MEN and MACHINES

IMAGINE a long row of men, each one surrounded by levers and dials to which in rotation they make adjustment. Count them—the old and the young—ten, twenty, thirty, fifty. Now imagine a small room, one side of which is built up into an instrument panel. Before this sits a man watching the needles and lights, every few minutes making adjustments to the switches. Apart from this one man the room is empty of life.

Finally imagine a yet smaller room. Here there are no control panels, no human hands at all; only a large box from which comes an occasional click and a whirring.

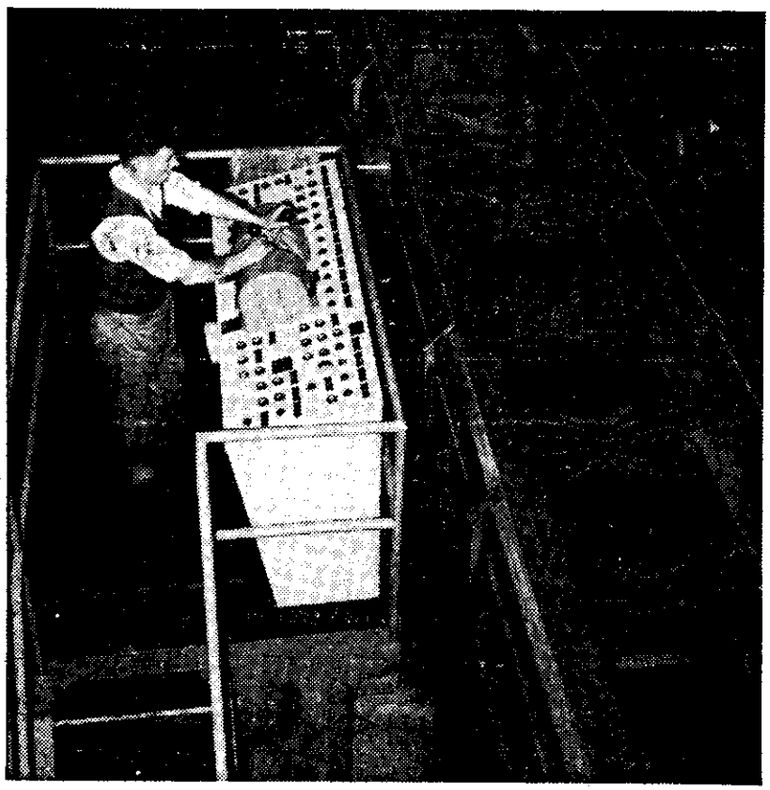
This is an outside view of automation, a word not easy to define precisely. It was coined about nine years ago by an executive of the Ford Motor Company, and has now almost supplanted the older "automatic control." A brief definition is that it is the practical applied recognition of the trend for machines and processes to become increasingly automatic. This trend goes back a long way, and to humble beginnings. As early as 1784 a continuous process flour mill, entirely automatic, was operating in Philadelphia. Another example often cited is Joseph Jaquard's automatic loom, controlled by punched paper cards (about 1801). Automatic regulators came earlier—much earlier. In France in 1680, for instance, Papin discovered that one could conserve steam up to a certain pressure merely by placing a weight on a pot lid. So long as there was water to boil, and fuel to boil it, the steam would build up and exhaust itself in a continuous process. This "Digester," as it was called, was the prototype of the modern pressure cooker. Carlyle knew about it —and knew also that technology, no matter how revolutionary it may seem, does not supplement nature (as is often claimed), but duplicates it in mechanical forms. "Why," said Teufelsdrockh in one of the midnight meditations of *Sartor Resartus*, "there is not a Man, or a Thing, now alive but has tools. The basest of created animalcules, the Spider itself, has a spinning-jenny, and warping-mill, and power-loom within its head: the stupidest of Oysters has a Papin's Digester, with stone-and-lime house to hold it in."

Automation, then, is the most recent chapter in a long story; but lately the pace has quickened. The industrial revolution laid the foundations for what has now become a technological civilisation; and within this civilisation, whether we like it or not, the principle of automation is a logical development. The present trend towards increasingly automatic machines and processes has three phases: the introduction of transfer machines, control engineering, and computer technology. Transfer machines integrate processes in terms of "flow" production. They involve the use of pneumatic, hydraulic and electrical devices to load components, position and unload them; and timing mechanisms are used for synchronisation.

Control engineering is a further step forward. It is based on the technique of "feedback," whereby a built-in electronic device notes information about output and feeds back "advice" to an earlier stage of a process, again to influence output. Control engineering has in it that element which must ultimately lead to a reorganisation of society—the replacement of human thought and supervision by mechanical agency.

Finally comes computer technology. The two main types of computer are the analogue and the digital. The first is used mainly to formulate engineering problems involving length, weight and other quantities, for solution by physical analogy. The second deals with arithmetical problems at speeds far beyond human capability. Computers and other electronic machines have been developed for various purposes. They are used for bookkeeping, for solving chess problems, for calculating the swing of votes at elections, and even for teaching such skills as typing and operating radar equipment.

★"AUTOMATION already exists to some extent in New Zealand"—this photograph, and the one at the foot of the page, show control panels installed at the Kawerau pulp and paper mill. ★



Many industrial plants have been subject to automatic control, in whole or in part, for a long time. Paper-making, printing, chemical and petroleum processing, are obvious examples. The new and sudden emphasis which seems lately to have been placed on automation comes from its belated extension to the automobile industry. It could have been expected that this industry, one of the most complex engineering industries using mass production methods, would have adopted the principle earlier. A large output placed it in the position to expend capital, and motor engineers have never been lacking in initiative. The delay was due partly to the unsuitability of the components, especially in weight, and also (in Britain) to the comparative lateness of standardisation in the main components between models. When it came at last, automation had a sharp impact. In Coventry, 12,000 men were on strike in May, believing that their livelihood was endangered by machines. The wider social problem did not pass unnoticed. "For whom are the machines going to work?" asked the *Manchester Guardian*. "That is a pressing question. We think of industry too much in terms merely of production, as if the problems of producers (managers or workpeople) were the only problems. But there is no virtue in producing anything unless it is produced for some purpose, and automatic machinery will be justified only if it can (and does) produce more of the goods that people want more cheaply, and so raise living standards all round. . . But why should any group of workers show enthusiasm for machines which, as far as they can see, seem to bring no immediate prospect but hardship and short commons?"

History shows that machines do not, in the long run, take away employment. The Luddites, who banded together in the early 1800's to destroy textile machinery were not eliminated by repressive legislation: they disappeared as employment increased and prosperity revived. But the vision of more work, higher standards of living and greater leisure is too far in the future to convince the worker that he has nothing to fear. First comes the transition period and the problem of the displaced worker. What people are most likely to be affected?

Walter Reuther, President of the C.I.O., testifying before a U.S. Congress sub-committee investigating Automation and Technological Change, said:

> *Newsweek* reports (referring to the Ford Automated engine plants) that the production has doubled, with 10 per cent of the work force. That is the general overall impact of automation upon manpower in industrial plants. There is a radio plant in the East where they had 200 workers assembling radios. They automated the assembly part of that plant, and two workers turn out now a thousand radio sets a day, where formerly 200 workers were required. Automation, unlike the first phase of the industrial revolution, will, I believe, have a greater impact upon white-collar workers than upon industrial workers, because it is easier to standardise many operations that white-collar workers do in the clerical field than it is to standardise some phases of industrial production in terms of metal-working.

(continued on next page)