

ACTIVITIES OF GOVERNMENT AGENCIES IN TECHNOLOGICAL RESEARCH

Text of Presentation Made by Ernest J. Hopkins, Federal Reserve Bank of Atlanta, Before the System Research Advisory Committee on September 23, 1944

The purpose of this necessarily sketchy presentation is to supply a factual background as a possible aid to your decision in the matter of the appropriation voted by the directors of the Federal Reserve Bank of Atlanta to the new Southern Research Institute. I was assigned to investigate and report on the present activities of Government agencies in the field of research on industrial and technological matters, especially for small business. This assignment, as I understood it, excluded the very large amount of Government research connected with the war, both because the war research had very little to do with small business, and because the Southern Research Institute was founded in anticipation of the readjustment period and is intended to operate primarily under conditions of peace. Also, because the assignment seemed to imply some comparison between what the Government agencies are doing and what the Southern Research Institute will do, it seems necessary first to state certain distinctive features of the Institute and of its plan of operation.

The first distinctive feature is that of location. The new institute is located in Birmingham, Alabama, at the center of a nine state area that has presented a virtual vacuum in the matter of technological research. With approximately 18 per cent of the national population, the nine Southeastern states, according to the latest figures of the National Research Institute--those of 1938--had only 983 resident research workers, or 2.2 per cent of the national total. In the ten year period preceding 1943, 10,825 patents had been granted to applicants resident in those nine states, and this was 2.9 per cent of the total number of patents granted in the nation in that period. There is an interesting correlation between those two figures, and the fact that these same states, while having in 1940, 14.1 per cent of the national total of workers in manufacturing, produced only 8.7 per cent of the nation's value of manufactured products, suggests another and related aspect of the picture. Much manufacturing industry in the Southeast is more or less rudimentary in type; technological advancement is urgently required. In 1939, while the average manufacturing worker in the United States was producing \$1, the average manufacturing worker in these nine southern states was producing only 58 cents. That is to say, the average American worker added \$3,130 in value to the materials that he processed, whereas the average Southeastern worker added only \$1,825. Since the levels of average wages also correlate roughly with the value added by manufacture, we have in the lack of research one reason for the low per capita income of the Southeast and of the failure of that region to contribute properly to the national income.

Economists who have studied this general situation almost unanimously agree that the higher technological developments needed to overcome the industrial lag must come about in the sector of independent or unaffiliated private enterprise. The South has an over-balance of branch plants

that are part of national multi-establishment concerns; and the particular units which these concerns have located in the South perform, more often than not, the preliminary and more rudimentary processing--a situation that goes back, historically, to the region's old lack of industrial experience and of labor skills, now happily ended by the war. In Alabama, for example, where the movement for the institute began, more than 80 per cent of all manufacturing production prior to the war was performed in the branch plants. Little can be done to change their status, and the improvement apparently must come, if at all, through a modernization and expansion of existing independent enterprises and the founding of new enterprises of types indigenous to the South. There is the further fact that many of the raw materials of the Southeast appear to require new technological developments if they are to be utilized by industry. For example, there are large deposits of low grade bauxite, which the existing aluminum industry has not learned how to process profitably. There are scattered deposits of mica, of different pottery clays, of phosphate rock, of soil that bears grain iron, and there is much experimentation to be done in the utilization of the wood wastes of the soft Southern pine, and the by-products of Southern cotton.

For the needed type of new industrial development, sufficient capital now exists, skilled labor exists, and the regional desire certainly exists, with an evident awakening of the entrepreneurial spirit. Some technological research also exists, mainly in state experiment stations and other public institutions; but promotion and capital seem hesitant to seize upon the findings of public research, perhaps because the public patent is an open patent and offers the new enterprise no security against direct competition, including the competition of big business.

So we come to the plan of the Southern Research Institute. The Institute, which opens its doors on October 1, may be described as a Mellon institute without a Mellon. Its founders, having no large single endowment available, set about to obtain capital from public subscriptions; the largest subscription is \$25,000 annually, and individual memberships are being sold for as little as \$25 annually. By this means more than \$400,000 in initial capital has been obtained, and this capital is to provide laboratory and library facilities and has already covered the purchase of a building large enough to accommodate 20 to 25 research workers and a two-acre plot of ground with room for future expansion.

The Institute will operate on the industrial fellowship plan, devised in 1907 by Robert Kennedy Duncan and followed for the past 30 years in the Mellon Institute of Industrial Research. Under the terms of this plan, a private business enterprise or company that has a research project in mind and that either has no laboratory of its own or prefers not to use its own laboratory for this particular investigation sponsors a research fellowship within the institute. The institute agrees to create a research fellowship, devoted to the particular project, within its organization, to find and employ a competent scientific specialist to undertake the given task, to direct and aid the research and to place its scientific resources

at the specialist's disposal. The business company on its part agrees to pay a stipulated sum to the institute. The cost of a fellowship is not, as a rule, prohibitive; in the case of the Mellon Institute, which had 101 such fellowships in existence at the time of its latest report, the sum of \$7,500 annually will pay the salary of the research fellow, ordinarily \$4,000 or \$4,500 a year, allow a thousand or two for expense and also includes \$1,500, or 20 per cent, to be paid to the institute on account of overhead expense. An expense of this order--depending, of course, upon the number of research fellows or assistants employed on a given project--appears to be within the scope of the small business enterprises, especially in the field of manufacturing.

As enough fellowships are sponsored, the contributions to overhead make it possible for such an institute to undertake research projects of its own. Such a development is contemplated by the Southern Research Institute, but can hardly occur in practice until enough sponsorships exist. It should be clearly understood that all results of research under an industrial fellowship sponsored by a private enterprise are held strictly confidential and are the sole property of that enterprise. The results of any research work undertaken by the institute on its own account are, of course, the property of the institute.

Three patent situations are to be distinguished, for they run as a main thread through this entire presentation. The end result of the industrial fellowship system is the purely private patent, assigned to and owned by the sponsoring enterprise. By diametric contrast, the end result of a research project undertaken by a public or a quasi-public institution or agency is what is known as the public service patent; and the purpose of a public service patent is generally to protect some finding of research from private exploitation. There is, broadly, a distinction between these two types of patent in that the public service patent generally covers some discovery, some more or less basic principle, whereas the purely private patent usually covers an invention, device or formula for applying a basic principal. The third situation, already suggested, is where both types of patent exist, the open public service patent covering the basic discovery, and the private patent covering some specific invention for the embodiment of the fundamental discovery in practice.

The research that already exists in the South is carried on mainly, indeed, I think, wholly in public institutions. Louisville has its Speed Scientific Institute of the University of Louisville and, I understand, a new institute on the research fellowship plan is being established in Kansas City. If there are any institutional laboratory resources directly available to private enterprises for their private work, east and south of those points, I am not aware of their existence. The founders of the institute had this fact in mind in adopting the industrial fellowship plan.

We come, then, with these elements of comparison in mind, to the question of what research activities are available to business, and especially to small business, from Government sources.

First, the small business division of the Bureau of Foreign and Domestic Commerce in the Department of Commerce may be mentioned only to state that it has no relation to physical or technological research. The small business division, which was organized last March, represents a reorganization of the field office system of the Bureau, with an increased emphasis upon the objective economic study of small business and the furnishing to small business of aids and guides of an advisory or informative nature.

Within the Department of Commerce, however, is the National Bureau of Standards--an immense research institution whose work is fundamental to much if not most of the technological research performed in the United States. The Bureau is a research and testing laboratory, emphasizing the testing of products rather than the development of processes. From the custodianship of the standard yardstick and the standard pound, the concept of measurement has expanded to include every type of measurement and analysis in the fields of electricity, temperature, radiation, organic material such as rubber, leather, textiles, paper, or plastics, inorganic materials such as brick, glass, porcelain, tile, cement, concrete, lime, building stone and so on, chemical tests and investigations of petroleum, paint, varnish, roofing materials, soap, cement, rubber, balloon fabrics, office supplies, steel, nonferrous alloys, platinum, electroplating, electro-typing, gases, and so on ad infinitum.

From this measurement or testing activity arises the occasional discovery of new properties of materials, new products or derivatives, and such discoveries lead in turn to public service patents. These patents are obtained by Government attorneys and are assigned to the Secretary of Commerce. It is not the practice to obtain patents on all discoveries of the Bureau of Standards, but primarily those that may be exploited, hence the number of such patents held by the Secretary of Commerce is not large--less than 100. All of them, however, are patents of basic discoveries; discoveries, largely, of new properties of materials, new products or new derivatives. These patents are open under nonexclusive license for industrial use, and in turn in many cases they have become the basis for private inventions and devices.

The National Bureau of Standards accepts research associates whose work at the Bureau is supported by large private technical or industrial organizations. Research associates are preferably accepted from associations or groups that represent major parts of the industry concerned. Single companies or individuals, however, may support projects at the Bureau, when it is clear that the results will be of value to the general public as well as to the private interest concerned.

At the present time there are associates present at the Bureau from the following organizations: American Petroleum Institute, American Society of Mechanical Engineers, American Standards Association, Castiron

Pipe Research Association, Radiation Laboratory of the Massachusetts Institution of Technology, National Radio Institute, Rubber Development Corporation, Wayne Wire and Die Company, Western Electric Company, Structural Clay Products Institute, United States Cane Sugar Refining Association, Zenith Radio Corporation, American Dental Association, American Society for Testing Materials, Asphalt Shingle and Roofing Institute, Calcium Chloride Institute, Co-ordinated Research Council (fuel and lubricating oils), National Lime Association, Portland Cement Association, American Iron and Steel Institute, and the National Research Council. To these may be added the representatives of the Textile Foundation, Incorporated, which exists under governmental auspices and is virtually part of the Bureau of Standards.

Small business may, and obviously does, benefit from the work of these associates, and from that of the Bureau in general, insofar as the findings of such research reach down ultimately to the smaller units within an industry. But there is still need of particular research in order to develop patentable applications of the basic findings, and the existence of such research depends entirely upon the access had by small concerns to laboratory facilities at their own command.

The Bureau of Standards helps small business to an unknown extent in another way. Dozens of requests for technical and scientific information are received at the Bureau by mail daily. All such requests, unless they are clearly idle or fantastic, are scrupulously answered by the Bureau. Either the information is already printed or otherwise available to the correspondence division, or else the request is routed to the research worker within the Bureau who is best qualified to answer it. Research workers of national note leave their work to reply to letters of inquiry from unknown persons, dealing with their specialties. How many of these requests come from small business concerns is not known, but it is stated that 90 per cent of all requests come from unidentifiable individuals writing on plain stationery. The total number of queries is many thousands a year.

In the course of my inquiry at the Bureau, three policies were expressed that may bear upon the matter of the Southern Institute. In the first place, the Bureau refers inquiries to private laboratories wherever it is possible. In the second place, the Bureau expressly encourages the foundation and development of research laboratories under private or quasi-public auspices throughout the country. A recent example is the new laboratory of the laundry industry, founded after that industry had been represented for some time by an associate at the Bureau. The third point bears upon the question of the duplication of research facilities. The interesting thought was expressed that duplication of research is desirable rather than the reverse; that the entire history of research contains many instances in which the best results have been obtained when many research workers, in different parts of the country, were working on the same or similar problems. The minds of research workers do not duplicate; moreover, there is value in interchange of information and, no doubt, in competition. For these reasons, duplication of research is never regarded by the Bureau as a problem or a waste, but precisely the reverse.

It was further stated that if all small business concerns in the country took to calling upon the Bureau for technological information, the Bureau would be swamped. The smaller industries, it was stated, might better try to help themselves. It was also stated that a research organization within a region might well have the confidence of the local industries, afford readier means of investigation, and stimulate particular technological developments more greatly than any national laboratory could do.

Turning to the research work that is performed under the Agricultural Research Administration of the Department of Agriculture, and the somewhat similar work performed in other departments, we are afforded, as it seems to me, at least a glimpse of the dynamics of a significant economic change that has been going on under our eyes for some time past. I refer to the process by which small business in manufacturing has increasingly adjusted itself to living in a world of industrial bigness--by which the small manufacturer, conventionally regarded as a direct competitor of the large, has actually found special functions, subfunctions, or variants of functions, so that today the small manufacturing enterprise is much more to be found in a supplemental or complementary position, in its relationship to large industry, than in a competitive position.

First, let me describe two divisions of the Agricultural Research Administration. The Bureau of Agricultural and Industrial Chemistry, within that administration, operates four large laboratories engaged in research upon agriculture and its products. One of these is at Wyndmoor, Pennsylvania; in this laboratory studies are made on tobacco, apples, potatoes, milk products, vegetables, hides and skins, tanning materials, fats, and oils. Another is at Peoria, Illinois; there studies are made on corn, wheat, soybeans, and agricultural residues. The third is at New Orleans, in the Southern region; its studies are concentrated upon cotton and cotton byproducts, peanuts, and sweet potatoes. At Albany, California, is the laboratory that makes studies on fruits, vegetables, potatoes, wheat, alfalfa, and poultry products and by-products.

It is obvious from this list of topics of research that not only the production of materials, but the uses of materials, are studied, and that these lines of agricultural research may very often have an industrial bearing. The Bureau in fact conducts its broad program of research in chemistry and the physical sciences, not only to gain new knowledge in agriculture, but also, expressly, to find new and wider industrial uses for agricultural products and for raw materials associated with agriculture.

Also within the Agricultural Research Administration is the Office of Experiment Stations, which administers Federal grants made to 48 state and 3 territorial experiment stations in agriculture, and co-ordinates the activities of these state and territorial stations. This office administers about seven million dollars of Federal funds annually; these are the Hatch, Adams, Purnell, and Bankhead-Jones funds. The last named fund is used to match state appropriations, and there are also state appropriations to the various stations, so that the seven million dollars of Federal money is increased by some 18 million dollars of state funds. The proportion of state funds within this yearly \$25,000,000 program

is increasing; in 1942 the states put up \$2.16 to every dollar of Federal money, whereas in 1944, the states are putting up \$2.71 to each Federal dollar.

The research work of the four Federal stations and the 51 state and territorial stations leads, in general, to public service patents. Some of the patents cover basic discoveries, but a good many also cover devices or processes in the invention class. A few general examples will illustrate the work itself, and also the economic trend to which I have referred.

In the past, fertilizer manufacturing was concentrated in two or three big concerns. Various state agricultural experiment stations, in studying the fertilizer requirements of particular areas or subareas, developed a wide variety of special fertilizer needs for given localities and soils. The large concerns generally had their established formulae and were not interested in adapting their production to supply these particular minor and usually relatively small and local markets. The needs that had been developed by soil research accordingly led to the establishment of hundreds of small, special-purpose fertilizer plants, so that the industry is now spread out into numerous small units as well as the central units. The small units generally buy their basic materials from the large concerns, but reprocess and recombine those materials along special formulae derived from the experiment stations and sold to limited groups of farms. In this way, agricultural research has guided and varied the production and has developed the market; while small businesses have come into existence to supply the markets so established.

The chemical industry also has been greatly affected by the outcome of agricultural research. A wide variety of chemical products has been developed and here, again, the tendency of the big chemical concerns is to farm out these new special products to small plants. For example, the research program into plant diseases has developed many new sprays, inoculations, and chemical treatments for seeds and soils. The largest chemical concerns take the attitude that they prefer to sell the basic chemicals to special-purpose manufacturing companies, which they also aid by advisory helps, and at times, I am told, by capital. Recently a state experiment station that regarded tobacco as a surplus crop conducted a new-use investigation, in the course of which it was found that a tobacco derivative had a medical value for the removal of blood clots and the treatment of coronary thrombosis. This basic patent is being made available at the present time to drug-manufacturing concerns, large and small, each of which, no doubt, will develop its own variant.

The manufacture of farm machinery formerly was concentrated in three or four big concerns. But research developed special-purpose equipment to suit special conditions of soil, slope, size of farm unit, and for different crops. The big concerns did not want to alter their assembly lines and these special types of equipment are largely produced by small or medium-sized manufacturing units today. One experiment station not long ago completed a study on the mechanical distribution of fertilizer.

A new machine was developed, which the International Harvester Company declined to make. International Harvester, however, recommended a little concern in Atlanta, and this company, aided and advised by International Harvester, first made 100 of the machines, then after field tests proved successful, made 20,000 of the machines in 1943. This instance appears to be typical of the economic trend I have tried to describe.

A Wisconsin station, at present, is conducting research into methods of speeding up the manufacture of high-grade cheese---a process now requiring considerable time. Should a method be developed of making a given cheese in, let us say, half the time, the station will take out a basic patent and various small cheese-making plants will be enabled to work out and perhaps to patent individual processes of applying the basic principles.

The corn research program, largest of all, has been pursued over a period of more than 35 years and has involved at least 12 states and the Federal stations. Numerous new industrial uses have been developed for corn cobs, corn stalks, the leaves of the corn plant, and the kernel itself. These industrial uses have entered into very many lines of manufacturing production. One interesting fact that was stated to me is that in finding new fertilizers to improve the breeds of corn, actually new ingredients have been put into the corn plant itself, and that some of these new ingredients have developed industrial uses.

So important has been the agricultural research program in its effects upon farming and industry alike, that in most states public appropriations for this purpose are no longer difficult to obtain. In New Jersey recently, a squab-raising industry developed, and encountered nutrition and disease problems. With very little campaigning, the squab-raisers obtained a state appropriation for special research, which the state experiment station, in view of the shortage of research workers at present, is having some difficulty in spending. This research may be expected to develop some special products for small industry to supply to the pigeon-farmers.

What has been said of the agricultural and research program applies in general to other types of Government research work. For example, among the 12 forest and range experiment stations of the United States Forest Service in the Department of Agriculture, some stations are performing research work that has an industrial bearing on the lumber and woodworking industries. An outstanding example, in the South, is the station at Olustee, Florida, that has devoted itself to problems of the naval stores industry in the south, and has gone far to modernize and regenerate that formerly run-down industry. The Forest Service also has a new appropriation for a station near Seattle, to develop alcohol from wood wastes.

The United States Bureau of Mines, in the Department of the Interior, has laboratories for studying the processing of low-grade ores and also has a number of pilot plants for determining the commercial aspects of manganese, chromite, magnesium, nickel, copper, antimony, bauxite, and other

minerals. The sponge iron process is also being studied and there is a broad program of hydro-metallurgy, electro-metallurgy, and the like.

Finally, again in the South, the Tennessee Valley Authority in its well-equipped laboratories has made both basic investigations and some inventions. An important new fertilizer, phosphate concentrate, developed from phosphate rock deposits in the TVA area, is being produced in a large factory. TVA also has a pilot plant for developing lamination and other forms of utilization of Southern wood wastes. A small-unit machine for cottonseed oil extraction, a new quick-freezing process, and other discoveries and inventions, have been developed.

Other Government research agencies, State and Federal, exist; this is an illustrative rather than a definitive presentation. But the principal ones have been mentioned, and they show the following features: the general technological aid to industries or industry groups in their entirety, the open and basic public service patent, the effect upon small business that is obviously significant but still indirect, and the failure to provide quite the same direct and specific laboratory services for small enterprises that are contemplated in the case of the Southern Research Institute.

There remains one new but rapidly developing service to small business that seems to me so important that I have saved it for my conclusion. This is both a private and a public service; it is conducted by 20 banks throughout the country as a private banking service to the industrial clients of those banks, and it is simultaneously conducted and is being considerably expanded, in a special division of the Smaller War Plants Corporation. This is the division known as the Technical Advisory Service of the SWPC. It is quite unrelated to the contract placement or to the lending activities of the SWPC.

The name, Technical Advisory Service, is somewhat misleading. This service does not give technical advice to any business. But it does place a business that needs technical advice or aid in touch with the people that can best supply the answer to the given problem. In other words, it is a technical referral service, rather like the service of a library in supplying bibliographies, excepting that the business that is in trouble is placed in touch with laboratories, business companies, professional services, and other living aids. This referral service does not involve any new research. Rather it is calculated to place any small business concern in touch with the most advanced existing technological developments in the nation and to put the small business abreast of its times. A vast amount has already been found out by the research of the past, and a vast amount of what has been found out is not protected by any trade secret. Through the technical advisory service of the banks and of the SWPC, the small business may find out what has already been found out. To the owner-manager of a decentralized small enterprise, too busily occupied in running his plant to keep abreast of all modern developments, this technical referral service is of the highest value and importance.

The idea was developed in the Liberty National Bank of Buffalo, New York, in 1937. It was the invention of Bert H. White, vice president in charge of investments of that bank and previously an industrial engineer. Mr. White first conceived of the referral service simply as an aid to the enterprises that borrowed from his bank. The better the technical status of the bank's clients, the better their credit status and the safer the loan--thus Mr. White reasoned. The idea caught on, was publicized, and a New York advertising man suggested that it be marketed to other banks. In June 1942, when Fortune magazine wrote up this service, twelve banks in various parts of the country were offering it to their clients. At the present time, I am informed, there are 20 such banks, one of which is the First National Bank of Atlanta, Georgia.

Mr. White became a lieutenant-colonel in the Army Air Corps. In 1943 the bank in Buffalo, as a patriotic service, offered to the Government the plan that it had developed. This service accordingly was established within the Smaller War Plants Corporation and 16 trainees from the SWPC went to Buffalo and were trained in the work in person by Colonel White. The SWPC began to extend this service to small business in war production or essential civilian production, just a year ago.

The basis of the service is a file containing sources of information of every type--technological, architectural, managerial--cross-indexed under types or categories of information. On the technological side, the file includes all the Government research agencies that I have mentioned and also includes private industrial research laboratories, of which there are 2,200 in the nation today. The file also includes business catalogs, scientific journals, individual research men, business service concerns, sources of every description. When Colonel White first set up this plan, the file contained 700 cards; today it contains between 20,000 and 25,000. The men in the SWPC who are in charge of this service know how to use this file; and also they are constantly adding to it and building it up. When and if the service of the Liberty National Bank of Buffalo is given back to the private banking system, it will be a bigger and better service than it was before.

I have here a document entitled "Index to Reports Furnished" by the SWPC on research, production, marketing, and management. The index shows 58 subcategories which are the main divisions of the file: abrasives, adhesives, agriculture, agricultural equipment, air conditioning, and so on. Included in the list are business economics and marketing. A glance down the pages of the report of problems solved shows such items as these: information on better welding methods, new and fast method of removing carbon from gasoline motors, substitutes for tetrasodium pyrophosphate used in paint cleaning compounds, how to prevent the tarnishing of metal embroidery thread, the machining of manganese castings, phiourea as a stabilizer for vitamin C, marketing outlet for carbon dioxide gas, market conditions for artificial limbs, absenteeism, operational programs to reduce fatigue among women

employees, incentive plan for a hosiery mill manufacturing children's hose, and so on. In 11 months of operation, up to August 31, the Smaller War Plants Corporation has been instrumental in finding the answers to 2,821 specific inquiries, each representing a bottleneck to war production in plants having as a rule less than 100 workers. How many inquiries the private banks having this service have helped to answer in addition, I am not informed.

A query on a specific problem comes to the service in a letter from the management of a factory. The problem is looked up in the file and a list of, let us say, 20 or 25 possible informants is selected. Without divulging the name of the company that is having the trouble, the SWPC sends the query to the list of possible informants and receives their answers. The answers are usually given very promptly, and it is remarkable how research men, working for private enterprises, stand ready to give such information as long as no trade secret is involved. These answers are brought together and summarized, with the names of the informants, and this summary is mailed back to the manufacturer who made the query. From that point on the manufacturer does the rest, getting directly into touch with those informants that he selects from the list. That is really all there is to this system. This is a free service, and not especially expensive to operate.

Some of the cases are rather dramatic. A small macaroni manufacturer received an army contract to make macaroni containing 10 per cent of soybean flour. He tried to make the macaroni, but it proved extremely brittle, cracked to pieces, and was rejected. He wrote his trouble to the SWPC. This proved to be a difficult problem to solve; the leading baking companies could not solve it, and the SWPC wrote all over the country. Finally, the SWPC got wind of a little baking concern that had experimented on the side with macaroni containing soybean flour. This concern was communicated with and supplied the answer. The main feature of the solution was that, in making the paste, the soybean flour was to be put in first and the wheat flour stirred into it afterward--a reversal of the normal process. A flexible macaroni resulted. The informant himself said he did not know why. The contract went ahead and that is how the army got its protein enriched macaroni in a form that did not crack.

A small Atlanta company that manufactured canvas tents in peacetime obtained a contract for canvas army cots. The cots were good cots and were accepted, but upon being taken to North Africa, the canvas went to pieces in about three weeks' time from a mildew peculiar to North Africa. Contract loss was threatened, but was prevented when the technical advisory service communicated with the leading chemical companies of the nation and found the proper mildew-resisting impregnation for the canvas. The samples were taken to North Africa, tested, and production was resumed. But a second difficulty immediately developed. When they tried to stitch this impregnated canvas, the needles of the sewing machines immediately became red hot and the plant had to close down repeatedly to let the needles cool. This difficulty, again, was referred to the SWPC. As it happened, other cases of needle heating had arisen. A small manufacturer of army pants had just had the same trouble and I have here the report on this case. First, the Singer Sewing Machine

suggested that a chromium plated needle was superior to a nickle plated needle. Hart Schaffner and Marx added that the needle should be of proper size and the thread should be run through Crisco. Durbrow and Hearne of New York suggested chromium needles, but stated that due to the WPB restrictions it was impossible to obtain chromium at this time. The editor of the American Wool and Cotton Reporter contributed the thought that a different shape of needle might be needed. The Union Special Machine Company of Philadelphia stated that they sold a needle cooler, a sort of fan, that played air upon the needle. Finally, the Torrington Company of Connecticut wrote that they had plenty of chromium and were filling orders for chromium-plated needles in two weeks' time, and also came through with the winning suggestion. This was a needle that had a "ball point," so that it was shaped like a spear, making a fairly large hole and reducing the friction on the shaft. This company enclosed a sketch of a ball-pointed needle. By combining the ball-point device with the chromium plating, the difficulty was solved and the Army in North Africa got its mildew-resisting cots.

A small rope manufacturer with a Navy contract had a staff of girls binding and sewing the ends of the ropes so they would not ravel when whipped around. The manager wrote that he thought a plastic might be found that would seal the rope ends. To the aid of this little cotton concern came Pyroxylin Products, Inc., of Chicago, Plymouth Cordage Company, Catalin Corporation of America, Creative Plastic Corporation, E. I. DuPont de Nemours Company, Inc., Mass and Waldstein Company, Tennessee Eastman Corporation, Extruded Plastics, Inc., of Connecticut, the plastics department of DuPont, and finally the right plastic was found and the difficulty solved. The pay-off on this item of aid came when the manager of the little company wrote to the SWPC that by means of this technological assistance he had been able to lay off 35 girls.

Many such cases could be cited, each with its separate drama. While the 2,800 queries handled by the SWPC have all been war connected, it is worth noting that the previous experience of the bank in Buffalo showed that the larger business companies are equally ready to come to the aid of the small business in time of peace. It seems to me that a small business aid of this referral type certainly should exist after the war, whether in Government, in the private banking system, or in both.

Some 25,000 patents, including enemy patents and patents wrested from nationals of enemy-occupied countries and not previously licensed to American interests, are in the hands of the Alien Property Custodian and are at present being exhibited in travelling libraries throughout the country. Many manufacturers, including small manufacturers, have expressed an interest in these patents and in some cases manufacturers, including small ones, have been licensed to use them. But I am informed at the Smaller War Plants Corporation, which is helping to circulate these patents, that an interesting reaction bearing upon this discussion is frequently expressed by the businessman. Upon learning that the patents, while royalty free, are also nonexclusive, many businessmen ask what good it would do them to have a patent if a competitor utilizing the identical patent can spring up at any time;

and many express doubts whether they could get financing for the production under the nonexclusive patent basis. This reaction, which I am told is common, seems to indicate pretty strongly that the thought of the small manufacturer, with respect to the technological process, runs along the lines of the exclusive patent or product; and this brings me to the concluding summary.

A very large amount of fundamental research and some amount of new invention are being developed by Governmental agencies. An important technical referral service, designed to put small business into touch with what has already been discovered and invented, is also conducted by Government. But neither the research conducted in the Bureau of Standards, nor in the Department of Agriculture, nor in other Government departments, meets the demand of business for the privately held invention or patent. The new Southern Research Institute, along with the Mellon Institute, the Battel Foundation, and a few other like organizations in the country, afford direct access of business companies to laboratory facilities and research work leading to the private patent. The independent industries of the South are greatly in need of laboratory facilities, and if we accept the idea that was expressed at the Bureau of Standards, then there is no problem as to duplication of research, for duplication in research is an advantage rather than the reverse.

Other issues, of course, are involved in your decision, with which this presentation is unconnected.