AUTOMATION IN INDUSTRY

9 February 1956

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Publication No. L56-96

INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

Mr. Arthur T. Vinson, Vice President-Manufacturing, Manufacturing Services Division, General Electric Company, was born in Plainfield, Illinois. He was graduated from Michigan State College in 1929 with a degree in electrical engineering. He completed the Advanced Management Program of Harvard University's Graduate School of Business Administration in 1951. He joined the General Electric Company as a student engineer at the Fort Wayne Works and in 1945 became assistant production manager. He was transferred to Schenectady, Apparatus Department in 1945 and in 1948 became manager of the Welding Equipment Division with headquarters in Fitchburg, Massachusetts. In 1951 Mr. Vinson served as manager of Employee and Community Relations of the Small Apparatus Division at Lynn, Massachusetts, and later returned to Schenectady as assistant manager of Manufacturing in the Manufacturing Services Division and manager of the Wage Administration of the Employee and Plant Community Relations Services Division. He assumed his present position in 1953.

AUTOMATION IN INDUSTRY

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GENERAL CALHOUN: Perhaps one of the most generally discussed and least understood word in our vocabulary today is automation. This term conjures up all sorts of visions, ranging from massive unemployment on the one hand to the only solution to a predicted labor shortage on the other.

This morning our speaker will dispel the illusions, unfrock this monster, and tell us what automation is, how it has developed, and its place in our economy. He is Mr. Arthur F. Vinson, Vice President-Manufacturing, Manufacturing Services Division, General Electric Company. It is a privilege, Mr. Vinson, to have you back and to present you to this year's class. Mr. Arthur F. Vinson.

MR. VINSON: Thank you very much. Good morning, Gentlemen: I have to confess that last year when I made my first appearance before this group, I came here with fear and trembling because I had been asked to substitute for Dr. Wiener of MIT. I assured the class that if any of them had come here planning to understand Dr. Wiener, they would have no trouble with me.

Chart 1, page 2.--No subject has been more publicized in recent years than "automation," yet what is it? If you were to assemble all that has been said and written in just the last year, you would find that there are just about as many definitions of automation as there are people trying to define it.

One of our young automation engineers recently remarked that if all the claims and promises of automation were to become realities, there simply wouldn't be any people left for us to motivate, manage, or measure! This very confusion about our mechanical and electronic future in manufacturing led "Business Week" to say that in some areas automation is 90 percent emotion and 10 percent fact. Maybe this only substantiates an old saying that people can be divided into three classes: The few who make things happen, the many who watch things happen, and the overwhelming majority who have no idea what has happened. Of course, we are all in that first class.

CHART 1

As a result, automation has come to mean as many different things as there are points of reference from which it is viewed. Chart 2, page 4.--It's a great deal like the old Aesop fable of "The Elephant and the Six Blind Men"--each of whom defined the whole elephant in terms of the particular part which he was able to touch and explore.

Chart 3, page 5.--To some people, automation means mechanization; to others, the push-button factory and materials handling; and to still others, automatic controls, automaticity, and cybernectics--words that conjure up visions of robots running machines and factories without men. Actually these words have little or no bearing on the industrial concept of automation today.

The word itself is a relative newcomer to the industrial vocabulary, but the ideas and thinking to which it applies are not new. They have been known for a long time, but have been applied only during the past decade to industry as we know it.

Chart 4, page 6.--Our GE definition is simple: Automation is a way of manufacturing based on continuous automatic production. As such, it embraces the automatic making, inspecting, assembling, testing, and packaging of parts and products in one continuous flow.

The important thing to know is that automation is not a second industrial revolution. Its nature is evolutionary, not revolutionary. Automation is built upon the solid foundation of progressive upgrading of both our manufacturing operations and people, and is of itself a progressive process.

Chart 5, page 7.--Here you see the concept: Notice the step-by-step improvement from the manual area of labor, processing and material handling equipment; on up to the mechanization area where controls and machines enter the picture, and thence into the automation area of fully automatic processing which builds up to the ultimate goal of the automatic factory.

It would seem obvious from this long and challenging development problem that the era of the so-called automatic push-button factory is still ahead of us except for the fluid process industries where continuous processing is the basis of their existence. It certainly will not come by just the sudden, uneconomic application of money or effort. Automation, as such, will have to pay its way in a step-by-step program as industry takes a practical approach to the constant use of each year's technical advances in manufacture.

CHART 2

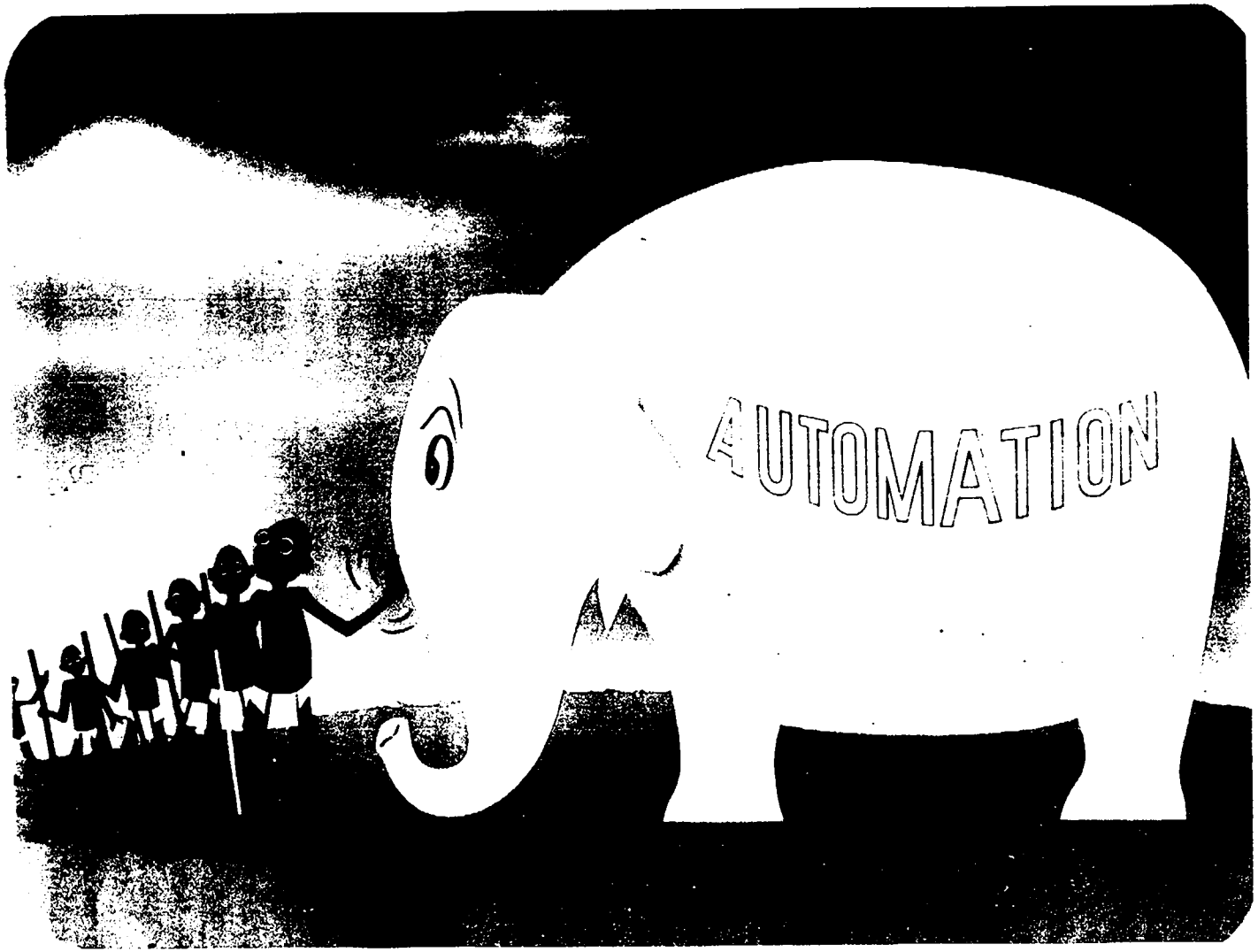

CHART 3

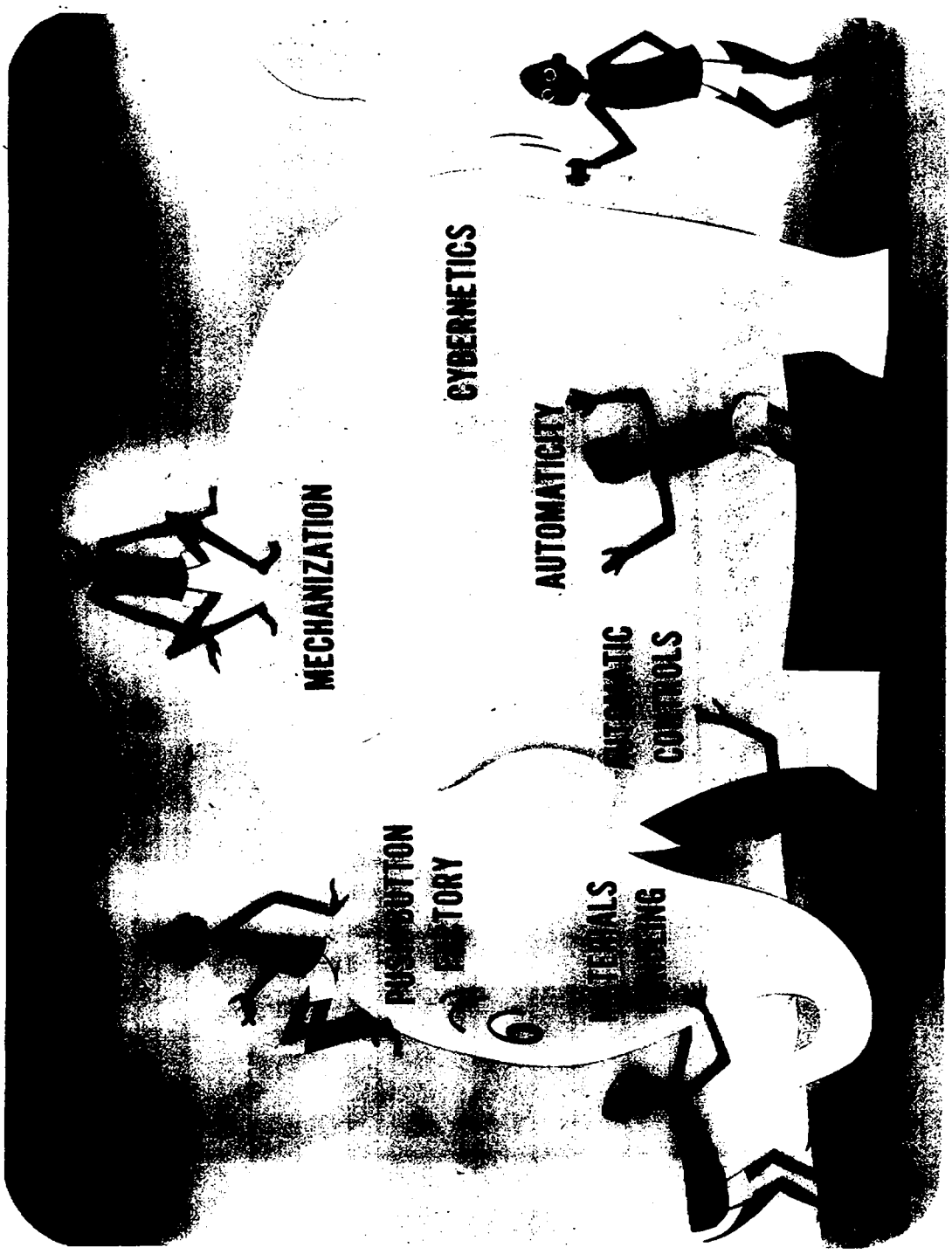

CHART 4

Automation

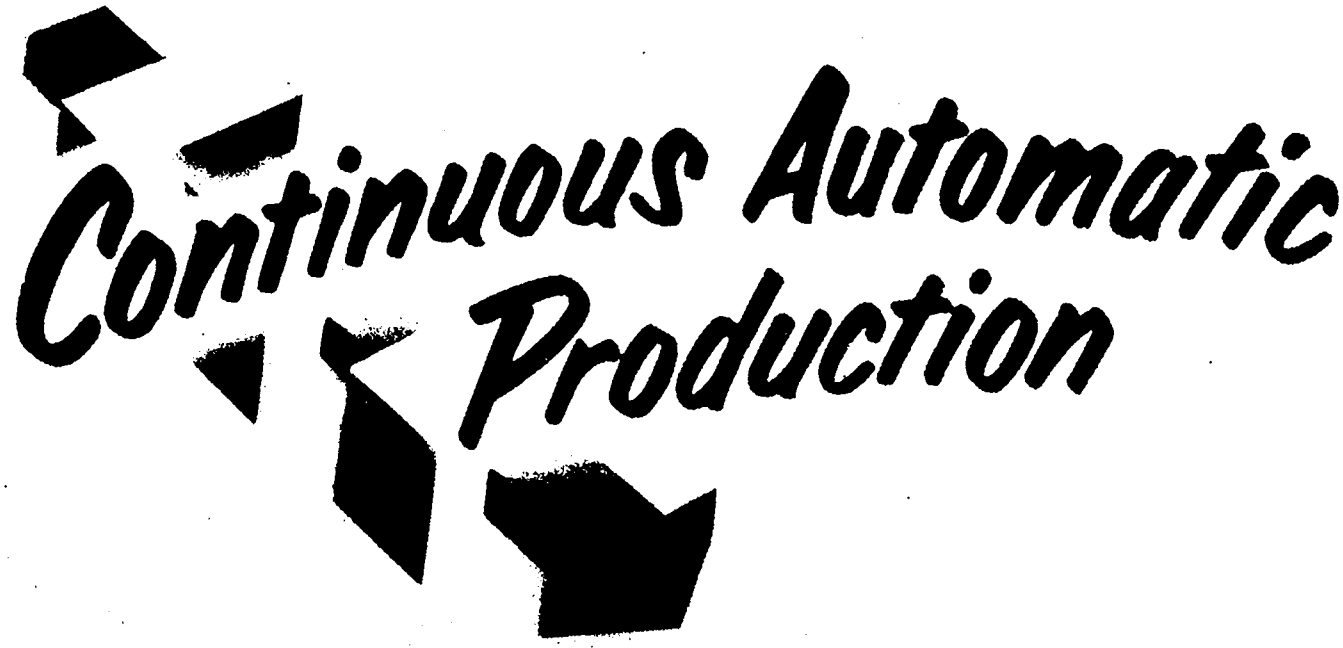

CHART 5

It is also true that automation is not limited to high-volume production items, such as refrigerators, lamps, or automobiles. In most of the industries today can be found operations in all of the levels of mechanization. There is ample opportunity to move these operations at least one more step up the ladder. And that means investing in more highly mechanized equipment rather than more buildings, filled with the same old kinds of equipment using the same old methods. Of course, new plants will be necessary also.

Chart 6, page 9.--The average industrial investment ratio of equipment versus land and buildings should rise in the 1954-64 decade from about 2 to 1 up to as high as 4 to 1, a further reminder that bricks and mortar are increasingly secondary to the production facilities that they house. Chart 7, page 10.--As a result of all this, annual factory output is expected to rise from 50 dollars per square foot to 75 dollars per square foot as industry increasingly utilizes the unique advantages of electrical automation in its manufacturing operations (Chart 8, page 11).

Already there has been a marked increase in the industrial use of power. Chart 9, page 12.--From 1946 through 1954, the power used by each production worker rose from 10,540 kilowatt-hours annually to 18,407--a 75 percent increase (Chart 10, page 13). In fact, the industrial use of power since World War II has gone up faster than industrial production itself, so that the electrical content of the average product has increased by a significant 18 percent. Chart 11, page 14.--This pattern of industrial electrification is continuing upwards so that in the near future we believe well over 90 percent of our Nation's manufacturing horsepower will be electric. There is no doubt in my mind that the trend to automation is and will be a key factor in this growth.

There's another almost obvious effect of the trend to automation which is vital to the interest of this audience, and that's to emphasize the importance of technological progress to our national defense.

Many of the key items of military equipment today, such as radar, gunfire control systems, guided missiles, and atomic weapons, are themselves products of automation principles. These military developments have spurred industrial technology; but even more important, continuing progress in industrial technology is essential as a source of knowledge for further improving the Nation's military equipment.

CHART 6

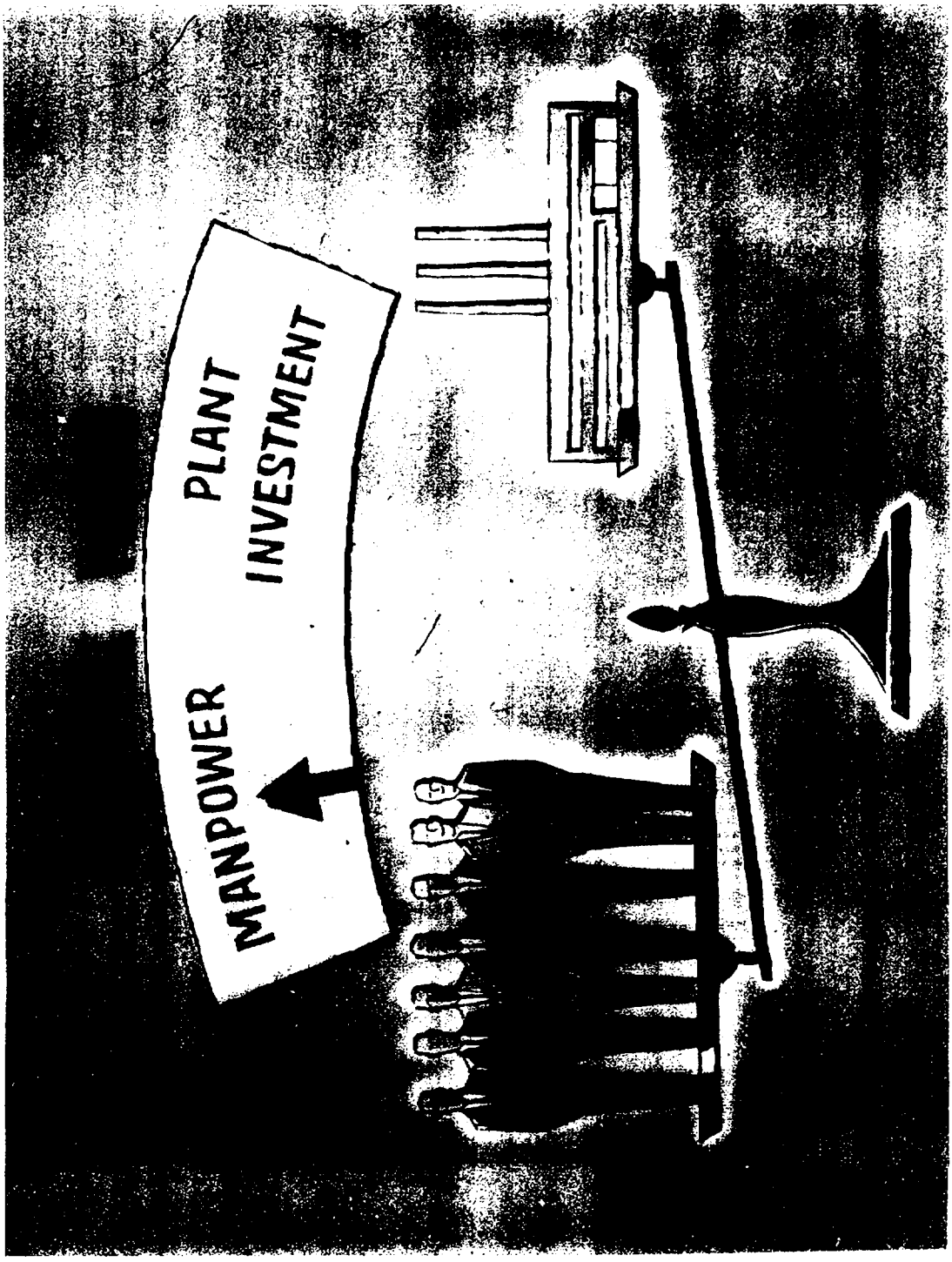

CHART 7

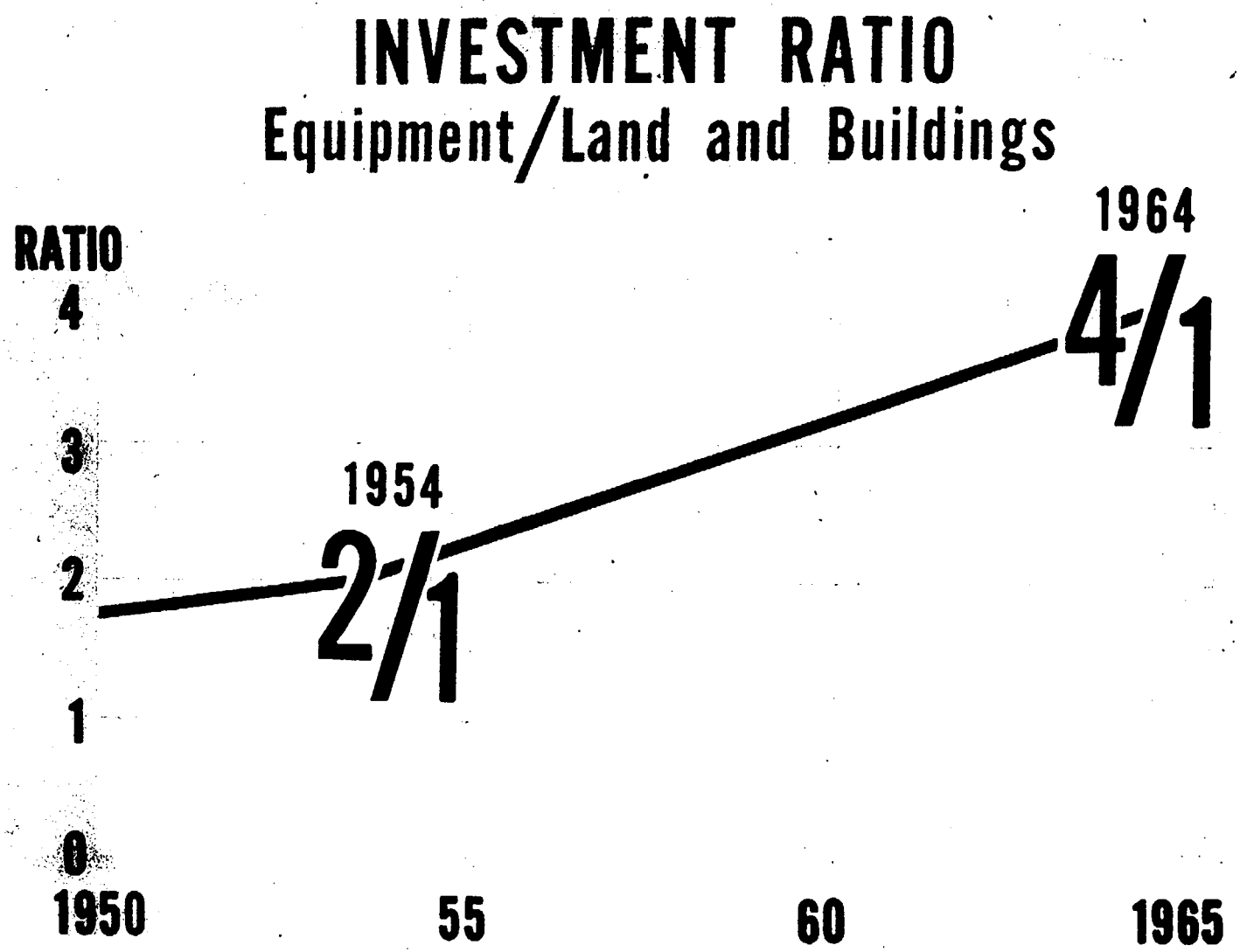
INVESTMENT RATIO
Equipment/Land and Buildings
RATIO
4
3
2
1
0
1950
55
60
1965
1954
2/1
1964
4/1

CHART 8

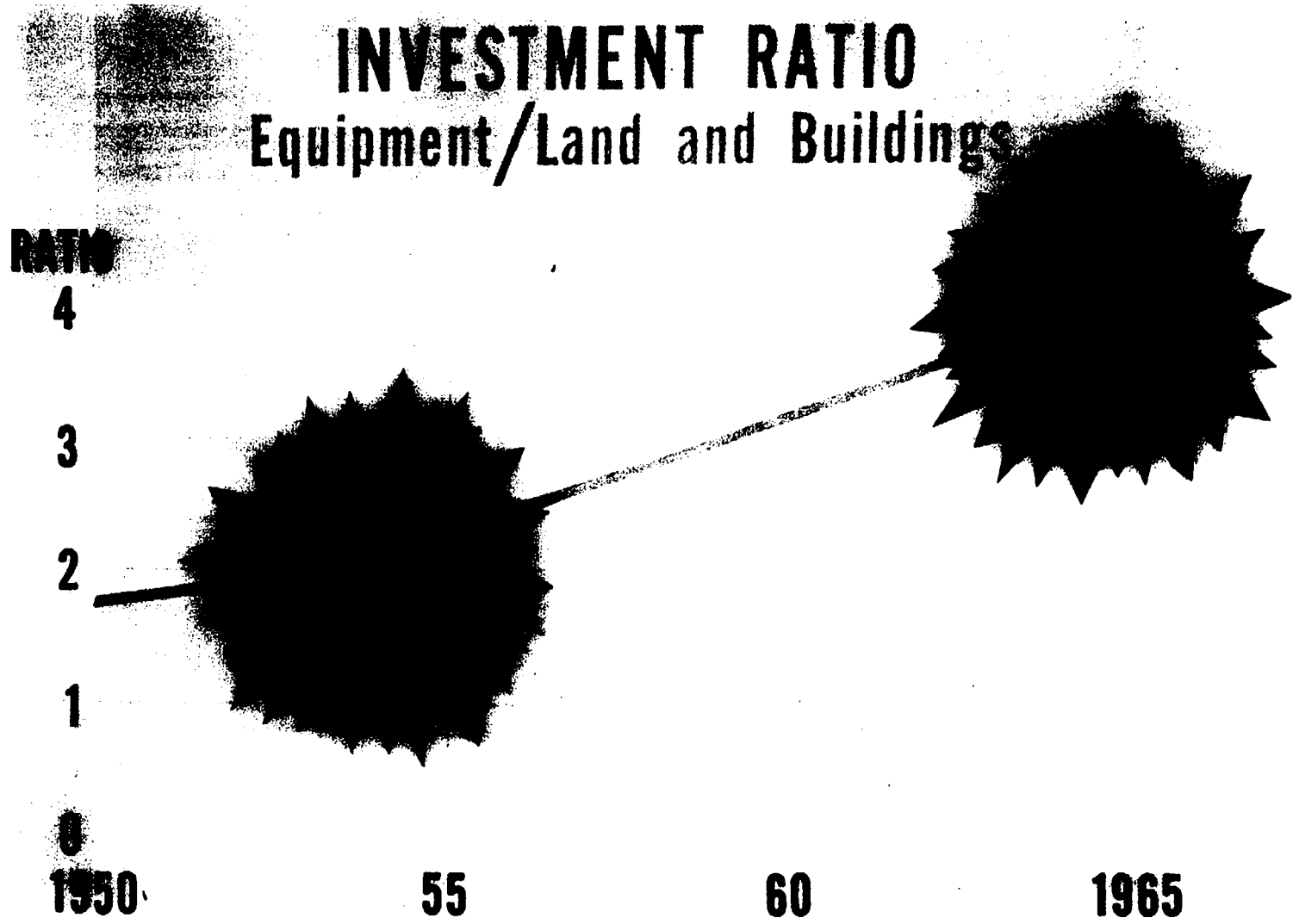

CHART 9

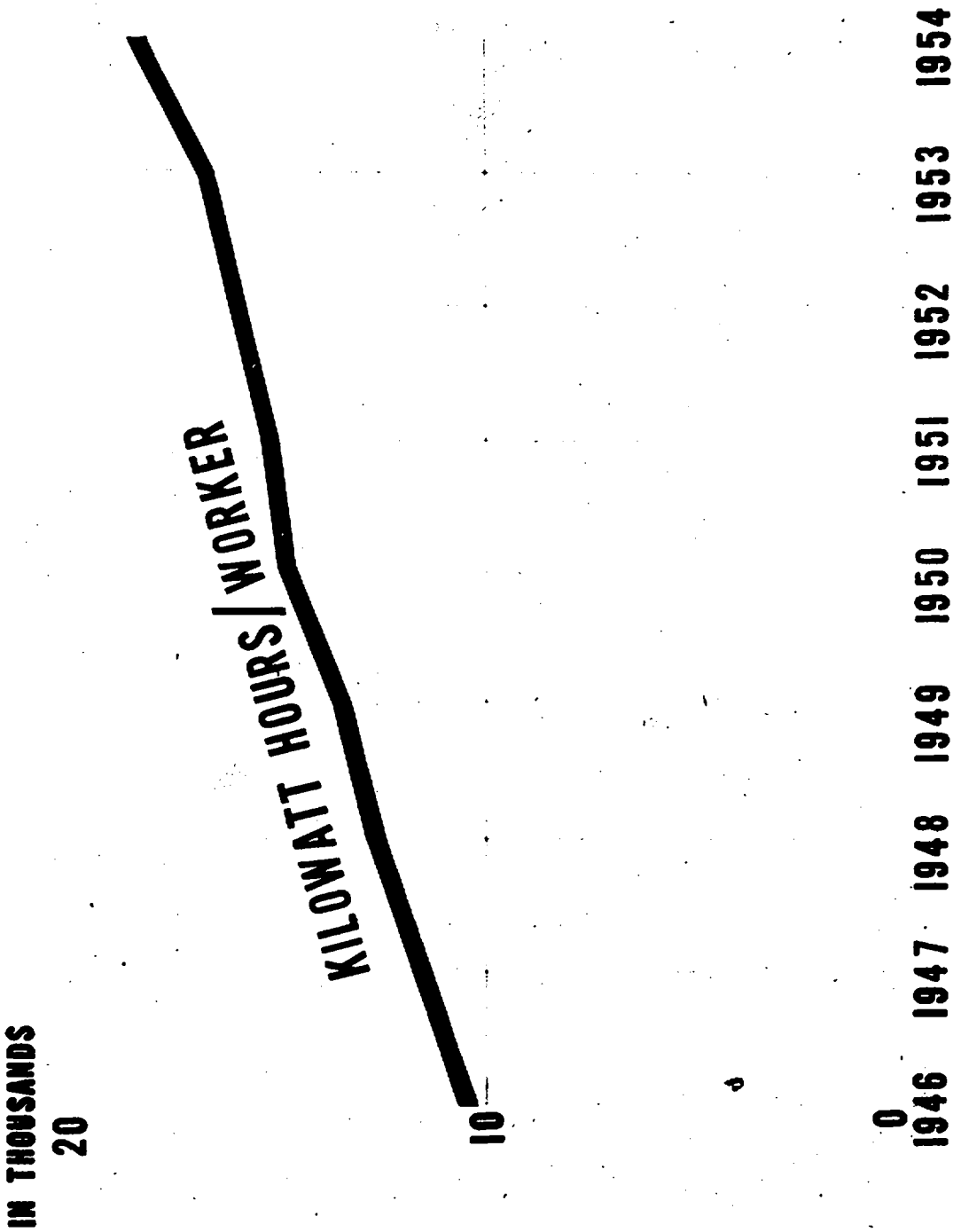
KILOWATT HOURS / WORKER
IN THOUSANDS
20
10
0
1946
1947
1948
1949
1950
1951
1952
1953
1954

CHART 10

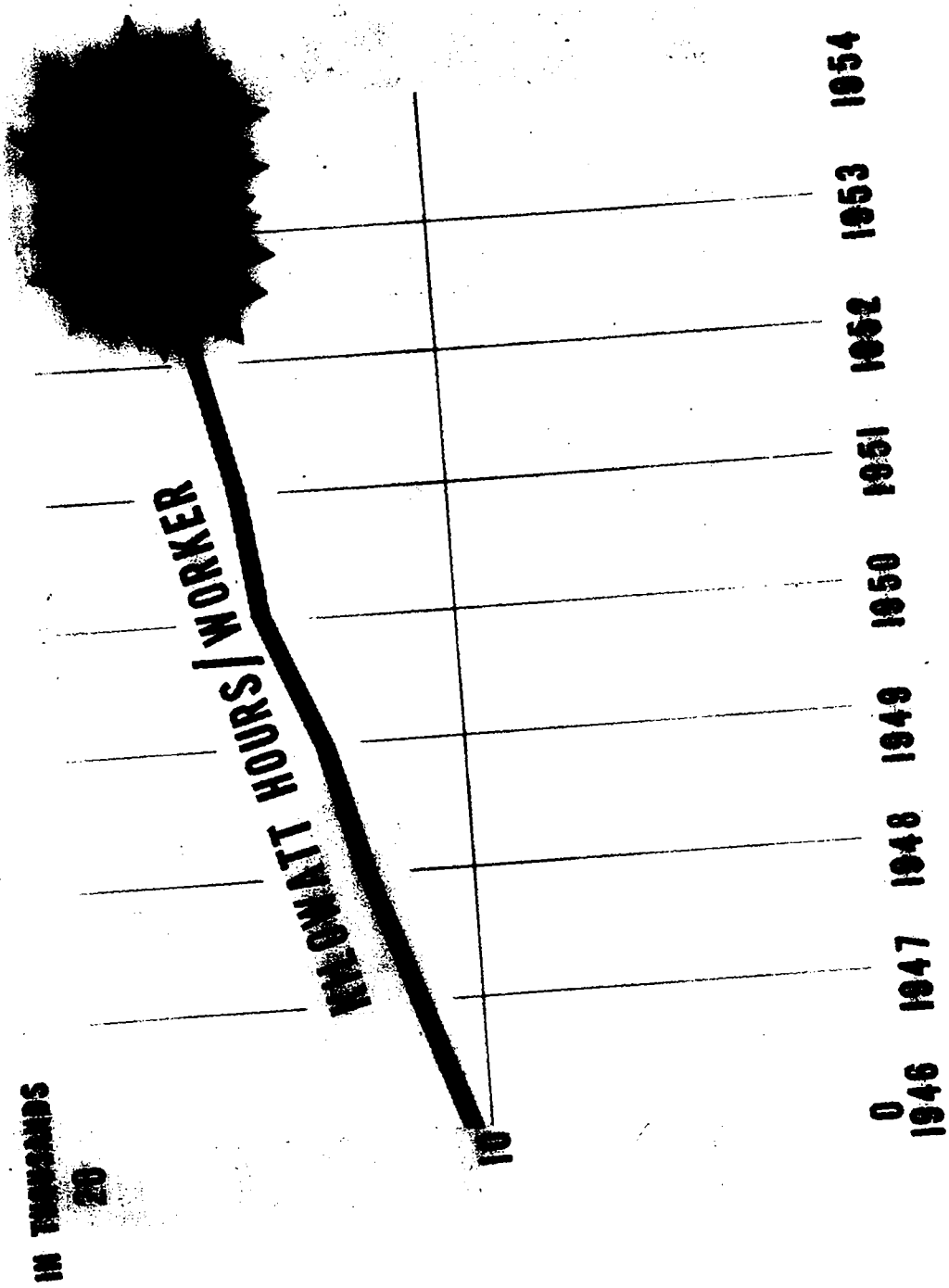
IN THOUSANDS
80
0
KILOWATT HOURS/WORKER
10
0
1946
1947
1948
1949
1950
1951
1952
1953
1954

CHART 11

U.S. MANUFACTURING HORSEPOWER-1964

For example, during World War II our industrial engineers helped design radical new systems of aircraft armament in which the aerial gunner had push-button control over his guns, and even had computers to help him aim the guns. In coming up with the gunfire control systems for the B-29, the A-26, the B-36, and other airplanes, the engineers used circuits and equipments originally developed for the steel industry. Thyratron tubes, very important in the B-36 armament, were originally industrial electronic tubes developed for the paper and resistance welding industries. The totally new approach in electric generating systems developed for the B-29 was directly based on our industrial experience.

Thus, continuing advances in industrial technology are vital to military technology.

My other point is that our margin of safety in modern arms depends on continuously increasing the productivity of American industry which produces them.

For example, the United States could not even consider a radar defense system if it did not have highly productive electronics and communications industries to design and produce the necessary elements in the huge quantities required.

Another example is jet engines. When the Korean War broke out, the Air Force needed thousands of jet engines as fast as possible. By applying the principles of mechanization and automation in our Evendale, Ohio plant, we were able to boost our monthly production of engines 1,200 percent. These J-47 jet engines powered the F-86 Sabres which scored a 14 to 1 edge over the Communist jet aircraft in the Korean War.

As an illustration of technical progress, the thrust of these engines has been increased 23 percent through design improvements, and the present J-47 engine has an allowable flying time of 1,200 hours, compared to 150 hours five years ago.

In spite of the cost of making more than 20,000 design improvements, we were able progressively to reduce the price by about 15,000 dollars per engine. The end result was a total saving to the taxpayers, from cost reductions on jet engines, of about four to six million dollars.

This illustrates how technological progress is essential to our national defense and why industry must continue to progress.

Of course, as you might suspect, when we start talking about automatic factories and automation, we hear much weeping and wailing. The human and social implications are at best only vaguely understood. The workingman's natural instinct for survival is not helped by the semantics involved either. To him the word, "automation," looks like nothing more than a thinly disguised version of the feared "automation"--replete with sinister implications of turning men into robots or doing away with them entirely. In fact, according to one survey, nearly three-fourths of the working population believe automation will result in layoffs and unemployment; they believe that its evils considerably outweigh its benefits.

This viewpoint is not surprising, nor is it new. Back in the year 1661, when a loom was set up in Danzig to weave as many as four to six webs at once, the authorities suppressed it because they thought it was hard on the poor people, who, taking courage from the authorities' example, seized the inventor and drowned him in a nearby creek! So you can see that the misunderstanding about automation cannot be dismissed lightly, because basically automation does take over jobs performed by men; but automation need not bring unemployment, as some people fear, for three very positive reasons:

First, in terms of the numbers of men required to produce a product, the reduction is a temporary displacement which can be offset by the demands of a broadening market as well as the creation of new industries. And don't forget, it still takes many men to build, service, and operate any automatic machine.

Second, automation does not happen overnight; it's an evolutionary process. Manual, direct-labor work will be progressively transformed into work which will be cleaner, easier, safer and more rewarding to the worker who, through the process of automation itself, will be trained for the more skillful accomplishments required in the better jobs of the future.

Third, and most important, automation is the necessary solution to a predicted shortage of labor. It is designed to do the work of men who are not there; it is a solution to a problem, not a cause.

Most economists agree that true advances in social conditions come about from increased production per worker, not from preserving outmoded techniques. When other countries, desiring to raise their living standards to a level approaching ours, have sought the reason for American productivity, time and again the answer has come back--more machines, more horsepower, and more investment per worker. What else can this mean except that jobs have become better--that more and more workers are becoming skilled technicians?

In 1900, United States industry as a whole employed an average of one engineer for every 250 employees. By 1952, the ratio was down to one in every 60 employees. And as an indication of the impact of the electrical manufacturing industry on this trend, the comparable statistic for General Electric is one engineer for every 20 employees. There can be little doubt that the resultant improvements in manufacturing technology, by relieving men's hands and backs of drudgery, will also free their minds for the demands on their skills and judgment that it will make.

I'm reminded here of an example in our General Electric Company foundry at Elmira, New York. Foundries, traditionally, have been one of the most dismal, hard, hot and dirty places to work in all of industry. As part of our planned progressive mechanization, we are taking out the menial and manual aspects of the job. Now mechanical devices do the lifting and positioning of heavy castings and molds; where hot metal has to be poured, we spot a localized blast of cooling air on the operator; our foundryman's job is becoming one of skilled handling. And to complete the process of transforming drudgery into more pleasant and rewarding work, we have created a new atmosphere by a complete facelifting--painting and cleaning until an oldtime worker would have difficulty in recognizing the shop. As a result of all this, the jobs are <u>good</u> jobs, and our human relationships are far better.

Just a brief mention of another example before we go on: Automatic sheet feeders on big punch presses that load, cycle the press, unload, and transfer the work on to the next station are a vast improvement from the operator's standpoint. The manual shoving and risk-taking elements are gone. The work is cleaner, easier and safer--and the operator has become a machine attendant, running the whole operation and producing twice as much. There are many, many more examples that I could mention if there was time, but the point is clear, I believe.

The trend toward automation has already played a big part in upgrading the labor force. For one thing it takes a specialist with a high degree of skill to run many of the new machines. For another, the problems of maintenance multiply as the machines become more complex. Thus, both the operator and the maintenance man have been upgraded and generally have gained their new skills on the job.

This fact is already recognized by some segments of labor management. Carl Huhndorff, research director of the AFL's International Association of Machinists, in a speech last year was quoted as saying:

> "What will probably happen over a period of years is that the work force of the country will require a higher degree of skill than they do at the present time. In other words, the employee mix between the skilled and unskilled workers will change to the advantage of the skilled workers. I agree with those who define automation as just another phase of the technological progress which has been going on since the beginning of time and which will continue until the end of time . . . . I will add that from an over-all point of view, society as a whole is going to benefit by it."

If there is anything really new about automation--and there is--I would say it is this: that today the principles of automation are being systematically applied by more and more businesses to the solution of their manufacturing problems. And automation is by no means restricted to the larger businesses. Small businesses, alert to the opportunities of automation, will improve their competititve positions and grow. As for the larger businesses, they must certainly evolve with the times, for no business is big enough to be permanently secure. Only <u>one</u> of the 15 largest manufacturers in 1900 is among the 15 largest today, and of the 100 largest industrial companies in 1909, only 36 were left among the 100 largest, 40 years later.

You are all familiar, I'm sure, with the predicted national increase in goods and services of 40 percent in the next 10 years--this increase to be produced by an available work force <u>only</u> 14 percent larger. The solution to this vital problem of increased industrial productivity--one of the great challenges and opportunities of today--is most certainly characterized by what we are calling automation.

Now, here's what I'm leading up to. This morning I am privileged to introduce the first industrial motion picture devoted to the history,

growth, concept, and future of automation. I'm proud to say it's a General Electric film, the latest in our "More Power to America" series, which is a continuing "look-ahead" program designed to help increase the productivity of American Industry.

May I therefore present our newest MPA production, "This is Automation."

Thank you for your generous reception of this film. From what you have just seen, I think it's abundantly clear that our productive future is the logical extension of our past technological progress, except that the productive demands will be greater than we have ever known.

Before concluding, I would like to emphasize the sometimes overlooked significance of the attitude and role of management in the practical realization of industrial automation.

Management must recognize that an automation program embraces all the functions of a business and not just the techniques of manufacturing. Management must recognize that an automation program is a step-by-step analysis of a company's products from a financial, marketing, and engineering viewpoint which results in simplification and standardization, the two keys to the successful application of automation in the factory.

It is up to management--management with vision, enthusiasm, imagination, and courage--to apply this way of manufacturing to their business. They must determine the degree of automation that their business requires and then develop an overall, progressive program, and see that it is properly carried out. Those who fail to do so will slowly lose ground, just as surely as those who attempt the program on too sweeping a front will lose their shirts. The game is going to be immensely rewarding for the successful, but very punishing on the reckless.

Management must also be farsighted enough to recognize that the competitive nature of business, today and in the years ahead, emphasizes the importance of and the growing need for trained manpower in the manufacturing function. This is a problem common to all of industry.

To look at this problem another way, we might say that the simplified organization chart of any department or business is the blueprint of a capital investment in manpower (Chart 12, page 21). It is not merely an expense to be absorbed monthly.

Chart 13, page 22.--Although the capital value of manpower can only be roughly determined, it should always outweigh plant investment in importance. What often happens, however--because manpower is a less tangible concept than plant--is that we tend to overlook the fact that the erosional forces of depreciation, obsolescence, and faulty planning apply to manpower investment, just as much as to plant investment. Nonetheless, the companies that will forge ahead are those who recognize these dangers and who are taking measures to protect and increase the value of their manpower, because the return on this investment is its rate of productivity.

We firmly believe that this enlightened approach to the future will not only help secure our national future, but will continue to give this Nation the highest standard of living enjoyed anywhere on this earth.

Thank you.

QUESTION: You discussed in your presentation very well how you have applied automation to the production of items. Would you care to discuss also how you have mechanized and perhaps applied automation to management of personnel and perhaps inventory control?

MR. VINSON: I would be glad to try, although that might take the rest of the day. First, let me make a statement which certainly is true with us--I won't speak for anybody else. Such things as office work, production control, and personnel records lack mechanization, and it is our firm belief that the automatic factory will be ready long before automatic controls of management.

In our case, we have made vast strides in inventory control. At Louisville, our material supplies to meet our production schedules are on UNIVAC. We have the IBM-705 in Schenectady in the same position. With a few advanced projects, we are attempting to stretch out a little farther in that field. We have not, to the best of my knowledge, completely mechanized personnel records.

But the real hope we have had for UNIVAC--and the only reason for getting that particular computer--was not for those conventional

CHART 12

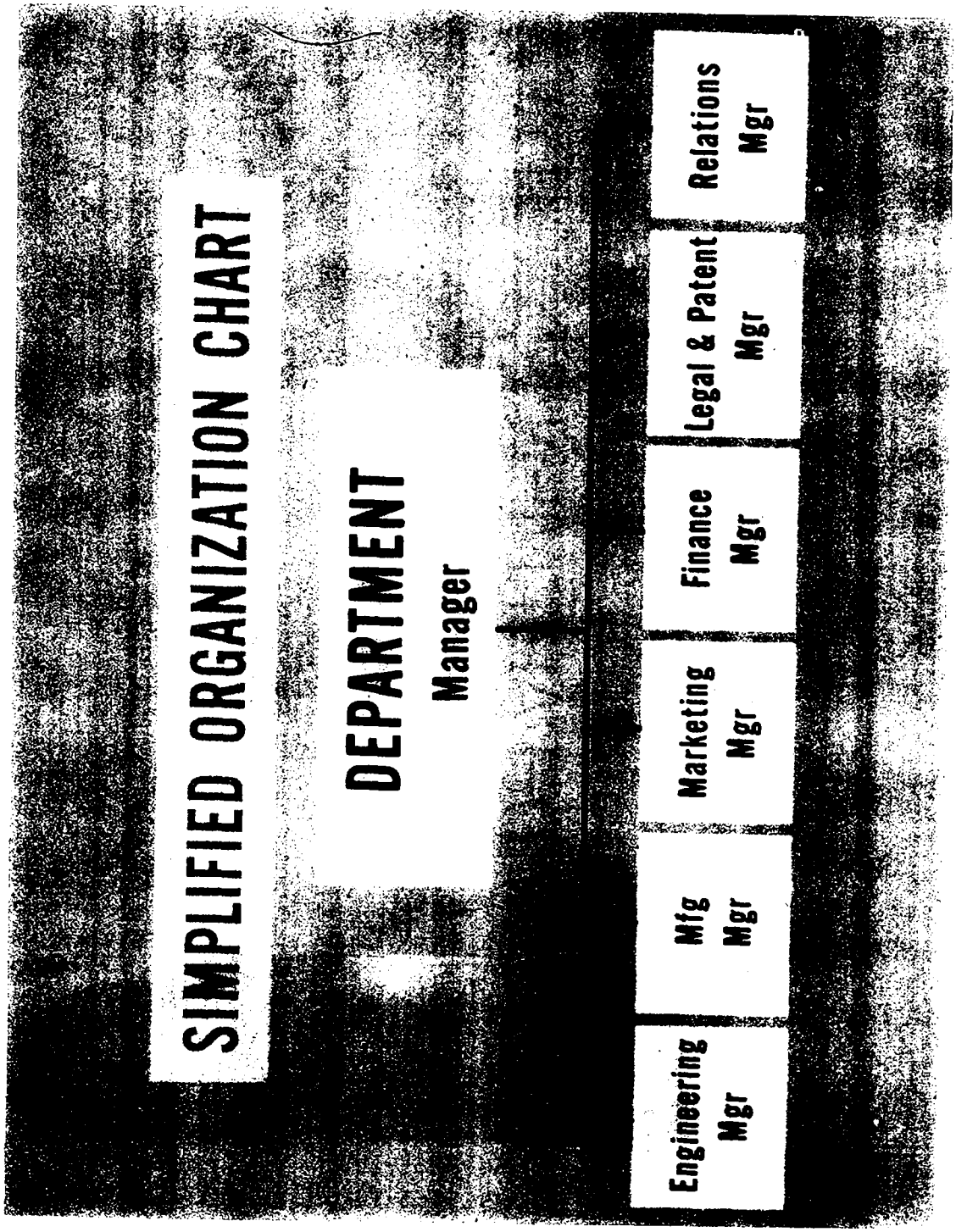
SIMPLIFIED ORGANIZATION CHART
DEPARTMENT
Manager
Engineering Mgr
Mfg Mgr
Marketing Mgr
Finance Mgr
Legal & Patent Mgr
Relations Mgr

CHART 13

things, but to reach out in our marketing field to see what your wives and mine buy in these appliances. We have peaks and valleys and we are analyzing this information to see what causes the peaks and valleys.

QUESTION: One of the first concerns of the military is production lead time. Today we talk about 2-1/2 to 3 years on a major item, and of course among the contributing factors in this lead time are machine tools. Now in this automation process you are getting much more complicated machine tools as such. Consequently, their lead time is more than it was before automation. We can look forward to a longer lead time to make a machine tool. Now we are continually trying to compress lead time, to contract. It seems to me automation will protract lead time on major items. The second part of my question is: Could you comment on the ability of the machine-tool industry itself to expand?

MR. VINSON: First on lead time, I will buy the first part but not the second. The lead time in getting into production, in our case at least, has been progressively decreasing. The J-47, for example, if I recall rightly--and I certainly wouldn't want to be quoted on this; I am speaking from memory--I believe was 24 months from release date until it was in production. The time on the latest engine at that same plant and locality is going to be 13 months. I think your only real hope--and this is purely my personal guess; the procurement time may be longer on some of these complex machines for quick acting in military products--is in building flexibility into the mechanization and automation we have in that field. That is being done.

Let me give you an example. In our plant at Louisville, the packaging machine handles not one model but five. It sets itself from a signal as appliances go down the line, and resets itself for the next model coming along. At Syracuse, in military electronic work, the mechanization being created is designed to handle a multitude of variables.

To get back to Louisville, we tried to build flexibility into much of the machinery there. As a matter of act, we built flexibility into the building. The building was designed to manufacture turbines and the structure is actually heavy enough. We did that by design so it could be quickly converted. Having gone through World War II and reconversion to peacetime products, we learned a lesson. We had a difficult time after the war getting back into commercial work. We lost position. We did not go out and get new factories; we converted

our factories to war goods almost overnight. We think we have learned something from that lesson. On every single discussion of automation, the question has been asked: How can we make it more flexible?

If the machine-tool builders--and this is the most difficult part of your question; I don't know enough about machine tools to answer the question fully--use the same type method that other manufacturers do (and I see some signs of their doing it) then lead time should not go up even on special machines. I would hope the kind of machines we would be using--I am going to except some of your high production military items, such as maybe transistors--would be modified standards which could be mechanized thus enabling us to take it from civilian use and use it on military production. If we had to build dynamotors for communications, and convert overnight again, I assure you we have mechanization where the gear would fit and would fit to a surprising degree.

QUESTION: With this automation and the upgrading of labor, I assume that most of these industries are introducing a training program that will keep their labor force in phase with their mechanization. On that assumption and with the dearth of engineering graduates in colleges, are you in a position to train the skills you want and, say, from the high school level?

MR. VINSON: That's easy. The answer is no, sir. We are very much aware of that particular problem and we are doing at least a dozen things. I will cite two or three important ones.

We inaugurated three or four years ago, in our manufacturing plants, an advanced course of work and assignment training programs along with night school for young graduate engineers and even Liberal Arts students--as well as some from the high school level. We have been very successful with a few carefully selected high school men in that course.

More specifically on your point of the high school level, we always had an apprentice training program; but we have had to completely overhaul our apprentice course in the last three years. We don't need more journeymen. We need electronic technicians, mechanical and electrical technicians. We have discontinued almost entirely our whole internal teaching of those courses and have turned them over to schools.

After the boys have had two years of training in the plant, they are given a leave of absence, with continuity of service if they wish,

to go to school and get a degree. Last year and the year before, a high percentage of the group went on and got their degrees. When they get through with that, they have had the benefit of experience (the apprentice course) and have a degree.

I wouldn't stand here and try to give any misinformation. This is a difficult training job. You can't train all common labor up to the technician level; but on a general selective basis, it is possible to work it out through specific programs. If we know we are going to get into a high degree of mechanization, the change-over has been planned maybe a year and a half ahead to avoid displacement of manpower in that particular plant. Some will be upgraded; some will not. It is not possible to upgrade all, but those who are not upgraded will be transferred to other work where they can meet requirements. There is a great deal of training to be done; we are on the way to doing it.

QUESTION: Sir, I would like to follow that question with one other question: Has industry given any thought to this rather large segment of the population that does not have the ability to acquire skills that will be required to work with automation?

MR. VINSON: Yes, sir. We have, and a lot of others have. I have heard a lot of talk about job enlargement programs. It is said that people don't like to do these simple tasks. That is true only of certain people. I don't think we had better be misled. I think there is a great segment of people who like to put nut No. 4 on bolt No. 4 all day long. In fact, we had as much difficulty transferring operators who have been on that kind of work to something more challenging than we have in the other direction.

There are many jobs left--and I think you saw some in those industry examples--which are no more than the manual loading of a machine, and I am a firm believer that there will be an adequate number of those jobs for people who want to do that kind of work. I could talk on this job enlargement thing all day. You probably can see I have some pretty strong feelings on it. I don't think that there is going to be a big move in the direction of enlarged jobs so that one person builds a whole tractor engine, or things like that. I think there will be many of these simple jobs and that it will be many, many years before we get the automation that will create that problem.

One thing you may have noticed is those plastic chairs. Perhaps you have heard the same view as that expressed by my wife when she

saw those chairs. She said, "I'll never have one of those in my house." I think the public is going to determine to a great extent the degree of automation. I don't think you are going to have complete automation--I am not going to say "ever"--for a long, long time, if ever. But I believe there will be many hundreds of thousands of those kinds of jobs and people will want them.

QUESTION: In the early part of your talk you mentioned a capital investment per square foot of about 50 dollars now, perhaps increasing to 75 dollars, I believe, in 10 years. Would you care to give us some estimate of the capital equipment or investment per worker and the projected change in the next 10 years?

MR. VINSON: The figure used in the talk was output per square foot, not investment. I don't have the figure accurately enough to give you. In our particular case, our investment per worker has gone up. As I recall the figures offhand, investment per worker has gone up 60 to 65 percent in the last 10 years, in that general range. I think for industry generally, it has been a little more. My prediction is that it will accelerate in the next 10 years maybe almost twice as fast. As a matter of fact, the ratio of 4 dollars to 1 dollar in equipment versus building that I used earlier is already a reality in that Ford Cleveland engine plant that you saw in the movie--a 4 dollar investment in machines and equipment for every dollar in the building. So that has accelerated. The general industrial figure is 2 to 1. Ours was 1 to 1 and has gone up to over 2 to 1. That is an index, but I think that comes pretty close to what you are after.

QUESTION: I still want to get back to the labor question. Take the women at your armature windings plant, I don't know whether you have automatized that line or not. Suppose you can, what are you going to do with those highly paid and highly trained women? You can't expect them to load machines from now on, and there are an awful lot of them. If you put them all back to keeping house in Schenectady, you are going to have trouble.

MR. VINSON: There is only one figure you are overlooking and that is the attrition figure--the turnover figure even in a plant like that at Schenectady. As a matter of fact, we hire about three people to keep one. Even in those skill trades, especially among women, the turnover is much higher than we would like to have it. So all you have to do is to plan it (you certainly know that mechanization is coming a year and a half or two years ahead). At that motor plant, we knew

2-1/2 years ahead. When you know that far ahead it is going to happen, all you have to do is quit hiring adequately ahead of time. You will still have a problem with a few experienced people and can plan to transfer them to challenging work.

Mr. Cordiner had the opportunity of testifying before a Senate Committee on this subject and in preparation for that he had a dozen of us scouting around getting facts and figures that would be positive and 100 percent accurate. One thing he asked me to get was a list of the people displaced in 1955 due to automation. I made a careful search of 126 plants and the answer was zero. No employee in 1955 was displaced because of automation. So it can be done. What would be pretty tough is, if there should be a recession at the time you are introducing some automation. My answer to that would be: Let's hold back automation a little while. What of it? Human things are very important. We must plan it very carefully. I don't expect we will be 100 percent successful, but we will try.

QUESTION: I was interested in your forward training program. Do you have a brochure on that that you could send us?

MR. VINSON: We sure do. I would love to send it.

COMMENT: If you would send it to our library here we could all have a look at it.

MR. VINSON: We will do that. Thank you.

QUESTION: I still am not satisfied with your figuring you can get flexibility in this program. I go back to the last war--we are accused of fighting the next war that way anyway--I inquired one time of the canning industry why it was necessary to have provisions put up in round cans because we were shipping so much air overseas. They didn't have any real automation, but they said they would have to retool because the machine has to rotate to make the round can and with a square can, they couldn't do that. There is a possibility of restricting ourselves in designing something not acceptable to automation and thereby run into difficulty.

MR. VINSON: I don't know that I am capable of answering your specific question about your cans. Maybe the round can is still the right answer even if you <u>are</u> shipping air. I can only say this, that I don't think there would be any technical problem in automating a square

can. We just finished, not more than two weeks ago, a series of engineering studies on the IBM-705 to determine what shape or configuration the transformer tank should take--the most economically sound shape to build a power transformer tank. They n ade calculations which previously might have taken something like 12 years. They found that the rectangular tank was cheapest. With the UNIVAC in Louisville our engineers came up with the best shape of refrigerator as rectangular, too. Maybe industry will come up with a rectangular can. We have misjudged those things more often than not. We believe flexible automation will keep pace with product design.

COLONEL BILBO: Mr. Vinson, on behalf of the Industrial College, I wish to thank you for a very interesting, informative and stimulating lecture.

MR. VINSON: Thank you very much.

(5 April 1956--450)M/sgh