on the market, nevertheless, they constitute *real* wealth for which an accounting must be made. Failure to do this would obviously make all food expenditure comparisons between country and city dwellers impossible or fallacious.

In 1929, the sum of such "imputed" items of food when added to the total of commercial production, amounted to almost 27 billion dollars. Our budget calls for an expenditure of about 30 billion dollars, including the luxury foods produced and consumed in 1929. The difference, about 3 billion dollars' worth, seems small. Nevertheless, it is sufficient to account for the substitution of one item of diet for another as recommended by our Department of Agriculture.

Studies made by the Brookings Institution show that 2.7 million families (income under $1,000) averaged only $350 per year for food, and that 4.7 million families (income from $1,000 to $1,500) averaged only $500 per year for food. The average per-family food budget, imputed and actual, calculated by us on the basis of the food actually produced, was over $900. Thus a wide variation in family food expenditure exists.

A discrepancy appears between our total expenditure of $26,919 million and the Brookings total of $23,548 million, a difference of $3,371 million. This is probably due to: (1) beverages and confectionery eaten in drugstores, etc., and, together with the following items, doubtless not listed in the

Brookings budget as "food" (2) meals consumed by traveling salesmen, business representatives, and pupils at schools; (3) repasts and banquets given by churches and other institutions. Again, certain expenses of the wealthy—for instance, food and drink consumed in cabarets, clubs, etc.—were probably listed in their budgets under "other expenses" and not under "food." The methodology of the N.S.P.P.C. precluded such omissions. Finally, the excess of exports over imports (consumer goods) is subtracted from the total production of all commodities in Column 6 (Flow-Sheet), and not from specific items. Exported food does not figure at all in the Brookings Institution's estimate.

The great difference between the per-family food expenditure in the low-income groups and the per-family expenditures in the high-income groups—as estimated by the Brookings Institution—is partly due to the fact that people in the low-income groups not only had to choose the cheaper foods but also had to buy bargain or "marked-down" foods. The bulk and nutritive value contained in a meal of, say, "hot dogs" and sauerkraut served on the kitchen table of a Harlem flat, will at least equal the bulk and calories of chicken *à la* king served at the Colony Club. Needless to say, the market values of these two meals are in no wise comparable. "Marked-down" and "marked-up" food probably cancel out in Column 6 of our Flow-Sheet, thereby giving us a medium average price for each food item. Still, the fact remains that poor people consume the "marked-down" items, while the "marked-up" delicacies go to those who are better off. Also the food expenditures of the rich, when based on budget studies, probably include the nourishment consumed by their retainers, a fact which tends to falsify diet comparisons.

Scarce goods—that is, delicacies such as rare imported wines and cigars, hot-house products, and similar goods—were carried over without alteration from our actual production and import lists to our budget. This does not affect the adoption by the whole people of the "liberal diet," the items of which can be provided by our resources and labor in the requisite quantities.

Textiles and Clothing. The spread between actual production and budget need is but 14% for food, whereas for clothing it is nearly 100%. Considering textiles and clothing together (clothing accounts for the major value of our textiles) we could have produced and used in 1929 about twice the quantity of goods we actually enjoyed. Measured by the retail dollar, just under ten billions dollars' worth of these essential goods were produced in that year, whereas just over twenty billions could have been produced with the existing equipment and labor force—goods which could have been used to the great advantage of the population.

Raw materials for yarns, textiles, yardage goods, etc., are either domestically available in abundant quantities, as in the case of cotton and wood pulp for cotton goods and rayon; or could be domestically supplied in a short period, as in the case of wool, which would require three years of sheep breeding; or they could readily be imported in any desired quantities, as in the case of silk. The capacity estimates do not exactly reflect the existing 1935 production potentialities. Cotton-fabric capacities, for instance, have dropped from 20,074,000,000 square yards in 1927 to the present figure of 16,500,000,000 square yards. However, it seems reasonable to assume that "dismantled" plants and equipment could either be put back into operation or be replaced by new equipment, particularly in view of the 100% excess capacity found to exist in our machine-tool industry.

However, considering the plant "as is," Table I clearly indicates that while the American people may prefer a system which enforces the practice of non-creating clothing (as well as the supplies required for most of their other needs and desires) they do not need to do without these goods because of any deficiency in productive ability.

The budget figures in Table I are calculated for 57 million males and a like number of females. The 11,400,000 infants of both sexes under five years are not included in this tabulation. They are, however, accounted for in Table XI, Appendix.

The clothing budget, when expressed in dollars, is deceptive. The per-family allowance, some $540, seems inordinately low for liberal living. This is due to the manner in which the budget figure was calculated. Studies were made which detailed the *items*, not the *prices*, of clothing purchased by families with incomes of six to seven thousand dollars per year. Obviously these wealthy families often bought custom-made or imported—i.e., expensive—garments. We were not interested in the expensiveness of such garments, often purchased at exorbitant prices in fashionable shops, but only in their *itemization* and *quantity*. Once these per family itemizations were obtained, we priced each garment at the *average* 1929 retail price—i.e., at prices paid by the average buyer in the average clothing store. This was a necessary procedure inasmuch as custom-made, styled, imported—i.e., expensive—clothing could not be provided for the entire population, whereas their counterparts, in budgeted quantities, could be made by American industry.

We were precluded by our Definition *b* (Foreword) from postulating an improvement in the *quality* of clothing or other goods and services. Only *quantities* were considered. Certainly the budgeted quantity of clothing—an increase of some 100% over the 1929 consumption—could not be worn threadbare by the average person. But no physical reason exists, as was suggested in the Foreword, why the new clothes could not be improved in quality as well as increased in quantity, once the pressure to produce at the lowest possible cost was removed. However, this possibility cannot be statistically demonstrated—i.e., reflected in higher retail prices per item. Consequently the Survey was precluded from marking up the prevailing prices, and the low estimate, based on 1929 retail value, resulted.

Actually, good clothes could be produced, at a very slight increase in man-hours, as easily as shoddy clothes. A doubling of quality is as practical as a doubling of quantity. Good-quality machine-made clothing could be provided in the budgeted quantities plus custom-made clothes in quantities at least as great as those provided in 1929. An increase in the quantity of custom-made clothes would depend on the diverting of more skilled labor to their production. This would not seem to be practical or desirable. The machine today can probably produce as good clothes as the hand craftsman, if considerations pertaining to "conspicuous waste" be excluded.

If the clothing budget were fulfilled and the whole people as a result provided with adequate wardrobes, the decorative function of clothing would probably predominate over the protective function now primary for most of the population. Consequently such an eventuality might put great pressure on the designers of clothing to outdo their previous efforts. Fortunately, a machine can execute a design as efficiently as a skilled craftsman.

Reference to Column 6 of the Flow-Sheet and to Appendix Tables X, XI, XII and XIII is suggested for those who are interested in detailed production, capacity, and budget figures.

Our capacity estimates consider only the mechanical equipment of mills and the technical knowledge and skill of management and workers. Such non-physical factors as seasonality of demand and the customary number of shifts are disregarded.[1] Having assured ourselves of the availability of

[1] In cotton textile mills one shift is customary in the North, and two or more in the South. This difference is one of custom and is due, probably, to market considerations.

TABLE I

Major Clothing Items*

(000,000 Omitted)

Item	1929 Production	Capacity	Budget
Men's and Boys'			
Suits	29.09	84.20	67.00
Coats	9.27	26.60	27.91
Shirts	173.06	424.00	363.50
Extra trousers	37.19	106.80	68.00
Underwear	286.35	495.00	331.00
Hosiery (pairs)	719.64	955.08	759.50
Women's and Girls'			
Dresses and frocks	206.46	485.00	275.25
Suits	14.50	38.11	34.41
Coats	23.04	63.30	36.25
Hosiery (pairs)	614.52	1069.20	681.00
Underwear	258.95	510.88	427
Foundation garments	53.37	106.74	139.75
Both sexes			
Shoes (pairs)	361.40	550.00	394.25
Sweaters	57.49	108.00	72.75
Hats	253.51	507.02	281.50

* Source: Appendix Table XII

raw materials, our studies were determined mainly by four considerations: (1) the hourly product capacity of existing spindles and looms; (2) number of working shifts and the hours per shift which have been proven practical; (3) "time out," computed in hours and days, for the average spindle and loom; (4) availability of skilled personnel.

HOUSING AND CONSTRUCTION. We have considered the housing and construction industry—amounting in 1929 to 25-1/3 billion dollars—in three main divisions: (1) housing, (2) other construction, and (3) equipment, supplies, and services. We will consider housing first.

Accounting in dollars for food and clothing, the spreads between actual production and our budget appears as 14% and 100%, respectively. In dwelling construction, this spread is not easily measured in dollars. Homes may be built to last many generations. Unlike the two preceding items, they can be considered as "capital goods," for they create real values every year they are occupied. The yearly addition to the national monetary income from dwellings takes the form of actual or imputed rent.

To express the spread between the actual production of homes and our budgeted satisfiable need or desire for homes, we shall abandon the "dollar yardstick" and consider instead the dwellings themselves.

The actual construction of dwellings in the period 1920 to 1929, inclusive, averaged 450,000 yearly, whereas our studies of capacities in the construction and allied industries —beginning with raw materials and labor and ending with building hardware and house furnishings—clearly indicate an existing capacity sufficient to construct 1,500,000 new dwelling units yearly, besides providing material and labor—equivalent to the annual construction of 200,000 dwelling units—to maintain existing and proposed dwellings. The spread between what was actual and what would be possible is seen to be greater than 300%.

Two-thirds of this million-and-a-half new dwellings which would annually become available to our people (were physical restrictions the only consideration) would replace the present inadequate structures, and the remaining third would be allocated to house the normal increase in population. These homes would not need to be "jerry-built," flimsy affairs, constantly in need of repairs, uneconomical in heat consumption, cramped for space and otherwise undesirable, as are so many of our "development" structures. On the contrary, they would be built to last indefinitely with only occasional repairs.

Most of them (many different building materials were considered) could be fireproof or fire-resisting. All could be well insulated and consequently economical to heat, designed for modern installations and labor-reducing household equipment, well planned for living comfort, and economical of repairs. With four to six rooms having a total of 1550 square feet of floor area—a third larger than many previous "model" layouts—they could be built in a wide variety of architectural styles. Of either single or multiple type, each dwelling unit would have a bathroom and shower, an extra toilet and lavatory, central heating, mechanical refrigeration, laundry equipment, a garage—would, in fact, be up-to-date in every respect.

It would take from five to ten years to house adequately that section of the population whose present living conditions are so deplorable. Assuming a population at the end of ten years of between thirty and thirty-five million families, production of homes could then be slowed down until homes would need to be built only at the replacement and normal population-growth rate of some 900,000 per year or less.

This home-building and maintenance program would not restrict other necessary construction. The year of greatest activity was 1928. Office buildings, lofts, public edifices, and other constructions went forward at an unprecedented rate. Undoubtedly there would be no need to continue these types of construction at this rate. However, to be conservative, we predicated the continuance of this construction rate *prior* to laying out our home-building program. These two rates of construction could, according to our capacity studies, go on concurrently, although in practice they undoubtedly would not. Here again, our estimates allow a wide margin of safety.[1]

The housing budget, unlike the food and clothing budgets, does not attempt to give the market value of proper shelter for the American people. It estimates only: (1) the rent value of existing dwellings after suitable deductions for the rent value of such obsolete shelters as would be torn down under our demolition program; (2) the rent value of such new dwellings as could be provided in the first and second

[1] The reader is referred to Tables I, II, III, of Chapter X, "Construction." Also to Appendix Tables VIII and IX.

years of released production; and (3) the annual value of the needed consumer supplies—fuel, electricity, phone service, etc.

Thus the four-billion-dollar increase of budgeted housing over the cost of 1929 housing, does not include the full value of the new homes but only their rent value. But this rent value increase continues to augment the national income as long as the houses last. Consequently the increase in the housing budget is cumulative in so far as it is derived from the construction of *new* homes. Since it would seem desirable to replace at least sixty per cent of the existing shelters with new houses, and since the rate of increase which capacity permits allows an increase of rent value of something over two billion dollars a year, the housing budget should continue to increase for at least ten years, adding eventually some twenty billion dollars to the national income.

Of course any such estimate is low. Not only does it exclude the production of houses more elaborate than those budgeted, but also it leaves out the supplementary increased values which would accrue from the general renovation of the countryside.

Home equipment has become, to contemporary man, nearly as important as shelter itself. Large unused capacities exist in the industries which supply the various items. Heating and lighting equipment, outdoor and miscellaneous tools, cooking equipment, accessories and utensils, laundry equipment, house furnishings and furniture, telephones and other services—all these could be provided in desired quantities.

While we have large facilities for supplying manufactured ice, the mechanical domestic refrigerator, which could be gradually installed in all homes were physical factors the only limitation on production, would largely end the need for the production of ice for home use.

Most fuels—whether natural or manufactured gas, fuel oil, anthracite or bituminous coal, or heat produced by electricity (except by water power)—are non-recurrent and therefore should be conserved. Available supplies are nevertheless ample for our needs, and better insulated homes equipped with central-heating plants as proposed in the building budget, would materially reduce fuel consumption.

Food and clothing have been sufficient, during intervals in the past, to nourish our people and to maintain bodily warmth in the great majority of our population. But in the less contiguous item of housing, we observe the effect of inadequate purchasing power reflected in squalid congested slums and cold-water flats; in the absence of sanitary plumbing; in the ubiquity of cardboard "development" houses, and unæsthetic eyesores which clutter the countryside. Appetizing food, decorative clothing, ten-tube radio sets—even good manners—would seem to require the background of a comfortable, attractive, and well-built home.

Transportation and Communication. Today, more than ever before in history, man is dependent upon transportation. Coincidently, the need for communication has arisen. On these two items alone we spent, in 1929, nearly twelve and one-half billion dollars—$11,291,334,000 and $1,032,856 on transportation and communication, respectively.

Ample mechanical means are available for the transportation of goods, for recreational travel, and for communications. Our transportation budget represents an approximate three-billion-dollar increase over the 1929 expenditure; that of telephones, telegrams, cables, and post office about 200 million. Physical capacities in all branches of communication allow for any foreseeable increases. However, owing to the impossibility of even approximately determining the effect of increased production of goods and services upon business communications, we carried over without increase the 1929 figures for the items of telegraphs, cables, and post office. In domestic telephones, a 200-million-dollar increase was allowed.

Recreational travel, as well as travel for business, need not be curtailed because of any lack in transportation facilities or the capacity to produce these facilities. While only a million and a half passenger automobiles were produced in 1932, over five and one-half million and an additional million trucks, could have been produced not only in that year but in previous and succeeding years. The gasoline and oil with which to run them could also have been supplied, as well as tires and other accessories.

Road space, especially that adjacent to cities, would seem to be the first limitation on the multiplication of automobiles. Since equipment, material, and labor could be turned into needed highways, this lack presents no serious difficulty. In 1929, three-quarters of our American families owned and operated a car and seemed to get about without undue discomfort.

Travel on railroads was at a peak in 1920, but the perfection of the automobile has greatly lowered our railroad passenger-mile performance and requirements. Without adding an extra coach or run to existing trains and schedules, we could travel one hundred billion passenger-miles on our railroad trains. This rate of travel is twice that of the peak demand in 1920. Due to the automobile, this peak demand will probably never again be approached. For this reason, we budgeted for this item of transportation only a 50% increase over 1929.

The transportation budget is based on two assumptions: (a) that railroad and steamboat passenger travel would increase by not more than fifty per cent even though the people were provided with the means of utilizing our transportation system as much as they desired within the limitations of physical carrying capacity; and (b) that motor cars to the limit of the present capacity (one-shift operation) of the automotive plants would be acceptable to the people.

These 5.6 million possible new cars a year might not be deemed sufficient. Such an annual production would make it possible to provide every family with a car in a few years. But more cars could easily be made by operating factories at two shifts. This possibility was not considered owing to the necessity of replanning cities and expanding the gasoline refineries. Both of these undertakings lie outside the limitation of our definition.

For these reasons the increase in transportation consequent on releasing production from the restraints of present effective demand was conservatively budgeted at only four billion dollars.

In 1932, motor-bus travel accounted for 17% of the total passenger-miles made by all common carriers. However, from the point of view of comfort, they leave much to be desired in long-distance travel. Also their load-factor is low and their depreciation rate, 27% per year, is high. With ample railroad passenger-miles available, and pecuniary considerations ruled out, most people would no doubt elect to travel long distances by train. Bus travel, however, under the existing institutional set-up, costs fewer dollars per mile.

Inter-urban railways are on the decline. Thirty per cent of the 1932 track mileage has been abandoned. Subways, elevated railroads, surface cars, and ferries, though often inadequate in capacity, owing to the habit of concentrating travel during certain peak hours, nevertheless, succeed in carrying the loads to which they are subjected. Furthermore, the expedient of "staggered" office and factory hours, if generally adopted, would distribute the loads over a longer time period.

Freight-haulage facilities, even when not considered from the angle of integrated agencies, are adequate to meet the needs of the budget. Care was exercised to consider ton-miles with reference to the various types of freight and the carriers customarily engaged in hauling each type. For instance, ton-mile box-car capacity indicates no ability to carry oil or coal. Inland waterways and coastwise shipping carry only certain kinds of freight.

The capacity of these last named agencies for hauling petroleum and coal is some 40% greater than the 1929 demand, and, for merchandise and manufactured tonnage, is some 400% greater. Pipe lines serve single industries in highly localized areas, and have an annual capacity of about 800 million barrels. The railroads, however, carry a greater proportion of petroleum products than do the pipe lines, and coastwise shipping carries about half as much.

The present railroad rolling stock has a carrying capacity about 50% greater than the greatest previous demand, and furthermore, the productive capacity of railroad-equipment makers is sufficient to replace 20% of the existing rolling stock in one year. Roadway and track maintenance capacity is four times greater than the record demand. Locomotive plants now in operation have produced 3600 units of all types in one year. A single year's capacity production of locomotives would give us sufficient tractive power to haul freight 600 billion ton-miles—which is the capacity of our rolling stock. And a 25% increase each year over 1929 capacity could thereafter be maintained. These capacities are so far ahead of any conceivable demand that a shortage of transportation facilities due to greatly increased industrial activities is not to be expected.

Postal, cable, telegraph, and telephone facilities have been given an "indefinite" capacity rating. Being services, they depend in the main upon organization and personnel. While elaborate equipment is essential, this equipment and the materials that go into it come from a variety of industries in all of which the facilities are ample. Both Postal and Western Union report that in 1929 they could have handled twice the number of messages they actually did transmit. Likewise, it may safely be assumed that our Post Office over the yearly period could handle any probable increase in mail. This is demonstrated by the peak load carried during the Christmas holidays.

PERSONAL. Under this heading are listed such items as cigars and cigarettes, notions, writing material, barbering, mortuary, etc.—a 1929 production total (retail) of about seven billion dollars. In the light of needs and desires, no limitations on production were discoverable. The supply of tobacco could be greatly expanded as well as that of the other items.

Personal supplies, like recreational facilities, are subject to nearly unlimited expansion assuming physical factors to be the only limitation on production. Owing to the difficulty of presenting this possibility in statistical form, we limited the expansion to the budgeted 2 million increase.

In the real world the abolition of poverty might result in a terrific boom in cosmetics, etc. Though the increase in the physical supply of such adjuncts to living could be easily effected, its translation into values is another matter. At present the cost of cosmetics largely consists of selling expenses. If cosmetics were made abundant, would dropping their price increase their consumption or would the arrest of selling pressure decrease their consumption? The problem would seem to be outside the province of the statistician.

RECREATION. In 1929, some seven billion dollars were spent on amusements and leisure-time activities, of which sum two billions was spent in the movies, two-thirds of a billion on the radio, about a quarter of a billion each on commercialized contests (baseball, football, boxing, hockey, etc.), and amusements (circuses, fairs, resorts, amusement parks, etc.), and the legitimate theater and vaudeville.

The balance of these seven billions of dollars was spent in more individualized activities such as golf (four hundred million), foreign travel (nine hundred million), musical instruments and opera (three hundred million), and camping, recreation farms, and "dude" ranches (a quarter of a billion).

As far more was spent on the movies than upon any other single item of recreation, it is of interest to note that even in 1930, the peak year of movie attendance, we availed ourselves of only one-half the number of seats that our moving picture houses, on a three-shows-per-day basis, could have supplied. Vendibility was found to be the limitation on the production of radio sets and in supplies for non-vicarious recreational activities, such as golf, camping, fishing, and games in which the consumer personally takes part.

In our budget estimates, we allowed for a six-billion-dollar expansion, or a total recreational budget of some twelve billion dollars. This figure was set not because of any definite limitation on the expansion of our leisure-time recreational possibilities, but because desires in this field are difficult to predict. Were twelve to twenty million full-time vacationists, now *without* pay, to be supplanted by a total population enjoying regular vacations *with* pay, spare-time activities would certainly be altered. An increase of nearly 100% over 1929 expenditures seemed adequate as a beginning.

The facilities for recreation are practically unlimited. Certain items of recreation such as foreign travel could not be increased beyond the 1929 rate without providing a monetary equivalent in exports. Others depend merely upon people having leisure and sufficient spending power to provide themselves with food, clothing, and shelter. We have assumed a large increase in the latter categories and no increase, or only the increase made possible by the physical equipment, in the former categories.

SAVINGS. Monetary savings is a subject pertaining largely to finance and as such is not especially relevant to this study. From the angle of the *real* world of physical events and occurrences, we may divide savings into two general categories with respect to the individual (or group) doing the saving. Monetary saving from this point of view becomes either (a) a deferring of consumption or (b) a diverting of consumption. (a) Is known as "hoarding," and has largely fallen into disfavor; (b) is generally practiced and consists in giving some other person or group (a bank or a business corporation) some fraction of one's personal "call" on goods and services.

The immediate effect of this procedure is that some person or group other than one's self spends for goods and services the money so received. The deferred effect (supposed) of this vicarious method of spending—which, unfortunately for many, is becoming increasingly theoretical—is that eventually, at some future date, the favor will be returned—i.e., the borrower will refrain from using a portion of his own purchasing power in favor of the lender who now may spend what he originally had plus an increase (interest).

For the purpose of this Survey, "savings" (Column 6, Flow-Sheet) were calculated by subtracting "premiums" (money paid out) from the total life-insurance payments (1929) and adding the increase of savings in all banks.[1] It happened that savings decreased in 1929, and therefore the amount of this decrease had to be subtracted from life-insurance payments less premiums, as shown in Table II.

[1] Building loans might have been included. Such equities largely lost their value, but probably later than the date (1929) of making out income returns.

TABLE II

Savings (1929)

Life-insurance payments	$3,275,000,000
Premiums paid out (subtraction)	1,962,000,000
Total	$1,313,000,000
Decrease in savings-bank deposits (subtraction)	195,000,000
Total	$1,118,000,000*

* For discussion of the non-inclusion of other so-called savings (investments, etc.) see page 103, "The Chart of Plenty," Viking Press, 1935.

HEALTH. In 1929, about three and one-quarter billions of dollars were spent on health—an average of $26 per person. A sum just over five billions—$42 per person—was budgeted as the amount needed to care adequately for the physical well-being of the people. No increase in this amount need be expected. On the contrary, were preventive therapeutics practiced—as they probably would be if care for the individual's health were assumed by society—the rate of improvement in public health would probably reduce the cost.

Today many doctors and nurses are either disemployed or only partially employed, while a few are overworked. The Milbank Memorial Fund[1] estimates that the existing medical personnel, if fully employed, is ample to care for the health of the population.

A tremendous increase in mental disorders has been noted in recent years. It is not unreasonable to suppose that a decrease in economic insecurity, due to releasing production, would show a decrease in such ailments. In any case, our facilities, including drugs and medical supplies, are ample (or could quickly be made ample) for the proper care of those in need of hospitalization.

The budget, derived from the intensive studies of medical associations, covers the cost of caring adequately for the total population. Consequently it does not include those

[1] Quarterly *Bulletin*, April, 1933.

special services of a theraputic nature which a small upper-income group enjoyed in 1929. No physical factor prevents this group continuing to enjoy such special services. Consequently the estimate of the Survey may be considered ultra-conservative in this service category.

EDUCATION. Education is a most important activity, yet it suffers from neglect. In the so-called "prosperous" days of 1929, 3.7 billions of dollars was spent upon education and some thirty million pupils were enrolled in educational institutions. An outlay of but $123 per pupil would seem insufficient to provide adequately for educational needs. Our budget requirements call for a total annual education bill of 12.6 billions—a huge increase over our present expenditures.

The Flow-Sheet shows only the cost of private education —1.4 billions—for the reason that public education is paid for largely out of real-estate and other taxes, and so appears in Column 6 as largely as rents.

A few figures on the disaster in education caused by the present economic crisis follow: public-school enrollment (1933) was nearly a million larger than in 1930, yet 15,000 teachers had been dropped and the expenditure per child per school day had fallen from sixty-three cents to forty-nine cents. Building expenditures dropped from 400 million to 154 million. There are 450 thousand rural teachers in the country and half of them receive less than $750 yearly, while 90 thousand receive less than $450. In April, 1934, 20,300 schools were closed, cutting off the educational opportunities for over a million children. Today over 200 thousand certified teachers are unemployed.

Educational requirements are a matter of judgment and not of measurement. The large increase in personnel recommended by our advisers at Teachers College, Columbia University, could easily be provided if the productivity of the country were released. This is due to the fact that there is no lack of individuals desiring to teach and capable of being trained to teach. Consequently an expansion of the teaching forces depends primarily on the nation's ability to support the increased staff. Since the nation is well able to provide food, clothing, shelter, etc., for the projected staff, the problem resolves itself into one of time. How long would it take to train and organize such an augmented staff? It would seem that this might not be 100% accomplished in the first year.

Ample equipment and supplies can be provided. The construction budget calls for a construction rate for all buildings other than dwellings equal to that of 1929. Such a rate would shortly provide the needed buildings, particularly were the construction of offices and lofts, which we now have in ample supply, curtailed in favor of educational buildings. The education budget would be particularly needed by a society which chose to avail itself of the leisure and income which modern technology and high energy conversion make possible. There is much to learn in the modern world and many adaptations to make in conditioning the national consciousness away from the concepts and practices enforced by scarcity, and toward the new ideology and opportunities which abundance would make possible.

Taxes. In 1929, direct taxes amounted to $1,420,793,-000. Presumably under any economic set-up, the nation will direct a part of its production to martial and civic purposes, as well as to the maintenance of its public servants. It is beyond the scope of this study to either predict or estimate the characteristics of a social order which utilized its productive facilities to provide the budgeted standard of life. For this reason we have carried over to the budget the 1929 tax figures unchanged.

It is permissible to observe, however, that such commodities and services as would be needed for martial and civic purposes could be provided with greater ease were the existing brakes on our production removed.

SOCIAL AND CIVIL SERVICES. Services, whatever their nature, expand and contract in direct relationship to effective demand. To assign a top limit, a capacity, is obviously impossible. Because of a counteracting or balancing-out effect that might occur were effective demand to be materially increased, we have carried the 1929 cost of social and civil services over to the budget unchanged.

Even in the allegedly prosperous days of 1929, some 40% of our population lived at an expenditure level below that of health and decency. Obviously, were these unfortunates to receive a materially increased purchasing power, social activities would show a marked rise. However, certain other services—charitable and relief organizations, for instance—would either be entirely eliminated or drastically reduced. Crime prevention and detection agencies in particular would be run with a greatly reduced personnel.

Because of the unpredictable nature of social and civil services, and in particular because of the balancing tendencies just described, we have made no provision in our budget for costs greater than the 1929 expenditures.

LABOR. In the preceding pages, a discussion of the labor situation for each department of national production was not made. For the purposes of a summary, labor can best be envisaged as a whole.

On page 201 is given a breakdown of labor by industries for (1) actual 1929 production and (2) the labor force needed to accomplish our budgeted production. This table shows that (1) in 1929, 45.8 million persons were employed in the industries, professions, and other services, and that

(2) an increase to 51.4 million persons would be needed. We have conservatively estimated the number of available workers in all fields at 52.3 millions.

These figures, however, must be accepted only in their broadest aspect, namely that of showing the central fact that no foreseeable labor shortage due to budgeted production need be anticipated.

Several factors would affect favorably the labor supply were our budgeted production to be undertaken:

First, obsolescence in equipment, production technique, and management would tend to disappear. Increased output weeds out obsolescence. A material reduction in Kmh[1] per unit of production could be confidently expected.

Second, a material increase in the national standard of life would tend to release for productive effort a great number of people.

Economic security, diminished frustration of material desires, increased educational and cultural opportunities, increased leisure, better health, decreased crime—these and other social benefits might be expected to materially increase the 52.3 millions of available persons in our estimate.

Third, skilled and unskilled foreign labor would clamor for admittance at the nation's gates. Under such conditions, needed foreign labor could be supported by the goods and services thus created.

FELIX J. FRAZER

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[1] Kmh stands for kilo-man-hours, or one thousand man-hours.

CHAPTER XIX

CONCLUSION

The findings of the Survey can best be grouped under three heads: (a) production, (b) capacity, and (c) budget.

Little need be said about production. Goods and services valued at $96,552,894,000 were *produced* in 1929, the year of maximum production. These include not only the goods and services produced for sale, but also food produced and consumed on farms, valued at $1,719,000,000, and the imputed rent on owned homes, valued at $6,861,000,000. In order to discover what goods and services were consumed in 1929 two deductions, (x) and (y), must be made, as follows:

Goods and services produced	$96,552,894,000
(x) Increase in inventory in 1929	1,500,000,000
(y) Excess of exports over imports not included in the Flow-Sheet before Column VI	1,135,000,000
Goods and services produced and consumed	$93,917,894,000

This sum, divided by the number of average families (of 4.12 persons) in the United States in 1929, gives an average family buying power of $3238. However, this sum throws little light on the living standard of the American people. Owing to the uneven distribution of income, some 19.5 million families had less than $2500 per year, and some 11.65 million families had less than $1500 per year. In general it can be stated that in 1929, 40% of our people had incomes which provided a living beneath the accepted level of health and decency, and another 40% existed close to poverty. Only some 9% possessed over $5000 per year, and 2.3% possessed $10,000 per year or more.[1]

[1] "America's Capacity to Consume," p. 54, Brookings Institution, Washington, D. C.

Regardless of how the goods and services produced and consumed in 1929 might have been divided, the people would nevertheless have been poor.

CAPACITY. It was realized, as our study got under way, that the concept of "capacity production" does not apply to an economy as a whole, but only to specific plants. Four main factors are involved in every capacity estimate: (1) supplies, (2) knowledge, (3) man-power, and (4) equipment. Supplies depend largely on natural resources and on knowledge. Owing to the continual advance in knowledge, it is difficult to determine even the extent of our natural resources. Iron is now extracted from certain ores existing largely in the Lake Superior region. When these give out other iron ores will be processed which for pecuniary reasons are not now exploitable. Obviously, knowledge—in this case metallurgy—is one of the basic factors which must be considered before the available supply of iron ore can be accurately estimated. However, accepting the limitations of existing knowledge—that is to say, postulating no improvements in technological methods, the natural resources of the United States were found to be more than ample to sustain the standard of life suggested by the budget.

A definite estimate of available man-power is also impossible. By limiting man-power to those individuals listed in the census as gainfully employed, over 52 million workers were found to be available. This number is sufficient to provide the budgeted quantity of goods and services even if we exclude the certainty that certain man-hour wastes, such as those involved in competitive selling, would be abolished if effective demand were able to command the production of desired providable goods.

Equipment (existing plant) has a determinable capacity in most cases. The capacity of any particular shoe factory is determinable if ample supplies (leather, etc.) and ample labor are assumed. The productive capacity of a drove of hogs, however, is not relevant information. If left to their own devices and supplied with sufficient food, their progeny will increase in geometric progression until their numbers leave the realm of the practical and the desirable.

By accepting Definition *b*, which excluded an advance in technology, or replacement of obsolete equipment, practical capacities were determined in all branches of industry excepting agriculture and the supplying of certain raw materials. Then these practical capacities were used as a limit against which to check budget requirements. Finally the budget was checked against available labor. Consequently the capacity estimates, given separately on the worksheets, were pertinent only as a first check against budgeted production.

The available labor force, though capable of providing the budgeted goods and services, could not operate the existing plant at its rated capacity. Consequently any totaling of capacities would have no significance, and the possibility of operating the whole plant at capacity was not considered. Since the operation of the whole plant at capacity would provide a plethora of unwanted goods, this limitation is not important to society.

BUDGET. The budgeted production can be accomplished with the existing plant by utilizing the available labor and managerial force to process the supplies that could be made available. Obviously the budgeted production of any one item can be exceeded. We budgeted some six million motor cars a year. Ten million could easily be turned out by diverting more steel, more labor, and more time (a double shift) to the production of motor cars. However, if we postulated a ten-per-cent increase over budget in every good and service, we would run into shortages of both supplies and labor. These could in most cases be made up by using a more advanced technology. Since the Survey, in order to be irrefutable, accepted the limitation of basing its capacity estimates on the productivity of the existing plant, the budget represents under our definition, *a minimum estimate of practical capacity.*

The budget totals $135,516,000,000, an increase of some 42 billion dollars, over the actual production of 1929. The goods and services represented by this 42 billion dollars consist of desired goods and service which the people of the United States could produce but do *not* produce. It measures lost or uncreated wealth.

To discover the cost of our practice of not producing desired goods and services during the years 1929 to 1933 inclusive, the national income of the years subsequent to 1929 may be translated into 1929 dollars, as in Table I.

TABLE I

Statement of Losses to the American People

(in billions of 1929 dollars)

Year	Budget*	National Income†	Annual Loss to Consumer
1929	135	93	42
1930	137	86	51
1931	138	79	59
1932	139	69	70
1933	141	76	65
Total Loss to Consumer (1929–1933)			287

* The budget would increase as durable consumer goods were added to the national stock. The above estimate includes in this category only the rent value of new residences.

† Including imputed income.

It is obvious that this period represents an orgy of extravagance probably without precedent in the history of the world. Owing to one taboo or another, people have practiced non-production since the beginning of human institutions, but it is unlikely that the record of the United States in 1929-1933 has ever been remotely approached.

The question arises why goods and services worth 69 billion were produced, for instance, in 1932—the year of maximum non-production—when the existing resources, man-power, equipment, and technology could have provided some 70 billion dollars more of goods and services, a quantity which would have satisfied the needs and reasonable wants of the population.

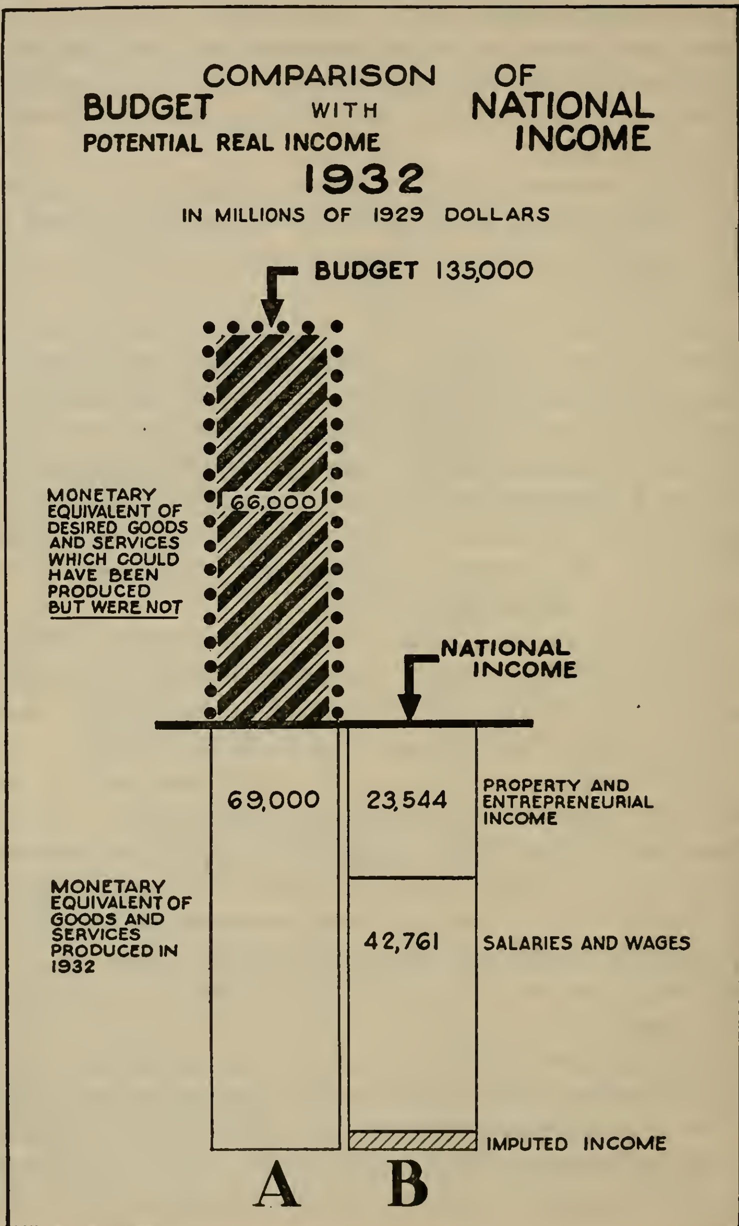
The Chart may indicate the nature of the "arrest" or "taboo" which causes our management to operate plants at some small percentage of capacity and to disemploy able-bodied men.

The sections beneath the heavy black line represent the national income. Column A is the monetary equivalent of the goods and services produced and consumed (approximately). These desired goods and services make up what is known as wealth and pertain to the physical objective world. Column B is the national monetary income represented as the aggregate of payments (wages, profits, interest, rent, pensions, etc.). It is purely an institutional matter and is the result of our way of doing things.

Column B governs Column A. In the contemporary Western World all but a minute fraction of real wealth (goods and services) is produced only when called for by dollars (token wealth). A convention governs and restricts a reality.

Restrictions on production of this character are not unusual. When practiced by so-called primitive tribes, they are known as a "taboo." For example on an island off Sumatra no work may be done in the fields when the priest's house is being built. Consequently the natives cannot keep cattle or cultivate rice since both need uninterrupted labor. As a result, these particular tribes maintain themselves in an artificial poverty.

It would seem that the practice of non-production, due in the Western World to the habit of producing goods only at the rate at which they can be exchanged for token wealth, is endured largely because its disastrous effect is not recognized. Production has been regulated by money income for


COMPARISON OF
BUDGET WITH NATIONAL
POTENTIAL REAL INCOME INCOME
1932
IN MILLIONS OF 1929 DOLLARS
BUDGET 135,000
66,000
MONETARY EQUIVALENT OF DESIRED GOODS AND SERVICES WHICH COULD HAVE BEEN PRODUCED BUT WERE NOT
NATIONAL INCOME
69,000
23,544
PROPERTY AND ENTREPRENEURIAL INCOME
MONETARY EQUIVALENT OF GOODS AND SERVICES PRODUCED IN 1932
42,761
SALARIES AND WAGES
IMPUTED INCOME
A
B

so long a time that society has become accustomed to thus regulating production and accepts this procedure as part of the natural order of things.

It is defended, when called into question, by reference to the basic postulate of the open-market system. According to this postulate, when buying power falls short of commanding a desirable and possible production of commodities, the competitive nature of our enterprise compels a reduction in prices. The price drop then is supposed to restore the equality between buying power and production, so that the former will be able to command the latter.

What is not recognized, at least generally, is that contemporary business practice has been employing ways and means of arresting the free play of price. This has been occurring to an increasing extent for quite 100 years in the sphere of heavy and monopolistic industry. In 1932 the United States Government, recognizing the unfairness of permitting certain branches of industry to restrict production in order to maintain prices, while other branches, in particular, agriculture, were still subject to the full effects of the free and open market, intervened to correct the injustice. A government agency made it possible for nearly all industry, through associations, to restrict production and thereby to control price, and another agency, by direct government intervention, performed the same service for the farmers. Consequently the free play of price, at least in a downward direction, was arrested in practically all the leading branches of trade. This would seem to mean that the American people had established a device for artificially perpetuating the differential between buying power and product capacity—for stabilizing, in other words, inflexible prices, limited profits, and general poverty.

The automatic regulatory device of the open market has been substantially abolished. Instead of the open market, we have for practical purposes a closed market. Instead of product capacity limiting our wealth, we permit dollar income, limited as described above, to regulate the production of desired goods and services.

Of course the fixing of prices is not intended to perpetuate poverty. On the contrary it is designed to restore prosperity. With certain charges (interest on debt, etc.) fixed, and others free, a general price drop is disastrous to the enterpriser. It is thought desirable to save the enterpriser. It is not realized that saving the enterpriser by this device costs the people the value of desired goods which are not produced—goods and services worth 287 billion 1929 dollars, 1929-33 inclusive. The cost of saving the enterpriser would seem exorbitant.

Furthermore, restoring the open market would not set matters right. Let us assume that the governmental regulating agencies are modified, the anti-trust laws enforced, and free competition restored in all lines of industry. Prices would rapidly be forced down below costs since available supplies would, in nearly all cases, exceed the effective demand. Every industry operating on borrowed money would be bankrupted by its inability to meet its fixed charges. Let us suppose that American enterprise should recover from this shock and that the new owners would start off again, with clean financial slates.

Prices would have fallen presumably to somewhere between one half and one quarter of their former height. But with labor treated as a commodity, wages would also have fallen. Consequently buying power would still be inadequate and profit, with the open market functioning, unrealizable. There would seem to be no point in the downward spiral at which buying power could be expected to command an adequate production of goods and services. Deflation and the restoration of the open market, which are measures suggested by the more orthodox economists, would seem as futile and even more cataclysmic than the present attempt to restore wealth by producing less of it.

It may be that the reason the open-market system has been discarded is due to the fact that fundamental conditions have changed. So long as the great majority of commodities could not, in the nature of things, be provided in quantities sufficient to satisfy the needs and wants of a total population, any temporary glut in any commodity or group of commodities could be corrected by transferring energy from the production of the plentiful commodities to the production of other commodities whose supply was still insufficient. Now that we are equipped to produce the great majority of commodities in desired quantities, no outlet[1] exists into which the man-power not required for the production of the potentially, plentiful goods can be directed.[2]

In this situation a nation equipped to produce goods and services along modern technological lines can either (a) create an artificial scarcity by restricting production and thereby maintain prices, profits and poverty;[3] or (b) such a nation can create an unprecedented plenty by putting its idle men and more or less idle equipment to work producing goods and services for its own citizens.

To accept the latter alternative would require several drastic changes in the existing economic system. First of all the commodity theory of labor would have to be discarded.

Today goods and services cannot be distributed in quantities greater than those commanded by the aggregate of in-

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[1] Air-conditioned houses and other similar improvements cannot be produced for the use of our citizens when they have not sufficient buying power fully to utilize the existing living facilities.

[2] Obviously the United States could turn its surplus energy to equipping a slice of Africa with factories, refineries, skyscrapers, sewers, etc. But what it would take in return for this diversion of energy is obscure. War is probably the only adequate outlet for our unused product capacity, under the open-market system.

[3] This policy requires governmental coöperation sometimes of a forceful nature. When military force is enlisted to preserve the *status quo* the resulting economic-political set-up is sometimes known as Fascism.

dividual incomes. The incomes of some 80% of our population consist largely of wages. Wages are the flexible factor in costs. Under the existing competitive system every employer is compelled, under penalty of bankruptcy, to keep costs to a minimum.

This compulsion, inherent in the existing system, forces every employer to hold the dollar wage of his employees down to a minimum and to reduce the number of his employees whenever possible. Since prices are not permitted to fall beneath a certain level, reducing the wage bill reduces also the buying power of the wage receiver. A lowered buying power on the part of the majority of the population reduces the consumption of goods. Reducing the consumption of goods reduces the profits of the enterpriser.[1] The net result is a reduction in the national income. Thus, with the price range fixed, technological improvements (i.e., reduction of man-hours per item) result in a lowered buying power, a smaller production of desired goods, and an increased destitution.

Despite the various forces working in an opposite direction, the compulsion to lower wages has enforced a standard of living only a little above the subsistence level for the majority of our citizens. It would seem, both on theoretical grounds and from empirical observation, that this compulsion to reduce the buying power of the non-property-owning citizen cannot be effectively counteracted within the frame of the existing system.[2] If this be so, our people cannot hope to enjoy the adequate quota of goods and services which the resources, man-power, equipment and knowledge of society can handily provide, unless the compulsion to reduce wage costs, now operative among all enterprisers, be abolished.

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[1] A lowered wage bill in practice is often not translated into greater profits. With prices fixed, a lowered wage bill usually results in a reduced rate of production, which nullifies the increased profit per item.

[2] For a fuller discussion of this point see the concluding chapter of "The Chart of Plenty," Viking Press, 1935.

If it were abolished, wages or the return for effort could be based on the goods and services which can be provided, instead of the present situation in which the production of goods and services is governed by a grossly inadequate national income largely consisting of wages.

Though it is somewhat outside the scope of a statistical survey to consider a problem in theoretical economics, it may not be out of place to suggest that in order to create a buying power commensurate with society's ability to produce and need to consume, would require:

First, that goods and services be divided into two classes: those which can be provided in desired quantities, and those intrinsically scarce (which need not be further considered since the open market still fosters their increased production[1]).

Second, that the prices of the former be fixed—at any price level—and totaled.

Third, that the total price (budgeted quantities multiplied by unit prices), translated into monetary terms, be issued to the prospective consumers to be canceled when exchanged for goods and services.

Fourth, that the industries concerned with producing and distributing these potentially plentiful goods be centrally controlled so that the budgeted quantity of goods (subject of course, to unforeseeable variations in consumer demands) shall be produced.

Such a solution is in line with western tradition. In the past centuries making war, keeping the peace, instructing the young, transmitting communications, maintaining highways, and delivering water have been successively removed from the

[1] The supply of goods intrinsically scarce is by definition less than the demand. Consequently their price does not tend to drop below the cost of production and their increase, so long as they are desired, is fostered by the normal "higgling of the market." The traditional open-market system would seem satisfactory—at least no better system is apparent—for handling the production and distribution of goods intrinsically scarce.

open market—the sphere of private enterprise—and operated as public services. To illustrate the desirability of extending the scope of public control over the remaining utilities, including the production and the distribution of goods and services which, by means of modern technology, can today be provided in desired quantities, the case of water may be cited.

To distribute water requires labor, supplies, equipment, and knowledge. If it were judged advisable to return the distribution of water to private competitive enterprise (in order to take advantage of the supposed greater efficiency of private over public control) two steps would have to be taken: (a) outlets for water would have to be padlocked or metered; (b) the release of water would have to be restricted to fit the buying power of the public. The result would inevitably be a marked reduction in the consumption of water, and a conservation of its supply.

It would seem just as unnecessary to conserve the supplies of goods that can be provided in desired quantities, as it is to conserve the supply of water. There would seem to be no basis, in the nature of things, for reducing the sow birth-rate, or restricting the acreage of needed agricultural products or even for mining less coal than is required to keep our people warm. The supplies, even of the non-recurrent raw materials, are ample. The labor force is adequate. Equipment lasts as long when used as when idle, or longer. And knowledge is likely to advance more rapidly when utilized than when suppressed.

The result of removing the production and distribution of such goods as can be supplied in desired quantities from the restrictions of the contemporary economic system, would be the release of our product capacity and the satisfaction, by tangible goods and services, of the needs and reasonable[1] de-

[1] "Reasonable" is used to exclude desires for first editions of Shakespeare, such desires as cannot, in the nature of things, be satisfied.

sires of our population. There would seem to be no more reason for frustrating these needs and desires than there is for withholding water from the thirsty. No virtue resides in withholding desired goods when the desired goods can be supplied by the application of labor and knowledge. The Western World is stultified by a convention which has come down from the long ages of scarcity. It does not yet realize that modern technology has abolished the necessity of withholding from consumption most items of the human budget.

HAROLD LOEB

APPENDIX

The following abbreviations were used in the tables:

Rep. = Report.
WS = Worksheet.
A.T. = Allocation Table.
IND. = Capacity is indeterminate but adequate for the budget.
N.S.P.P.C. = National Survey of Potential Product Capacity.

NOTES ON TABLE II. This table presents a detailed breakdown of the commodities which have been grouped together and listed under one general heading in Column 4. For instance, the first item which appears in Column 4 is titled "paper packaging" and given the key number 1 in Table 2. Turning to the latter table, it is seen that three separate items are given the same key (identifying) number, namely, paper bags (Kraft), waxed paper, and bags (paper). These three items therefore have been combined and shown under the single heading "paper packaging" in Column 4. This method was followed throughout in compiling Column 4.

GENERAL NOTES. Three zeros (000) have been omitted in most instances. The year refers to 1929 unless otherwise noted.

TABLE I

Column 1 (table)

1929

Raw Material (000 Omitted)

	Product	Production Quantity*	Production Value	Capacity Quantity*	Capacity Value	Budget Quantity*	Budget Value	Imports Quantity*	Imports Value	Exports Quantity*	Exports Value
	Animal										
Rep. 603	Beef, Veal, Calves	13,141,002	725,342			18,720,000	1,074,004				
,, 603	Swine {Pork	12,297,000	1,173,470			14,406	1,373				
	Swine {Lard	4,118,343	391,151								
,, 603	Sheep—Lamb	1,490,223	188,978			1,650,000	209,220				
,, 603	All Poultry	2,890,482	647,726			3,375,000	756,338				
,, 727	Game Animals, Edible	98,727	13,625								
,, 743	Game Birds, Edible	32,661	8,165								
	Fisheries										
Rep. 596	Fish	3,567,000	123,054			2,708,333	93,521	211,176	15,557	18,179	2,510
	Milk										
Reps. 582–5	Milk	101,608,000	2,462,232			176,375,000	4,250,637	933,433	22,496	371,097	8,943
	Eggs										
Rep. 576	Eggs	2,934,017	775,118			4,221,388	1,085,444	347	91	13,593	4,081
	Forage										
Reps. 704–5	All Forage	408,011,008	1,472,399			569,221,589	1,950,223	120,000	731	18,000	109
	Cereals										
Rep. 597	Corn	119,850,000	1,707,861			136,444,000	1,944,332	27,832	398	575,736	8,224
,, 768	Wheat, Oats, Rye	86,493,000	1,339,002			86,493,000	1,339,002	776,800	13,608	5,831,100	100,995
,, 768	Barley, Rice, Buckwheat, Sorghums	18,811,000	233,112			17,261,000	198,112	36,149	773	1,270,327	21,633
	Fruits and Vegetables										
Rep. 615	Potatoes—White	17,013,840	357,297			16,125,000	338,625	256,561	4,305	164,000	3,223
,, 143	Potatoes—Sweet	3,391,830	59,208			3,250,000	56,729				
,, 143	Vegetables, Leafy	5,411,711	131,279			16,875,000	493,250				
,, 143	Tomatoes	4,008,048	53,849			6,875,000	89,375	1,192,053	3,828		
,, 143	Farm Garden Vegetables	8,653,680	226,046								
,, 143	Other Misc. Vegetables	7,604,341	187,656			8,000,000	185,282	151,235	7,133	251,447	7,611
,, 143	Fruit, Citrus	5,335,407	175,039			7,050,039	225,750	60,987	2,015	501,404	23,776
,, 143	Fruit, Non-Citrus, and Berries	18,958,346	480,287			32,949,961	1,084,525	4,072,374	46,631	857,932	35,751
,, 143	Nuts	970,112	53,171			375,000	33,558	283,935	28,095	10,900	1,481
,, 615	Nursery Vegetable — Seeds, Horticultural Flowers, Bulbs, etc.		145,703								
	Oil Seeds										
Rep. 608	Flax and Cotton Seed	14,070,960	245,266					1,358,076	46,551		
,, 764	Other Seeds	485,061	14,446					771,045	31,635	5,926	246

TABLE I (*Continued*)

COLUMN 1 (table), *continued*

1929

RAW MATERIAL

	Product	Production Quantity*	Production Value	Capacity Quantity*	Capacity Value	Budget Quantity*	Budget Value	Imports Quantity*	Imports Value	Exports Quantity*	Exports Value
	SUGAR										
Rep. 620	Sugar, Beet	14,630,000	51,805			32,648,000	115,607				
" 620	Sugar, Cane	5,836,000	23,332			5,836,000	23,332	510,000	893		
" 620	Honey	83,546	12,260			83,546	12,260	180	24	8,676	775
	TOBACCO										
Rep. 599	Tobacco	1,456,510	265,887					68,066	53,821	565,902	146,083
	FIBERS										
Rep. 587	Cotton	7,287,000	1,248,663					223,275	53,333	3,981,509	770,830
" 587	Flax							11,314	3,277		
" 587	Hemp	1,196	155					3,138	407		
" 587	Wool	350,464	100,246					255,360	} 87,344	239	88
" 587	Mohair	14,461	6,797					25,011	}		
	FOREST PRODUCTS										
Rep. 591	Forest Products (cu. ft.)	14,797,197	881,059					63,800	17,708	138,645	15,287
	FUELS										
Rep. 602	Anthracite (tons)	73,828	385,643	100,000	522,350			487	3,329	3,406	32,569
" 602	Bituminous (tons)	535,000	952,781	752,000	1,339,264			495	2,157	17,429	65,742
" 602	Oil, Crude (bbls.)	1,007,323	1,280,417					78,933	79,943	26,394	37,800
" 602	Natural Gas (M. cu. ft.)	1,918	157,596								1,167
" 602	Natural Gasoline (bbls.)	52,271	183,733								
	MINERALS										
Rep. 553	Ferrous Ores (tons)	81,874	202,190	89,952	227,578			3,971	30,280	1,461	4,775
" 553	Non-Ferrous Ores (tons)		449,887		464,338				293,251		16,378
" 553	Non-Metallic Ores (tons)	24,441	178,244	27,243	196,687			3,920	58,438	2,525	38,817
" 553	Stone—Sand—Gravel—Clay (tons)	368,698	361,624	438,549	415,919			369	3,999	639	2,611
	TOTAL RAW MATERIALS—DOMESTIC PRODUCTION		20,132,801								
	IMPORTS (Not Included Above)										
Rep. 575	Rubber							1,262,939	240,966		
" 575	Tea and Coffee							1,571,631	328,264		
" 575	Farinaceous Substances							181,442	4,711		
" 575	Fertilizers (tons)							778	17,639		
" 575	Drugs							130,465	13,459		
" 575	Chemicals, Colors and Gums							374,049	25,395		
" 575	Fibers							571,671	479,666		
	EXPORTS AND IMPORTS										
	TOTAL								1,992,308		1,350,939
	RAW MATERIALS AVAILABLE FOR DOMESTIC CONSUMPTION		20,774,170								

* Lbs., unless otherwise noted.

TABLE I (*Continued*)
COLUMN 2 (table)
TO CONSUMER

	Item	Production		Capacity	
		Quantity*	Value	Quantity*	Value (theoretical)
	Foods				
Rep. 572	Meats	17,238,000	3,800,476	34,056,000	7,486,937
WS 150, Reps. 727–43	Poultry, incl. wild game	1,652,913	669,517		Ind
Rep. 571	Fish, fresh	1,415,000	73,832	1,655,000	86,323
Reps. 574–86	Milk	46,249,930	1,115,052		Ind
Rep. 696-B	Flour	15,683,878	472,026	24,412,346	719,985
Rep. 696-B	Breakfast foods	3,110,000	175,223	5,183,330	292,038
Rep. 754	Vegetables	41,475,450	941,937		Ind
Reps. 755–6	Fruits and nuts	20,680,974	568,253		Ind
Rep. 598	Eggs	2,581,935	848,639		Ind
Rep. 726	Sugar, beet	2,047,071	108,553	3,080,000	163,237
Rep. 726	Sugar, other	1,129,250	73,690		Ind
WS 125	Coffee, tea and spices	1,321,000	480,244	1,835,000	667,006
WS 180	Beverages		456,000		Ind
	Housing				
Rep. 765	Ice, artificial	39,000,000	92,440	75,530,000	174,300
Rep. 621	Natural gas (M. cu. ft.)	357,853,000	29,598		Ind
Rep. 621	Manufactured gas (M. cu. ft.)	401,154,000	444,115	602,333,000	666,839
Rep. 621	Other fuels†		691,086		Ind
Rep. 779	Willow ware (M. ft., b. m.)	36	22,851	38	23,129
	Transportation				
Rep. 621	Motor gasoline (bbls.)	300,000	1,053,000	376,170	1,316,250
	Personal				
Rep. 719	Tobacco		1,246,241		Ind
Rep. 196	Horticultural supplies		145,703		Ind

TABLE I (*Continued*)

Column 2 (table), *continued*

Supplies for Further Fabrication

	Item	Production		Capacity	
		Quantity*	Value	Quantity*	Value (theoretical)
	Foods, Etc.				
Rep. 593	Lard	2,598,000	339,448	5,204,000	678,900
Rep. 572-A	Fats (not for food)	934,000	69,927	1,868,000	139,854
Rep. 609	Hides and skins		155,779		Ind
Reps. 574–86	Milk	55,358,070	1,347,180		Ind
Rep. 696-B	Flour	6,409,202	220,455	11,152,011	330,462
Rep. 696-B	Flour (not for food)	6,900,120	203,503	12,063,132	365,774
Rep. 754	Vegetables	4,608,000	325,738		Ind
Rep. 769	Vegetable oil		138,472		Ind
Reps. 755–6	Fruits and nuts		396,107		Ind
Rep. 598	Eggs	352,082	115,723		Ind
	Oils (not for food)		156,185		Ind
Rep. 726	Sugar (imports)	9,776,778	209,277		Ind
Rep. 20	Animal feeds (tons)	24,656	402,253	33,365	544,261
	Miscellaneous foods		190,194		Ind
	Yarns and Fabrics				
Rep. 744	Cotton yarn	647,725	253,349	1,472,000	575,793
Rep. 744	Cotton cloth		1,138,846		2,588,286
Rep. 744	Wool yarn	60,517	44,340	109,430	80,181

Rep.	744	Wool cloth		242,083		665,063
Rep.	744	Worsted yarn	98,956	155,417	227,500	357,280
Rep.	744	Worsted cloth		329,054		903,994
Rep.	744	Silk yarn	18,524	106,513	46,310	266,283
Rep.	744	Silk cloth		358,773		896,933
Rep.	744	Rayon yarn	131,329	158,908	196,993	238,362
Rep.	744	Other fibers	570,321	87,943	1,267,380	195,428
		Rubber, Crude				
		Rubber (all imported)	1,262,939	240,966		Ind
		Forest Products				
Rep.	779	Lumber (M. ft., b. m.)	36,886	993,738	37,344	1,005,808
Rep.	779	Cooperage		207,820		210,241
Rep.	779	Planing mill products (M. cu. ft.)	1,566	553,584	1,585	560,139
Rep.	779	Wood preserving		190,945		238,681
Rep.	779	Miscellaneous products		208,073		232,975
Rep.	779	Paper pulp		234,760		284,902
		Fuels				
Rep.	621	Gasoline (bbls.)	90,631	318,148	113,642	398,926
Rep.	621	Gas and fuel oil (bbls.)	405,858	361,214	493,929	439,597
Rep.	621	Kerosene and lubricants (bbls.)	33,951	238,103	67,359	472,396
Rep.	621	Natural gas (M. cu. ft.)	114,152,000	190,099		Ind
Rep.	621	Manufactured gas (M. cu. ft.)	836,757,000	208,576	1,256,302,000	313,177
Rep.	621	Coal, anthracite (tons)	12,448	52,290	16,800	70,826
Rep.	621	Coal, bituminous (tons)	393,024	1,236,345	576,408	1,813,881
Rep.	621	Coke (tons)	52,373	257,505	57,107	280,783
Rep.	621	Miscellaneous residues (bbls.)	40,744	97,257	80,836	193,958
Rep.	765	Ice, artificial	50,000,000	118,513	94,500,000	174,300

TABLE I (*Continued*)

COLUMN 2 (table), *continued*

SUPPLIES FOR FURTHER FABRICATION

	Item	Production Quantity*	Production Value	Capacity Quantity*	Capacity Value (theoretical)
	MINERALS				
WS 84	Pig iron (tons)	41,757	779,647	50,943	951,169
WS 84	Iron alloys (tons)	987	70,261	1,216	79,842
WS 32	Copper, refined (tons)	1,542	558,506	1,695	613,743
WS 34	Lead, primary and secondary (tons)	1,085	147,560	1,206	163,956
WS 131	Zinc, refined (tons)	673	87,329	852	110,543
WS 65	Aluminum (tons)	176,603	101,092	220,788	126,365
WS 112	Graphite		6,704		13,408
WS 108–19, Rep. 697	Stone		276,361		IND
Rep. 697	Sand (tons)	99,253	194,536		IND
Rep. 697	Gravel (tons)	123,319	205,776		IND
WS 8	Cement (bbls.)	170,198	251,893	259,344	383,829
Rep. 697	Other minerals		76,941		IND
	CHEMICALS				
WS 16-A	Chemicals		1,539,005		IND
	TRANSPORTATION				
	Freight		2,293,000		IND

* Lbs., unless otherwise noted.
† For breakdown, see Column 3 (table).

TABLE I (*Continued*)
COLUMN 3 (table)
TO CONSUMER

	Item	Production Quantity*	Production Value	Capacity Quantity*	Capacity Value (theoretical)
	FOODS, ETC.				
Reps. 504–72	Meats	17,238,000	3,800,476	34,056,009	7,486,937
Rep. 503	Lard	2,598,000	315,456	5,204,000	630,794
Reps. 170,171,601	Fats, incl. oleomargarine	2,237,384	244,160	2,429,000	278,615
WS 150, Rep. 727–43	Poultry, (incl. wild game and birds)	1,652,913	669,517		IND
Reps. 571–723	Fish, fresh	1,415,000	73,832	1,655,000	86,323
Reps. 47–723	Fish, cured	725,000	118,588	799,546	136,847
Rep. 574	Milk	46,249,930	1,115,052		IND
Rep. 574	Butter	2,141,915	937,456		IND
Rep. 574	Cheese	588,200	112,723		IND
Rep. 574	Miscellaneous milk products	2,665,000	207,912		IND
Rep. 696	Flour	15,683,878	472,026	24,412,346	719,985
Rep. 782	Breakfast foods	3,110,000	175,223	5,183,330	292,039
Rep. 782	Bread	14,019,000	978,140	19,150,000	1,699,917
Rep. 782	Biscuits	1,394,000	281,764	3,220,000	650,847
Rep. 782	Cake, including macaroni	2,001,000	320,506	26,450,000	3,047,997
Rep. 754	Vegetables, fresh	41,475,450	941,937		IND
Rep. 754	Vegetables, canned	4,608,000	325,738	5,097,345	360,330
Rep. 755	Fruits, fresh	20,307,862	547,853		IND
Rep. 755	Fruits, canned	3,986,000	396,107	4,409,000	438,172
Rep. 756	Nuts	970,112	88,000		IND
Rep. 598	Eggs	2,581,935	848,639		IND
Rep. 726	Sugar, cane	8,078,312	395,917	13,318,000	653,263
Rep. 726	Sugar, beet	2,047,071	108,553	3,061,000	163,237
Rep. 726	Sugar, other	671,400	53,694		IND
Rep. 165					
WS 125	Coffee, tea, and spices	1,321,000	480,244	1,835,000	667,006
Reps. 33–53–163	Beverages		456,000		IND
	Miscellaneous foods		293,080		IND

TABLE I (*Continued*)
COLUMN 3 (table), *continued*
TO CONSUMER

	Item	Production		Capacity	
		Quantity*	Value	Quantity*	Value (theoretical)
	WEARING APPAREL				
Rep. 567	Knit underwear................(doz.) 48%	20,334	135,091	30,094	199,935
Rep. 566	Sweaters and bathing suits.......(doz.) 87%	6,996	149,641	13,082	307,505
Rep. 565	Hosiery, seamless...............(doz.) 52%	85,433	199,990	142,717	334,049
Rep. 564	Hosiery, full-fashioned...........(doz.) 88%	31,928	311,632	60,025	1,105,412
	HOUSING				
Rep. 765	Ice, artificial............................	39,000,000	92,440	75,530,000	174,300
Rep. 621	Natural gas....................(M. cu. ft.)	357,853,000	29,598		IND
Rep. 621	Manufactured gas.............(M. cu. ft.)	401,154,000	444,115	602,333,000	666,839
Rep. 621	Fuel oil...........................(bbls.)	33,191	116,720	60,335	227,604
Rep. 621	Coal, anthracite.....................(tons)	68,528	357,711	93,874	490,071
Rep. 621	Coal, bituminous....................(tons)	102,000	181,560	150,000	266,893
Rep. 621	Coke and firewood........................		35,000		38,599
Reps. 350–497	Electric power...................(k. w. h.)	9,773,000	127,600	12,216,000	159,500
Rep. 543	Willow ware.....................(cu. ft.)	36	22,851	38	23,129
	TRANSPORTATION				
Rep. 621	Motor gasoline....................(bbls.)	300,000	1,053,000	376,170	1,316,250
	PERSONAL				
Rep. 719	Cigars and cigarettes...............(pieces)	129,341,000	977,569		IND
Rep. 719	Chewing and smoking tobacco...............	386,000	268,672		IND
Rep. 196	Horticultural supplies.....................		145,703		IND
	Other personal supplies....................		160,180		227,923
Reps. 306–683	Soap....................................		301,191		385,524

TABLE I (*Continued*)
COLUMN 3 (table), *continued*
SUPPLIES FOR FURTHER FABRICATION

	Item	Production		Capacity	
		Quantity*	Value	Quantity*	Value (theoretical)
	FOODS, ETC.				
Rep. 572 A	Fats, inedible	934,000	69,927	1,868,000	139,854
Rep. 609	Leather (hides)	135,854	481,340	271,708	962,680
Rep. 639	Furs, dressed		40,237		IND
Rep. 574	Milk	15,077	363,000		IND
Rep. 696A and B	Flour, not for food	6,900,120	203,503	12,063,132	354,095
Reps. 20, 608, 764	Oil cake and seeds	620,524	127,745	1,201,100	238,891
Rep. 726	Sugar	2,521,344	132,388		IND
Rep. 20	Animal feed	15,334,000	402,753	26,500,000	704,113
Rep. 172 A					
WS 16	Fertilizers		233,046		IND
Rep. 766	Chocolate	296,812	58,072	364,187	71,254
Reps. 613, 574	Ice cream mix	137,203	15,278		IND
Rep. 160	Yeast	178,578	17,271		IND
	YARNS AND FABRICS				
Rep. 787	Cotton goods (sq. yds.)	8,541,546	1,138,846	19,412,600	2,588,286
Rep. 787	Cotton small wares		65,169		162,923
Rep. 787	Woolen goods (sq. yds.)	264,200	242,083	724,300	665,063
Rep. 787	Worsted goods (sq. yds.)	249,750	329,054	684,246	903,994
Rep. 787	Broadsilk goods (yds.)	456,900	385,773	1,142,250	964,433
Rep. 787	Rayon fabrics (yds.)	187,516	137,498	468,790	343,745
Rep. 787	Silk rayon yarns	24,758	105,345		IND
Rep. 787	Knit cloth goods (yds.)	63,795	103,505	70,085	113,742
Rep. 787	Fur felt and wool felt		156,524		IND
Rep. 787	Dyeing and finishing		465,820		1,058,682
Rep. 787	Rope, cord, and twine	731,750	125,239		IND

TABLE I (*Continued*)
COLUMN 3 (table), *continued*
SUPPLIES FOR FURTHER FABRICATION

	Item	Production Quantity*	Production Value	Capacity Quantity*	Capacity Value (theoretical)
	RUBBER, CRUDE				
Rep. 575	Rubber	1,262,939	240,966		IND
	LUMBER				
Rep. 780	Lumber (M. cu. ft.)	34,426	927,464	34,832	938,418
Rep. 780	Cooperage		207,820		210,242
Rep. 780	Planing-Mill products (M. cu. ft.)	1,566	553,584	1,535	560,139
Rep. 780	Wood preserving		190,945		238,681
Rep. 780	Boxes, not cigar (M. cu. ft.)	370	135,026	375	136,526
Rep. 780	Other wood products		237,402		261,012
	PAPER				
WS 17	Newsprint (tons)	1,409	80,707	1,696	97,120
WS 17	Book (tons)	1,498	168,272	1,775	199,374
WS 17	Others (tons)	6,942	520,771		IND
WS 17	Matrix, absorbent (tons)	4	1,516	5	1,777
WS 17	Tissue (tons)	288	39,452	339	46,251
WS 17	Hanging (tons)	99	7,148	139	8,510
	FUELS, ETC.				
Rep. 621	Gasoline (bbls.)	90,631	318,148	113,642	398,926
Rep. 621	Fuel Oil (bbls.)	405,858	361,214	493,929	439,597
Rep. 621	Kerosene and lubricants (bbls.)	33,951	238,103	67,359	472,396
Rep. 621	Natural Gas (M. cu. ft.)	114,152,000	190,099		IND
Rep. 621	Manufactured Gas (M. cu. ft.)	836,757,000	208,576	1,256,302,000	313,177
Rep. 621	Coal, anthracite (tons)	12,448	52,290	16,861	71,637
Rep. 621	Coal, bituminous (tons)	333,000	1,046,170	465,800	1,464,638
Reps. 350, 497	Electric Power (industrial) (kw.-hr.)	50,879,000	1,168,812	63,475,000	1,461,015
Rep. 621-B	Coke (tons)	46,000	224,310	50,200	244,498
Rep. 621-B	Misc. petroleum residues (bbls.)	40,744	97,257	80,836	193,958

Rep. 765	Ice, artificial	50,000,000	118,513	73,530,000	174,300
	Minerals				
Rep. 83	Pig iron and scrap, sold		189,144		230,756
Rep. 97	Cast-Iron pipe (tons)	1,924	85,890	2,340	104,786
Rep. 85	Steel ingots and castings (tons)	56,433	2,144,232	64,931	2,466,726
Reps. 102–110	Non-Ferrous alloys (tons)		734,646		Ind
WS 32	Copper (not in alloys)		444,405		484,401
Rep. 34	Lead (not in alloys)		135,360		150,361
Rep. 131	Zinc (not in alloys)		71,086		78,195
Reps. 65, 109	Aluminum		53,775		Ind
Rep. 105	Precious metals				
Reps. 414, 437	Alloys and foils		71,937		Ind
Reps. 397, 398					
WS 148	Non-Metals		36,185		Ind
Reps. 108, 119	Lime (quick) and cut stone		167,270		196,788
Rep. 118	Brick, tile and pottery		405,557		450,619
Rep. 697	Stone (crushed)		107,312		Ind
Rep. 697	Sand (tons)	99,253	194,536		Ind
Rep. 697	Gravel (tons)	123,319	205,776		Ind
Rep. 8	Cement (bbls.)	170,198	251,893	259,344	383,829
Reps. 392, 454, 406, 118, 554, 438	Gas and electric fixtures, and miscellaneous manufactured products		103,363		Ind
	Chemicals				
Reps. 669, 317, 325	Paints and varnish supplies		621,046		821,061
Reps. 315, 316, 319	Oils and greases		564,136		Ind
WS 16	Cleaning supplies		32,961		Ind
Reps. 187, 410, 492					
WS 16	Explosives and other Chemicals		284,965		Ind
WS 174					
	Transportation				
Rep. 816	Freight		1,223,000		Ind

* Lbs., unless otherwise noted.

TABLE I (*Continued*)
COLUMN 4 (table)
SUPPLIES FOR FURTHER FABRICATION

Key Number (Table II)		Item	Production: Quantity*	Production: Value	Capacity: Quantity*	Capacity: Value (theoretical)
		AGRICULTURE AND FOOD SUPPLIES				
A.T.	1	Paper packaging (tons)	681	114,589	1,362	229,176
A.T.	2	Glass containers and accessories		155,490		326,510
A.T.	3	Metal containers		299,076		598,152
A.T.	4	Agricultural supplies (not machinery)		198,080		218,667
A.T.	5	Fertilizers (tons)	245,675	247,607	IND	IND
		WEARING APPAREL AND SUPPLIES				
A.T.	6	Clothing supplies		122,256	225,518	IND
A.T.	7	Shoe supplies, leather (hides)	112,758	399,512		799,024
A.T.	7	Shoe cutstock and miscellaneous supplies		170,560		236,806
A.T.	8	Silk (yds.)	434,055	366,485	1,085,138	916,213
A.T.	8	Rayon fabrics (yds.)	187,516	137,498	468,790	343,745
A.T.	8	Rayon yarn	109,153	145,285	163,730	217,928
A.T.	8	Cotton goods (yds.)	7,615,320	972,812	17,307,545	2,210,936
A.T.	8	Wool goods (yds.)	264,200	242,083	725,824	665,063
A.T.	8	Worsted goods (yds.)	249,750	329,054	686,126	903,995
A.T.	8	Knit goods and cotton small ware		152,972		259,410
A.T.	8	Embroideries, laces, and ribbons		158,214		395,535
A.T.	6	Furs (dressed)		40,237		IND
		HOUSING AND CONSTRUCTION				
A.T.	9	Plumbing equipment and supplies		160,509		IND
A.T.	10	Heating equipment and supplies		225,739		IND
A.T.	11	Non-metallic building material		295,768		IND
A.T.	11	Glass (sq. ft.)	648,643	325,679	1,497,126	958,160

A.T. 13	Stone products ....(tons)	122,860	233,598	193,360	370,802
A.T. 14	Cement ....(bbls.)	66,083	97,773	164,535	308,755
A.T. 14	Brick and clay products....................		186,738		255,806
A.T. 15	Lighting equipment and supplies.............		243,454		486,908
A.T. 16	Steel and iron construction supplies ...(tons)	1,359	163,293	2,383	265,255
A.T. 16	Wrought iron pipe and tubes ....(tons)	3,170	189,129	5,561	331,805
A.T. 17	Fabricated and structural steel ....(tons)	5,005	195,691	8,781	343,318
A.T. 17	Galvanized and corrugated sheets .....(tons)	1,424	104,310	2,498	183,000
A.T. 17	Ornamental iron work......................		477,037		836,907
A.T. 17	Sheet iron work...........................		133,490		234,193
WS 197 to 215 inc.	Lumber..................................		927,464		Ind
	Wood products............................		190,945		Ind
	Planing-Mill products......................		553,584		Ind
A.T. 18	Miscellaneous supplies.....................		147,747		304,296
A.T. 19	Furniture supplies.........................		149,537		239,339
A.T. 20	Highways................................		365,714		429,241
WS 174	Cleaning supplies..........................		32,961		Ind
	Transportation				
Rep. 816	Freight transportation costs................		1,440,000		Ind
Rep. 816	Inland-waterways freight..................		38,000		Ind
A.T. 21	Springs..................................		173,000		173,000
A.T. 22	Rails and fastenings ....(tons)	3,595	163,618	3,595	163,618
A.T. 25	Miscellaneous equipment and supplies........		104,905		Ind
A.T. 23	Electric power ....(kw.-hr.)	5,639	52,264	7,049	65,283
A.T. 24	Coal ....(tons)	127,318	300,878	186,367	440,385
A.T. 26	Springs and stamped parts, auto............		359,969		359,969
A.T. 27	Tires and tubes, auto..............(pieces)	44,860	346,500	71,206	550,000
A.T. 28	Miscellaneous supplies and equipment (auto.)		383,038		Ind
	Recreation				
A.T. 29	Radio sets and musical instruments..........		106,505		Ind
	Health				
A.T. 30	Hospital equipment and supplies............		153,729		283,603

TABLE I (*Continued*)
COLUMN 4 (table), *continued*
SUPPLIES FOR FURTHER FABRICATION

	Item	Production		Capacity	
		Quantity*	Value	Quantity*	Value (theoretical)
	EDUCATION				
A.T. 31	Paper products ....(tons)	2,961	273,253	3,479	316,084
A.T. 32	School supplies and equipment..............		124,535		234,183
A.T. 33	Lithographing..........................		181,014		362,028
A.T. 34	Bookbinding...........................		102,783		205,566
A.T. 35	Printing and service supplies...............		236,778		IND
	CIVIL				
Reps. 350, 497	Electric power, coinage, armament, etc........		132,453		IND
	MINING				
A.T. 36	Explosives, etc..........................		71,700		IND
	BUSINESS AND OFFICE SUPPLIES				
A.T. 38	Paper products ....(tons)	1,813	358,359		IND
A.T. 39	Advertising............................		154,742		IND
A.T. 39	Commercial printing.....................		773,005		IND
A.T. 40	Miscellaneous business supplies..............		72,117		IND
A.T. 41	Telephone and telegraph...................		391,000		IND
A.T. 42	Office supplies (not paper).................		87,008		114,699
A.T. 43	Office furniture and repairs.................		228,533		386,718
	MACHINERY				
A.T. 37	Parts and supplies........................		102,171		IND
A.T. 37	Textile apparatus and machinery............		172,921		307,824
A.T. 37	Conveying and elevating machinery..........		150,422		297,835

A.T.	37	Boiler shop products and castings		527,000		1,043,460
A.T.	37	Bearings		123,000		243,540
A.T.	37	Miscellaneous parts		939,462		1,860,135
		MANUFACTURING SUPPLIES				
A.T.	44	Paper products (tons)	4,125	553,052	4,790	641,540
A.T.	44	Paper boxes		294,253		588,506
A.T.	45	Transportation supplies		110,974		IND
A.T.	46	Rubber goods		150,382		300,764
A.T.	47	Electrical supplies and equipment		968,397		IND
A.T.	48	Miscellaneous tools		160,313		IND
A.T.	49	Non-metallic equipment		96,784		IND
A.T.	50	Wrought iron pipe (tons)	2,259	182,729	2,259	182,729
A.T.	50	Other metal products		294,400		IND
A.T.	50	Rolled finished steel (not elsewhere classified) (tons)	33,628	2,210,508	33,628	2,210,508
A.T.	51	Miscellaneous Supplies		497,009		957,279
A.T.	52	Wood products		100,241		101,459
A.T.	52	Cotton bags	1,245,000	170,175	1,886,364	257,841
A.T.	52	Metallic supplies and equipment		206,666		IND
A.T.	53	Wire products		241,465		IND
A.T.	54	Electric power (kw.-hr.)	50,879,000	1,168,812	63,475,000	1,461,015
A.T.	55	Coal (tons)	223,307	797,602	326,461	1,165,541
A.T.	55	Coke (tons)	48,300	224,310	52,666	244,587
A.T.	56	Gasoline (bbls.)	90,631	318,148	113,642	398,926
A.T.	56	Gas and fuel oil (bbls.)	405,858	361,214	493,929	439,597
A.T.	56	Kerosene and lubricants (bbls.)	33,951	238,193	67,359	472,396
A.T.	56	Natural gas (M. cu. ft.)	114,152,000	190,099		IND
A.T.	56	Manufactured gas (M. cu. ft.)	836,757,000	208,576	1,256,302,000	313,177
		TELEPHONE AND TELEGRAPH				
A.T.	57	Telephone appliances		158,644		IND
A.T.	58	Telephone and telegraph appliances		166,293		IND
A.T.	59	Copper wire (tons)	272	118,626		IND
A.T.	60	Other wire		98,973		IND

* Lbs., unless otherwise noted.

TABLE I (*Continued*)
COLUMN 5 (table)
TO CONSUMER

	Item	Production Quantity*	Production Value	Per Cent Excess Capacity	Capacity Quantity*	Capacity Value (theoretical)
	FOODS					
Rep. 504–572	Meats	17,238,000	3,800,476	97	34,056,009	7,486,937
Rep. 593	Lard	2,598,000	315,456	99	5,204,000	630,794
Rep. 170–171–601	Fats (including oleomargarine)	2,237,384	244,160	14	2,429,000	278,615
Rep. 727–743- W.S. 150	Poultry (including wild game and birds)	1,652,913	669,517			IND
Rep. 571–723	Fish (fresh)	1,415,000	73,832	17	1,655,000	86,323
Rep. 47–723	Fish (cured and canned)	725,000	118,588	15	800,000	136,847
Rep. 574	Milk	46,249,930	1,115,052			IND
Rep. 574	Butter	2,141,917	937,456			IND
Rep. 574	Cheese	588,200	112,723			IND
A.T. 2	Ice cream (gallons)	280,000	328,414	170	780,000	887,605
Rep. 574	Miscellaneous milk products	2,665,000	223,192			IND
Rep. 696	Flour	15,683,878	472,026	74	24,412,346	719,985
Rep. 782	Breakfast foods	3,110,000	175,223	67	5,183,330	292,039
Rep. 782	Bread	14,019,000	978,140	74	19,150,000	1,699,917
Rep. 782	Biscuits	1,394,000	281,764	131	3,220,000	660,847
Rep. 782	Cakes, etc. (including macaroni)	2,001,000	320,506	851	26,450,000	3,047,997
Rep. 754	Vegetables (fresh)	41,475,450	941,937			IND
Rep. 754	Vegetables (canned)	4,608,000	325,738	11	5,097,354	360,330
Rep. 755	Fruits (fresh)	20,307,862	547,853			IND
Rep. 755	Fruits (canned and dried)	3,986,000	396,107	11	4,409,000	438,172
Rep. 756	Nuts	970,112	88,000			IND

Rep. 598	Eggs	2,581,935	848,639			Ind
Rep. 726	Sugar (cane)	8,078,312	395,917	65	13,329,215	653,263
Rep. 726	Sugar (beet)	2,047,071	108,553	50	3,070,607	163,237
Rep. 726	Sugar (other)	671,400	53,694			Ind
A.T. 1	Confectionery	1,512,000	453,000	58	2,249,000	715,000
Rep. 165–						
W.S. 125	Coffee, tea and spices	1,321,000	480,244	39	1,835,000	667,006
Rep. 33–53–163	Beverages (gallons)	406,438	456,000	54	1,212,121	701,576
A.T. 4	Illicit liquors		2,000,000			Ind
A.T. 3	Miscellaneous foods		504,807			Ind
	Wearing Apparel					
A.T. 6	Suits (men's) (pieces)	29,090	483,635	173	79,110	1,320,324
A.T. 6	Overcoats and topcoats (men's) (pieces)	9,270	144,038	173	20,670	393,224
A.T. 6	Extra pants and knickers (men's) (pieces)	37,190	83,283	155	94,830	212,372
A.T. 6	Hosiery (men's) (pairs)	719,640	128,365	52	1,093,850	195,115
A.T. 6	Shirts (men's) (pieces)	173,060	192,000	129	396,310	439,680
A.T. 6	Underwear (men's) (pieces)	286,350	139,442	69	483,930	235,657
A.T. 6	Sleeping apparel and bathrobes (men's) (pieces)	49,520	36,956	134	115,880	86,477
A.T. 7	Coats (women's) (pieces)	23,040	367,350	158	59,440	947,763
A.T. 7	Dresses and frocks (pieces)	206,460	882,013	128	485,000	2,010,990
A.T. 7	Suits, inc. knit (women's) (pieces)	14,500	179,490	158	37,410	463,084
A.T. 7	Hosiery (women's) (pairs)	614,520	353,866	74	1,069,260	615,727
A.T. 7	Underwear (women's) (pieces)	258,950	178,576	98	510,280	353,686
A.T. 7	Miscellaneous women's undergarments (pieces)	73,400	108,981			Ind
A.T. 1	All shoes (pairs)	361,400	965,919	52	550,000	1,468,944
A.T. 2	Hats (pieces)	253,510	366,166	99	507,020	732,331
Rep. 566	Sweaters (pieces)	57,490	89,265	87	108,000	167,333
A.T. 5	Work clothes (pieces)	172,910	159,748	127	576,580	362,628
A.T. 4	Miscellaneous (inc. shoe repairing and custom tailoring)		1,207,594			Ind
A.T. 3	Furs		277,593			Ind

* Lbs., unless otherwise noted.

TABLE I (*Continued*)

COLUMN 5 (table), *continued*

TO CONSUMER

	Item	Production		Per Cent Excess Capacity	Capacity	
		Quantity *	Value		Quantity *	Value (theoretical)
	HOUSING					
A.T. 3	Heating equipment and supplies		48,849			IND
A.T. 4	Lighting equipment and supplies		29,563			IND
A.T. 5	Outdoor equipment and supplies		61,533			IND
A.T. 6	Miscellaneous equipment and tools		209,220			IND
A.T. 7	Cooking equipment and supplies		180,663			IND
A.T. 9	Utensils		107,363			IND
A.T. 8	Accessories (kitchen)		123,760			IND
A.T. 10	Laundry equipment		289,173			IND
A.T. 12	Painting and statuary		38,594			IND
A.T. 12	Living room furnishings		469,342			IND
A.T. 11	Bedroom furnishings		820,194			IND
Rep. 765	Ice	39,000,000	92,440	89	75,530,000	174,300
Rep. 621	Natural gas (M. cu. ft.)	357,853,000	29,598			IND
Rep. 621	Artificial gas (M. cu. ft.)	401,154,000	444,115	50	602,333	666,839
Rep. 621	Fuel oil, kerosene and lubricants (bbls.)	33,191	116,720	95	63,335	227,604
Rep. 621	Coal (anthracite) (tons)	68,528	357,711	37	93,874	490,071
Rep. 621	Coal (bituminous) (tons)	102,000	181,560	47	150,000	266,893
Rep. 621	Coke and firewood		35,090	09		38,599
Rep. 350–497	Electric power (kw.-hr.)	9,773,000	618,799	25	12,221,625	773,499
W.S. 39	Domestic telephones		782,000			IND
W.S. 168	New residence, farm and urban	414,354	2,725,000	230	1,550,000	9,000,000
	TRANSPORTATION					
Rep. 621	Motor gasoline (bbls.)	300,000	1,053,000	25	375,000	1,316,250

A.T.	1	Automobiles....................(cars)	4,592	3,044,000	23	5,642	3,712,195
A.T.	2	Automobile parts and accessories.........		194,036			Ind
A.T.	3	Automobile tires (replacements).....(tires)	40,250	223,500	59	63,998	354,762
A.T.	4	Horses, bicycles and motorcycles.........		52,258			Ind
A.T.	5	Stable expenses........................		9,460			Ind
		Personal					
Rep.	719	Cigars and cigarettes............(pieces)	129,341,000	977,569			Ind
Rep.	719	Smoking and chewing tobacco...........	386,000	268,672			Ind
A.T.	3	Smoking accessories....................		5,538	100		11,076
A.T.	1	Writing material.......................		179,266	100		358,532
A.T.	2	Toilet accessories.....................		92,312			Ind
A.T.	4	Notions................................		150,728			Ind
A.T.	5	Perfumes, etc..........................		193,440			Ind
A.T.	6	Clocks, watches and jewelry............		247,262	16		286,880
Rep.	306–63	Soap...................................		301,191	28		385,524
Rep.	684 AT7	Other personal supplies................		160,180	42		227,923
W.S.	6A Rep. 818	Miscellaneous personal supplies..........		97,408			Ind
A.T.	7	Mortuary expenses (undertaking, graves, etc.)............................		276,410			Ind
Rep.	196	Horticultural supplies..................		145,703			Ind
		Recreation					
A.T.	1	Radio..................................		383,657	200+		1,899,102
A.T.	2	Music, instruments, etc.................		158,886	13		179,541
A.T.	3	Miscellaneous books, etc................		386,198	100		772,396
		Health					
A.T.	1	Druggists' preparations................		124,778	100		249,556
A.T.	2	Drugs and patent medicines.............		318,907	100		637,814
A.T.	3	Miscellaneous..........................		40,288			Ind
		Education					
W.S.	167	Supplies...............................		425,614			Ind
A.T.	2	Textbooks and periodicals..............		134,638			Ind

TABLE I (*Continued*)

COLUMN 5 (table), *continued*

CAPITAL GOODS

	Item	Production		Per Cent Excess Capacity	Capacity	
		Quantity*	Value		Quantity*	Value (theoretical)
	BUILDINGS					
Rep. 326	Commercial		1,102,000			1,102,000
Rep. 326	Factory		896,000			896,000
Rep. 326	Educational		451,000			451,000
Rep. 326	Hospitals and institutions		179,000			179,000
Rep. 326	Public buildings		143,000			143,000
Rep. 326	Religious and memorial		125,000			125,000
Rep. 326	Social and recreational		165,000			165,000
	CONSTRUCTION					
Rep. 326	Railroads		532,000			532,000
Rep. 326	Electric power		853,000			853,000
Rep. 326	Telephone and telegraph		740,000			740,000
Rep. 326	Electric railroads		194,000			194,000
Rep. 326	Pipe lines		91,017			91,017
Rep. 326	Gas and water works		280,000			280,000
Rep. 326	Highway and bridges		887,000	17		1,037,790
Rep. 326	Federal public works		308,000			308,000
Rep. 326	Sewerage		88,000	50		132,000
	MACHINERY					
Rep. 832	Agricultural		179,433	100		358,866

Rep. 832	Business and office appliances		170,188	100		340,366
Rep. 832	Construction machinery		111,363	101		223,839
Rep. 832	Food processing		280,740	104		572,710
Rep. 832	Metal working		463,547	100		927,094
Rep. 832	Mining		159,602	106		328,780
Rep. 832	Pumps and hydraulic equipment		156,271	100		312,542
Rep. 832	Power generators and transformers		493,761	100		987,522
Rep. 832	Miscellaneous industrial		221,403	109		462,732
Rep. 832	Locomotives and cars		118,860	98		235,343
Rep. 832	Meters and instruments		115,440	98		228,571
Rep. 832	Miscellaneous		2,487,777	98		4,925,798
W.S. 19	Trucks (new)		369,000	23		453,870
W.S. 1	Steamships and ferries (new)		221,000	150		552,500
Rep. 816	Freight transportation (truck only)		77,000			IND

* Lbs., unless otherwise noted.

TABLE I (*Continued*)

COLUMN 6 (table)

TO CONSUMER

Item	Consumption Value[1]	Per Cent Excess Capacity	Capacity Value (theoretical)	Retail Budget Value (theoretical)	Production Quantity	Capacity Quantity	Budget Quantity
					(Lbs., unless otherwise noted.)		
FOODS							
Meats	5,413,684	97	10,664,957	5,955,000	15,514,200	30,650,408	17,000,000
Lard	446,685	99	888,903	152,000	2,598,000	5,196,000	875,000
Fats (inc. oleomargarine)	371,123	14	423,080	190,000	2,237,384	2,429,000	1,000,000
Poultry (incl. wild game and birds)	879,205		IND	1,196,000	1,652,913	IND	2,250,000
Fish (fresh)	184,580	17	215,959	275,000	1,415,000	1,655,000	1,625,000
Fish (cured and canned)	177,882	15	204,564		725,000	800,000	
Milk	2,586,921		IND	4,450,000	46,249,930	IND	79,550,000
Butter	1,142,478		IND	2,331,000	2,141,915	IND	4,375,000
Cheese	219,810		IND	378,000	588,200	IND	IND
Ice cream (gals.)	821,035	170	2,216,795	1,412,000	280,000	780,000	IND
Miscellaneous milk products	334,788		IND	576,000	2,665,000	IND	IND
Flour	783,563	74	1,363,400	259,000	15,683,878	24,412,346	5,175,680
Breakfast foods	590,501	67	986,137	195,000	3,110,000	5,183,330	1,026,300
Bread	1,260,801	74	2,193,794	416,000	14,019,000	19,150,000	4,626,270
Biscuits	467,728	131	1,080,452	154,000	1,394,000	3,220,000	460,020
Cakes, macaroni, etc.	532,040	851	5,059,700	176,000	2,001,000	26,450,000	660,330
Vegetables (fresh)	1,853,826		IND	2,262,000	37,327,900	IND	45,622,995
Vegetables (canned)	540,725	11	594,798	595,000	4,608,000	5,097,354	5,068,800
Fruits (fresh)	955,319		IND	1,748,000	18,277,076	IND	35,507,972
Fruits (canned and dried)	657,538	11	723,292	1,085,000	3,986,000	4,409,000	6,576,900
Nuts	137,092		IND	71,000	970,112	IND	500,000
Eggs	1,076,007		IND	1,549,000*	2,581,935	IND	4,221,388
Sugar (cane)	518,651	65	855,774	363,000	8,078,312	13,329,215	5,630,583
Sugar (beet)	142,204	50	213,306	100,000	2,047,071	3,070,607	1,426,808
Sugar (other)	75,172		IND	53,000	671,400	IND	467,966

Confectionery	679,500	58	1,073,610	680,000	1,512,000	2,249,000	1,512,000
Coffee, tea and spices	720,366	39	1,001,309	720,000	1,321,000	1,835,000	1,321,000
Beverage (gals.)	592,800		701,596	594,000	406,438	1,212,121	500,746
Illicit liquors	2,000,000		Ind	2,000,000	Ind	Ind	Ind
Miscellaneous foods	757,211		Ind	757,000	Ind	Ind	Ind
Wearing Apparel							
Suits (men's) (pieces)	768,980	173	2,099,315	1,778,000	29,090	79,110	67,000
Overcoats and top coats (men's) (pieces)	229,020	173	625,225	683,000	9,270	20,670	27,910
Extra pants and knickers (men's) (pieces)	132,420	155	337,671	250,000	37,190	94,830	68,000
Hosiery (men's) (pairs)	200,250	52	304,380	216,000	719,640	1,093,850	759,500
Shirts (men's) (pieces)	303,360	129	694,694	636,000	173,060	396,310	363,500
Underwear (men's) (pieces)	217,530	60	367,626	252,000	286,350	483,930	331,000
Sleeping apparel and bathrobes (men's) (pieces)	58,760	134	137,498	163,000	49,520	115,880	140,700
Coats (women's) (pieces)	587,760	158	1,516,421	924,000	23,040	59,440	36,250
Dresses and frocks (women's) (pieces)	1,393,580	128	3,177,362	1,858,000	206,460	470,728	275,250
Suits, inc. knit (women's) (pieces)	281,180	158	725,444	1,149,000	14,500	37,410	34,160
Hosiery (women's) (pairs)	580,340	74	1,009,792	554,000	614,520	1,069,260	681,000
Underwear (women's) (pieces)	278,580	98	555,750	461,000	258,950	510,880	427,000
Women's miscellaneous undergarments (pieces)	174,370		Ind	678,000	73,400	Ind	286,260
All shoes (pairs)	1,555,130	52	2,365,000	1,695,000	361,400	550,000	394,250
All hats (pieces)	640,790	99	1,281,580	712,000	253,510	507,020	281,500
All sweaters (pieces)	144,610	87	271,080	183,000	57,490	108,000	72,750
All work clothes (pieces)	254,000	127	576,580	269,000	172,910	576,580	196,330
Misc., incl. shoe repairing and custom tailoring	1,932,150	100	3,864,000	3,864,000	Ind	Ind	Ind
Furs	444,149		Ind	444,000	Ind	Ind	Ind

* Includes eggs used in manufacturing cakes, etc.

TABLE I (*Continued*)

COLUMN 6 (table), *continued*

Item	Consumption Value[1]	Per Cent Excess Capacity	Capacity Value (theoretical)	Retail Budget Value (theoretical) First Year	Retail Budget Value (theoretical) Second Year	Production Quantity	Capacity Quantity	Budget Quantity
						(Lbs., unless otherwise noted.)		
HOUSING, ETC.								
Heating equipment	84,020		IND	294,000	367,000			
Lighting equipment	50,848		IND					
Outdoor equipment	105,837		IND					
Miscellaneous equipment and tools	410,071		IND	527,000	625,000			
Cooking equipment	354,094		IND	455,000	540,000			
Utensils	184,664		IND					
Accessories (kitchen)	212,867		IND	1,422,000	1,688,000			
Laundry equipment	710,245		IND					
Painting and statuary	38,594		IND	1,231,000	1,461,000			
Bed room and living room furniture	2,527,490		IND	2,064,000	2,450,000			
Ice	110,928	89	209,160	139,000	139,000	39,000,000	75,530,000	48,837,837
Natural Gas (M. cu. ft.)	223,109		IND	223,000	223,000	357,853	IND	357,853
Artificial gas (M. cu. ft.)	1,776,460	50	2,667,356	2,220,000	2,220,000	401,154	602,333	501,443
Fuel oil, kerosene and lubricants (bbls.)	304,785	95	594,331	594,331	594,331	33,191	63,335	63,335
Coal (anthracite) (tons)	1,016,670	37	1,392,882	1,392,882	1,392,882	68,528	93,874	93,874
Coal (bituminous) (tons)	902,700	47	1,326,960	1,326,960	1,326,960	102,000	150,000	150,000
Coke and firewood	83,786	09	91,327	91,327	91,327	IND	IND	IND
Electric power (domestic) (kw.-hr.)	618,799	25	773,499	774,000	774,000	9,773,000	12,221,625	12,220,197
Domestic telephones	782,000		IND	977,000	977,000	IND	IND	IND
Domestic servants	1,492,000		IND	1,492,000	1,492,000	IND	IND	IND
Dyers and cleaners	301,838		IND	377,000	377,000	IND	IND	IND
Laundry services (outside)	541,588		IND	676,000	676,000	IND	IND	IND
Storage and moving	24,131		IND	24,000	24,000	IND	IND	IND

Imputed rent (owned homes)	6,153,231		Ind			Ind	Ind	Ind
Rents (rented homes)	4,975,183		Ind	12,755,000	13,546,000	Ind	Ind	Ind
Imputed and real rents (farms)	708,354		Ind			Ind	Ind	Ind
Rents (hotel rooms)	645,066		Ind	645,000	645,000	Ind	Ind	Ind
				Retail Budget Value (theoretical)				
Transportation								
Motor gasoline (bbls.)	2,257,926	25	2,831,206	2,821,000		300,000	375,000	375,000
Automobiles (cars)	4,048,520	23	4,937,219	4,937,219		4,592	5,642	5,642
Automobile parts and accessories	675,000		Ind	844,000		Ind	Ind	Ind
Automobile tires (replacements)	515,000		818,850	644,000		40,250	63,998	50,373
Horses, bicycles, and motorcycles	78,387		Ind	110,000		Ind	Ind	Ind
Stable expenses	9,460		Ind	9,000		Ind	Ind	Ind
Auto and motorcycle taxes	333,554		Ind	377,000		Ind	Ind	Ind
Auto garaging	1,105,215		Ind	1,381,000		Ind	Ind	Ind
All passenger transportation (passenger miles)	1,979,070*		Ind	3,000,000		Ind	Ind	Ind
Gasoline taxes	289,202		Ind	361,000		Ind	Ind	Ind

* 25% deducted for commercial travel.

TABLE I (*Continued*)

COLUMN 6 (table), *continued*

TO CONSUMER

Item	Consumption Value[1]	Per Cent Excess Capacity	Capacity Value (theoretical)	Retail Budget Value (theoretical)	Production Quantity	Capacity Quantity	Budget Quantity
					(Lbs., unless otherwise noted.)		
PERSONAL							
Cigars and cigarettes......(pieces)	1,808,503		IND	2,171,000	129,341,000	IND	155,209,200
Smoking and chewing tobacco.....	497,043		IND	594,000	386,000	IND	463,200
Smoking accessories..............	10,245	100	20,491	12,000	IND	IND	IND
Writing materials................	306,545	100	613,090	400,000	IND	IND	IND
Toilet accessories................	139,391		IND	278,000	IND	IND	IND
Notions..........................	247,959		IND	496,000	IND	IND	IND
Perfumes, etc....................	292,094		IND	584,000	IND	IND	IND
Clocks, watches and jewelry.......	430,236	16	499,171	499,000	IND	IND	IND
Soap............................	454,798	28	582,141	582,000	IND	IND	IND
Other personal supplies...........	240,270	42	480,000	480,000	IND	IND	IND
Miscellaneous personal supplies....	97,408		IND		IND	IND	IND
Barbering........................	511,727		IND	718,000	IND	IND	IND
Hairdressing and beauty..........	387,690		IND	582,000	IND	IND	IND
Stamps and postcards............	230,162		IND		IND	IND	IND
P. O. Box rentals................	8,518		IND	257,000	IND	IND	IND
Miscellaneous P. O...............	469		IND		IND	IND	IND
Money Order fees................	17,420		IND		IND	IND	IND
Telegrams and cables............	94,287		IND	94,000	IND	IND	IND
Tips and gratuities..............	429,718		IND	430,000	IND	IND	IND
Undertaking services............	205,464		IND	205,000	IND	IND	IND
Cemetery-vaults, etc............	276,410		IND	276,000	IND	IND	IND
Horticultural supplies............	218,703		IND	327,000	IND	IND	IND
RECREATION							
Motion-picture theatres..........	2,000,000		5,000,000	2,500,000	5,000,000*	12,000,000*	6,000,000*
Legitimate and vaudeville theatres.	221,902		IND	500,000	7,500*	17,500*	16,095*

Contests							
Baseball	40,678		Ind	660,000	Ind	Ind	Ind
Football	71,725		Ind		Ind	Ind	Ind
Basketball and hockey	4,362		Ind		Ind	Ind	Ind
Boxing and wrestling	12,401		Ind		Ind	Ind	Ind
Motor races and polo matches	12,590		Ind		Ind	Ind	Ind
Field days	10,314		Ind		Ind	Ind	Ind
Horse racing	69,475		Ind		Ind	Ind	Ind
Amusements							
Circuses and carnivals	29,584		Ind	50,000	Ind	Ind	Ind
Fairs (state and county)	33,282		Ind	40,000	Ind	Ind	Ind
Pageants, celebrations, resorts, amusement-parks	188,382		Ind	371,000	Ind	Ind	Ind
Music							
Radios and radio parts	633,034	200+	1,899,102	1,000,000	Ind	Ind	Ind
Musical instruments, sheet music, records, etc.	262,162	13	296,243	296,000	Ind	Ind	Ind
Concerts and operas	11,095		Ind	16,000	Ind	Ind	Ind
Activities							
Golf (including club dues)	349,558		Ind	1,000,000	Ind	Ind	Ind
Boating and outboard sailing	18,751		Ind	25,000	Ind	Ind	Ind
Riding horses	13,462		Ind	15,000	Ind	Ind	Ind
Hunting and fishing	94,485		Ind	94,000	Ind	Ind	Ind
Bowling and billiards	102,948		Ind	102,000	Ind	Ind	Ind
Minor sports	167,890		Ind	200,000	Ind	Ind	Ind
Playing cards	20,000		Ind	30,000	Ind	Ind	Ind
Theatre (amateur)	11,062		Ind	40,000	Ind	Ind	Ind
Athletic clubs	41,072		Ind	60,000	Ind	Ind	Ind
Aviation and gliding	11,910		Ind	20,000	Ind	Ind	Ind
Fireworks	5,342		Ind	5,000	Ind	Ind	Ind
Dancing, supper, night-clubs (excluding food and drink)	39,897		Ind	100,000	Ind	Ind	Ind

* Admissions.

TABLE I (*Continued*)

COLUMN 6 (table), *continuea*

TO CONSUMER

Item	Consumption Value*	Per Cent Excess Capacity	Capacity Value (theoretical)	Retail Budget Value (theoretical)	Production Quantity	Capacity Quantity	Budget Quantity
					(Lbs., unless otherwise noted.)		
RECREATION CONTINUED							
TRAVEL							
Foreign travel	885,248		IND	885,000	IND	IND	IND
RESORT ROOMS							
Camping, and recreation farms, and dude ranches	260,997		IND	3,000,000	IND	IND	IND
MISCELLANEOUS							
Pets (dogs, cats, birds)	15,485		IND	20,000	IND	IND	IND
Books, games and athletic supplies	579,297	100	1,158,594	1,158,000	IND	IND	IND
SAVINGS							
Savings (net life-insurance and savings banks only)	1,118,000		IND	1,118,000	IND	IND	IND
HEALTH							
Drug preparations	188,415	100	376,829 }	876,000	IND	IND	IND
Drugs and patent medicines	481,549	100	963,099 }		IND	IND	IND
Miscellaneous	60,835		200,000	200,000	IND	IND	IND
Doctors and nurses	1,870,000	43	3,147,569	2,722,000	IND	IND	IND
Beds in hospitals	656,000	41	990,753	1,313,000	IND	IND	IND
EDUCATION							
Kindergarten and elementary schools	189,750		IND		IND	IND	IND

Colleges and universities	315,500		Ind		Ind	Ind	Ind
Other schools and educational institutions	166,560		Ind	12,612,000	Ind	Ind	Ind
Dormitories	195,694		Ind		Ind	Ind	Ind
Supplies	425,614		Ind		Ind	Ind	Ind
Textbooks and periodicals	179,069		Ind		Ind	Ind	Ind
Taxes							
Federal and state income taxes	1,076,534		Ind	1,077,000	Ind	Ind	Ind
Federal and state inheritance taxes	210,489		Ind	210,000	Ind	Ind	Ind
Special taxes	133,770		Ind	134,000	Ind	Ind	Ind
Social							
Religious	1,101,022		Ind	1,101,000	Ind	Ind	Ind
Fraternal orders	401,022		Ind	401,000	Ind	Ind	Ind
Civic associations and clubs	123,500		Ind	124,000	Ind	Ind	Ind
Other clubs and activities	120,575		Ind	121,000	Ind	Ind	Ind
Relief and welfare associations	161,114		Ind	161,000	Ind	Ind	Ind
Labor organizations	121,850		Ind	122,000	Ind	Ind	Ind
Civil							
Legal services	327,557		Ind	328,000	Ind	Ind	Ind
Other civic fees	78,139		Ind	78,000	Ind	Ind	Ind
Total (retail) value of goods and services produced	96,552,894						

*To obtain the *net* market value of the goods produced and consumed, we must subtract the exports, not included elsewhere and the increase of inventory, and add the imports, not included elsewhere, as follows:

Value (at retail) of production	96,552,894,000
Less (exports minus imports at retail prices)	1,135,000,000
Less increase in inventory	1,500,000,000
Total Consumed	93,917,894,000

TABLE I (*Continued*)
COLUMN 6 (SUPPLEMENTARY TABLE)
(000,000 Omitted)

Foods	Production, 'P' Value	Capacity, 'C'* Value (theoretical)	Budget, 'B' Value (theoretical)	Relation of Production or Capacity to Budget	
				P-B (Excess)	B-P (Deficiency)
Meats	$5,413		5,955		542
Lard	447		152	295	
Fats (including oleomargarine)	371		190	181	
Poultry, including wild game and birds	879		1,196		317
Fish (fresh)	184				
Fish (cured and canned)	178		275	87	
Milk	2,587		4,449		1,862
Butter	1,142		2,331		1,189
Cheese	220		378		158
Ice cream	821		1,412		591
Milk products (miscellaneous)	335		576		241
Flour	783		259	524	
Breakfast foods	591		194	397	
Bread	1,261		416	745	
Biscuits	468		154	314	
Cakes, etc. (including macaroni)	532		176	356	
Vegetables (fresh)	1,854		2,262		408
Vegetables (canned)	541		595		54
Fruits (fresh)	955		1,748		793
Fruits (canned and dried)	657		1,085		428
Nuts	137		71	66	
Eggs	1,076		1,549		443
Sugar (cane)	519		363	158	
Sugar (beet)	142		100	42	
Sugar (other)	75		52	23	
Confectionery	679		679		

Coffee, tea and spices	720		720		
Beverages	593		593		
Illicit liquor	2,000		2,000		
Miscellaneous foods	757		757		
SUB-TOTAL				3,188	7,026
				C–B (Excess)	B–C (Deficiency)
WEARING APPAREL					
Suits (men's)		2,099	1,778	321	
Overcoats and topcoats (men's)		625	683		58
Extra pants and knickers (men's)		338	250	88	
Hosiery (men's)		304	216	88	
Shirts (men's)		695	636	59	
Underwear (men's)		367	252	115	
Work clothes (men's)		577	269	308	
Sleeping apparel and bathrobes (men's)		137	163		26
Coats. (women's)		1,516	924	592	
Dresses and frocks (women's)		3,177	1,858	1,319	
Suits, including knitted (women's)		725	1,149		424
Hosiery (women's)		1,010	554	456	
Underwear (women's)		556	461	95	
All shoes		2,365	1,695	670	
All hats		1,282	712	570	
All sweaters		271	183	92	
Miscellaneous (including shoe repairing and custom tailoring)		3,864	3,864		
Furs		444	444		
SUB-TOTAL				4,773	508
TOTAL				7,961	7,534

* Capacity figures, given for wearing apparel, are omitted for foods, in accordance with the limitations of our definition. We had, even in 1929, sufficient unused land, the requisite knowledge, and an adequate (unemployed) labor supply to raise the needed food called for by our budget. (In *re* this latter point see Chap. II, "Agriculture.")

TABLE II

COLUMN 4—ALLOCATION TABLE

FOOD AND SUPPLIES FOR FURTHER FABRICATION

(000 Omitted)

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
1	Paper bags (kraft)....................(tons)	437	63,884	874	127,768	Rep. 818
2	Bottle caps (paper)..................(tons)	24	5,524	48	11,048	Rep. 818
1	Waxed paper ....(tons)	159	35,464	318	70,928	Rep. 818
1	Bags (paper).........................(tons)	85	15,240	170	30,480	Rep. 818
3	Foil (except gold)...................(tons)		20,995		41,990	Rep. 435
2	Glass containers......................(gr.)	29,764	121,654	62,320	258,838	WS 5
2	Bottle caps (tin).........................		28,312		56,624	WS 113
3	Cans (tin)................................		278,081		556,162	WS 106
4	Essential oils (50% food)..................		3,326		6,652	Rep. 667

	Agricultural Supplies					
4	Wire (barbed)....................(tons)	222	13,824	222	13,824	Rep. 818
4	Poultry netting....................(tons)	47	7,536	47	7,536	Rep. 818
4	Bale wire....................(tons)	72	5,088	72	5,088	Rep. 818
4	Tools (not edged)....................		50,000		50,000	Rep. 153
1	Wire-fence (woven)....................(tons)	183	15,521	183	15,221	Rep. 818
4	Carriages, wagons, etc....................		8,224		16,448	Rep. 652
4	Saddlery and harness....................		9,337		18,674	Rep. 680
4	Cotton ties....................(tons)	43	1,842	43	1,842	Rep. 818
4	Horse and mule shoes....................	19	2,702	19	2,702	Rep. 818
4	Wire (plain iron)....................(tons)	632	39,743	632	39,743	Rep. 818
4	Wire (galvanized)....................(tons)	233	16,994	233	16,994	Rep. 818
5	Lime (quick and hydrated)....................(tons)	755	5,722	755	5,722	Rep. 423
5	Lime stone (crushed)....................(tons)	6,149	8,666	7,234	10,195	Rep. 65
5	Phosphate rock....................(tons)	51	173	55	186	Rep. 422
5	Fertilizers....................(tons)	91,230	219,674	93,092	224,157	WS 16A
5	Calcium phosphate....................(tons)	38,139	5,530	44,869	6,506	WS 16C
5	Copper sulphate....................(tons)	78,669	4,345	87,410	4,828	WS 16C
5	Lead arsenate....................(tons)	30,682	3,497	45,121	5,143	WS 16C
4	Miscellaneous Agriculture Supplies....................		23,943			

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

WEARING APPAREL FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
6	Buttons		27,592			WS 89
6	Needles		6,489			Rep. 411
6	Hooks and fasteners		7,673			Rep. 411
6	Furs (dressed)		40,237			Rep. 640
6	Raincoat fabrics	25,575	9,681	51,150	19,362	WS 6B
7	Heels (rubber)	292,719	17,927	314,752	19,276	WS 6B
7	Soles (rubber)	46,188	8,959	49,665	9,633	WS 6B
7	Soling strips (rubber)	14,213	1,717	15,283	1,846	WS 6B
	Shoe buttons		821		821	WS 89
6	Wool-felt hats	494	4,980	1,357	13,681	Rep. 729
6	Button-holes (men's clothing)		573			Rep. 718
8	Broad-silk goods	434,055	366,485	1,085,138	916,213	Reps. 595, 31
8	Yarn (rayon)	109,155	145,285	109,155	145,285	Rep. 814
8	Knit goods and cloth		87,803		96,487	Rep. 814
8	Worsted goods	249,750	329,054	686,126	903,995	Rep. 814
8	Woolen goods	264,200	242,083	725,824	665,063	Rep. 814
8	Cotton goods	7,615,320	972,812	17,307,545	2,210,936	Rep. 814
8	Embroidery, laces, ribbons		158,214		395,535	Rep. 814
8	Fabrics (rayon)	187,516	137,498	468,790	343,745	Rep. 814
6	Small wares (cotton)		65,169		162,923	Rep. 814
6	Hat and cap material		25,031			Rep. 814
7	Leather (for shoes)	112,758	399,512	225,518	799,024	Reps. 609, 14A
7	Lasts, etc.	48,941	7,689	49,535	71,783	Rep. 780
7	Boots and shoes (cut stock)		133,447			Reps. 630, 14A

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

HOUSING AND CONSTRUCTION SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
9	Bathtubs (enam. iron) .... (pcs.)	944	21,355			Rep. 413
9	Laundry tubs (enam. iron) .... (pcs.)	175	3,011			Rep. 413
9	Lavatories (enam. iron) .... (pcs.)	1,117	8,050			Rep. 413
9	Sinks (enam. iron) .... (pcs.)	1,211	12,872			Rep. 413
9	Sinks and tubs (sheet iron)		219			Rep. 413
10	Range boilers (copper and iron) .... (pcs.)	818	5,910			Rep. 413
9	Valves, faucets, etc.		86,046			Rep. 413
9	Siphons (vit. china) .... (pcs.)	318	2,095	436	2,870	Census
9	Washdowns (vit. china) .... (pcs.)	1,365	5,651	1,870	7,741	Census
9	Reverse traps (vit. china) .... (pcs.)	207	1,005	284	1,377	Census
9	Flush tanks (vit. china) .... (pcs.)	221	6,615	1,673	9,062	Census
9	Lavatories (vit. china) .... (pcs.)	348	4,780	477	6,548	Census
9	Other fixtures (vit. china) .... (pcs.)		4,845		6,637	Census
9	Bowls and tanks (semi-vit.) .... (pcs.)		389		533	Census
9	Lav. and baths (semi-vit.) .... (pcs.)		232		318	Census
9	Laundry tubs and kitchen sinks .... (pcs.)		529		725	Census
9	Other semi-vit. fixtures .... (pcs.)		2,815		3,856	Census
11	Asbestos shingles .... (sqs.)	89,416	5,277	Limited		Rep. 492
11	Lumber (asbestos) .... (sq. ft.)	35,395	3,094	Limited		Rep. 492
11	Other material (asbestos)		2,052	Limited		Rep. 492
11	Pipe and boiler coverings (asbestos) .. (lin. ft.)	118,976	5,930	Limited		Rep. 492
11	Millboard (asbestos)	7,280	345	Limited		Rep. 492
11	Insulating cement (asb.)	71,197	1,018	Limited		Rep. 492
11	Concrete products		51,153		102,306	Rep. 656
11	Lime (quick and dehydrated) .... (tons)	1,640	13,540			Rep. 423
12	Stone (cut)		114,630		228,860	WS 119
11	Brick (common) .... (M)	5,505,359	58,732		80,455	Rep. 392
13	Brick (face) .... (M)	2,139,408	36,119		49,478	Rep. 392
13	Brick (hollow enam.) .... (M)	43,940	1,605		2,199	Rep. 392

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

HOUSING AND CONSTRUCTION SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
13	Terra cotta........................(tons)	134	13,921		19,070	Rep. 392
13	Hollow bldg. tile....................(M)	4,164	30,142		41,290	Rep. 392
13	Roofing tile ....(sqs.)	46,330	15,027		20,585	Rep. 392
13	Flue lining........................(tons)	243	2,499		3,423	Rep. 392
13	Wall coping........................(tons)	42	507		695	Rep. 392
13	Chimney pipe top...................(tons)	20	310		425	Rep. 392
13	Tile drain and sewer...............(tons)	2,534	27,876		38,186	Rep. 392
12	Crushed stone......................(tons)	48,934	68,228		80,268	Rep. 68
12	Sand and gravel....................(tons)	73,712	47,145		57,494	Rep. 120
12	Slate..............................(tons)	214	3,595		4,180	Rep. 44
14	Gas and electric fixt. (public bldg.)..........		13,817		27,634	Rep. 406
14	Other elec. fixtures..........................		11,830		23,660	Rep. 406
14	Other elec. light equip.......................		13,473		26,946	Rep. 406
14	Incandescent mantels..........................		1,596		3,192	Rep. 406
14	Insulated wire................................		32,000		64,000	Rep. 439
14	Res. gas and elec. fixtures...................		51,257		44,270	Rep. 406
	ELECTRICAL SUPPLIES					
14	Lamp sockets and receptacles.........(doz.)	100,572	11,819		23,638	Rep. 554
14	Snap switches........................(gr.)	46,849	11,290		22,580	Rep. 554
14	Attach. plug-caps....................(gr.)	59,024	2,002		4,004	Rep. 554
14	Conven't. outlets....................(gr.)	9,270	2,451		4,902	Rep. 554
14	Face plates..........................(gr.)	16,572	1,330		2,660	Rep. 554
14	Wiring (misc.)................................		9,504		19,008	Rep. 438
14	Conduits (interior)...........................		56,270		112,540	Rep. 554
15	Tools and hand saws...........................		5,342			Rep. 419
15	Axes and adzes, etc...........................		5,105			Rep. 418
15	Augers, etc...................................		1,112			Rep. 418
14	Fuse blocks...................................		2,680		5,360	Rep. 554
15	Wood chisels..................................		448			Rep. 418

	Miscellaneous Building Supplies					
19	Artificial leather		65,029		154,831	WS 13
11	Glass (window) (sq. ft.)	422,599	25,962	812,690	49,927	WS 72A
11	Glass (misc.) (pcs.)	225,864	299,717	684,436	908,233	Rep. 23
11	Rubber flooring (long tons)	8,565	4,267	17,130	8,534	WS 6
11	Wall paper (tons)	106	28,074			Rep. 818
	Heating					
10	Boilers		40,324			Rep. 403
10	Radiators		41,116			Rep. 403
10	Unit heaters		9,239			Rep. 403
10	Furnace (warm air)		43,311			Rep. 403
10	Mechanical stokers		11,161			Rep. 403
10	Other heating		3,621			Rep. 403
10	Fittings, specialties and valves		81,101			Rep. 403
	Highway Construction					
20	Concrete products		28,745			Rep. 656
20	Natural asphalt (tons)	856	5,021	1,097	6,437	Rep. 162
20	Stone (crushed) (tons)	49,632	68,988	58,392	81,162	Reps. 69, 66, 63
20	Sand and gravel (tons)	100,833	59,847	122,967	72,984	Rep. 120
20	Slate (tons)	10	167	12	194	Rep. 44
20	Brick (vit.) (M)	274,155	5,971	375,582	8,179	WS 118
20	Cut stone		5,820		11,640	WS 119
20	Cement (bbls.)	72,442	114,096	77,092	114,096	WS 196
20	Elec. fixtures (street and highway)		3,288			Rep. 554
20	Paving material		29,275			WS 31
20	Sheet-iron work (galvanized)		44,496			WS 104
	Housing					
19	Upholstery material		8,988			Rep. 814
11	Awning, tents, etc.		9,846			Rep. 814
11	Linoleum		35,655			Rep. 814
11	Window shades		7,393			Rep. 814
19	Spring mattresses		24,656			Rep. 814
19	Textile house furnishings (sq. yds.)	46,766	25,520			Rep. 814
19	Furniture springs		26,344			Rep. 438
	Steam tables (hotel)		1,322			Rep. 404
18	China-firing and decorating		1,554		3,108	Rep. 653
18	Household machinery		131,815		266,914	Rep. 832
11	Cement (misc. constr.) (bbls.)	12,432	18,400	18,723	27,711	WS 196

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

HOUSING AND CONSTRUCTION SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
	BUILDING CONSTRUCTION SUPPLIES					
16	Nails, brads, etc. (tons)	46	7,176	80	12,589	Rep. 817, WS 196
16	Fence (woven-wire) (tons)	146	12,416	256	21,625	Rep. 817, WS 196
16	Fly screening (steel) (tons)	32	9,942	56	17,442	Rep. 817, WS 196
17	Fly screening (copper) (tons)	2	1,768	2	2,056	Rep. 817, WS 196
17	Screening (other metal) (tons)	5	3,336	6	3,879	Rep. 817, WS 196
17	Cloth (other metal wire) (tons)	42	3,536	49	4,112	Rep. 817, WS 196
16	Pipe and tube (wrought) (tons)	3,170	189,129	5,561	331,805	Rep. 817, WS 196
16	Steel (fabricated) (tons)	272	17,020	477	29,860	Rep. 817, WS 196
16	Steel (structural) (tons)	4,733	178,671	8,304	313,458	Rep. 817, WS 196
16	Reinforcing bars (tons)	1,089	42,416	1,911	74,414	Rep. 817, WS 196
16	Bolts, nuts and rivets (tons)	46	7,176	80	12,589	Rep. 817, WS 196
16	Plates (galv. and corr.) (tons)	1,424	104,310			Rep. 817, WS 196
17	Lead (primary and secondary) (tons)	96	13,056	168	22,905	Rep. 283
16	Iron work (ornamental)		477,037		836,907	Rep. 594
16	Iron work (sheet)		133,490		234,193	WS 104
16	Doors and windows (steel)		72,160		126,596	WS 94
11	Roofing (asphalt) (M. squares)	28,437	36,110	Unlimited		WS 30, Rep. 511
11	Shingles (asphalt) (M. squares)	11,676	42,291	Unlimited		WS 30, Rep. 511
11	Saturated felt (asphalt) (tons)	205	9,803	Unlimited		WS 30, Rep. 511
11	Roof coating and cement (asphalt)		6,311	Unlimited		WS 30, Rep. 511
11	Other roofing		6,569	Unlimited		Rep. 511
13	Cement (residences) (bbls.)	24,647	36,447	123,099	247,429	WS 196
13	Cement (other) (bbls.)	41,436	61,326	41,936	61,326	WS 196

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

TRANSPORTATION EQUIPMENT AND SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
	RAILROAD					
25	El. locomotives		8,857			Rep. 554
25	Overhead trolley wire		2,283			Rep. 554
25	Railway signals		22,572			Rep. 554
25	Railway parts		3,410			Rep. 554
25	Railway supplies		6,490			Rep. 554
21	Leaf springs		90,000			Rep. 444
21	Hot-wound springs		83,000			Rep. 444
25	Concrete products		128		256	Rep. 656
22	Rails and fastenings (tons)	3,595	163,611	3,595	163,618	Rep. 817
25	Car and locomotive wheels (tons)	234	19,352	234	19,352	Rep. 817
25	Railroad spikes (tons)	186	10,333	186	10,338	Rep. 817
25	Bolts, nuts and rivets (tons)	100	12,650	100	12,650	Rep. 817
25	Sand and gravel (tons)	31,842	9,548	38,786	11,644	Rep. 120
25	Lead (primary and secondary) (tons)	6	816	7	907	Rep. 283
25	Pig-iron and scrap (long tons)	382	5,231	382	5,231	Rep. 282
25	Cement (bbls.)	2,182	3,230	3,286	4,864	WS 196
23	Elec. power (kw.-hr.)	5,639	52,214	7,049	65,283	WS 216
24	Anthracite (tons)	3,166	8,747	4,288	11,848	Rep. 621A
24	Bituminous (tons)	124,152	292,131	182,081	428,437	Rep. 621A
	AUTOMOTIVE					
28	Motor hardware		60,813		60,813	Rep. 432
28	Motor vehicle lamps		32,746			Rep. 554
28	Generators (sets)	4,772	28,210			Rep. 554
28	Vehicle parts		3,209			Rep. 554
28	Spark plugs (gr.)	59,836	16,397			Rep. 554
28	Starters (units)	5,003	32,849			Rep. 554

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

TRANSPORTATION EQUIPMENT AND SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
28	Parts and supplies		12,980			Rep. 554
28	Storage batteries	14,090	77,834	28,180	155,668	Rep. 402
28	Brake lining (asbestos)	100,122	14,807			Rep. 402
28	Clutch facing (asbestos) (pcs.)	39,096	3,911			Rep. 402
28	Molded brake covers (asbestos) (ft.)	20,169	2,281			Rep. 402
26	Springs (leaf)		300,000		300,000	Rep. 444
26	Parts (stamped)		56,985		56,985	Rep. 407
26	Springs (valve)		2,984		2,984	Rep. 438
28	Copper (tons)	138	49,844	152	54,774	Rep. 285
27	Tires (units)	22,430	322,200	35,603	511,429	WS 6B
27	Tubes (units)	22,430	24,300	35,603	38,571	WS 6B
28	Rubber fabrics (tons)	22,407	11,864	44,814	23,728	WS 6B
28	Waste (lbs.)	321,393	35,293	642,786	70,586	Reps. 741, 303

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

HEALTH SUPPLIES FOR FURTHER FABRICATION

(000 Omitted)

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
30	Health and dental motors		6,597			Rep. 554
30	Health lamps		5,616			Rep. 554
30	X-ray apparatus		10,498			Rep. 554
30	Misc. health apparatus		553			Rep. 554
30	Enamel ware (hospital)		591			Rep. 407
30	Dental supp. and equip.		35,180		70,360	Rep. 661
30	Drug grinding		6,669		13,338	Rep. 658
30	Surg. and orth. apparatus		71,607		143,214	Rep. 688
30	Lab. and hos. furniture		14,283		28,566	WS 3
30	Hos. rubber sheet (tons)	3,048	1,144	6,096	2,288	WS 6B
30	Surgeons' rubber gloves		991		1,982	WS 6B

RECREATION SUPPLIES

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
	RADIO					
29	Transmitting sets		5,788			Rep. 554
29	Misc. radio parts		51,472			Rep. 554
29	Radio batteries (pcs.)	393	2,477	786	4,954	Rep. 554
29	Radio dry batteries (cells)	387,346	17,739	774,792	35,478	Rep. 554
	MUSICAL INSTRUMENTS					
29	Parts and motors		14,274		28,548	Rep. 665
29	Organs, pianos and parts		4,248		8,496	Rep. 666
29	Sporting goods		5,000		10,000	Rep. 685
29	Theatrical scenery		5,507		11,014	Rep. 690

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

EDUCATION SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
31	Newsprint (tons)	1,409	80,707	1,696	97,120	WS 17F
31	Coated book paper (tons)	300	49,514			Rep. 818
31	Uncoated book paper (tons)	1,248	141,516	1,479	167,673	Rep. 818
31	Matrix (absorbent) (tons)	4	1,516	4	1,777	Rep. 818
32	Optical goods		4,127			Rep. 670
32	Instrument and meter transformers (sets)	40	2,456			Rep. 554
32	Laboratory and scientific test meters (sets)	32	6,006			Rep. 554
32	Professional and scientific instruments		89,746		179,492	Rep. 646
32	Sporting and athletic goods		8,289		16,578	Rep. 685
32	Slate (blackboard)		1,779		2,069	Rep. 44
	PRINTING AND PUBLISHING					
34	Book binding		102,783		205,566	Rep. 629
35	Engraving (not wood, copper or steel)		10,933		21,866	Rep. 660

35	Engravers material		3,129		6,258	Rep. 659
35	Engraving (wood, steel and copper)		47,900			Rep. 636
35	Ink (printing)		42,750			Rep. 645
33	Lithographing		121,014		362,028	Rep. 649
35	Photo-engraving		77,382		154,764	Rep. 675
35	Printing materials (not ink or type)		8,579		17,158	Rep. 679
35	Stereo- and electrotyping		35,617		71,234	Rep. 687
35	Type-founding		2,603		5,206	Rep. 693
35	Type-metal		7,885		Ind	Rep. 450
	Mining Supplies					
36	Safety fuses		9,170			Rep. 410
36	Blasting and detonating caps		640			Rep. 410
36	Explosives (powder)		60,507			Rep. 492
36	Overhead wires (5% to mining)		652			Rep. 817
36	Lamps (carbide)		751			Rep. 406
	Machinery					
37	Parts and supplies		102,171		Ind	Rep. 832
37	Appliances and machinery (textile)		172,921		307,824	Rep. 832
37	Conveyances and elevators		150,422		297,835	Rep. 832
37	Boiler-shop equipment		527,000		1,043,460	Rep. 832
37	Bearings		123,000		243,540	Rep. 832
37	Miscellaneous parts		939,462		1,860,135	Rep. 832

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

MANUFACTURING SUPPLIES FOR FURTHER FABRICATION

(000 Omitted)

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
44	Glazed and fancy papers (tons)	30	10,575			Rep. 818
44	Gummed paper tape (tons)	35	13,026			Rep. 818
44	Labels and tags (tons)	60	30,898			Rep. 818
44	Lace paper (tons)	4	2,152			Rep. 818
44	Waterproof wrappers (tons)	24	3,259			Rep. 818
44	Absorbent paper (vulcanized) (tons)	72	5,350			Rep. 818
44	Other conv'd paper (tons)	138	64,599			Rep. 818
44	Boxes, containers, board (tons)	3,137 710	346,447 63,940			Rep. 818
44	Manila No. 2 white (tons)	41	5,543			Rep. 818
44	Photo mounts, mats, etc. (tons)	11	6,765			Rep. 818
44	Jacquard cards (tons)	1	476			Rep. 818
45	Seats, public building and convey.		41,044			WS 3
45	Auto tires (tires)	7,115	27,327			WS 6
45	Auto tubes		8,675			WS 6
45	Tires, solid rubber		19,173			WS 6
45	Garage supplies and auto repairs (17% of total)		11,775			WS 19
46	Rubber fabrics		6,762		13,528	WS 6B
46	Mech. rubber goods		115,794		231,588	WS 6B
46	Hard rubber goods		17,937		35,874	WS 6B
46	Rubber cement		4,698		9,396	WS 6B
45	Tire repairs, etc.		2,580		5,160	WS 6B
46	Rubber thread		5,189		10,378	WS 6B

47	Ovens, industrial		861			Rep. 554
47	Welding apparatus		10,730			Rep. 554
47	Coils (units)	7,768	9,502			Rep. 554
47	Magneto generators (sets)	792	14,461			Rep. 554
47	Spark plugs (doz.)	9,387	2,024			Rep. 554
47	Distributors (sets)	7,748	14,440			Rep. 554
47	Tungsten lamps (large) (pcs.)	88,063	16,559			Rep. 554
47	Carbon lamps (large) (pcs.)	572	102			Rep. 554
47	Motors, stationary (units)	5,552	134,582			Rep. 554
47	R.R. veh. parts and supp. (25% of total)		6,490			Rep. 554
48	Scissors (30% of total)		1,000			Rep. 418
48	Miscellaneous cutlery		6,631			Rep. 418
48	Augers, bits, etc. (50% of total)		1,112			Rep. 418
48	Chisels (50% of total)		448			Rep. 418
48	Cutting dies		3,981			Rep. 418
48	Miscellaneous edged tools		4,107			Rep. 418
51	Fire extinguishers		4,566			WS 151
48	Tools (not edged)		40,462			WS 153
51	Emery wheels, etc.		32,154			Rep. 394
51	Hones, whetstones, etc.		869			Rep. 394
50	Stamped ware		55,838			WS 177
50	Enamelware		10,860			WS 177
50	Tinware		5,727			Rep. 414
50	Collapsible tubes		8,912			Rep. 116
47	Storage batteries		20,642			Rep. 554
47	Dry batteries (1½ v.) (10% of total) (pcs.)	36,290	6,470			Rep. 554
47	Dry batteries (other) (pcs.)	28,057	701			Rep. 554
47	Battery parts		5,936			Rep. 554
47	Transformers		77,825			Rep. 554
47	Other control apparatus		44,289			Rep. 554
48	Fuses (50% of total) (pcs.)	116,225	5,678			Rep. 554
47	Sand and emery paper (40% of total)		21,295			Rep. 394

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

MANUFACTURING SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
50	Barrels and kegs (steel)		37,825			Rep. 427
51	Photo and blue print		375			Rep. 406
51	Industrial fixtures		2,148			Rep. 406
48	Files (metal) (doz.)	98,966	13,031			Rep. 417
48	Files (wood) (doz.)	890	116			Rep. 417
48	Files (other) (doz.)		462			Rep. 417
48	Metal saws		8,380			Rep. 419
52	Ammunition		997		997	
52	Explosives		9,587		9,587	Rep. 492
51	Rifles, etc. (parts and repairs)		3,554			Rep. 415
48	Locks (building hardware)		13,201			Rep. 432
48	Miscellaneous hardware		61,706			Rep. 432
47	Switchboards					Rep. 449
47	Circuit breakers		37,003			Rep. 554
47	Knife switches		9,136			Rep. 554
47	Miscellaneous switches		6,270			Rep. 554
47	Carbons		17,049			Rep. 554
47	Lightning arresters		6,515			Rep. 554
47	Overhead trolley wire		33			Rep. 554
47	Search and floodlights		3,875			Rep. 554
47	Signals (not railroad)		166,293			Rep. 554
47	Rectifying apparatus		4,259			Rep. 554
47	Other electrical machinery supplies		213,318			Rep. 554

49	Electro-plating		23,727			Rep.	412
52	Glass products		12		12	WS	148
47	Motor-generators (sets)	21	13,397			Rep.	449
47	Electric furnaces (units)	3	5,190			Rep.	449
47	Industrial heating devices (units)		3,915			Rep.	449
52	Cement (bbls.)	12,411	18,136	12,411	18,136	WS	8
	Wire Products						
53	Nails, brads, spikes (tons)	68	4,495	43	438	Rep.	438
53	Tacks (tons)	3	576			Rep.	438
53	Staples (tons)	29	2,342			Rep.	438
53	Rope cables (tons)	382	60,702			Rep.	438
53	Woven wire fence (tons)	36	3,104			Rep.	438
53	Other wire cloth (tons)	20	6,555			Rep.	438
53	Other woven wire (tons)	97	8,250			Rep.	438
53	Valve springs		332			Rep.	438
53	Other springs		19,244			Rep.	438
53	Other fabricated wire		38,585			Rep.	438
53	Fourdrinier wire	2	4,765			Rep.	438
53	Other copper wire cloth	1	588			Rep.	438
53	Other metal strand	1	683			Rep.	438
53	Insulated wire		91,244			Rep.	439
50	Screw machine products		91,468			WS	90
50	Wood screws		12,990			WS	90
50	Nails, cut and wrought (tons)	1	164			WS	86
50	Horse and mule shoes (tons)	6	500			WS	86
50	Wire (coated) (tons)	52	8,143			WS	86
50	Wire (cold drawn) (tons)	29	4,256			Rep.	437
50	Brass wire (90% of total) (tons)	40	18,334			Rep.	437
52	Abrasives (25% of total) (tons)	231	5,561			Rep.	398
50	Steel (rolled finished) (not elsewhere classified) (tons)	33,628	2,210,508			WS	86
44	Bags, paper		64,621		129,242	Rep.	624

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

MANUFACTURING SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
52	Belting (leather)		35,631		71,262	Rep. 625
52	Blacking, stains, etc. (50% of total)		12,340		24,680	Rep. 626
52	Bluing (50% of total)		682		1,364	Rep. 627
52	Bone, carbon and lamp black		20,169		40,338	Rep. 628
44	Boxes, paper (not elsewhere classified)		294,253		588,506	Rep. 631
51	Brushes (not rubber) (50% of total)		22,775		45,550	Rep. 633
52	Glue and gelatin (90% of total)		29,192		58,384	Rep. 641
52	Grease and tallow (not lubricants)		61,608		123,216	Rep. 642
52	Hairwork		1,694		3,388	Rep. 643
50	Hand-stamps, stencils, etc.		15,036		30,072	Rep. 644
52	Optical goods (27% of total)		11,220		22,440	Rep. 670
52	Lapidary work		11,942		23,884	Rep. 647
52	Artificial flowers		14,425		28,850	Rep. 622
52	Cleaning and polishing preparations (10% of total)		5,078		10,156	Rep. 654
52	Concrete products		6,602		13,204	Rep. 656
52	Foundry supplies		10,459		20,918	Rep. 638
52	Leather goods (not elsewhere classified)		35,951		71,902	Rep. 648
52	Oils (essential) (50% of total)		3,327		6,654	Rep. 667
52	Photo. (app. and paper)		102,827		205,654	Rep. 676
52	Saddlery and harness (50% of total)		11,669		23,338	Rep. 680
52	Soap (2% of total)		9,337		18,674	Rep. 683
52	Tanning materials and dyes		39,836		79,672	Rep. 689

52	Turpentine and rosin		36,281		72,662	Rep. 692
47	Pole-line hardware		19,036			Rep. 554
47	Stationary generators and frequency changers (sets)	12	21,823			Rep. 554
47	Synchronous converters (sets)	0.2	4,241			Rep. 554
47	Self-contained generators (sets)	30	6,840			Rep. 554
47	Meters (pcs.)	2,706	25,731			Rep. 554
47	Instrument and meter transf. (60% of total) (tons)	100	3,620			Rep. 554
47	Copper wire (not insul.) (60% of total) (tons)	28	11,170			Rep. 438
47	Insulated wire (40% of total)		122,168			Rep. 438
51	Carriages, etc. (40% of total)		6,580			Rep. 652
50	Wrought pipe (75% of total) (tons)	2,259	182,729			Rep. 817
50	Copper wire (50% of total) (tons)	272	118,626			Rep. 437
50	Other wire (90% of total) (tons)	25	24,347			Rep. 437
48	Lumber saws		6,676			Rep. 419
52	Rags (cotton) (units)	1,245,000	170,175	1,886,364	257,841	Rep. 328
52	Miscellaneous textile supplies		109,918			Rep. 814
54	Elec. power (kw.-hr.)	57,432	1,168,812		1,461,015	WS 216
55	Coal (tons)	223,307	797,602	326,461	165,541	Rep. 621
55	Coke (tons)	48,200	224,310	52,666	244,587	Rep. 621B
56	Ind. gasoline (bbls.)	90,631	318,148	113,642	398,926	Rep. 621A
56	Gas and fuel oil (bbls.)	405,858	361,214	493,929	439,597	Rep. 621A
56	Kerosene and lubricating oils (bbls.)	33,951	238,103	67,359	472,396	Rep. 621A
56	Natural gas		190,099			Rep. 621A
56	Manufactured gas (M. cu. ft.)	336,757,000	208,576	1,256,302M	313,177	Rep. 181

TABLE II (*Continued*)

COLUMN 4—ALLOCATION TABLE

BUSINESS OFFICE SUPPLIES FOR FURTHER FABRICATION

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
38	Writing paper (60% of total)..........(tons)	195	36,313			Rep. 818
38	Envelopes (writing paper) (60% of total) (tons)	22	7,966			Rep. 818
38	Tablets (writing paper) (60% of total).(tons)		1,513			Rep. 818
38	Cover paper.......................(tons)	28	6,430			Rep. 818
38	Card index, etc....................(tons)	9	3,641			Rep. 818
38	Envelopes (Kraft paper).............(tons)	30	9,540			Rep. 818
38	Envelopes (other)..................(tons)	96	25,990			Rep. 818
38	Tablets (book paper)...............(tons)	1	810			Rep. 818
38	Tablets (news print)................(tons)	4	2,233			Rep. 818
38	Tablets (other)....................(tons)	4	2,200			Rep. 818
38	Rolls (adding machine)..............(tons)	6	1,768			Rep. 818
38	Catalogue paper...................(tons)	112	9,571	131	11,220	Rep. 818
38	Tubes (paper board)................(tons)	20	6,087			Rep. 818
38	Twisted paper, cords, etc............(tons)	3	425			Rep. 818
38	Wrapping paper....................(tons)	713	72,562			Rep. 818
38	Kraft paper.......................(tons)	275	26,516			Rep. 818
38	Bags (wrapping paper)..............(tons)	96	17,212			Rep. 818
40	Pins..................................		859			Rep. 411
40	Mirrors (50% of total)....................		12,001			WS 148
38	Carbon-paper and inked ribbon..............		17,295		34,590	Rep. 635
38	Envelopes (not elsewhere classified) (40% of total)..........................		24,515		49,030	Rep. 637
39	Window and show case lighting.............		1,108			Rep. 406
39	Carbon lamps (50% of total).........(pcs.)	5,025	501			Rep. 554
39	Tungsten lamps (50% of total)........(pcs.)	136,016	9,234			Rep. 554

39	Cards (cut and designed)		19,648			Rep. 650
39	Signs and advertising novelties		118,044			Rep. 682
39	Reflectors (gas and elec.)		4,961			Rep. 406
39	Newspaper and periodical adv. (90% of total)		1,120			WS 162
39	Other advertising		126			WS 162
39	Commercial printing		773,005			WS 4B
40	Indus. cooking app.		2,250			Rep. 554
40	Barber supplies		5,692			Rep. 554
40	Fans (50% of total)		5,098			Rep. 554
40	Time record. dev. (50% of total)		21,083			WS 111
40	Lamps (desk and reading)		539			WS 111
41	Telephone and telegraph		391,000			WS 39
40	Lockers		5,233		10,466	Census
43	Repairs to fixtures		35,174		70,348	Census
42	Writing ink (50% of total)		2,297		4,594	Rep. 645
42	Mucilage and paste (30% of total)		2,655		5,310	Rep. 663
38	Adding machine paper (tons)	197	56,147			
42	Pencils (40% of total)		11,190		22,220	Rep. 672
42	Stylographic pens (gr.)	1,945	285	3,890	570	WS 189
42	Pen points (gold) (gr.)	37,439	1,783	74,878	3,566	WS 189
42	Pen points (steel and brass) (gr.)	2,007,189	1,289	4,014,378	2,578	WS 189
42	Other products pen industry		6,084		12,168	WS 189
40	Safes and vaults (40% of total)		19,362		38,724	Rep. 681
38	Stationery goods (not elsewhere classified)		29,625		58,350	Rep. 686
42	Stationery rubber goods		1,208		2,416	WS 6
42	Typewriters and parts (90% of total) (pcs.)	1,778	60,277			WS 10
43	Office and store furn.		193,359		386,718	WS 3
	Telephone and Telegraph Supplies					
57	Telephone app.		158,644			WS 39
58	Telephone and Telegraph app.		166,293			Rep. 554
59	Copper wire (not insulated) (tons)	18	7,447			Rep. 438
59	Insulated wire		67,179			Rep. 439
59	Copper wire (tons)	272	118,626			Rep. 438
60	Other wire (tons)	25	24,347			Rep. 438

TABLE III

Column 5—Allocation Table

Food and Supplies to Consumer

Identifying No.	Item	Production		Capacity		
		Quantity	Value	Quantity	Value	
1	Confectionery	1,512,000	453,000	2,249,000	715,000	WS 27
2	Ice cream (gals.)	280,000	328,414	750,000	887,605	WS 127
3	Miscellaneous foods (not elsewhere classified)		201,212	Ind.		
3	Edible gelatine		7,514			WS 129
3	Rubber jar rings		3,001			WS 6A
4	Distilled and vinous liquors (illicit)		2,000,000			Doane Budget
	Wearing Apparel to Consumer					
3	Fur goods		207,593			WS 191
1	Boots and shoes (leather) (prs.)	361,402	965,924	446,175	1,192,499	WS 2
1	Boots and shoes (rubber) (prs.)	56,811	81,024	61,087	87,123	WS 6B
4	Suspenders and garters (doz.)	12,801	26,530			Rep. 732
4	Handkerchiefs (doz.)	39,985	28,548	62,574	44,676	Rep. 731
2	Wool and felt hats (doz.)	405	4,075			Rep. 729
7	Women's clothing (pcs.)	368,258	296,446	736,516	592,892	Rep. 721
7	Women's clothing (pcs.)	212,639	904,760	425,678	1,809,520	Rep. 720
7	Women's clothing (pcs.)	36,059	414,182	72,118	828,364	Rep. 719
6	Men's clothing (other) (pcs.)	47,204	111,695	94,408	223,390	Rep. 717
6	Men's clothing (suits and trousers) (pcs.)	55,174	648,253	110,348	1,296,506	Rep. 715
6	Boys' clothing (suits, knickers, etc.) (pcs.)	25,793	81,153	51,586	162,306	Rep. 716
4	Gloves and mittens (doz. prs.)	20,310	71,346			Rep. 570
4	Broad-silk goods (yds.)	22,845	19,288	57,113	48,220	Rep. 595
4	Rayon yarn	12,128	1,467	12,182	1,467	Rep. 594

4	Knit goods		8,921			Rep. 569
4	Knit cloth (yds.)	6,379	6,781	7,010	7,452	Rep. 568
6	Collars (doz.)	5,698	81,740			Rep. 409
6	Shirts (doz.)	19,564	228,321	39,128	456,642	Rep. 409
7	Corsets (doz.)	53,364	76,802			Rep. 405
5	Men's work clothing (pcs.)	9,268	123,411	15,447	205,685	Rep. 324
4	Trimmings		45,179			Rep. 753
4	Embroideries		2,528			Rep. 752
4	Lace goods		2,923			Rep. 750
2	Hats and caps (doz.)	4,539	35,900			Rep. 747
2	Straw hats (men's)		18,739			Rep. 745
2	Fur and felt hats		102,004			Rep. 770
2	Millinery		195,693			Rep. 777
4	Cotton goods (yds.)	926,226	166,034	2,105,059	377,350	Rep. 232
4	Second-hand clothing		12,042			Census
	Housing to Consumer					
4	Tungsten lamps (pcs.)	88,063	16,559			Rep. 554
4	Carbon lamps (pcs.)	572	102			Rep. 554
9	Vacuum bottles		5,466			Rep. 432
8	Glass products		24,760			Rep. 148
12	Mirrors		12,000			Rep. 148
4	Desk and reading lamps		538			Rep. 454
3	Elec. air heaters		1,833			Rep. 454
7	Grills (pcs.)	262	504			Rep. 454
7	Percolators and toasters (pcs.)	3,161	12,838			Rep. 454
7	Elec. stoves and hot plates (pcs.)	694	1,419			Rep. 454
7	Kitchen ranges (pcs.)	225	15,514			Rep. 454
7	Fireless cookers (pcs.)	80	395			Rep. 454
8	Flatirons and curling-irons (pcs.)	5,026	10,802			Rep. 454
3	Water heaters (pcs.)	58	1,640			Rep. 454
8	Miscellaneous cleaners		4,432			Rep. 454
8	Aluminum cooking utensils		35,100			WS 109

TABLE III (*Continued*)

Column 5—Allocation Table

Housing to Consumer

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
8	Table and kitchen cutlery		7,776			Rep. 418
6	Scissors		2,063			Rep. 418
6	Dry batteries (units)	10,000	1,780			Rep. 454
4	Electric fuses (gr.)	116,225	5,678			Rep. 454
8	Asbestos table mats (tons)	1,615	766			Rep. 402
9	Stamped ware (household)		9,964			Rep. 407
9	Enamel ware (kitchen)		7,050			Rep. 407
6	Nails and brads (tons)	6	396	6	460	Rep. 438
6	Tacks		64			Rep. 438
5	Wire (insulated)		4,287			Rep. 438
6	Fire extinguishers		4,000			WS 151
6	Tools (not edged)		9,000			WS 153
9	Incinerators (domestic)		908			Rep. 403
10	Bluing		682		1,364	Rep. 627
10	Brooms		19,166		38,332	Rep. 632
10	Brushes (not rubber)		22,774		45,548	Rep. 633
4	Candles		6,686		13,372	Rep. 634
10	Cleaning and polishing preparations		45,701		91,402	Rep. 654
2	Concrete products (garden and garbage)		751		1,502	Rep. 656
6	Glue and gelatin		3,246		6,492	Rep. 641
10	Household machinery and equipment		131,815			Rep. 454
3	Water heaters (coal and wood)		1,444			Rep. 404
3	Water heaters (gas) (pcs.)	895	18,203			Rep. 404

3	Water heaters (kerosene).............(pcs.)	27	448			Rep. 404
3	Water heaters (gasoline).............(pcs.)	2	42			Rep. 404
9	Enamel ware (household)..................		23,249		28,352	Rep. 407
7	Enamel ware (kitchen)....................		16,450		20,061	Rep. 407
7	Stoves (coal and wood) cook ....(sets)	740	32,098			Rep. 404
3	Stoves (coal and wood) heat..........(sets)	199	2,892			Rep. 404
3	Parts for stoves.........................		1,823			Rep. 404
7	Cooking stoves (gas).................(sets)	1,602	57,354			Rep. 404
7	Other gas appliances and parts.............		3,323			Rep. 404
7	Cooking stoves (kerosene)............(sets)	758	11,352			Rep. 404
7	Parts for above..........................		588			Rep. 404
7	Cooking stoves (gasoline)..................		2,182			Rep. 404
7	Parts for above..........................		543			Rep. 404
7	Other stove sets (50% of domestic)..........		1,565			Rep. 404
3	Stoves (fuel oil).........................		830			Rep. 404
7	Portable ovens...........................	735	2,882			Rep. 404
7	Cooking equipment (miscellaneous)..........		3,620			Rep. 404
7	Fittings (stove).....................(sets)		18,036			Rep. 404
3	Fuel oil burners.....................(pcs.)	102	19,694			Rep. 404
12	Mattresses..............................		123,280			Rep. 814
½-11 ½-12	Household furniture.......................		659,023		1,318,046	WS 3
5	Garden hose.........................(ft.)	145,254	9,049		18,098	WS 6A
5	Rubber water hose........................		8,806		17,612	WS 6A
11	Upholstery materials......................		2,246			Rep. 814
5	Awnings, tents, etc..................(yds.)	106,747	39,391	242,607	89,525	Rep. 814
½-11 ½-12	Housefurnishing goods................(doz.)	21,774	153,966			Rep. 814
10	Rope....................................	182,148	34,139			Rep. 814
6	Twine (not binder).......................	80,654	18,610			Rep. 814
6	Woven jute goods....................(yds.)	12,154	1,178			Rep. 814
12	Carpets and rugs.................(sq. yds.)	73,410	174,286	166,841	396,105	Rep. 814
9	Oil cloth........................(sq. yds.)	125,675	23,639	220,482	41,472	Rep. 814

TABLE III (*Continued*)

COLUMN 5—ALLOCATION TABLE

HOUSING TO CONSUMER

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
9	Linoleum (asphalted)		53,484			Rep. 814
6	Window shades		29,572			Rep. 814
5	Mattresses (spring)		98,624			Rep. 814
6	Mats and matting		1,692			Rep. 814
6	House furnishings		102,082			Rep. 814
12	Carpets and rugs (rag)		5,510			Rep. 814
8	Paper napkins (tons)	28	6,900			Rep. 818
8	Paper dishes and spoons (tons)	16	6,113			Rep. 818
8	Paper cups (tons)	18	10,714			Rep. 818
10	Rubber gloves		1,935			WS 6A
	TRANSPORTATION SUPPLIES TO CONSUMER					
2	Auto lamp bulbs		3,638			Rep. 454
1	Automobiles (units)	4,592	3,044,000	5,600	3,712,195	WS 19
3	Auto tires (replacement) (pcs.)	40,250	223,500	63,889	354,762	WS 6A
3	Motor cycle tires (replacement)		3,634		5,768	WS 6A
3	Auto tubes (replacement) (pcs.)	1	47,700	2	75,714	WS 6A
3	Tire repairs and sundries		14,588		29,176	WS 19A
2	Spark plugs	6,648	1,822			Rep. 454
2	Storage batteries (auto) (sets)	1,565	8,648	3,130	17,396	Rep. 454
2	Asbestos brake lining (lbs.)	11,124	14,807			Rep. 402
2	Asbestos brake lining (molded) (lbs.)	2,241	253			Rep. 402
2	Skid chains (tons)	40	11,491	47	13,362	Rep. 438
4	Motor cycles (units)	32				
4	Bicycles (units)	308	37,622			WS 21
4	Parts		5,410			WS 21
2	Trunks, suitcases and bags (leather)		63,969			WS 38

3	Waste (cotton)	6,559	720	13,118	1,440	Rep. 814
5	Horse blankets		1,448			Rep. 814
3	Belting		557			Rep. 814
4	Carriages, wagons and sleds		1,644			Rep. 814
4	Horses		2,500			Census
	PERSONAL SUPPLIES TO CONSUMER					
1	Writing paper (tons)	217	40,409	238	44,405	Rep. 818
1	Envelopes (writing paper) (tons)	24	8,851			Rep. 818
1	Tablets (writing paper) (tons)	2	1,682			Rep. 818
4	Crepe paper (tons)	14	5,004			Rep. 818
2	Toilet paper (tons)	140	25,323			Rep. 818
2	Paper towels (tons)	52	8,036			Rep. 818
4	Confetti		61			Rep. 818
4	Papeteries (tons)	3	17,459			Rep. 818
2	Combs and hairpins (non-metal)		2,482		4,962	Rep. 655
7	Mortuary concrete		1,942		3,884	Rep. 656
5	Perfumes and cosmetics		193,440		286,880	Rep. 674
3	Tobacco pipes		5,538		11,176	Rep. 677
4	Pocket books, purses, etc.		68,628		137,256	WS 38
4	Pins		850			Rep. 411
4	Hair and safety pins		4,554			Rep. 411
4	Flashlight cases (pcs.)	11,483	7,050			Census
2	Safety razors		1,824			Rep. 418
2	Razor blades		39,967			Rep. 418
2	Razors (not safety)		404			Rep. 418
4	Pocket-knives		5,333			Rep. 418
4	Flashlight batteries (pcs.)	216,241	7,707			Rep. 418
4	Fans (electric) (pcs.)	380	5,098			Rep. 454
6	Clocks		21,083			WS 111
6	Watches		34,370			WS 111
6	Watch cases		13,491			WS 111
6	Watch parts		931			WS 111
6	Jewelry		177,387			WS 126
2	Blacking, stains and dressings		12,341		28,642	Rep. 626
1	Envelopes		36,772		713,544	Rep. 818
1	Writing ink		2,298		4,596	Rep. 645

TABLE III (*Continued*)

COLUMN 5—ALLOCATION TABLE

PERSONAL SUPPLIES

Identifying No.	Item	Production Quantity	Production Value	Capacity Quantity	Capacity Value	
4	Mucilage and paste		3,984			Rep. 663
1	Pencils		16,663		33,326	Rep. 672
1	Fountain pens (pcs.)	97,409	22,384	194,818	44,768	Rep. 673
1	Fountain pens (desk sets) (sets)	2,734	2,377	5,468	4,754	Rep. 673
1	Stationery goods (not elsewhere classified)		44,437		88,874	Census
4	Umbrellas, parasols and canes (pcs.)	16,500	25,000			WS 15
1	Stationery rubber goods		1,812		3,624	WS 6A, Rep. 686
2	Rubber gloves		1,935		3,870	WS 6A, Rep. 686
7	Caskets and coffins (pcs.)	1,307				WS 9
7	Shipping cases and metal vaults		75,962			Rep. 817
1	Portable typewriters (pcs.)	146	1,581			Census
7	Manufactured statuary		10,045			Census
7	Artists' materials		9,459			WS 173
	RECREATION SUPPLIES TO CONSUMER					
3	Ammunition		31,685			Rep. 492
3	Pistols and revolvers (pcs.)	68	892			Rep. 415
3	Rifles (pcs.)	137	1,372			Rep. 415
3	Shotguns (pcs.)	589	8,866			Rep. 415
3	Parts for rifles, etc.		386			Rep. 415
3	Fireworks		6,584			Rep. 491
1	Radio receiving sets (sets)	5,025	253,260			Rep. 514
1	Radio loud speakers (units)	3,339	30,551			Rep. 514
1	Combination phonograph and radio (sets)	152	22,194			Rep. 554
1	Radio transformers (units)	573	1,042			Rep. 554
1	Radio replacement parts		16,791			Rep. 554
1	Radio tubes		82,013			Rep. 554
3	Gasoline camp stoves (sets)	131	539			Rep. 454

2	Pianos		42,501			Rep. 664
3	Photographic app. and paper		51,413			Rep. 179
3	Saddlery and harness		2,333			Rep. 680
3	Sporting and athletic goods		45,000			Rep. 685
3	Carriages and sleds (children)		28,817		57,634	Rep. 651
3	Toys (not incl. games and playground equip.)		74,828			Rep. 691
3	Bathing caps		1,842		3,684	WS 6A
2	Phonographs (pcs.)	755	43,027			WS 22
2	Records (pcs.)	105,085	34,129			WS 22
3	Music (printing and publishing)		16,538			WS 4B
3	Periodicals (copies)	90,053	79,250			WS 4B
3	Books (volumes)	117,075	132,677			WS 4B
3	Pamphlets		160,137			WS 4B
3	Water craft		231,300			WS 1
3	Canvas rubber soled shoes (prs.)	43,954	30,335			WS 6A
3	Nets and seines		616			Rep. 814
3	Flags and banners		3,835			Rep. 814
3	Regalia badges		7,927			Rep. 814
3	Fish lines		2,893			Rep. 814
2	Second-hand music*		497			Census
2	Second-hand books*		2,372			Census
	HEALTH SUPPLIES TO CONSUMER					
3	Rubber goods		10,946		21,892	WS 6A
1	Druggists' preparations		124,778		249,556	WS 182
2	Drugs and proprietary medicine		318,907		637,814	WS 182
3	Ophthalmic products		29,342			WS 182
	EDUCATIONAL SUPPLIES TO CONSUMER					
2	Newspapers (copies)	19,985,000	275,781			WS 4B
2	Periodicals (copies)	77,020	68,300			WS 4B
2	Books (volumes)	118,289	66,338			
2	Pamphlets (copies)	39,696				
	SOCIAL SUPPLIES TO CONSUMER					
1	Religious products	41,629	36,945			WS 4B

* Census of Retail Distribution, 1930.

TABLE IV

PER CAPITA INCOME DEFLATED

1860–1932

Year	(000,000 Omitted) Monetary Income	Imputed Income	Total Income	Population	Per Capita Income	General Price Level	Per Capita Income Deflated
1860	4,463	3,869	8,332	31,443,321	264	71	372
1870	4,642	3,465	8,107	38,558,371	210	102	206
1880	5,987	3,100	9,087	50,155,783	181	82	221
1890	10,776	2,860	13,636	63,056,438	216	78	277
1900	13,659	2,064	15,723	76,129,408	206	79	261
1909	28,057	1,944	30,001	90,691,354	331	94	352
1910	29,524	2,085	31,609	92,267,080	343	97	354
1911	30,840	2,198	33,038	93,682,189	353	96	368
1912	32,598	2,222	34,820	95,097,298	360	100	360
1913	33,784	2,330	36,114	96,512,407	374	100	374

1914	35,402	2,420	37,822	97,927,516	386	100	386
1915	37,143	2,515	39,658	99,342,625	399	103	387
1916	43,791	2,703	46,494	100,757,735	461	117	394
1917	51,269	3,017	54,286	102,172,845	531	139	382
1918	58,360	3,750	62,110	103,587,955	600	157	382
1919	67,530	4,321	71,671	105,003,065	683	173	396
1920	76,182	5,557	81,739	106,539,282	767	193	397
1921	65,412	5,100	70,512	108,207,853	652	163	400
1922	68,298	4,738	73,036	109,872,675	665	158	421
1923	70,398	5,042	75,440	111,537,497	676	165	410
1924	73,666	5,230	78,896	113,202,319	697	166	420
1925	77,053	5,370	82,423	114,867,141	718	170	422
1926	78,447	5,264	83,711	116,531,963	718	171	420
1927	81,961	5,284	87,245	118,196,785	738	171	432
1928	84,799	5,300	90,099	119,861,607	752	176	427
1929	85,340	5,465	90,805	121,526,429	747	179	418
1930	73,165	5,226	78,391	123,191,000	636	168	379
1931	61,212	4,018	65,230	124,070,000	526	150	351
1932	43,484	2,940	46,424	124,822,000	372	132	282
1933				125,693,000			

Sources: "Index of the General Price Level," Federal Reserve Bank of New York. Population—Statistical Abstract of the United States, 1933. Monetary Income (1890–1924), Dr. B. M. Anderson, Jr., Chase National Bank. Monetary Income (1860–1890, 1924–1932), R. Doane. Imputed Income—Willard I. King, "National Wealth and Income."

TABLE V

DOLLAR WAGES PER EMPLOYED WORKER AND DOLLAR VALUE OF PRODUCTS PER WORKER IN THE MANUFACTURING INDUSTRIES AND PER CAPITA INCOME—1869 TO 1932

Year	Population	Wage Earners*	Wages*	Gross Value of Products§	General Price Level†	Wages per Employed Worker		Value of Products per Worker		Per Capita Income 1913 Dollars
						Current Dollars	1913 Dollars	Current Dollars	1913 Dollars	
1869	37,906,158	2,053,996	620,467,000	3,386,000,000	111	302	272	1,648	1,485	(1860) 372
1879	49,092,687	2,732,595	947,954,000	5,370,000,000	77	347	451	1,965	2,552	(1870) 206
1889	61,775,121	4,251,535	1,891,220,000	9,372,000,000	77	445	578	2,204	2,862	(1880) 221
1899	74,798,612	5,306,143	2,320,938,000	13,000,000,000	77	437	568	2,450	3,182	(1890) 277
1904	82,601,384	5,468,383	2,610,445,000	14,794,000,000	86	477	555	2,705	3,145	(1900) 261
1909	90,691,354	6,615,046	3,427,038,000	20,672,000,000	94	518	551	3,125	3,324	352
1914	97,927,516	7,023,685	4,067,719,000	24,217,000,000	100	579	579	3,448	3,448	386
1919	105,003,065	9,000,059	10,461,787,000	62,193,000,000	173	1,162	671	6,879	3,996	396
1921	108,207,853	6,946,570	8,202,324,000	43,653,000,000	163	1,181	725	6,284	3,855	400
1923	111,537,497	5,778,156	11,009,298,000	60,556,000,000	165	1,254	760	6,898	4,181	410
1925	114,867,141	8,384,261	10,729,969,000	62,714,000,000	170	1,280	783	7,480	4,400	422
1927	118,196,785	8,349,755	10,848,803,000	62,718,000,000	171	1,299	760	7,511	4,392	432
1929	121,526,429	8,838,743	11,620,973,000	70,435,000,000	179	1,315	735	7,969	4,452	418
1931	124,070,000	6,523,026	7,185,971,000	41,350,000,000	150	1,102	735	6,339	4,226	351
1932 ‡		5,253,560	5,755,962,000	34,321,000,000	132	1,096	830	6,533	4,949	282

* Wages, wage-earners, population, and value of products from Statistical Abstract for 1933, and Census of Manufactures (General Report, 1930; Schedule 1, p. 15), and

† "Index of the General Price Level," Federal Reserve Bank of New York.

‡ Data for 1932 are estimated from figures given in "Federal Reserve Bank Levels," Statistical Abstract for 1933. The extraordinary increase shown in the wage per worker (measured in 1913 dollars) is largely due to the inclusion of automobiles, stocks, bonds, etc., in the general price level. These items are not often purchased by wage-earners, but were deflated to a greater extent than the more essential commodities in 1932.

§ Although these totals include duplications, the trend is much the same as the trend of net values. See supplementary table Va.

TABLE V-A

NET VALUE OF PRODUCTS AND PRODUCTION PER WORKER IN THE MANUFACTURING INDUSTRIES

1899–1931

	Workers Employed	Net Value of Products	Net Value: Production per Worker (current dollars)	Net Value: Production per Worker (1913 dollars)	General Price Level
1899	5,306,143	7,350,000,000	1,385	1,799	77
1904	5,468,383	9,700,000,000	1,774	2,063	86
1909	6,615,046	13,150,000,000	1,988	2,115	94
1914	7,023,685	15,600,000,000	2,221	2,221	100
1919	9,000,059	38,300,000,000	4,256	2,460	173
1921	6,946,570	27,000,000,000	3,887	2,385	163
1923	8,778,156	38,200,000,000	4,352	2,638	165
1925	8,384,261	39,550,000,000	4,717	2,775	170
1927	8,349,755	40,150,000,000	4,809	2,812	171
1929	8,838,743	47,250,000,000	5,346	2,987	179
1931	6,523,026	27,400,000,000	4,201	2,801	150

SOURCE: Statistical Abstract of the United States, 1933.

TABLE VI

Workers Gainfully Engaged and Average Wages, 1929

Industry	Workers Engaged*	Wages and Salaries: Total (Actual)	Wages and Salaries: Per Worker (Calculated)
Farm	2,027,000	$ 1,313,000,000	$ 647
Mining and quarrying	1,054,160	1,639,176,000	1,555
Manufacturing	12,145,309	18,636,352,000	1,534
Construction	1,359,701	2,619,544,000	1,927
Electric light and power, and manufactured gas	336,435	530,650,000	1,577
Transportation	2,904,565	4,970,422,000	1,711
Communication	532,734	702,598,000	1,319
Total workers	20,359,904	$30,411,742,000	Avge. $1,494
Trade			
Wholesale and retail	5,561,865	8,209,337,000	1,476
Services			
Finance	1,421,838	3,245,846,000	2,282
Government	3,003,272	4,983,892,000	1,659
All other services	4,857,880	5,906,815,000	1,216
Total workers gainfully engaged	35,204,759	$52,757,632,000	$1,499†
Plus workers reporting themselves in industries but engaged part time or not at all	4,240,475		
Total	39,445,234		Average $1,337

* The total of workers actually engaged was considerably larger, but these totals were corrected to represent the equivalent of the numbers that would have been engaged full-time to accomplish the same tasks.

† Senate Document No. 124, basing its calculation on some slightly different grounds, arrives at an average wage of $1,475, which figure we have employed in our text.

Source: Senate Document No. 124, 73rd Congress, 2nd Session, Washington, D. C., 1934.

TABLE VII

ENTREPRENEURS ENGAGED AND AVERAGE WITHDRAWALS, 1929

Industry	Entrepreneurs Engaged	Withdrawals Total		Withdrawals Average
PRODUCTION INDUSTRIES				
Mining and quarrying....	14,109	$ 70,217,000		$4,976
Manufacturing..........	133,173	380,644,000		2,858
Construction............	167,811	436,249,000		2,600
Transportation..........	168,508	299,121,000		1,775
Miscellaneous industries..	692,395	1,567,873,000		2,264
Total................	1,175,995	2,754,104,000	Avge.	2,342
TRADE				
Wholesale and retail.....	1,601,379	2,402,072,000		1,500
SERVICES				
(Excluding finance)......	677,390	2,344,725,000		3,461
Total entrepreneurs*...	3,454,764	7,500,901,000		2,171
Farmers*...........	6,029,000	5,696,000,000		945
Grand total.........	9,483,764	$13,196,901,000		$1,392†

* The discrepancy between Table XXI, "Breakdown of Labor," and the above is due to the fact that Table XXI lists the "full time equivalent" of farm owners and tenants, while the above table lists the "total number" of farm owners and tenants.

† Not including bankers. Finance is not covered in Senate Document No. 124. On p. 14 of this source are given the following totals:

Entrepreneurial Income (excluding "property income") amounting to $12,206,000,000.....	$16,136,000,000
Entrepreneurs (gainfully employed).........	9,020,000
Average withdrawal......................	1,789

The discrepancy between the above figure, $1,789, and our figure, $1,392, is partly due to the inclusion in the former of net rents and royalties which amounted to $4,116,000,000.

SOURCE: Senate Document No. 124, 73rd Congress, 2nd Session, Washington, D. C., 1934.

TABLE VIII

CONSTRUCTION

MATERIALS PRODUCED (1929) AND MATERIALS REQUIRED FOR BUILDING 1,550,000 DWELLING UNITS PER YEAR AND MATERIALS REQUIRED TO MAINTAIN EXISTING HOMES (EQUIVALENT TO MATERIALS REQUIRED TO BUILD 200,000 DWELLING UNITS) PER YEAR

Materials Available	Brick	Cement	Sand	Crushed Stone and Gravel	Glass	Rough and Finished Lumber	Steel	Tile, Slate, Asphalt Roofing	Gypsum
	(1000 pieces)	(1000 bbls.)	(1000 tons)	(1000 tons)	(1000 sq. ft.)	(1000 ft. b. m.)	(1000 long tons)	(1000 squares)	(1000 tons)
1. Production—1929	8,055,357	172,856	99,253	220,619	402,559	36,886,032	39,883	41,895	5,102
2. Capacity—1934	11,098,400	271,308	Unlimited	Unlimited	1,200,000	36,886,032	46,300	5,950	
3. Excess capacity (2 minus 1)	2,993,043	98,452			797,441	0	6,417	21,085	848
4. Consumption in residential construction—1929	2,000,000	24,647	25,000	55,000	100,000	12,200,000	1,000	14,498	690
5. Total available for dwelling units (3 plus 4)	4,993,043	123,099	Unlimited	Unlimited	897,440	12,200,000	7,000	35,583	1,438
Materials Required for	(pieces)	(bbls.)	(tons)	(tons)	(sq. ft.)	(ft. b. m.)	(tons)	(squares)	(tons)
1 frame house	10,353	69	23	36	300	22,564		8.8	4
1 brick and steel house	36,000	72	67	42	300	6,500	1 ton	8.8	4
1 brick and frame house	36,000	82	54	36	300	17,250		8.8	4
1 fabricated steel house	9,180	78	28	44	300	2,200	8 tons	8.8	19
1 brick and frame apartment	315,592	855	344	206	2,720	94,976	18.6 longtons	61.8	43
1 brick and steel apartment	315,592	1,300	450	460	2,720	82,000	50	61.8	35*
Material Required for	(1000 pieces)	(1000 bbls.)	(1000 tons)	(1000 tons)	(1000 sq. ft.)	(1000 ft. b. m.)	(1000 long tons)	(1000 squares)	(1000 tons)
50,000 frame	517,650	3,450	1,150	1,180	15,000	1,128,200		440	200
100,000 brick and frame	3,600,000	8,200	5,400	5,600	30,000	1,725,000		880	400
400,000 brick and steel	14,400,000	28,800	26,800	16,800	120,000	2,600,000	400	3,520	1,600
400,000 fabricated	3,672,000	31,200	11,200	17,600	120,000	880,000	3,200	3,520	7,600
5,000 brick and frame apartments (160,000 dwelling units)	1,577,960	4,275	1,720	1,030	13,600	474,880	93	309	215
20,000 brick and steel apartments (640,000 dwelling units)	6,311,840	36,000	7,000	9,200	54,400	1,640,000	1,000	1,236	700†
TOTAL required for 1,750,000 dwelling units	30,079,450	101,975	55,270	49,410	353,000	8,448,080	4,693	9,905	10,715

* Includes terra cotta partitions as substitute for gypsum @ 1,500 cu. ft. per room.

CONSTRUCTION

LABOR REQUIRED TO BUILD 1,550,000 DWELLING UNITS PER YEAR AND LABOR REQUIRED PER YEAR TO MAINTAIN EXISTING HOUSES (EQUIVALENT TO LABOR REQUIRED TO BUILD 200,000 NEW DWELLING UNITS)

Type	Common Labor	Mason	Lather	Plasterer	Carpenter	Painter	Plumber	Tiler	Slater	Roofer	Electrician	Steel Worker	
MAN-DAYS PER HOUSE													
Frame	82.5	14.7	5.7	23.7	89.7	34	20	4	3		4		
Brick and frame	80	19.4	5.7	23.7	83.5	29.5	20	4	3		4		
Brick and steel	80	19	6	12	20	25	20	4	3		4	8	
Fabricated	73	15		12	10	25	20	4		2	4	16	
Brick and frame apartment (32 families)	648	425	70	201	562	380	62	65		7	12	40	
Brick and steel apartment (32 families)	648	425	30	180	300	380	62	65		7	12	200	
APPROXIMATE TOTAL OF MEN REQUIRED*													
50,000 frame	16,500	3,000	1,140	4,800	17,940	6,800	4,000	800	600		800		
100,000 brick and frame	31,900	8,000	2,300	9,600	33,300	11,800	8,000	1,600	1,200		1,600		
400,000 brick and steel	128,000	30,400	9,600	19,200	32,000	40,000	32,000	6,400	4,800		6,400	12,800	
400,000 fabricated	116,000	24,000		19,200	16,000	40,000	32,000	6,400		3,200	6,400	25,400	
160,000 dwelling units in 5000 brick and frame apartment buildings	12,900	8,500	1,400	4,000	11,200	7,600	1,240	1,300		140	240	800	
640,000 dwelling units in 20,000 brick and steel apartment buildings	51,600	34,000	2,400	14,400	24,000	30,400	4,960	5,200		560	960	16,000	
Landscaping, sewerage, etc. (estimated)	500,000												
TOTAL	856,900	107,900	16,840	71,200	134,440	136,600	82,200	21,700	6,600	3,900	16,400	55,000	
GRAND TOTAL													1,509,680
TOTAL EMPLOYED—1930													
Building construction	419,802	170,903		85,477	929,426	429,982	237,813	23,636			280,636	28,966	
TOTAL EMPLOYED IN 1930 (Building-construction industry)													2,606,322
39% building homes	163,000	66,400		33,300	360,000	167,000	92,500	9,200			109,000	11,600	
TOTAL EMPLOYED IN 1930 (home building)													1,012,000

* Total men required equals number of man-days per house multiplied by the number of houses and divided by 250, the assumed number of working days per year.

Notes on Tables X, XI, XII, and XIV

In the present budget study, consideration is given to our entire population of 125,000,000, rather than to a fragment thereof. The division into 37,500,000 white-collar and professional workers and 87,500,000 industrial workers—both inclusive of their dependents—is based upon the breakdowns of the population according to types of work found in the Statistical Abstract of the United States. White-collar work covers clerical, executive, sales promotion, and the like; while industrial work covers agriculture, machine tending, and similar occupations.

For the purpose of budget studies, many different methods of dividing the population are possible. For the sake of simplicity, however, the seven broad classifications given in Table X are employed in our budget computation. The primary adult classes—men and women between the ages of 15 and 64—require an apparel budget fitted to their workaday life. Men and women of 65 and over need the same type of wearing apparel, but are given a separate classification because their quantitative needs differ. Boys, girls, and babies have peculiar requirements of their own.

TABLE X

Breakdown of Population
(Basis of the Wearing-Apparel Budget)

Classification	Professional & White-Collar	Industrial	All Children	Total
Men (15–64)	10,000,000	31,000,000		41,000,000
Women (15–64)	16,000,000	24,500,000		40,500,000
Older men (over 65)	1,000,000	2,500,000		3,500,000
Older women (over 65)	1,500,000	2,000,000		3,500,000
Boys (5–14)			12,500,000	12,500,000
Girls (5–14)			12,500,000	12,500,000
Infants (under 5)			11,500,000	11,500,000
Total	28,500,000	60,000,000	36,500,000	125,000,000

The individual amounts of apparel listed—the fundamental basis of the budget—were derived mainly from the study by the Heller Committee for Research in Social Economics, University of California, which in 1927 compiled a budget of actual expenditures by the professional class of the San Francisco area. This has been supplemented by the 1927 budget studies of Typographical Union No. 6, covering skilled workers of the New York City area, which was based on a Department of Labor study.

An agreement by various expert observers supplied the additional data to round out the listings of apparel requirements. In the final analysis, the needs of the white-collar workers were founded upon a composite of the California "professional" and "clerk" requirements; while the needs of the industrial workers were based upon the mean of the California "worker" and the New York "skilled worker."

TABLE XI

Clothing Budget and Production

(Not Including Work or Baby Clothes)

Article[2]	Budget: Males (Total 57,000,000) — Professional and White-Collar, Age 15/65, 10,000[1]	Professional and White-Collar, Age 65/up, 1,000	Manual Labor, Age 15/65, 31,000	Manual Labor, Age 65/up, 2,500	All, Age 5/14, 12,500	Actual Production 1929: Total Production (in millions)	Production per Capita[3]
Suits	2	1	1	1	1	29.09	½
Overcoats and Topcoats	½	⅓	½	⅓	½	9.27	⅙
Extra Pants and Knickers	1½	½	½	½	1⅝	37.19	⅔
Hosiery (pairs)	13	11	15	9	10½	719.64	12⅙
Shirts	7	5	7	5	4¾	173.06	3
Underwear	5	4	7	4	4	286.35	5
Sleeping Apparel	2½	2	2½	2	2½	49.52	⅞
Shoes (pairs)	3	2	4	1½	4	180.70	3⅙
Hats	2½	1	2½	1	2	120.30	2 1/9
Sweaters	½	½	½	½	1	28.75	½
Females (Total 56,500,000)	16,000[1]	1,500	24,500	2,000	12,500		
Coats	1	½	½	½	½	23.04	2/5
Dresses and Frocks	6½	2½	5	2	3 3/10	206.46	3⅔
Suits (inc. Knit)	1	⅓	½	⅓	2/5	14.50	¼
Hosiery (pairs)	13	8	13	7	10 3/10	614.52	10⅞
Underwear	10	5	7	3	6½	258.95	4⅗
Brassieres	1½	1	1½	1	—	24.68	⅖
Corsets, Girdles	1½	1	2	½	—	28.69	½
Sleeping Apparel	3	2	3	2	2 1/7	20.03	⅓
Shoes (pairs)	4	2	3	1½	3 3/10	180.70	3⅕
Hats	3	1	3	1	2	133.21	2⅓
Sweaters	½	½	½	½	1 3/10	28.74	½

[1] 000 omitted.
[2] In pieces unless otherwise noted.
[3] Total population, less infants under five years, consisted of 113,500,000 individuals.

The findings given in Table XI are summarized in Table XII according to total male requirements and total female requirements in the various major items of the budget. A similar breakdown for 1929 production and capacity is given for purposes of comparison.

TABLE XII

Production, Capacity, Budget—of Garments by Sex
(000,000 Omitted)

Item	Sex	Total Budget Quantities and Value of Apparel (All Groups): Quantity	Total Budget: Retail Value (theoretical)	1929 Production: Quantity	1929 Production: Retail Value	Capacity: Quantity	Capacity: Retail Value[1] (theoretical)
Suits	M	67.00	$1,777.80	29.09	$768.98	84.20	$2,215.86
	F	34.41	881.72	14.50	281.18	38.11	732.09
Coats	M	27.91	682.96	9.27	229.02	26.60	657.03
	F	36.25	924.39	23.04	587.76	63.30	1,614.15
Hosiery (pair)	M	759.50	216.93	719.64[2]	200.25[2]	955.08	276.97
	F	681.50	554.05	614.52[3]	580.34[4]	1,069.20	1,052.78
Underwear	M	330.25	251.56	286.35	217.53	495.00	376.20
	F	427.00	461.16	258.95	278.58	510.88	551.75
Sleeping apparel and bathrobes	M	140.75	162.72	49.52[2]	58.76[2]	105.90	129.20
	F	155.25	356.43	20.03[3]	51.83[3]	40.06	103.35
Shoes (pair)	M	209.75	901.93	361.40	1,555.13	550.00	2,365.00
	F	184.75	793.35				
Hats	M	131.50	248.90	120.30	229.09	507.02	1,281.58
	F	150.00	463.51	133.21	411.70		
Sweaters	M	34.75	87.45	57.49	144.61	108.00	271.08
	F	38.25	95.60				
Shirts	M	363.87	636.13	173.06	303.36	424.00	742.00
Extra pants and knickers	M	68.06	250.34	37.19	132.42	106.80	380.58
Work clothes	M	196.33	269.39	172.91	254.00	345.82	508.00
Dresses and frocks	F	275.50	1,858.03	206.46	1,393.58	485.00	3,273.75
Brassieres	F	64.25	80.96	24.68	31.00	49.36	62.19
Corsets, girdles, etc.	F	75.50	240.94	28.69	91.54	57.38	183.04
Major items			$12,196.25		$7,800.66		$16,776.60
Total value, including miscellaneous clothing			$18,196.25		$9,732.81		$20,640.99

[1] All budget and capacity values based upon 1929 average retail garment prices.
[2] Includes all girls' garments in this classification of apparel, since figure for children could not be broken down by sex.

Total *individual* yearly expenditures per man, woman, older man, older woman, etc., according to the terms of the present budget, are shown in Table XIV. A theoretic average of the requirements for a family consisting of man, woman, boy, and girl is given at the foot of this table, according to total yearly expenditures of such an average group.

TABLE XIV

ANNUAL COST OF CLOTHING OF THE TWO GROUPS

Expenditure per Person and per Family According to Table XI

Group	Professional	Industrial
Man	$168.43	$150.94
Woman	216.59	174.24
Older man	101.28	98.55
Older woman	104.12	93.90
Boy	93.11	93.11
Girl	112.34	112.34
Baby	50.00	50.00
Family of four (man, woman, boy, girl)	$590.47	$530.63

TABLE XV

Textile Furnishings for 750,000 Six-Room Houses

Item	Rooms										Total per Dwelling-Unit (sq. ft.)	Total All Units (sq. yds.)
	Vestibule	Hall	Living Room	Kitchen	Dining Room	Upper Hall	Bed Room No. 1	Bed Room No. 2	Bed Room No. 3	Bath Room		
Rug (incl. rag rugs)	1 @ 3x5		1 @ 9x12 1 @ 3x5 1 @ 4x7		1 @ 9x12		1 @ 9x12 4x7	1 @ 8x10	1 @ 7x9		553	46,083,000
Runner		1 @ 3x12				2½x12					66	5,499,000
Portières		2 @ 7x3½	2 @ 7x4								105	8,749,000
Curtains			2 @ 6x4 2 @ 6x5	2 @ 6x3	1 @ 6x5		4 @ 3x5	2 @ 3x5	1 @ 3x5	1 @ 6x3	297	24,749,000
Tablecloths				4x4							16	1,333,000
Linoleum				12½x10½							131	10,917,000
Tapestry covers			3 @ 2x3				2 @ 1½x3	1 @ 1½x3	1 @ 1½x3		36	3,000,000
Turkish towels										8 @ 1½x3	36	3,000,000
Damask towels										8 @ 1½x3	36	3,000,000
Miscellaneous Items												
Blankets (double)							2 @ 7x8	2 @ 5x8	2 @ 5x8		544	45,333,000
Comfortables and quilts							1 @ 7x8	1 @ 5x8	1 @ 5x8		136	11,333,000
Bedspreads							1 @ 7x8	1 @ 5x8	1 @ 5x8		136	11,333,000
Sheets							4 @ 7x8	4 @ 5x8	4 @ 5x8		544	45,333,000
Pillowcases (double)							4 @ 1½x3	4 @ 1½x3	4 @ 1½x3		108	9,000,000
Huck towels (kitchen)				8 @ 2x3							48	4,000,000
Bath mat										1 @ 2x3	6	500,000
Tablecloths and napkins					4 @ 4½x4½ 12 @ 1¾x1¾						117	9,750,000
Miscellaneous												1,500,000
Total												244,412,000

Note: All measurements in feet.

Household Budget

This study is intended as a practical determination of the textile products necessary to furnish 800,000 proposed apartments and 750,000 six-room homes per year; also the replacements required for the nation's 29,000,000 occupied homes. These products are those generally listed as "house-furnishing goods."

To facilitate proper and detailed study, a floor plan was prepared of typical two-, three-, and four-room units in a thirty-two family apartment; also a plan of a six-room house suitable for a family of four or five persons.

Thus this budget provides complete house-furnishing equipment for 1,550,000 new homes, plus the replacement materials required for the gradual rejuvenation of 29,000,000 existing homes, after proper allowances for depreciation. Calculations are based on the assumption that the new homes be completely furnished in a manner suited to the families for which they are intended.

In order to be able to estimate the requirements of each of the 800,000 apartments and the 750,000 six-room individual houses, the equipment was assumed to be standardized. Each kitchen was provided with linoleum for the floor, cotton draperies for the windows, tablecloths, and the like. All windows are draped, the floors covered with suitable rugs or carpets, the halls with rugs or runners. Portières are hung between the kitchen and living room. The bath has a bath mat, and the beds have all necessary covering for summer and winter. (Obviously such uniformity or standardization would not be practiced under actual conditions and is useful mainly as an average for estimating total requirements.)

The method followed in constructing Tables XV and XVI is to estimate in square yards the total textile material required to furnish all new construction.

Table XVII is a summary of these estimates. Column 1 of Table XVII indicates reports from which the data were obtained; Column 2 the item; Columns 3 and 4 the material required for completely equipping all dwellings with house-furnishings. Column 5 gives a figure representing the year-serviceability, establishing the depreciation factor that was assumed in computing the replacement material requirements in Column 6 for present occupied homes. Column 7 gives the total budget.

The 1929 capacity and production, and the corresponding ratios of production and capacity to budget material requirements are shown in Columns 8, 9, 10, and 11. The total also presents the various items in related groups, which facilitates the determination of ratios between production, capacity, and material, as is illustrated in the following table:

Group	Ratios P/BM*	Ratios C/BM*
Rugs, carpets, etc.	.80	1.12
Bed coverings	.53	1.20
Sheets, pillowcases, etc.	.47	1.08
Draperies	.84	1.92
Table covers	.69	1.34
Towels, cloths, etc.	.64	1.46

* P, production; BM, budgeted materials; C, capacity.

It appears from this study that the available cotton goods is sufficient for the budget requirements if allowance is made for the unused capacity. Such articles as sheets and pillowcases exceed production by, respectively, two and six times the budget provision. However, these items as given in the Census of Manufactures are rather difficult to interpret in terms of definite articles since the word "sheeting" therein used covers many grades of cotton goods which are not the commonly understood household "sheetings." Likewise pillowcases are generally made from "pillow-tubing," though they may be made from sheeting.

The production of tablecloths, napkins and towels is not adequate to the budget requirements. Where these shortages exist for the full equipment of the new apartment or home, the assumption is entertained that the occupying families will have enough such items in reserve to serve them until new material is available.

TABLE XVI

Textile Furnishings—800,000 Apartment Dwelling Units

One floor, containing 8 apartments.

		Living room and hall	Kitchen and dining alcove	Bed room No. 1	Bed room No. 2	Bath Room		Living room and hall	Kitchen and dining alcove	Bed room No. 1	Bath room	Material required for each floor sq. ft.	Total material required for 800,000 apartments sq. yds.
Rugs	A D G H	8x10 8x10 8x10 9x12		7x7 6x8 6x8 6x8	6x8 7x9 7x9 7x9		B C E F	7x9 9x12 8x10 8x10		7x7 8x10 7x9 7x9		1364.	15,155,000
Runners........	A D G H	2½x4–2½x6 2½x4–2½x10 2½x10–2½x9 2 @ 2½x12					B C E F	2½x4–2½x6 2 @ 2½x6 2½x9 2½x9				267.	2,966,000
Portières........	A D G H	2 @ 7x4 2 @ 7x4 7x6–7x4 7x6–7x4					B C E F	2 @ 7x4 7x4–7x6 7x4 7x4				434.	4,822,000
Linoleum........	A D G H		8 x10 9½x9 12½x9 13½x9				B C E F		6x8 7x10			517.	5,750,000
Curtains...........		8 @ 6x5	4 @ 5x3	5 @5x3	7 @ 5x3	4 @ 5x3		8 @ 6x5	2 @ 5x3	8 @ 5x3	4 @ 4x3	978.	10,866,000
Tablecloths.........			4 @ 4x5						4 @ 4x5			160.	1,777,000
Tapestry covers.....		4 @ 1½x3						4 @ 1½x3				36.	400,000
Dresser covers.......				8 @ 1½x3	7 @ 1½x3					8 @ 1½x3		103.	1,149,000
Bath mats..........						4 @ 2x3					4 @ 2x3	48.	533,000
Tablecloths and napkins...........		8 sets—3 @ 4½x4½ and 12 @ 1¾x1¾										780.	8,667,000 8,667,000

Miscellaneous textile furnishings	All apartments		
Blankets (double)................	16 @ 7x8 plus 8 @ 5x8	2432.	27,022,000
Comfortables, quilts..............	8 @ 7x8 plus 4 @ 5x8	608.	6,755,000
Bedspreads......................	8 @ 7x8 plus 4 @ 5x8	608.	6,755,000
Sheets..........................	32 @ 7x8 plus 16 @ 5x8	2432.	27,022,000
Pillowcases (as double)...........	40 @ 1½x3	180.	4,000,000
Turkish towels..................	48 @ 1½x3	216.	2,400,000
Damask towels..................	48 @ 1½x3	216.	2,400,000
Huck towels....................	48 @ 1½x3	216.	2,400,000
Miscellaneous..................			1,600,000

Budgeted Quantities of all House Furnishings

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Report No.	Item	800,000 Apartments sq. yds.	750,000 6-rm. Houses sq. yds.	Replacement Goods for 29,000,000 Existing Homes sq. yds.	Years of Service	'BM' Total Budgeted Material sq. yds.	'P' 1929 Production sq. yds.	'P/BM' Ratio Per Cent	'C' 1929 Capacity sq. yds.	'C/BM' Ratio Per Cent
323	Carpets and rugs	15,854,000	45,390,000	125,368,000	10–15	186,612,000	73,410,000		168,758,000	
778	Rag rugs	2,162,000	6,190,000	48,647,000	5	56,999,000	10,211,000		20,422,000	
771	Linoleum	5,750,000	10,932,000	67,645,000	5–10	84,327,000	180,413,000		180,413,000	
611	Bath mats	533,000	500,000	6,458,000	3	7,491,000	4,032,000		9,159,000	
	Total floor coverings	24,299,000	63,012,000	248,118,000		335,429,000	268,066,000	80.	378,752,000	112.
806	Wool blankets	8,917,000	14,959,000	57,850,000	10	81,726,000	46,159,000		126,810,000	
611	Cotton blankets	18,105,000	30,372,000	234,882,000	5	283,359,000	94,061,000		213,775,000	
775	Quilts and comfortables	6,755,000	11,332,000	87,626,000	5	105,713,000	76,800,000		153,600,000	
611, 775	Bedspreads	6,755,000	11,332,000	43,813,000	10	61,900,000	66,464,000		147,355,000	
	Total bed coverings	40,532,000	67,995,000	424,171,000		532,698,000	283,484,000	53.	641,540,000	120.
611	Sheets	27,022,000	45,331,000	584,304,000	3	656,657,000	338,634,000		769,622,000	
611	Pillowcases	4,000,000	9,000,000	116,010,000	3	129,010,000	21,264,000		48,327,000	
	Total bed linen	31,022,000	54,331,000	700,314,000		785,667,000	359,898,000	47.	817,949,000	108.
806, 775	Draperies	3,639,000	8,749,000	33,836,000	10	46,224,000	68,065,000		160,277,000	
750, 611	Lace, plain curtains	12,182,000	24,749,000	319,028,000	3	355,959,000	270,381,000		612,294,000	
	Total draperies	15,821,000	33,498,000	352,864,000		402,183,000	338,446,000	84.	772,571,000	192.
611	Tapestry covers	836,000	2,340,000	30,153,000	3	33,329,000	9,810,000		22,325,000	
270, 775	Table covers[1]	712,000	1,993,000	25,686,000	3	28,391,000	97,596,000		173,308,000	
611	Tablecloths and napkins	8,543,000	9,750,000	125,678,000	3	143,971,000	35,868,000		81,518,000	
	Total table covers	10,091,000	14,083,000	181,517,000		205,691,000	143,274,000	69.	277,151,000	134.
611	Turkish towels	2,400,000	3,000,000	58,005,000	2	63,405,000	82,415,000		187,306,000	
611	Plain damask towels	4,800,000	7,000,000	193,350,000	1–3	205,150,000	75,207,000		170,925,000	
	Miscellaneous	1,600,000	1,500,000	58,005,000		61,105,000	54,484,000		123,820,000	
	Total towels, etc.	8,800,000	11,500,000	309,360,000		329,660,000	212,106,000	64.	482,051,000	146.

[1]Includes table oilcloth, Rep. 270.

Percentage of Retail Price to Manufacturers' Value

The wide range of prices, as well as the variety of items, listed in Column 6, Table I, made impossible a single factor to correlate retail prices and manufacturers' prices. Therefore it became necessary to consult many different sources. Those most generally referred to were the Census of Manufactures and the Census of Distribution, both made by the Bureau of the Census, Department of Commerce. *The Progressive Grocer*, the official organ of the Retail Grocers' Association of the United States, was also referred to extensively.

In arriving at the percentage of retail markup for foodstuffs and similar consumer goods, manufacturers' prices for certain quantities of an item were taken from the Census of Manufactures and compared to the same quantities sold at retail as reported in the Census of Distribution. The ratio thus obtained was then applied to the entire production of the item in question. (To the resulting total of all consumer commodities was added the value of the food consumed on farms, which was figured at wholesale prices.)

The production values of automobiles and equipment given in the Census ot Manufactures, and the retail values given in "Facts and Figures of the Automobile Industry" for 1930, published by the National Automobile Chamber of Commerce, gave us the factor by which the retail markup of these items was calculated.

A similar procedure was used through the various classes of consumer goods such as wearing apparel, housing, personal, recreation, and health. Services, such as telegraph and telephone, domestic help, etc., are given in the Census at retail prices and there is consequently no markup.

TABLE XVIII

Ratio of Retail Markup to Manufacturer's Price

Foodstuffs

	Ratio		Ratio
Meats	1.91	Ice Cream	2.76
Lard	1.91	Beverages	1.25
Poultry and wild game	1.91	Eggs	2.72
Fish, fresh	1.91	Sugar	3.10
Fish, canned	1.91	Confectionery	1.25
Fruits	3.10	Coffee, tea, and spice	3.06
Nuts	3.10	Fats, incl. oleomargarine	1.25
Vegetables	3.10	Miscellaneous foods	1.50
Flour	1.66		
Breakfast food	1.66		
Bread	2.50		
Biscuits	2.50		
Cake, etc.	2.50		
Milk	2.76		
Butter	1.25		
Cheese	1.25		
Miscellaneous milk products	1.25		

Wearing Apparel

Men's Wear		Women's Wear	
Suits	1.59	Coats	1.60
Coats and topcoats	1.59	Dresses and frocks	1.58
Pants and knickers	1.59	Suits	1.57
Hosiery	1.56	Hosiery	1.64
Shirts	1.58	Underwear	1.56

TABLE XVIII (*Continued*)

RATIO OF RETAIL MARKUP TO MANUFACTURERS' PRICE

	Ratio		Ratio
Underwear	1.56	Brassieres, corsets, and sleeping apparel	1.60
Sleeping robes, etc.	1.59		
All shoes	1.61	Miscellaneous, incl. shoe repairs, etc.	1.60
All hats	1.75		
All sweaters	1.62		
All work clothes	1.59		
Housing			
Heating equipment	1.72	Bed and living room furniture	1.96
Lighting equipment	1.72	Natural gas	8.00
Outdoor equipment	1.72	Artificial gas	4.00
Misc. equipment and tools	1.96	Fuel oil, kerosene, and lubricants	1.60
Cooking equipment	1.96	Anthracite coal	2.87
Utensils	1.72	Bituminous coal	5.05
Accessories, kitchen	1.72	Coke and firewood	3.00
Laundry equipment	1.72	Ice	1.10
Transportation			
Motor gasoline	1.14	Horses, bicycles and motorcycles	1.50
Automobiles	1.33		
Personal			
Tobacco and accessories	1.85	Perfumes, etc.	1.51
Writing materials	1.71	Clocks, watches, etc.	1.74
Toilet accessories	1.51	Soap	1.51
Notions	1.65	Personal supplies	1.50
Recreation			
Radios	1.65	Books, sporting goods, etc.	1.50
Music and instruments	1.65		
Health			
Drugs, preparations	1.51	Miscellaneous supplies	1.54

TABLE XIX

IMPORTS OF CONSUMER GOODS, 1929

(Not included until Column 6)

Item	Value Wholesale	Value Retail[1]
Meat products	$ 61,732,000	
Fish	39,772,000	
Furs	108,049,000	
Drugs	10,581,000	
Dyeing and tanning materials	8,109,000	
Laces, etc.	11,723,000	
Wool wearing apparel	19,975,000	
Wool manufactures	64,869,000	
Precious stones, pearls, etc.	79,650,000	
Automobiles	5,151,000	
Pigments, paints, varnishes	3,823,000	
Photographic goods	7,359,000	
Scientific and professional instruments	4,074,000	
Clocks, watches, etc.	16,922,000	
Miscellaneous	81,122,000	
	$522,911,000	$814,172,000

[1] Average retail markup, 55.7 per cent.

TABLE XX

EXPORTS OF CONSUMER GOODS, 1929

(Not deducted until Column 6)

Item	Value Wholesale	Value Retail[1]
Cotton manufactures	$ 135,100,000	
Automobiles, parts, etc.	539,300,000	
Photographic and projection apparatus	31,600,000	
Books and printed matter	27,100,000	
Silk manufactures	20,400,000	
Tobacco manufactures	19,500,000	
Automobile tires	33,500,000	
Pigments, paints, varnishes	29,100,000	
Iron and steel manufactures	87,000,000	
Naval stores, gums and resins, etc.	31,000,000	
Animal oils and fats	117,700,000	
Hides and skins (raw)	117,500,000	
Animal products (inedible)	7,900,000	
Miscellaneous textile products	24,100,000	
Non-metallic minerals	41,800,000	
Total	$1,262,600,000	$1,948,301,000
Exports (not included in Table I)	$1,948,301,000	
Imports (not included in Table I)	814,172,000	(See Table XIX)
Balance, exports over imports	$1,134,129,000	

[1] Average retail markup, 54 per cent.

TABLE XXI

Reports and Their Sources

Report No.	
8	Bureau of Mines.
	Statistical Bulletin, American Petroleum Institute.
10	"Petroleum Refineries in the United States," Bureau of Mines, Department of Commerce.
	Statistical Bulletin, American Petroleum Institute.
	"Survey of Current Business," Department of Commerce.
11	"Petroleum Refineries in the United States," Bureau of Mines, Department of Commerce.
12	Bureau of Mines, Department of Commerce.
	Statistical Bulletin, American Petroleum Institute.
	"Survey of Current Business," Department of Commerce.
15	"Natural Gas," Bureau of Mines, Department of Commerce.
20	Bureau of Agricultural Economics, Department of Agriculture.
	Census of Manufactures, Bureau of the Census.
22	*Statistical Bulletin*, Bureau of Mines, Department of Commerce.
	Census of Manufactures, Bureau of the Census.
	"Trend of Employment," Department of Labor.
23	"Survey of Current Business," *Business Week*, McGraw-Hill Publishing Co., Inc.
	Glass Containers' Association.
31	Census of Manufactures, Bureau of the Census.
	Federated Textiles Industries.
33	American Bottlers of Carbonated Beverages.
	Census of Manufactures, Bureau of the Census.
34	"Mineral Resources," Bureau of Mines, Department of Commerce.
38	Census of Manufactures, Bureau of the Census.
43	Bureau of Mines, Department of Commerce.
44	"Mineral Resources," Bureau of Mines, Department of Commerce.
45	National Canners' Association.
	Canning Machinery and Supplies Association.
	Census of Manufactures, Bureau of the Census.
47	National Canners' Association.
	Census of Manufactures, Bureau of the Census.
	Department of Labor.
53	Census of Manufactures, Bureau of the Census.
63	"Mineral Resources," Bureau of Mines, Department of Commerce.
65	"Mineral Resources," Bureau of Mines, Department of Commerce.
66	"Mineral Resources," Bureau of Mines, Department of Commerce.
68	"Mineral Resources," Bureau of Mines, Department of Commerce.
	Minerals Yearbook, American Bureau of Metal Statistics.
69	"Mineral Resources," Bureau of Mines, Department of Commerce.
83	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	"15th Census of Agriculture," Bureau of the Census.
85	"15th Census of Agriculture," Bureau of the Census.
87	*General Crop Report*, Dec., 1933, Department of Agriculture.
	"15th Census of Agriculture," Bureau of the Census.
102	"15th Census of Agriculture," Bureau of the Census.
105	"15th Census of Agriculture," Bureau of the Census.
	Yearbook of Agriculture, 1933, Department of Agriculture.
108	Institute of Leather, Cloth, and Lacquered Fabrics Manufacturers.
109	American Bureau of Metal Statistics.
110	American Bureau of Metal Statistics.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
116	Bureau of Mines, Department of Commerce.
117	American Bureau of Metal Statistics.
118	Bureau of Mines, Department of Commerce.
119	Census of Manufactures, Bureau of the Census.
120	"Mineral Resources," Bureau of Mines, Department of Commerce.
	Mineral Yearbook, American Bureau of Metal Statistics.
127	Bureau of Mines, Department of Commerce.
129	American Bureau of Metal Statistics.
131	American Iron and Steel Institute.
132	American Iron and Steel Institute.
143	"Paper Authority Report," National Recovery Administration.
144	Department of Agriculture.
148	*Yearbook of Agriculture*, 1933, Department of Agriculture.
150	*Yearbook of Agriculture*, 1932, Department of Agriculture.
	Census of Agriculture, 1929, Bureau of the Census.
153	Census of Agriculture, 1929, Bureau of the Census.
160	Census of Manufactures, 1929, Bureau of the Census.
162	Bureau of Mines, Department of Commerce.
163	Census of Manufactures, 1929, Bureau of the Census.
165	*Spice Mill*, Spice Mill Publishing Company, Inc.
	Census of Manufactures, 1929, Bureau of the Census.
	National Coffee Roasters Association.
	Tea Association of the U. S. A.
	Jabez Burns & Sons.
170	Census of Manufactures, 1929, Bureau of the Census.
	Bureau of Agricultural Economics, Department of Agriculture.
	Internal Revenue Bureau, Treasury Department.
171	Census of Manufactures, 1929, Bureau of the Census.
	Bureau of Agricultural Economics, Department of Agriculture.
172	*Chemical and Metallurgical Engineering*, McGraw-Hill Publishing Co., Inc.
	Census of Manufactures, 1929, Bureau of the Census.
179	National Automobile Chamber of Commerce.
	Annual Report, 1929, Dominion Bureau of Statistics, Canada.
181	"Statistical Abstracts," 1931, 1932, 1933, Department of Commerce.
187	Census of Manufactures, 1929, Bureau of the Census.
196	*Yearbook of Agriculture*, 1932, Department of Agriculture.
232	*Yearbook of Agriculture*, 1932, Department of Agriculture.
282	Census of Manufactures, 1929, Bureau of the Census.
283	American Bureau of Metal Statistics.
285	American Bureau of Metal Statistics.
303	Census of Manufactures, 1929, Bureau of the Census.
306	Census of Manufactures, 1929, Bureau of the Census.
	Colgate-Palmolive-Peet Company.
315	National Lead Company.
	Bureau of Agricultural Economics, Department of Agriculture.
	Census of Manufactures, 1929, Bureau of the Census.
316	Bureau of Agricultural Economics, Department of Agriculture.
	Census of Manufactures, 1929, Bureau of the Census.
317	*Chemical and Metallurgical Engineering*, McGraw-Hill Publishing Company, Inc.
	National Lead Company.
	Census of Manufactures, 1929, Bureau of the Census.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
319	Census of Manufactures, 1929, Bureau of the Census.
	Bureau of Agricultural Economics, Department of Agriculture.
324	Census of Manufactures, 1929, Bureau of the Census.
	Sweet-Orr Co.
325	*Naval Stores Yearbook*, 1932.
	Hercules Powder Company.
	Census of Manufactures, 1929, Bureau of the Census.
326	F. W. Dodge Corporation.
	Bureau of Labor Statistics, Department of Labor.
	Engineering News-Record, McGraw-Hill Publishing Company, Inc.
	Commercial and Financial Chronicle, William B. Dana Publishing Company.
	Interstate Commerce Commission Reports.
	Bureau of Labor Statistics, Department of Labor.
	F. W. Dodge Corporation.
328	Tariff Readjustment Hearings, 1929, Government Printing Office.
	Census of Manufactures, 1929, Bureau of the Census.
350	Edison Electric Institute.
	Census of Electric Industries, 1929, Department of Commerce.
361	*Motion Picture Almanac*, Quigley Publishing Company.
	Motion Picture Producers and Distributors of America.
392	Census of Manufactures, 1929, Bureau of the Census.
394	Census of Manufactures, 1929, Bureau of the Census.
395	Census of Manufactures, 1929, Bureau of the Census.
396	Census of Manufactures, 1929, Bureau of the Census.
397	Census of Manufactures, 1929, Bureau of the Census.
399	Census of Manufactures, 1929, Bureau of the Census.
410	Census of Manufactures, 1929, Bureau of the Census.
411	Census of Manufactures, 1929, Bureau of the Census.
412	Census of Manufactures, 1929, Bureau of the Census.
413	Census of Manufactures, 1929, Bureau of the Census.
414	Census of Manufactures, 1929, Bureau of the Census.
415	Census of Manufactures, 1929, Bureau of the Census.
417	Bureau of Mines, Department of Commerce.
419	Bureau of Mines, Department of Commerce.
422	Census of Manufactures, 1929, Bureau of the Census.
423	Census of Manufactures, 1929, Bureau of the Census.
427	Census of Manufactures, 1929, Bureau of the Census.
432	Census of Manufactures, 1929, Bureau of the Census.
433	Census of Manufactures, 1929, Bureau of the Census.
435	Census of Manufactures, 1929, Bureau of the Census.
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439	Census of Manufactures, 1929, Bureau of the Census.
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450	Census of Manufactures, 1929, Bureau of the Census.
490	Census of Manufactures, 1929, Bureau of the Census.
491	Census of Manufactures, 1929, Bureau of the Census.
492	Census of Manufactures, 1929, Bureau of the Census.
497	*Electrical World*, McGraw-Hill Publishing Company, Inc.
	Edison Electric Institute.
504	*Food Industries*, McGraw-Hill Publishing Company, Inc.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
509	Census of Manufactures, 1929, Bureau of the Census.
511	Census of Manufactures, 1929, Bureau of the Census.
514	Circular No. 296, Department of Agriculture.
543	Forest Service, Department of Agriculture.
	Tariff Readjustment Hearings, 1929, Government Printing Office.
	Census of Manufactures, 1929, Bureau of the Census.
553	American Bureau of Metal Statistics.
	American Iron and Steel Institute.
	"Metal Statistics," American Metal Market Company.
	"Statistical Abstract," 1933, Department of Commerce.
	Bureau of Mines, Department of Commerce.
554	Census of Manufactures, 1929, Bureau of the Census.
555	Census of Manufactures, 1929, Bureau of the Census.
556	Census of Manufactures, 1929, Bureau of the Census.
557	Census of Manufactures, 1929, Bureau of the Census.
566	Bureau of Labor.
	Census of Manufactures, 1929, Bureau of the Census.
568	Census of Manufactures, 1929, Bureau of the Census.
569	Census of Manufactures, 1929, Bureau of the Census.
570	Census of Manufactures, 1929, Bureau of the Census.
	Tariff Readjustment Hearings, 1929, Government Printing Office.
571	Circular No. 296, Department of Agriculture.
572	Census of Manufactures, 1929, Bureau of the Census.
	Commerce Yearbook, 1932, Department of Commerce.
	Bureau of Animal Industry, Department of Agriculture.
574	"Handbook of Dairy Statistics," 1933, Department of Agriculture.
575	*Commerce Yearbook*, 1929, Department of Commerce.
576	Circular No. 296, Department of Agriculture.
580	*Yearbook of Agriculture*, 1931, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
	Census of Manufactures, 1929, Bureau of the Census.
582	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	Circular 296, Department of Agriculture.
	"Milk Production in the United States," 1933, Department of Agriculture.
585	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	Circular 296, Department of Agriculture.
	"Milk Production in the United States," 1933, Department of Agriculture.
586	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	Circular 296, Department of Agriculture.
587	"Statistical Abstract," 1933, Department of Commerce.
	Yearbook of Agriculture, 1933, Department of Agriculture.
	"15th Census of Agriculture," Bureau of the Census.
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591	Senate Document 12, Government Printing Office.
	Report 590, Forest Service, Department of Agriculture.
594	Business Research Division of the Tubize Chatillon Corporation.
	Census of Manufactures, 1929, Bureau of the Census.
595	Federated Textile Industries.
	Census of Manufactures, 1929, Bureau of the Census.
596	Bureau of Fisheries, Department of the Interior.
	"Statistical Abstract," 1933, Department of Commerce.
597	*Yearbook of Agriculture*, 1933, Department of Agriculture.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
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599	*Commerce Yearbook*, 1932, Department of Commerce.
602	*Commerce Yearbook*, 1932, Department of Commerce.
	"Natural Gas," 1929, Bureau of Mines, Department of Commerce.
	"Natural Gasoline," 1929, Bureau of Mines, Department of Commerce.
603	*Yearbook of Agriculture*, 1931–1932, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
	"Statistical Abstract," 1933, Department of Commerce.
608	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	"Statistical Abstract," 1933, Department of Commerce.
613	Census of Manufactures, 1929, Bureau of the Census.
	"Handbook of Dairy Statistics," November, 1933, Department of Agriculture.
614	Bureau of Labor Statistics, Department of Labor.
	Census of Manufactures, Bureau of the Census.
	Fred H. Colvin, Editor, *American Machinist*, McGraw-Hill Publishing Company, Inc.
	Ralph E. Flanders, Jones & Lamson Machine Co.
620	15th Census of Agriculture, Bureau of the Census.
	Yearbook of Agriculture, 1933, Department of Agriculture.
	"Statistical Abstract," 1933, Department of Commerce.
621	*Commerce Yearbook*, 1933, Department of Commerce.
	"Facts and Figures," American Petroleum Institute.
622	Census of Manufactures, 1929, Bureau of the Census.
624	Census of Manufactures, 1929, Bureau of the Census.
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629	Census of Manufactures, 1929, Bureau of the Census.
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631	Census of Manufactures, 1929, Bureau of the Census.
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649	Census of Manufactures, 1929, Bureau of the Census.
650	Census of Manufactures, 1929, Bureau of the Census.
651	Census of Manufactures, 1929, Bureau of the Census.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
652	Census of Manufactures, 1929, Bureau of the Census.
653	Census of Manufactures, 1929, Bureau of the Census.
654	Census of Manufactures, 1929, Bureau of the Census.
655	Census of Manufactures, 1929, Bureau of the Census.
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	"Statistical Abstract," 1933, Department of Commerce.
	Census of Manufactures, 1929, Bureau of the Census.
	Rice Millers' Association.
	Northwestern Miller, Miller Publishing Company.
	Bureau of Agricultural Economics, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
	"Survey of Current Business," Department of Commerce.
	American Institute of Food Distribution.
705	*Yearbook of Agriculture*, 1933, Department of Agriculture.
	"Feeds and Feeding," Henry and Morrison, Henry, Morrison Co.
715	Census of Manufactures, 1929, Bureau of the Census.
716	Census of Manufactures, 1929, Bureau of the Census.
717	Census of Manufactures, 1929, Bureau of the Census.
718	Census of Manufactures, 1929, Bureau of the Census.
719	Census of Manufactures, 1929, Bureau of the Census.
720	Census of Manufactures, 1929, Bureau of the Census.

TABLE XXI (*Continued*)

REPORTS AND THEIR SOURCES

Report No.	
721	Census of Manufactures, 1929, Bureau of the Census.
723	Census of Manufactures, 1929, Bureau of the Census.
726	Census of Manufactures, 1929, Bureau of the Census.
727	Conservation Commissions of various states.
729	Census of Manufactures, 1929, Bureau of the Census.
731	Tariff Readjustment Hearings, 1929, Government Printing Office.
	Census of Manufactures, 1929, Bureau of the Census.
732	Census of Manufactures, 1929, Bureau of the Census.
741	Census of Manufactures, 1929, Bureau of the Census.
744	Census of Manufactures, 1929, Bureau of the Census.
745	Census of Manufactures, 1929, Bureau of the Census.
747	Census of Manufactures, 1929, Bureau of the Census.
750	Census of Manufactures, 1929, Bureau of the Census.
752	Census of Manufactures, 1929, Bureau of the Census.
753	Census of Manufactures, 1929, Bureau of the Census.
764	"Statistical Abstract," 1933, Department of Commerce.
	Yearbook of Agriculture, 1933, Department of Agriculture.
	"Fats and Oils," Department of Agriculture.
766	Census of Manufactures, 1929, Bureau of the Census.
769	"Fats and Oils," Department of Agriculture.
	"Statistical Abstract," 1933, Department of Commerce.
770	Census of Manufactures, 1929, Bureau of the Census.
777	Census of Manufactures, 1929, Bureau of the Census.
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780	Census of Manufactures, 1929, Bureau of the Census.
782	Census of Manufactures, 1929, Bureau of the Census.
814	Census of Manufactures, 1929, Bureau of the Census.
817	American Iron & Steel Institute.
818	Census of Manufactures, 1929, Bureau of the Census.
832	Census of Manufactures, 1929, Bureau of the Census.

TABLE XXII

Capacity Definitions

With the exception of agricultural raw materials (livestock, cotton lint, vegetables, etc.), the capacity figures which appear in Columns 1 to 6, Table I, are based upon the use of existing equipment (usually 1929) operated at the efficiency attained in 1929. Where seasonability or raw material supply is a limiting *physical* factor, it is accepted as such, but neither "custom" nor "demand" as affected by purchasing power nor tradition are so considered. Thus, all rated capacities are practical and involve no additions to plant or equipment. The bases for determining these capacities are charted below.

Product of Industry	Capacity Operating Schedule: Hours per Week	Capacity Operating Schedule: Daily Shifts	Capacity Operating Schedule: Work Year (Days or Weeks)	Capacity Determinants	Work-Sheet No.	Sources
Ship and boat building	40–50	1	52	Estimate based upon actual production in 1919. Practical Capacity is very flexible as few concerns have a "constant" plant. Most firms can expand "keel capacity" by rentals or contracts to meet demand. The large number of "buzz-saw and planer" builders makes close estimate of actual capacity very difficult.	1	*Marine Engineering & Shipping Age*, Simmons-Boardman Company. National Association of Engine and Boat Manufacturers. Census of Manufactures, Bureau of Census.
Boots and shoes, leather	49.2	1	240	Best month's production in year multiplied by 12. Leather supply is limiting factor.	2	National Boot and Shoe Association. J. F. McElwain Co. Census of Manufactures, Bureau of the Census.
Furniture	54	2–3		Study of shifts, hours worked and number of employees in 2500 establishments.	3	Census of Manufactures, Bureau of the Census. *Furniture Index*, Furniture Index, Inc.
Glass containers	168	3–4	40	Glass tank furnace area available for melting; production rate 1 ton per 9 sq. ft. per 24 hours.	5	Tariff Commission. Census of Manufactures, Bureau of the Census.
Glass, window	168	3	300	Average speed for drawing (28 inches per minute) times the number of machines.	5	Window Glass Manufacturers Association Glass Containers Association. "Survey of Current Business," Department of Commerce.
Boots and shoes, rubber				Best month's production (1929) multiplied by 12. Information supplied by U. S. Rubber Company.	6	Rubber Manufacturers Association of America. War Department Survey. Census of Manufactures, Bureau of the Census.
Tire casing and tubes, automobile	80	2	50	Confidential report from the industry.	6A	Same as 6.
Leather, tanning and hides	47.6	1–2		Report by the industry. Production now limited by raw material (hides).	7	The Tanners Council. Bureau of the Census.
Cement	168	3	365	Practical capacity calculated from the average daily output of "clinker" (underground) cement over a period of 2 or	8	Bureau of Mines, Department of Commerce. Cement Association.

				3 months continuous operation by each plant. Operating schedule is for kilns only—grinding capacity under continuous operation exceeds kiln capacity.		Cement Institute.
Typewriters and parts	36	1		Actual 1929 production taken as capacity. A supply of parts can be expanded to meet any demand, but assembly of new machines demands skill requiring 2½ to 3 years training.	10	Typewriter Institute. Census of Manufactures, Bureau of the Census.
Power laundries, dyers and cleaners	46	1	51–52	Comparison of actual time worked with full time.	11	Bureau of Census, *Laundry Age* magazine, *National Cleaner and Dyer* magazine, National Association of Dyers and Cleaners.
Artificial leather	48	3	312	Capacity is based on a maximum quantity of 1.27 to 1.30 sateen, coated to finished weight of 17.5 ounces per linear yard in a 24-hour working day.	13	Institute of Leather, Cloth, and Lacquers Fabrics Manufactures. Census of Manufactures, Bureau of the Census.
Bakery products (biscuits, crackers, etc)	48	1	52	Total square feet of oven surface multiplied by production per square foot.	14	Census of Manufactures, Bureau of the Census. *Bakers Weekly.*
Bakery products (spaghetti, noodles)	48	1	52	Capacity of drying rooms, with allowance for time idle in 1929.	14	National Macaroni Manufactures Association. *Food Industries*, McGraw-Hill Publishing Company.
Pulp (wood and other fibers)	48	3		Estimate by American Paper and Pulp Association.	17	American Pulp and Paper Association.
Paper	48	3		Capacity figures taken from Paper Authority Report.	17A	Paper Authority Report.
Paper (all grades)	48+	3		Report by Paper Authority, based on average hourly output of machine equipment adjusted to full yearly operation.	17G	Paper Authority Report.
Crude oil (refining)				Capacity estimates for the industry supplied by the American Petroleum Institute and the U. S. Bureau of Mines.		"Coke," 1933, Bureau of Mines, Department of Commerce. "Statistical Abstracts," 1933, Department of Commerce. "Fuel Briquettes," 1932, Bureau of Mines, Department of Commerce. "Pennsylvania Anthracite Coal Tables," Bureau of Mines, Department of Commerce. "Bituminous Coal Statistics," Bureau of Mines, Department of Commerce. *Commerce Year Book*, 1931, Department of Commerce. Census of Manufactures, Bureau of the Census. Bulletin 11, American Gas Association. Technical Association of the Pulp and Paper Industry. News-Print Service Bureau.
Motor gasoline, natural gasoline, gas and fuel oil, kerosene and lubricants				Capacity figures for these by-products are expressed as (fixed) percentages of crude oil capacity given above.	18	
Bituminous coal	48	1	308	"With existing labor force, assuming 308 working days a year." From "Salient Statistics of the Bituminous Coal Industry, 1913, 1923 and 1929–32," Bureau of Mines, Department of Commerce.	18H	
Anthracite coal	48	1	306	Capacity estimates taken directly from "Pennsylvania Anthracite Coal Tables," Bureau of Mines, Department of Commerce.	18G	
Coke	168	3	310	Capacity estimates from "Coke and By-products," 1932–33, Bureau of Mines, Department of Commerce.	18E	
Manufactured gas	168	3	310	Capacity estimates by Statistical Department, American Gas Association.	18E	

TABLE XXII (*Continued*)

CAPACITY DEFINITIONS

Product of Industry	Capacity Operating Schedule: Hours per Week	Capacity Operating Schedule: Daily Shifts	Capacity Operating Schedule: Work Year (Days or Weeks)	Capacity Determinants	Work-Sheet No.	Sources
Automobiles and trucks	48–54	1		Confidential report from the industry based on a complete survey. This report states two-shift operation would double 1929 output.	19	Annual Report, 1930, Dominion Bureau of Statistics. United States Chamber of Commerce. Census of Manufactures, Bureau of the Census.
Beverages (carbonated, cereal, still, etc.)	48–54	1	45	Capacity for cereal and carbonated products is an estimate by the industry for 1929. Capacity for distilled spirits is taken as equaling the capacity in 1929 as estimated by the industry. Capacity for wines is based on the highest reported storage space. Repeal of prohibition has made accurate estimates of capacities impossible.	23	Census of Manufactures, Bureau of the Census. American Bottlers of Carbonated Beverages.
Canning and preserving	48–60	1		The peak production year for individual products during last decade (1923–33) were totaled. (Seasonality and weather are the limiting factors.)	26	Census of Manufactures, Bureau of the Census. National Canners Association. Canning Machinery and Supplies Association.
Confectionery and chewing gum	48–54	1		1929 production with allowance for idle time.	27	Census of Manufactures, Bureau of the Census. National Confectioners Association.
Building roofing				Capacity considered dependent on effective demand. Raw material supplies unlimited.	30	"Statistical Abstract," 1929, Department of Commerce. Census of Manufactures, Bureau of the Census.
Paving materials				Same as building roofing.	31	Census of Manufactures, Bureau of the Census.
Copper (smelting and refining)	168	3		1929 electrical and fire refineries, continuous operation.	32	American Bureau of Metal Statistics. Census of Manufactures, Bureau of the Census. United States Copper Association.
Lead (smelting and refining)	8	1	310	Practical capacity for primary lead only (supply of secondary dependent on price and production of primary).	34	Census of Manufactures, Bureau of the Census. American Iron & Steel Institute. Bureau of Mines. *Commerce Yearbook*, Department of Commerce.
Artificial ice	96	2	50–52	Rated capacity of installed refrigerating machines to manufacture artificial ice.	35	Census of Manufactures, Bureau of the Census, Milling Report. *Food Industries*, McGraw-Hill Publishing Company.

Grain-mill products (flour)	168	3		Milling capacity of installed equipment (1929 production exceeds budget).	36	Census of Manufactures, Bureau of the Census. *Commerce Yearbook*, Department of Commerce, Survey of Current Business.
Leather trunks, suitcases, and bags		1		Actual production 1929 taken as capacity. The industry is open to expansion if raw material (leather) is available.	38	Census of Manufactures, Bureau of the Census.
Telephone				No capacity figures are obtainable. The figure given in the budget for this industry (a 20% increase over 1929) is an estimate of desired service believed to be within the capacity of this industry.	39	Census of Electric Industries, 1929, Bureau of the Census. Interstate Commerce Commission. "Statistical Abstracts," 1933, Department of Commerce. American Telephone & Telegraph Company.
Stone quarrying	48	1	52	1929 production with allowance for idle time.	40	"Mineral Resources," Bureau of Mines, Department of Commerce. "Statistical Abstract," 1933, Department of Commerce.
Sand and gravel	48	1	52	Same as stone quarrying.	41	"Mineral Resources," Bureau of Mines, Department of Commerce. Census of Manufactures, Bureau of the Census.
Mica				Estimate based on probable demand. The figure is conservative as raw material supply is unlimited.	43	Bureau of Mines, Department of Commerce.
Copper mining	48	2		Capacity of present plants to mine and mill on two-shift basis. Excludes mines abandoned for economic considerations.	45	American Bureau of Metal Statistics. Census of Manufactures, Bureau of the Census. United States Copper Association.
Gold mining				Past production taken as maximum. In practice shift in exchange value of gold as money influences working capacity.	47	Census of Manufactures, Bureau of the Census.
Silver mining				Capacity is largely dependent upon output of other metals (zinc, lead, copper, gold) having silver as a by-product. Exchange value also limiting factor on direct silver mining which produced only 14.6% of total silver in 1933.	47A	Census of Manufactures, Bureau of the Census.
Ferro-alloying metals				Capacity estimate for molybdenum based on equipment of producing plants (two); other metals 1929 production taken as capacity.	53	Census of Manufactures, Bureau of the Census. Bureau of Labor. "Mineral Resources of the United States," Department of Commerce.
Abrasives				1929 production with allowance for idle time.	54	"Mineral Resources," Bureau of Mines, Department of Commerce.
Asphalt				1929 production with allowance for idle time.	57	Bureau of Mines, Department of Commerce.
Asbestos (raw)				1929 production with allowance for idle time.	58	"Mineral Resources," Bureau of Mines, Department of Commerce. Bureau of Commerce. Bureau of Mines.
Barium (barytes)				1929 production with allowance for idle time and same ratio used for calculating imports increase.	59	Bureau of Mines, Department of Commerce.
Feldspar				Capacity based on estimate of probable demand. Raw material supply is unlimited.	60	"Mineral Resources," Bureau of Mines, Department of Commerce.

TABLE XXII (*Continued*)

CAPACITY DEFINITIONS

Product of Industry	Capacity Operating Schedule: Hours per Week	Daily Shifts	Work Year (Days or Weeks)	Capacity Determinants	Work-Sheet No.	Sources
Zinc (mine production)				1929 production with allowance for idle time. Output of other zinc-bearing ores will affect total volume of zinc.	61	American Bureau of Metal Statistics.
Gypsum				1929 production with allowance for idle time.	63	*Mineral Yearbook*, American Bureau of Metal Statistics. "Mineral Resources," Bureau of Mines, Department of Commerce.
Fuller's and filtering earth				1929 production taken as capacity. Raw material supply is unlimited.	64	"Mineral Resources," Bureau of Mines, Department of Commerce. *Commerce Yearbook*, Department of Commerce.
Aluminum				Personal estimate based on production at Massena, N. Y., plant. No figures published for this industry.	65	American Bureau of Metal Statistics.
Sulphur				1930 production taken as capacity. Raw material supply is unlimited.	67	Bureau of Mines, Department of Commerce.
Phosphate rock				1929 production with allowance for idle time. New western deposits indicate unlimited supply.	68	Bureau of Mines, Department of Commerce.
Slate				1929 production with allowance for idle time.	69	"Mineral Resources," Bureau of Mines, Department of Commerce.
Silica				Same as slate.	70	Bureau of Manufactures, Bureau of the Census.
Salt				1929 production assumed to be 90% of capacity. Raw material is unlimited.	72	"Mineral Resources," Bureau of Mines, Department of Commerce.
Clay	57.7			1929 production with allowance for idle time.	73	*Mineral Yearbook*, American Bureau of Metal Statistics.
Talc and soapstone				Same as clay.	75	American Bureau of Metal Statistics.
Meat products	54	1	52	Stockyard, killing-line, and chilling equipment.	82	Census of Manufactures, Bureau of the Census. *Commerce Yearbook*, 1932, Department of Commerce. Bureau of Animal Industry, Department of Agriculture.
Pig iron	168	3		Capacity estimates of the American Iron & Steel Institute. (Excludes long-idle plants and ferro-alloy furnaces.)	83	American Iron & Steel Institute. Census of Manufactures, Bureau of the Census. American Metal Markets, American Metal Markets Co., Inc.
Iron alloys	168	3		Estimate of capacity is based on the capacity ration (82% in 1929) of blast furnaces.	84	American Iron & Steel Institute. Census of Manufactures.

Steel (ingots and castings)	168	3	365	Report of American Iron & Steel Institute Committee on Capacity (excludes long-idle plants).	85	American Iron & Steel Institute. *Commerce Yearbook*, 1932, Department of Commerce.
Rolled finished steel				See "Wire" (Worksheet 91).	86	American Iron & Steel Institute. Census of Manufactures, Bureau of the Census.
Screw-machine products				See "Wire" (Worksheet 91).	89	Census of Manufactures, Bureau of the Census.
Springs (auto, R. R., etc.)				See "Wire" (Worksheet 91).	90	Census of Manufactures, Bureau of the Census.
Wire, all kinds				Estimates of capacity are based on the capacity ratio (86.5% in 1929) for steel production. Wire is largely a one-shift industry, hence, two-shift operation theoretically doubles capacity.	91	Census of Manufactures, Bureau of the Census.
Wire products		2		Same as iron and steel manufactures (except for non-ferrous wire where production was assumed to be 97% of capacity).	92	Census of Manufactures, Bureau of the Census.
Steel and iron manufactures		1		Capacity for these industries is based on the capacity ratio (86.5% in 1929) for steel production. These are largely one-shift industries hence two-shift operation theoretically doubles capacity.	94	Census of Manufactures, Bureau of the Census.
Steel manufactures				Same as steel & iron manufactures.	94	Census of Manufactures, Bureau of the Census.
Cast-iron pipe				Same as steel and iron manufactures.	97	Census of Manufactures, Bureau of the Census.
Miscellaneous hardware				Same as steel and iron manufactures.	98	Census of Manufactures, Bureau of the Census.
Files and saws				Same as steel and iron manufactures.	99	Census of Manufactures, Bureau of the Census.
Enamel iron ware, range boilers and plumbers supplies				Same as steel and iron manufactures.	100	Census of Manufactures, Bureau of the Census.
Cutlery and edged tools				Same as steel and iron manufactures.	104	Census of Manufactures, Bureau of the Census.
Metal containers (tin cans and other tinware)		2		Reported capacity of the two largest producers which was 166% of 1929 production.	106	Census of Manufactures, Bureau of the Census.
Lime				1924–25 production with allowance for kilns abandoned since. New material supply is unlimited.	108	Census of Manufactures, Bureau of the Census.
Sugar (beet)	168	3	92	Highest actual output in last 10 years. Supply of beets is a limiting factor.	112	"Facts about Sugar," Sugar Institute. Sugar Reference Book. United States Beet Sugar Association. Census of Manufactures, Bureau of the Census.
Sugar (cane)—not refineries	53	1		Dependent entirely on supply of cane, which was estimated at 3,800,000 tons.	112	Bulletin, Department of Agriculture. Bureau of Agricultural Economics.
Sugar (refineries)				Capacity figure is that reported by the Sugar Institute.	112	
Stamped enamel ware		2		See "Wire" (Worksheet 91).	113	Census of Manufactures, Bureau of the Census.
Brick, tile, pottery				1929 production assumed to be 90% of capacity. This figure does not include clay mined by manufacturers and not purchased.	119	Census of Manufactures, Bureau of the Census.

TABLE XXII (*Continued*)

CAPACITY DEFINITIONS

Product of Industry	Capacity Operating Schedule: Hours per Week	Daily Shifts	Work Year (Days or Weeks)	Capacity Determinants	Work-Sheet No.	Sources
Marble granite, slate processing				Capacity is assumed equal to capacity to produce raw material.	119	Census of Manufactures, Bureau of the Census.
Machinery (electrical) supplies and accessories		1–2		Full capacity assumes two-shift operation doubles 1929 production.	121	Census of Manufactures, Bureau of the Census.
Coffee	48	1		Based on the estimates of authority, who had completed a private census of all roaster and grinding equipment in the United States.	125	*The Spice Mill*, Spice Mill Publishing Company. National Coffee Roasters Association. Tea Association of United States. Census of Manufactures, Bureau of the Census. Jabez Burns and Company.
Milk products (frozen)				Comparison of peak production (summer) with yearly total.	127	Census of Manufactures, Bureau of the Census. Survey of Current Business, 1932 Supplement, U. S. Department of Commerce. The Creamery Package Mfg. Company. National Dairy Products Company. American Institute of Food Distribution Evaporated Milk Association.
Zinc (smelting and refining)				Practical capacity (excludes obsolete horizontal retorts) of electrolytic smelters, primary and secondary distillation plants. (From Ingalls Theoretical Capacity.	131	American Bureau of Metal Statistics. Bureau of Mines, Department of Commerce.
Cottonseed products	132	2	300	Rated capacity of installed presses. The raw material supply is at present limited.	132	Food Industries (a publication). Federal Trade Commission Report, 1933 (Senate Document No. 209, Part 13). Census of Manufactures, Bureau of the Census. Bureau of Agricultural Economics, Department of Agriculture.
Fresh fish				Capacity assumes full-time operation of fishing fleet. The 1929 per cent of production to capacity was calculated from records of Atlantic Fisheries Company for trawlers.	134	U. S. Bureau of Fisheries, Department of Commerce.
TEXTILES						
Rayon fiber (yarn)	168	3	350	Average production-rate per complete spinning machine taken at 200 lbs. of	135	Census of Manufactures, Bureau of the Census.

				rayon of 160 denier per 24 hours (continuous operation).		Business Research Division, Tubize Chatallon.
Cotton manufactures (yarn and fabrics)	144	3	51	Maximum active spindles at an efficiency of 95 per cent.	137	Census of Manufactures, Bureau of the Census. Association of Cotton Textile Merchants.
Silk (broad goods)	80	2		100,000 looms operating at rate of 2½ yds. per loom per 24 hours (continuous operation).	138	Census of Manufactures, Bureau of the Census. The Federated Textile Industries.
Woolen (yarn and fabrics)	49.3	1		Active spindles and active looms.	139	Census of Manufactures, Bureau of the Census.
Worsted (yarn and fabrics)	49.3	1		Active spindles and active looms.	140	Census of Manufactures, Bureau of the Census.
Carpets and rugs	49.3	1		Comparison of actual time worked with full time, and comparison of actual labor force with full force.	142	Census of Manufactures, Bureau of the Census. The Textile Industry's Statement to the Code Authorities of NRA.
Hosiery (seamless)	104	2	50	Estimates of the United States Department of Labor.	144	Census of Manufactures, Bureau of the Census. *Hosiery Review* 1933 (Articles by G. W. Taylor).
Hosiery (full fashioned)	80	2	50	4,100 footing machines in place, production 3½ dozen pairs per hour.	144	See above.
Knit outerwear	104	2		Comparison of actual time worked with full time and comparison of actual labor force.	145	Census of Manufactures, Bureau of the Census. Bureau of Labor Statistics, Department of Labor.
Glass products (mirrors, etc.)				Estimate of capacity is based on the capacity ratio (47% in 1929) for window-glass production.	148	Census of Manufactures, Bureau of the Census.
Fire extinguishers		2		Capacity estimate is based on two-shift operation—which theoretically doubles capacity.	151	Census of Manufactures, Bureau of the Census.
Knit outerwear	52–104	1–2	52	Comparison of actual time worked with full time; comparison of actual labor force with full force.	153	
Knit cloth	52–104	1–2	52		154	
Optical goods		2		Capacity estimate is based on two-shift operation.	171	Census of Manufactures, Bureau of the Census.
Musical instruments				Capacity estimate is based on the actual production of pianos in 1919 with a 50% deduction for plants dismantled since 1919.	187	Census of Manufactures, Bureau of the Census.
Pens		2		Capacity estimate is based on two-shift operation.	189	Census of Manufactures, Bureau of the Census.
Wood products (lumber, etc., boxes, planing-mill products, cooperage, veneer, etc.)				Practical capacity based on the average yield of forests during 1919–1929, which is from 3 to 5 times the present annual growth. Those portions of the total forest yield allotted to various wood products are the averages so used during 1919–1929.	197A	Census of Manufactures, Bureau of the Census. Statistical Abstract of the United States, 1933, Department of Commerce. Tariff Readjustment, 1929, *Hearings*, Vol. XV, Washington, D. C. Forest Service, Department of Agriculture.
Electric power (all)		3	365	Capacity figured on basis of operation 90% of time with 42% load factor.	216	"Statistical Bulletin" (August, 1933). Edison Electric Institute.

TABLE XXII (*Continued*)

Capacity Definitions

Product of Industry	Capacity Operating Schedule: Hours per Week	Daily Shifts	Work Year (Days or Weeks)	Capacity Determinants	Work-sheet No.	Sources
Hotels				Capacity is based on an estimate of the probable utilization of hotel facilities (measured in 1929 dollar values) by the public if family incomes were increased to an average of $4370.	223	United States Census, 1930. *Fortune* Magazine, Time, Inc. Horwath & Horwath, "Capacity," Ahrens Publishing Co.
Machinery (all products, not including transportation equipment)		1–2		Capacity figures where given based on highest yearly production for items specified, with two shifts instead of one. Skilled labor shortage prohibits two shifts for industry as a whole. (Items specified were 25% of total production in 1929.)	Report 614	Bureau of Labor Statistics, U. S. Department of Labor. Census of Manufactures, Bureau of the Census. *The American Machinist*, McGraw-Hill Publishing Co.

Other industries contributing to the total of goods and services were carefully appraised. These include:

- Transportation of all kinds
- Telegraph and cable
- Motion pictures
- Printing and publishing
- Construction of all kinds

Definite capacity figures for this group were not compiled. Those figures which appear either as capacities or budget quantities represent desirable output attainable with existing labor and equipment.

The items listed above embrace those industries or products whose capacities appear as definite and figures in Columns 1 to 6. However, many of these determinations involved the prior study or measurement of capacities in related industries whose production served as a raw material or other source of supply. Notable examples are:

Agriculture (where capacity for crops, livestock, etc., has been studied and defined in terms of a National Budget).

The chemical industry: Fertilizers, paints and varnishes

In addition, a wide variety of goods were produced on a one-shift or part-time basis in 1929, the limiting factor being demand. In such cases, where raw materials and labor supply are ample, two-shift operation theoretically doubles capacity. A partial list of such items is as follows:

- Boxes (other than wood)
- Artists' materials
- Clocks and watches
- Electro-plating
- Gas and electric fixtures
- Fireworks and firearms and ammunition
- Educational supplies
- Recreation supplies
- Cleaning supplies
- Ground earths and minerals
- Tools (not edged)
- Tin and other foils
- Drugs and medical supplies

Where no figures are given, the work week and number of shifts are those obtaining in 1929. "Allowance for Idle Time" includes deductions for maintenance and repair during work year.

Note: The items are listed in the order determined by the worksheet numbers. This is done to facilitate a cross reference between the Master Chart, the column tables and the above index.

TABLE XXII-a

Worksheets and Their Sources
(Not included in Table XXII.)

Work-sheet	
4	National Industrial Conference Board.
	Brookings Institution.
	Census of Manufactures, Bureau of the Census.
7	The Tanner's Council.
	Bureau of the Census.
15	Census of Manufactures, Bureau of the Census.
	Code Authority of the Umbrella and Parasol Industry.
16	*Chemical & Metallurgical Engineering*, McGraw-Hill Publishing Company, Inc.
	Census of Manufactures, Bureau of the Census.
	S. D. Kirkpatrick.
	F. de John.
	General Chemical Company.
	Colgate–Palmolive–Peet Company.
	Departmental Report, 1929, War Department.
	Warner Chemical Company.
20	Census of Manufactures, Bureau of the Census.
21	Census of Manufactures, Bureau of the Census.
	"New American Motorcyclist and Bicyclist," Cycling Press, Inc.
	Motorcycle and Allied Trades Association.
22	Census of Manufactures, Bureau of the Census.
29	Census of Manufactures, Bureau of the Census.
33	Census of Manufactures, Bureau of the Census.
	Statistical Abstract of the United States, 1933, Department of Commerce.
37	*Motion Picture Almanac*, Quigley Publishing Company.
	Motion Picture Producers and Distributors of America.
	Film Weekly, Goodbody & Co.
	Bulletin S-114, Department of Commerce.
44	American Iron and Steel Institute.
	Census of Manufactures, Bureau of the Census.
48	"Coke in 1930," Department of Commerce.
49	Bureau of Mines, Department of Commerce.
50	American Iron and Steel Institute.
52	"Metal Statistics," American Metal Markets Company.
55	Bureau of Mines, Department of Commerce.
56	Statistical Abstract of the United States, Department of Commerce.
62	"Metal Statistics," American Metal Markets Company.
71	"Statistical Abstract," 1933, Department of Commerce.
	Census of Manufactures, Bureau of the Census.
74	American Bureau of Metal Statistics.
76	Bureau of Mines, Department of Commerce.
77	American Bureau of Metal Statistics.
78	"Mineral Resources," Bureau of Mines, Department of Commerce.
81	Census of Manufactures, Bureau of the Census.
	Bureau of Agricultural Economics, Department of Agriculture.
87	Bureau of the Census.
88	Census of Manufactures, Bureau of the Census.
93	Census of Manufactures, Bureau of the Census.
95	Census of Manufactures, Bureau of the Census.
96	Census of Manufactures, Bureau of the Census.
101	Census of Manufactures, Bureau of the Census.

TABLE XXII-A. (*Continued*)

WORKSHEETS AND THEIR SOURCES
(Not included in Table XXII.)

Work-sheet	
102	Census of Manufactures, Bureau of the Census.
103	Census of Manufactures, Bureau of the Census.
105	Census of Manufactures, Bureau of the Census.
107	Census of Manufactures, Bureau of the Census.
110	Census of Manufactures, Bureau of the Census.
114	Census of Manufactures, Bureau of the Census.
115	Census of Manufactures, Bureau of the Census.
116	Census of Manufactures, Bureau of the Census.
117	Census of Manufactures, Bureau of the Census.
120	Yearbook of Agriculture, 1933, Department of Agriculture.
	Circular 296, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
123	Census of Manufactures, Bureau of the Census.
124	Census of Manufactures, Bureau of the Census.
	Commerce Yearbook, 1931, Department of Commerce.
	Associated Corn Products Manufacturers.
128	*Spice Mill*, Spice Mill Publishing Company.
	Report, Department of Commerce.
	Census of Manufactures, Bureau of the Census.
	Bureau of Agricultural Economics, Department of Agriculture.
129	Census of Manufactures, Bureau of the Census.
	Survey of Current Business, Annual Supplement, 1932, Department of Commerce.
130	Internal Revenue Department.
	Census of Manufactures, Bureau of the Census.
	Commerce Yearbook, Department of Commerce.
	Survey of Current Business, Annual Supplement, 1932, Department of Commerce.
133	Census of Manufactures, Bureau of the Census.
	Statistical Abstract of the United States, Department of Commerce.
136	Census of Manufactures, Bureau of the Census.
	"Gas & Coke Industries, 1929," Bureau of Mines, Department of Commerce.
143	Census of Agriculture, Bureau of the Census.
	Circular 296, Department of Agriculture.
	Yearbook of Agriculture, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
	Statistical Abstract, 1933, Department of Commerce.
149	Census of Agriculture, Bureau of the Census.
	Yearbook of Agriculture, Department of Agriculture.
	Dairy Statistics, 1933, Department of Agriculture.
150	Census of Agriculture, Bureau of the Census.
	Circular 296, Department of Agriculture.
	Yearbook of Agriculture, 1933, Department of Agriculture.
	Commerce Yearbook, 1932, Department of Commerce.
152	Census of Manufactures, Bureau of the Census.
152-A	Census of Manufactures, Bureau of the Census.
153-A	Census of Manufactures, Bureau of the Census.
	Bureau of Labor Statistics, Department of Labor.
155	Census of Manufactures, Bureau of the Census.
162	American Newspaper Publishers Association,
	Associated Business Papers,

TABLE XXII-A. (*Continued*)

WORKSHEETS AND THEIR SOURCES
(Not included in Table XXII.)

Work-sheet	
163	Census of Manufactures, Bureau of the Census. Circular 296, Department of Agriculture. Yearbook of Agriculture, 1933, Department of Agriculture. Census of Agriculture, Bureau of the Census.
164	Circular 296, Department of Agriculture. Yearbook of Agriculture, 1933, Department of Agriculture. Census of Agriculture, Bureau of the Census.
165	Circular 296, Department of Agriculture. Yearbook of Agriculture, 1933, Department of Agriculture. Census of Agriculture, Bureau of the Census. Commerce Yearbook, 1932, Department of Commerce.
166	Circular 296, Department of Agriculture. Yearbook of Agriculture, 1933, Department of Agriculture. Census of Agriculture, Bureau of the Census. Commerce Yearbook, 1932, Department of Commerce. Statistical Abstract, 1933, Department of Commerce.
168	Census of Manufactures, Bureau of the Census.
169	Census of Manufactures, Bureau of the Census.
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TABLE XXIII

Breakdown of Labor by Industries

	1929		1930		1931		1932		Estimated requirements for budget	
	No. of Employees	Total Engaged	No. of Employees	Total Engaged	No. of Employees	Total Engaged	No. of Employees	Total Engaged		Total
Farms*										
Farmers										
(equivalent full time)†	5,495,000		5,547,000		5,622,000		5,722,000			
Managers	70,000		74,000		78,000		82,000			
Wage earners										
(equivalent full time)†	2,027,000		1,890,000		1,748,000		1,484,000			
Unpaid family labor										
Total engaged (farms)		7,592,000		7,511,000		7,448,000		7,288,000		7,971,000
Total gainfully occupied										
Mines and Quarries										
Total employees–anthracite	155,000		145,000		126,000		98,000		155,000	
Total employees–bituminous	484,000		451,000		402,000		326,000		400,000	
Total employees–metal	130,000		109,000		78,000		48,000		129,000	
Total employees–non-metal	108,000		93,000		74,000		55,000		108,000	
Total employees–oil and gas	178,000		167,000		124,000		103,000		178,000	
Entrepreneurs and others	15,000		15,000		15,000		14,000		14,000	
Total engaged		1,070,000		980,000		819,000		644,000		984,000
Electric Light and Power										
Total engaged	336,000	336,000	344,000	344,000	322,000	322,000	283,000	283,000	352,000	352,000
Manufactures										
Food and tobacco	1,014,000		959,000		879,000		805,000		1,064,000	
Paper, print'g, and publish'g	830,000		815,000		736,000		660,000		913,000	
Textiles and leather	2,233,000		2,005,000		1,859,000		1,637,000		3,000,000	
Construction materials and furniture	1,324,000		1,066,000		822,000		608,000		2,000,000	
Chemicals and petroleum refining	478,000		450,000		398,000		345,000		500,000	
Metals and metal products (including machinery)	3,312,000		2,845,000		2,256,000		1,717,000		3,350,000	
Miscellaneous and rubber	490,000		404,000		337,000		269,000		490,000	
Entrepreneurs and others	342,000		316,000		279,000		216,000		250,000	
Total engaged		10,023,000		8,860,000		7,566,000		6,257,000		11,567,000

Construction										
Employees	1,360,000		1,210,000		886,000		505,000			
Entrepreneurs	168,000		168,000		168,000		168,000			
Total engaged		1,528,000		1,378,000		1,054,000		673,000		2,437,000‡
Transportation										
All employees, steam railroads	1,841,000		1,655,000		1,401,000		1,151,000		1,650,000	
All employees, water trans.	296,000		282,000		239,000		208,000		296,000	
All employees, motor trans.	495,000		472,000		440,000		412,000		495,000	
All employees, street railroads	246,000		236,000		213,000		185,000		185,000	
All employees, air trans.	3,000		5,000		6,000		6,000		6,000	
All employees, pipe lines	24,000		23,000		20,000		17,000		24,000	
Entrepreneurs	168,000		173,000		174,000		161,000		169,000	
Total engaged		3,073,000		2,846,000		2,493,000		2,140,000		2,825,000
Communication										
Employees, telephone	436,000		426,000		368,000		334,000		436,000	
Employees, telegraph	97,000		94,000		81,000		68,000		81,000	
Total engaged		533,000		520,000		449,000		402,000		517,000
Trade										
Wholesale trade employees	1,605,000		1,546,000		1,400,000		1,264,000		1,696,000	
Wholesale trade entrepreneurs	91,000		85,000		83,000		80,000			
Retail trade employees	3,957,000		3,805,000		3,563,000		3,224,000		5,467,000	
Retail trade entrepreneurs	1,510,000		1,349,000		1,131,000		1,051,000			
Total engaged		7,163,000		6,785,000		6,177,000		5,619,000		7,163,000
Finance										
All employees, banks	386,000		375,000		342,000		310,000		386,000	
Insurance	456,000		464,000		456,000		438,000		456,000	
Real estate	580,000		549,000		477,000		387,000		580,000	
Total engaged		1,422,000		1,388,000		1,275,000		1,135,000		1,422,000
Civil										
Federal employees	933,000		956,000		964,000		952,000		933,000	
State and County	351,000		363,000		365,000		389,000		351,000	
City	650,000		711,000		624,000		592,000		650,000	
Public education	1,069,000		1,126,000		1,174,000		1,189,000		2,896,000	
Total engaged		3,003,000		3,156,000		3,127,000		3,122,000		4,830,000

* Including entrepreneurs. Also there were (in 1929, 1,633,000; in 1930, 1,660,000; in 1931, 1,729,000; and in 1932, 1,828,000) unpaid workers belonging to families of farmers.

† The total of workers was larger, but this total was corrected to represent the equivalent of the number that would have been engaged full-time to accomplish the same tasks.

‡ Estimated 500,000 required for landscaping, preparation of homesite, sewerage, etc.

TABLE XXIII (*Continued*)

BREAKDOWN OF LABOR BY INDUSTRIES

	1929		1930		1931		1932		Estimated requirements for budget	
	No. of Employees	Total Engaged	No. of Employees	Total Engaged	No. of Employees	Total Engaged	No. of Employees	Total Engaged		
SERVICE										
RECREATION AND AMUSEMENT										
Legitimate theatres	49,000		39,000		26,000		17,000		49,000	
Motion picture production	20,000		16,000		14,000		11,000		20,000	
Motion picture theatres	286,000		286,000		245,000		225,000		286,000	
Radio broadcasting	9,000		10,000		11,000		11,000		11,000	
Other recreat. and amuse.	43,000		48,000		37,000		31,000		86,000	
Entrepreneurs	48,000		43,000		37,000		35,000		48,000	
Total engaged		455,000		442,000		370,000		330,000		500,000
PROFESSIONAL										
Private hospitals	227,000	227,000	231,000	231,000	231,000	231,000	227,000	227,000	228,000	228,000
Clergyman	147,000	147,000	149,000	149,000	151,000	151,000	153,000	153,000	147,000	147,000
Private universities, etc.	68,000		72,000		72,000		71,000		68,000	
Private secondary schools	31,000		31,000		31,000		31,000		31,000	
Private elementary	69,000		68,000		69,000		69,000		69,000	
Other private schools	15,000		15,000		15,000		15,000		15,000	
Total engaged		183,000		186,000		188,000		186,000		183,000
Physicians and surgeons	119,000		121,000		121,000		121,000		121,000	
Dentists	63,000		65,000		65,000		65,000		116,000	
Other curative personnel	59,000		60,000		60,000		60,000		59,000	
Trained nurses (private)	142,000		149,000		149,000		149,000		149,000	
Other semi-professional personnel	13,000		13,000		13,000		13,000		13,000	
Dentists and employees	72,000		74,000		70,000		62,000		132,000	
Total engaged		468,000		482,000		477,000		470,000		590,000
Lawyers	136,000		139,000		139,000		139,000		136,000	
Non-professional	79,000		81,000		81,000		81,000		79,000	
Total engaged		215,000		220,000		220,000		220,000		215,000
Consulting engineers	12,000		13,000		13,000		13,000		18,000	
Employees, consult. eng.	52,000		53,000		41,000		27,000		70,000	
Total engaged		64,000		66,000		54,000		40,000		88,000
Grand total		1,304,000		1,333,000		1,321,000		1,296,000		1,451,000

Personal Service										
Hotel employees	377,000		374,000		347,000		298,000		377,000	
Power laundry	255,000		248,000		235,000		216,000		255,000	
Cleaning and dyeing	72,000		66,000		60,000		49,000		72,000	
Barber and beauty shop	368,000		353,000		329,000		298,000		552,000	
Entrepreneurs	40,000		36,000		31,000		29,000		40,000	
Total engaged		1,112,000		1,077,000		1,002,000		890,000		1,296,000
Domestic Service										
Chauffeurs	94,000		84,000		72,000		57,000		94,000	
Cooks (female)	256,000		230,000		196,000		157,000		256,000	
Cooks (male)	16,000		15,000		12,000		10,000		16,000	
Housekeepers	195,000		175,000		149,000		119,000		195,000	
Laundresses	352,000		316,000		269,000		215,000		352,000	
Nurses (not trained)	153,000		137,000		117,000		93,000		153,000	
Waiters	1,000		1,000		1,000		1,000		1,000	
Waitresses	11,000		11,000		8,000		7,000		11,000	
Other servants	1,231,000		1,110,000		942,000		754,000		1,231,000	
Total engaged		2,309,000		2,079,000		1,766,000		1,413,000		2,309,000
Business Service										
Accounting	11,000		12,000		10,000		9,000		11,000	
Trade assn. employees	41,000		40,000		36,000		29,000		41,000	
Cham. of Com. employees	5,000		5,000		5,000		5,000		5,000	
Entrepreneurs	5,000		5,000		5,000		5,000		5,000	
Total engaged		62,000		62,000		56,000		48,000		62,000
Miscellaneous Service§										
Entrepreneurs	40,000		35,000		29,000		28,000		40,000	
Employees	251,000		248,000		266,000		279,000		251,000	
Total engaged		291,000		283,000		295,000		307,000		291,000
Total Engaged, All Services		5,535,000		5,276,000		4,810,000		4,283,000		5,909,000
Miscellaneous Industries‖										
Entrepreneurs	693,000		689,000		682,000		680,000		693,000	
Employees	2,255,000		2,077,000		1,833,000		1,605,000		2,255,000	
Total engaged		2,948,000		2,766,000		2,515,000		2,285,000		2,948,000
Grand Total, People Engaged		44,224,000		41,809,000		38,053,000		34,131,000		48,929,000

Total workers employable, listed in census as gainfully occupied —1929, 48,830,000—1934, 51,642,000.
Total workers employed, listed in census as gainfully employed—1929, 44,225,000—1934, 40,870,000 (excluding unpaid and part-time farm labor).
Total workers required for budget - - - - - - - - - - - - - 48,929,000.

§ Photography, mortuary, athletic and country club employees.
‖ Fisheries, forestry, taxicabs, b~okerage, architects, artists, authors, pharmacists, etc. This category contains the explanation of the differences between this table and our special reports such as on health.

NOTES TO TABLE XXIII

In order to obtain estimates of the labor required for ideal capacity production, by which is meant an output sufficient to produce our consumers' budget, we have drawn freely on the figures given in Senate Document No. 124, 73rd Congress, 2nd Session, which was prepared by the Division of Economic Research, Bureau of Foreign and Domestic Commerce, United States Department of Commerce, in co-operation with the National Bureau of Economic Research, Inc. The above source is probably more accurate than the Census estimates for 1930.

The labor required for future production is dependent on the increased rate of mechanization, as well as on other unpredictable changes in the efficiency with which labor is utilized. The effect of these indefinite factors can be seen by examining Table 5 (Per Capita Wages and Value of Product Per Worker in the Manufacturing Industries) given elsewhere in this Appendix.

In the 18 years (1914 to 1932), the total *increase* in value per worker (in terms of "1929 dollar value") was $2687, an average of about $149 per year. The effect of temporary conditions can readily be interpreted. Thus, the end of the War witnessed a sudden slackening of production, but labor was not immediately dismissed and consequently the production per worker actually decreased. The effect of the present depression on productivity of labor is even more glaringly evident from the table. During the first two years, an effort was made to retain employees in the face of a severe curtailment of output. When it was realized that no immediate improvement in demand could be expected, every effort was made to lower costs by the introduction of mechanization wherever possible, and by a wholesale reduction of labor forces. It was inevitable that the least efficient (highest-cost) plants and labor forces would be the first to suffer. A consequent *increase* in labor productivity of $1294 in one year, or over nine times the average, was the result of closing down inefficient plants and discharging ineffective workers.

If we discount this abnormal condition and endeavor to obtain a curve of increased productivity, we obtain a figure (measured in 1929 dollars) of $119 per year as the increased productivity of labor due mainly to improved technology. It seems reasonable to assume that this average increase will continue for the next five years and we have therefore used this figure in computing our labor requirements. Although it is obvious that this increment will not be the same for all industries, the error (in assuming this $119 increment per year for all manufacturing industries) will not seriously affect our results.

We have given above the men *actually working* in each industry. This does not agree with the census figures which give the number, according to a worker's trade or ordinary occupation, regardless of whether they are working or not. This is especially noteworthy in the case of the construction industry where, in 1929, the number of laborers, masons, carpenters, etc., ordinarily classified by the census as in the "construction industry," totalled 2,606,322 (W.S. 218) while, according to the *BREAKDOWN OF LABOR* report (W.S. 331), the total number *engaged* in the construction industry was only 1,528,000. The enormous difference is only partially accounted for by the carpenters not engaged in construction, etc., etc., and is largely attributed to unemployed construction workers.

Listing, for 1929, the wage earners, salaried employees and entrepreneurs in industry, and comparing the output with our theoretical budget, gives us a foundation for estimating the labor required to attain our budgeted production.

It is obvious that technological improvement, as illustrated in Table XXII will have an influence on the number of men required. The detailed examination of this influence was beyond the scope of the survey. In the same way, the number of entrepreneurs could be reduced by consolidations, etc., but this is also neglected.

Our rough studies indicate that we could obtain the budget output with the labor available although there may have to be considerable shifting in occupation to meet new conditions.

TABLE XXIV

Value of Product per Worker in the Manufacturing Industries

	Production per Worker (1913)	General Price Level	Production per Worker (1929)
1869	$1,485	111	$2,658
1913		100	
1914	3,448	100	6,172
1915		103	
1916		117	
1917		139	
1918		157	
1919	3,996	173	7,153
1920		193	
1921	3,855	163	6,900
1922		158	
1923	4,181	165	7,484
1924		166	
1925	4,400	170	7,876
1926		171	
1927	4,392	171	7,862
1928		176	
1929	4,452	179	7,969
1930		168	
1931	4,226	150	7,565
1932	4,949	132	8,859

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