

closely with comparable statistical data on the horsepower installed, wages paid and wage earners engaged as reported in the Biennial Census of Manufactures. Suffice it to say that the total of primary horsepower installed for all industries gained 24 per cent when 1927 was compared with the average of years between 1919 and 1923; wages gained 10 per cent while the number of wage earners increased 1 per cent.

These are rough but accurate recent indications of (1) the lack of uniformity in technical growths of industries; (2) the lag in wage income under the growth of physical volume of production with the consequent slack in consuming power; and (3) the displacement of human labor power by electrical machine power.

This last displacement is being brought about by the greater flow of capital into industry and its substitution for labor. Precisely how much capital, labor and management should be combined to effect a proper combination of forces is another of the unsolved problems of economics. Here again Professor Douglas has in a previous study essayed the task and here again has been obliged to isolate a segment of the complex of variables that enter into the problem. The particular mathematical methods employed may, if extended and perfected, in the course of time, point the way to solution.

Interesting and illuminating data of the volume of new funds obtained by security issues in recent years are becoming available. New money flowing into productive and operating enterprises, old and new, amounted to 2414 millions of dollars in 1924. They grew to 6141 millions of dollars in 1929. Between 1924 and 1925 the increase was 13 per cent annually. But between the first half of 1928 and the first half of 1929 the rate of growth bounded to 63 per cent. This amazing rate of change could tell a story if detailed information were investigated.

If funds raised for capital purposes were put immediately to work to expand industry, as they were intended, we probably would have postponed the current period of depression into the future. Men would have been engaged in new or expanded industries. We would probably now be enjoying an interval of prosperity until we got to the point where the market became unable to absorb the commodities prepared for the consuming population. The situation is one of a lagging standard of living.

Under our present condition of productive over-capacity we can not only raise our own high standard

of living but export commodities and capital and raise the standards of living abroad. But national and political barriers intervene and economic science offers at present but a timid academic voice in protest.

Aside from the necessarily slow processes of educating and attempting to obtain agreement on analyses, ideas and doctrines, what is there that can be done to put the economic machine in order and prevent periodic depressions, and that one element known as technological unemployment? The two are interwoven and cannot be treated separately if a genuine solution is to be effected.

We virtually know what ought to be done. First, production should be planned and controlled. Particular and general expansion should be regulated and guided. Second, the standard of living should grow apace with growth in productive capacity. The consuming power of the underlying population should be permitted to develop so as to clear the market of commodities at its disposal.

A stable general price level is not enough to insure against trouble. True enough, it would prevent dislocation in industry; it would obviate the shift of obligations between debtors and creditors. But most of all, and this fact is not stressed by the stabilizing school, a steady price level would support the planning element, a purposive element in national and international economy.

Assuming that agreement among men and mice is possible and attainable, what can be done to hang the bell on the cat? We must recognize the virtues as well as the defects of the system of profit making and competition and lay out our program accordingly.

The engineer and the economist can and should pool their abilities in a common effort. The engineer, who now views industrial mechanization as the monster which he nurtured and which in turn is causing him to lose his job, can direct his energies into constructive channels.

Let him turn economist and statistician in industry. He can measure the present productive over-capacity of his industry in terms of idle machine hours, the per cent of actual output to potential output. He can advise his employer on the rate of introduction of new equipment and of the possibilities of using the productive capacity standing idle in the most prosperous of times. The consuming public pays for this idleness in that element of price which is generally termed overhead, interest on investment, fixed charges and burden.

The economist and the engineer can forecast prospective sales, regularize activity and employment, and in their humble way add to the rationalization of business.

A major controlling force could be instituted in our national economy if a national advisory board of engineers, economists, financiers and business men were created to work in conjunction with our governmental and financial institutions to recommend and assist in putting into effect, a program that would delay funds from flowing into some industries and assist the flow into others.

At present the extended purchase of government bonds by the Federal Reserve Banks, ardently advocated in some quarters as a method for lifting us out of the business recession by the route which will put more credit into the market, increase the price of industrial bonds, facilitate new issues and raise the commodity price level, is an indiscriminate one. It is more than likely that industry has sufficient capacity to proceed with. True enough, a start in expansion would help, but it would only pave the way for the next recession as previously pointed out. It would constitute a further installation of the new "make work" fallacy in industry.

At the present time the rediscount rate of the Federal Reserve System is regulated geographically. But ways and means can be devised for varying the rates industrially, a difficult thing to do, to be sure, but perhaps a good thing. With effective methods for industrial co-operation established, it is one very possible to achieve.

Concluding as we began, technological unemployment is part of the entire phenomenon of general periodic unemployment and is perhaps closest to the heart of the matter because mechanization of industry is closest. Its cure may well be effected by the cure of periodic general unemployment and business recession.

**Mr. Kendall.** I am interested in the principle presented here this morning and should like to ask the speaker whether or not he considers it applicable to manufactured products as well as to the raw material commodities he has used? More specifically, would it be applicable to cotton textiles as well as to cotton?

**Mr. Douglas.** I think there is a very real relationship between the flexibility of value of end products and their raw materials. The thing is,

of course, somewhat complicated by the fact that many raw materials have several end products whose prices may not all move in the same direction at the same time, and by the fact that the nearer you get to the consumer the more differentiated and unstandardized the product becomes, and therefore the more difficult to measure. I am convinced, however, that the relationship does exist between the flexibility of value of consumers' goods and their raw materials. I am not so sure about producers' goods. As I have hinted, we may have one of the causes of the business cycle right there.

**Mr. Leffler.** I get the impression from your paper that it is based on an assumption of a more or less static society that is willing to spend the same proportion of its funds on the same things in 1928 as in 1909? Should not your figures take into account shifts in the demand curve as well as the different points on it?

**Mr. Douglas.** What you say would be true if I were comparing 1909 with 1928. But you will notice that I am comparing pairs of years, 1909-1910, 1910-1911, etc., and this reduces changes in the demand curve. Changes such as the substitution of rayon for cotton, increased use of copper due to public utilities' consumption, etc., are not marked in year to year comparisons. I should like to reduce the periods still further—even to months—but have not been able to do so thus far. I believe the formula can be used for short-term predictions because there is a certain regularity in life which enables us to assume that the past will repeat itself to a certain extent. There will, of course, be unpredictable changes in techniques and desires in the distant future.

**Mr. Leffler.** I hold Professor Douglas' scheme to be most ingenious and valuable, but I do feel the problem of technological unemployment to be of such importance that any prediction scheme should hold for more than one or two years in the future.

**Mr. Kendall.** Technological unemployment has been defined as that unemployment resulting from labor-saving devices. I believe it has a broader meaning than that. I question whether there is any difference between the man thrown out of work because of the introduction of a labor-saving machine and the one thrown out of work because of