of silica gel. The changing process can, in addition, be made quite rapid if several of these units equipped with the proper connectors are always available for rapid exchange with a spent unit. These tubes are applicable for use with any of the solid absorbents, such as granulated charcoal, in addition to silica gel.

Cooling jacket for motor-driven Ten Broeck glass tissue grinder. While preparing homogenized tissues it has been found convenient to keep the preparation cold by circulating cold fluid in an outer jacket that is fused to a Ten Broeck glass homogenizer, as is illustrated in Fig. 2. For some procedures tap water is cold enough, for others ice water or alcohol cooled in Dry Ice may be used as the cooling agent. The pestle may be attached to a stirring motor by means of a heavy rubber tube placed between a "hose-connection" on the pestle and the chuck of the motor. It is possible to observe the homogenizing process through the jacket. Rubber tubing connections permit movement of the jacketed portion of the homogenizer in an up-and-down motion over the pestle fixed in the motor.

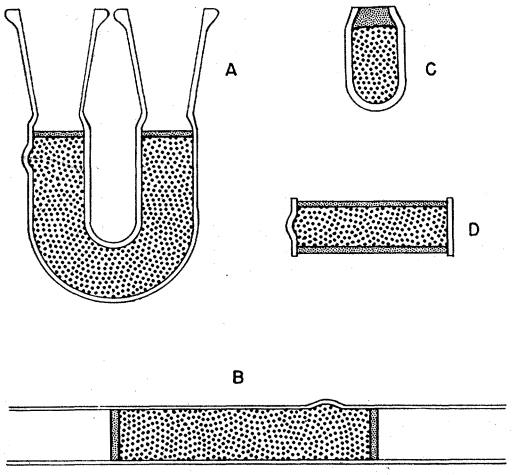

Fig. 1. Various types of permanently sealed solid-adsorbent drying tubes employing sintered glass disks.

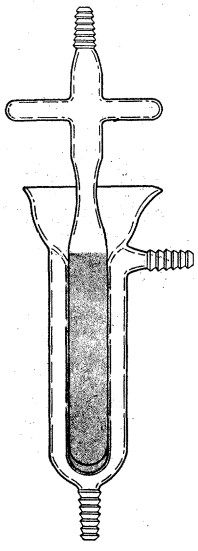

Fig. 2. Cooling jacket for motor-driven Ten Broeck glass tissue grinder.

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A Defense against New Ideas

I was flattered to see that my prewar dictum "There is no adequate defense, except stupidity, against the impact of a new idea" was still considered sufficiently relevant to justify printing [*Science* **120**, 963 (1954)]. However, recent events, in particular the leading article in the same number of *Science* by the board of directors of the AAAS, suggest that the dictum is outdated. I should like to amend it to read: "There is no adequate defense, except stupidity or a clumsy security system, against the impact of a new idea."

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Cycle Analysis through Industry Study

In March 1953 (*1*) I presented figures for the period 1922–30 to show that a fall in profit rate is followed by a decrease in the rate of investment. The figures given were based on totals for all United States corporations, without classification. The result is much clearer when the corporations are taken in industry groups (*2*).

Of the total increase of $54.0 billion in tangible corporate capital during the period 1922–30, $31.4 billion, or 58 percent, is represented by the utility sector, including transportation, and the service sector, including hotels, restaurants, entertainment, and so forth. Taking fixed capital only—that is, land, buildings, and equipment—the corresponding percentage is 66; in other words, two-thirds of the total increase in fixed capital for the entire corporate economy during that period occurred in its utility and service sectors. Of these two sectors, the service sector was relatively small. In either capital or earnings, more than nine-tenths was represented by the utility sector.

The net earnings of these two sectors of the corporate economy from operations, before deduction of interest paid but after deduction of taxes, so as to represent, comparatively, the net earnings on total tangible capital, are shown in Table 1, computed as a percentage of such capital; in addition, bond yields of the utility sector are also given for comparison (*3*). As the figures show, the earnings of both sectors held to a 6-percent level or better for the years 1922–26, inclusive, and then dropped to a new and fairly consistent level almost 1 percent lower. Bond yields dropped also but not to the same extent, so that the

Table 1. Earnings of utility and service sectors, in percentages.

Year	Earnings, utilities, including transportation	Earnings, services (hotels, restaurants, entertainment, etc.)	Earnings, both sectors	Bond yields, utilities, including transportation
1922	6.2	5.6	6.2	5.9
1923	6.7	6.8	6.7	6.0
1924	5.9	6.1	5.9	5.7
1925	5.9	7.3	6.0	5.4
1926	6.1	5.9	6.1	5.1
1927	5.1	4.8	5.0	4.9
1928	5.2	4.7	5.2	4.9
1929	5.4	5.0	5.4	5.2

effect on equity earnings was accentuation of the drop.

Of the remaining groups of corporations, the only large sectors are finance and goods. Available data are inadequate for the finance sector. This sector includes primarily (i) banking companies, (ii) realty holding companies, (iii) insurance companies, (iv) mortgage companies, (v) investment companies (other than realty), and (vi)stock dealers and brokers. The factor of physical capital is important only in the first two of these groups, banking and realty holding companies, but the wide fluctuations in income of the finance sector as a whole derive chiefly from the remaining four groups. No satisfactory data on capital for each group are available, however. Moreover, in the first group, physical capital, in the form of buildings, is large, but income is attributable primarily to nonphysical capital. The finance sector, it is clear, presents no basis for conclusions in respect to any relationship of income to physical capital. Nevertheless, it is interesting to note that the net earnings of that sector, whether before or after deduction of interest paid, and as a percentage of either physical or total capital, was actually higher in 1925 than in any other year of the period 1922–29. It is also interesting to note that in the case of the portion of that sector represented by banking companies, the first group mentioned, the percentage of net profit to total capital was higher in 1925 than in any other year of that period, and in both 1926 and 1928 it was higher than in 1929 (*4*, p. 262).

Table 2. Earnings and bond yields of goods sector, in percentages.

Year	Earnings	Bond yields
1922	8.3	6.0
1923	10.1	6.0
1924	7.5	5.9
1925	8.8	5.6
1926	8.3	5.4
1927	7.3	5.1
1928	8.6	5.1
1929	8.7	5.3

Only the goods sector, manufacturing and trade, showed definite strength at the close of the period 1922–29. Earnings and bond yields (*4*, p. 468) for this sector of the economy, taken as a whole, are shown in Table 2.

An analysis of the goods sector into its product components shows that the major growth during the period 1922–29 and the major strength toward the close of that period were in automobile production and production tributary to the automobile, principally gasoline. Automobile and gasoline, respectively, were the major factors in the subgroups metals and metal products, and chemicals and allied substances, shown in *Statistics of Income* (*2*). Income in both of those groups built up strongly to a peak in the third quarter of 1929 and then fell off rapidly from that peak (*5*).

These were the groups that were going strong to the very edge of the stock market collapse. It was these groups apparently that took hold of the economy at its 1927 dip and carried it back up; but before a complete return to the 1925–26 level, in the torrent that followed the general break, they themselves were carried down. They would, it appears, have gone still higher had that break not occurred. The economy otherwise had begun to give way long before. The break that occurred in the economy as a whole in 1929 was a delayed effect, all the worse because of the large amount of fixed capital that had accumulated in the total economy since the high profit level of 1925–26.

The high rate of capital accumulation was derived from the high profit level of 1926 and prior years, as if assuming that that profit level would continue and in fact increase. In part, that high rate of capital accumulation was generated, chain-reaction-wise, by itself, because of the strong though partial support that it itself gave, as demand for goods, to the profit level. The expectation that the high profit level would continue and increase was not realized; from the excess of investment created the compensatory decline necessarily followed.

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References and Notes

1. G. T. Altman, *Science* **117**, 336 (1953).
2. Except where otherwise shown, all figures given here are based on *Statistics of Income* (U.S. Treasury Dept.).
3. The bond yields shown are averages of railway and public utility bond yields. The figures are based on Moody's, as quoted in *Statistical Abstract of the U.S.* (U.S. Dept. of Commerce, 1940), p. 307.
4. Computed from *Banking and Monetary Statistics* (Federal Reserve System, Washington, D.C., 1943).
5. H. Barger, *Outlay and Income in the United States 1921–1938* (National Bureau of Economic Research, New York, 1942) pp. 278–79, 282–83.

20 September 1954.