CHAPTER II. OPERATIONS AT JEFFERSONVILLE

LOCATION

Early in 1958, it became apparent that neither adequate office space nor a sufficient labor force would be available in the Washington area for the large-scale clerical operations of the 18th Decennial Census, and it would be necessary, therefore, to establish operations offices elsewhere. Surveys were made of Federally owned space outside Washington which might be available on a rent-free basis, along with evaluations of the size and quality of the labor market available at such locations.

For the population and housing censuses operations office, the site chosen was in Jeffersonville, Ind. (adjacent to the city of Louisville, Ky.). An Army Quartermaster Corps Depot which had been in operation in Jeffersonville had closed down in June of 1958 leaving a number of vacant buildings and some furnishings and supplies.

In addition to obtaining the use of 527,867 square feet of space at the Jeffersonville Depot, of which 311,658 square feet were warehouse or storage space, the Bureau of the Census acquired a considerable amount of surplus property without cost from the Depot and from nearby Federal agencies.

The Jeffersonville Operations Office opened in July 1958 to process the data from the 1958 economic censuses. This work was completed about the time that the operations for the 1960 population and housing censuses began, so that many of the people who had been employed on the economic censuses were assigned to work on the censuses of population and housing with little or no interruption in their employment.

Except for a small force of experienced key managerial and technical personnel assigned from the Washington office, recruitment for the Jeffersonville operations was from local sources and was carried out in accordance with the Civil Service Commission's regular competitive requirements. The Bureau's Board of Civil Service Examiners conducted a special examination in the Louisville area to obtain an adequate register of clerical applicants. All of the personnel were hired on a temporary basis.

Decentralizing the clerical processing operations to Jeffersonville had many advantages for the Census Bureau. The availability of space and the abundant supply of qualified clerical workers made it a good location for a processing office.

The principal disadvantage was the difficulty in maintaining constant contact between the managerial, planning, and research staffs in Washington and the operating officials in Jeffersonville. Two direct telephone tielines between the Operations Office and the Bureau were in almost constant use, and Bureau personnel made frequent trips between Washington and Jeffersonville.

SHIPMENT OF ENUMERATION BOOKS BY DISTRICT OFFICES

After completion of the enumeration and the quality-control checks of the enumeration, each Census District Office made a preliminary count of population in its area. In addition, preliminary counts of housing units, and of persons and housing units in the sample, were also made. The counts (for county totals, for places of 10,000 or more, and sometimes for smaller areas) were released locally and also transmitted to the Washington headquarters of the Bureau. If the Washington office did not reply within 5 days telling the District Office to hold the enumeration books for further review, because the counts or sampling rates seemed questionable, the District Office shipped them to Jeffersonville. When questions arose, each problem was handled on an individual basis, and a solution determined prior to shipment of the enumeration books to Jeffersonville.

RECEIPT AND CHECK-IN OF THE ENUMERATION BOOKS

Some 814,000 enumeration books were received and checked in by the Jeffersonville office. Mechanical devices, assembly line procedures, and specialization of tasks were utilized to expedite the handling and reduce costs.

Cartons of enumeration books from the field offices throughout the United States were delivered by truck to the receiving area in Jeffersonville. Ten to twelve truckloads arrived daily during July 1960, shortly after the census enumeration had terminated in most of the districts.

Because the 100-percent data were to be processed before the sample data, shipments were separated immediately, according to a code appearing on the label of the carton, into cartons containing the 100-percent, or stage-I, enumeration books, and cartons containing the sample, or stage-II, enumeration books.

Checking in the enumeration books received from the field offices involved verifying that all identification items, population counts, housing counts, and number of pages listed were identical on the enumeration book label and on the transmittal listing. When this check-in was completed, and all inconsistencies were resolved and missing books or other documents were found or replaced, the enumeration books were placed in specially constructed portable steel bins and moved to an area where 9 miles of permanent steel shelving had been set up to receive them. The books were kept in this central file when not in use.

Since the ED served as the basic building block in determining the inclusion of each person and housing unit in the correct geographic location, and also served as a control unit in the various processing operations, it was essential that all changes affecting boundaries of ED's

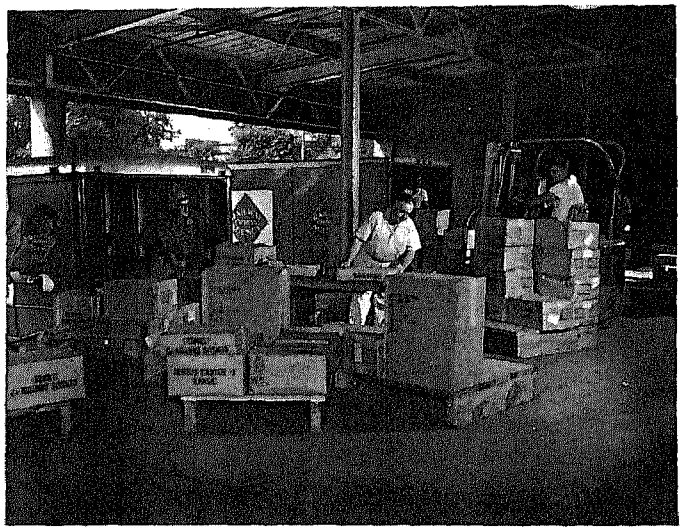

Figure 1. Receipt of Enumeration Books. Enumeration books were sent from the 399 field offices to the Jeffersonville Census Operations Office. Ten to twelve truckloads a day were received in June 1960, as the census enumeration terminated in the various areas of the United States.

during the field enumeration be authorized by the Bureau and that such changes be reflected in all related control records. Accordingly, whenever it was found during the check-in that an ED had been split or that two or more ED's had been combined in the course of the field work without the approval of the Bureau headquarters, or when there was an extra or missing ED, the problem was directed to a team of specialists in the geographic and field work of the censuses, for correction of discrepancies, inconsistencies, or omissions. About 4,800 problem referrals were processed, and in some cases enumeration books and maps were returned to field offices for rechecking.

PREPARATION OF PRELIMINARY REPORTS

The preliminary reports of 1960 population and housing figures were based on the field counts reported on ED Control Registers (see form 1, appendix J).

As the ED Control Registers were received from the field, they were grouped by State and prefix area, and as soon as prefix areas were accounted for, they were issued to clerical personnel for preparation of the preliminary report tables. The ED Control Register was used as a worksheet for cumulating the ED counts for the areas for which figures were to be published. After the requisite 1960 totals had been established on the ED Control Registers, they were transferred to worksheets on which the 1950 data for these areas had previously been posted. On all tables the percent change from 1950 to 1960 was computed and entered on the preliminary report worksheets. These worksheets were verified 100 percent before the tables were sent for typing.

The following tables were prepared for each State:

1. Population by counties

2. Population of all incorporated places with 1,000 inhabitants or more

3. For the three Middle Atlantic and the six New England States, population by counties and minor civil divisions and population of all incorporated places regardless of size

4. Population of standard metropolitan statistical areas (SMSA's) by component areas

5. Population of SMSA's inside and outside central cities

6. Population of the two standard consolidated areas around and including New York City and Chicago

7. Total housing units in urban places of 10,000 inhabitants or more

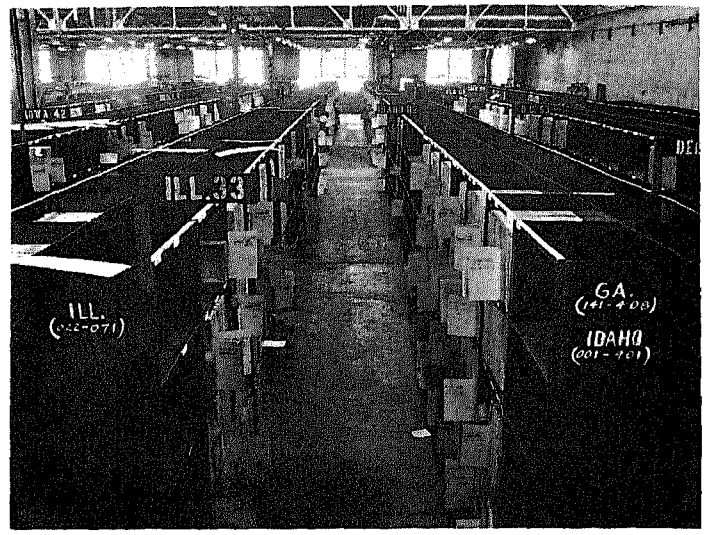

Figure 2. Shelves of Enumeration Books. Nine miles of shelves were needed for the incoming enumeration books at the Jeffersonville Census Operations Office.

The first of the preliminary reports was issued on May 25, 1960; the last of the preliminary population reports was issued on October 21, 1960, and the last preliminary housing report was issued on September 22, 1960.

(See also the section on "Correction of Preliminary and Final Population Counts" in chapter V.)

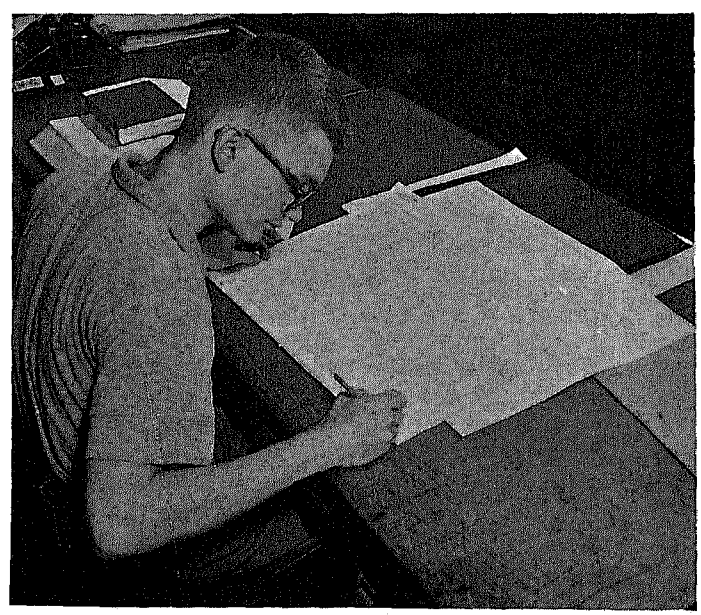

Figure 3. Posting Preliminary Population Figures.

PREPARATION OF BREAKER SHEETS

A special form, called a breaker sheet, was prepared and inserted as the first page of each enumeration book to identify the ED, to record preliminary counts of population and housing, and to separate one ED from another. Entries on the breaker sheet, like those on the schedules, were made by marking appropriate circles, so they could be read by FOSDIC. A sample breaker sheet is reproduced in appendix J--form 2.

The breaker sheet was prepared from information contained on the Advance Transmittal Listing (see form 3, appendix J) which was sent to Jeffersonville by the field office at the same time the enumeration books were shipped. Since the Advance Transmittal Listing was sent by airmail, it arrived in advance of the enumeration books, hence the designation. It was a numerical listing of all the ED's in the prefix area, with population and housing counts and the number of pages used in each book.

The entries on the breaker sheets were verified by computing a "nonsense total" for each enumeration book from the entries on the breaker sheet--i.e., adding the ED number to the number of persons enumerated and to other numbers appearing in code for FOSDIC on the breaker sheet--and comparing it with the nonsense total obtained by adding corresponding entries on the enumeration book label. If there was a discrepancy, the incorrect entry on the breaker sheet was located and corrected.

After the breaker sheet had been ascertained to be correct, the verification clerk inserted it face up on the inside front cover of the enumeration book and fastened it in position with pressure-sensitive tape. At the time the breaker sheets were inserted, any blank pages at the end of the enumeration book were sealed to the back cover with tape, to prevent their being microfilmed.

CODING

Editing and coding of some of the population items on the stage-II schedules was the largest clerical operation in the processing of the 1960 censuses.

Coding consisted of converting written entries made by the enumerator to numbers (codes), and the marking of the corresponding circles on the FOSDIC schedules. Editing consisted of the examination and correction of incomplete or inconsistent entries. Although most of the editing was done in the course of the electronic processing, some entries were supplied or corrected manually by the coders in the process of coding.

None of the stage-I, 100-percent, items needed to be coded in the processing office, nor did any of the stage-II sample housing items, since the enumerator had precoded them by marking the appropriate circles on the schedules instead of writing out the answers. This was true of most of sample population items also. However, some sample population questions, such as those on occupation, had thousands of possible answers, so the enumerator wrote the responses on the schedules and they were coded in the processing office.

Experience in previous censuses had demonstrated the desirability of specialization in coding. Therefore, the work was divided into (1) the coding of entries for industry, occupation, and class of worker (referred to as industry and occupation coding) and (2) the coding of all other items (referred to as general coding). Separate units were established for these two types of coding.

Figure 4. Coding in Enumeration Books at the Jeffersonville Census Operations Office. This was the largest clerical operation in the 1960 census processing.

Prior to the start of the coding operations, detailed plans were prepared. Some of the major decisions made were--

1. General coding would be done first and schedules would then be sent to industry and occupation coders.

2. Each section would work on one State until the entire State was completed. The principal advantage of working by State instead of smaller units was that the clerks learned the "place of work" and "migration" codes that occurred most often in one State and were able to continue to use these same codes frequently as long as they continued to work on the same State.

3. A few small States were to be completed first in order to provide a flow of work to the later operations.

General Coding

The general coders coded the following items on the sample schedules:

Detailed relationship to head of household (including relationships specified on the sample schedule but classified as "other relative" or "nonrelative" on the 100-percent schedules)
Family and household composition
Entries for "other races," which were specified on the sample schedules, and also, for five Southwestern States, Spanish surnames
Birthplace
Mother tongue
Parent's birthplace
Migration (year the person moved to present residence, and place of residence in 1955)
Place of work
Income (from wages and salaries, from own business, and from other sources)

The coding scheme for many of these items did not require coding of the most common answers, as the schedule provided for the enumerator's precoding so that the enumerator's entries were sufficient to enable the computer to tabulate the data properly. For example, if the place of work was in the same city as the place of residence, the enumerator filled in an appropriate circle. In other cases,

no entry was necessary; e.g., no "place of work" was required for a person under 14 years of age. However, in certain of these cases, the coder still had to determine that the enumerator's entry was correct.

In cases where the entry was particularly difficult to code, because of inadequate entries by the enumerators or because it referred to situations too complex to cover in the manual of instructions, the coder wrote out a problem referral slip explaining the situation. Enumeration books containing such problems were referred to Technical Assistants for resolution. These Technical Assistants had been trained by population subject specialists from Washington headquarters of the Bureau prior to the start of the coding. The population subject specialists themselves resolved the still more difficult problems which were referred by the Technical Assistants.

Industry and Occupation Coding

The industry and occupation coders coded entries for only those persons over 14 years of age who reported employment within the past 10 years. In addition to coding instructions, the coders had indexes of occupations and industries and "Company Name Lists." A Company Name List was prepared for each county from the returns of the 1958 economic censuses. It consisted of names and industry codes of all manufacturing establishments employing 50 or more people and all businesses with 100 or more employees. If the company name entered on the population schedule was also found on the Company Name List, the code on the list was used. When the code could not be determined by using the Company Name List, it was determined from the enumerator's entry describing the person's industry, and, if necessary, by reference to other items on the schedule as well.

As in general coding, cases that were particularly difficult to code were recorded on a problem referral slip and were referred to a group of specially trained Technical Assistants who, by the use of research material, judgment, and experience, determined the correct solutions. To provide for the most efficient utilization of the Technical Assistants, since problems of interpretation occur very frequently in industry and occupation coding, a system was adopted whereby the Technical Assistants recorded the solutions on the problem referral sheets only, and a group of transcription clerks who required no special training or experience then entered the codes in the enumeration books. Several subject specialists from Washington spent much of their time in Jeffersonville determining solutions for the still more difficult problems referred to them by the Technical Assistants.

CRITICAL REVIEW OF THE SAMPLE

While the coding operation was going on, a critical review of the sample to detect biases in selection of households by size of household was being carried out. Only about 1 percent of the ED's required any degree of edit. The edit consisted of cancellation of specified sample households, or duplication of others, in accordance with the expected frequencies by household size based on 100-percent data, to bring the distribution of sample households by size of household within the tolerances of the household distribution in the 100-percent data.

MICROFILMING

Equipment

Over a 6-month period in late 1958 and early 1959, the Bureau conducted intensive studies to determine the combination of microfilm camera, type of schedules and enumeration books, intensity of markings on schedules, quality of printing, type of film, and method of filming operations and of film development that would result in a film input to the FOSDIC machine which could be read most clearly and accurately by FOSDIC. All types of commercially available cameras and film which met the following basic requirements were investigated:

1. Photograph on 16 mm. film at a reduction of 28 to 1.
2. Consistent location of image on the film.
3. Ability to control minimum spacing between frames.
4. Ability to control film density (the darkness of the background on the negative, on which the enumerators' marks appeared white) to a standard established by the engineers who developed FOSDIC.

Films developed by various processing methods were evaluated for contrast and sharpness. Facilities for film processing were investigated to determine adequacy for handling the large volume of census microfilm.

As a result of these studies, detailed specifications for cameras, film, and processing were developed. A contract was negotiated which covered the rental of 25 cameras for a period of about 13 months beginning May 1, 1960, the purchase of 50,000 rolls of 100 feet each of 16 mm. microfilm, and film development service for 50,000 rolls at a rate of 190 to 300 rolls per day.

Various other items of equipment were necessary in the microfilming operation. Voltage regulators were installed on each camera to eliminate camera light fluctuations due to power surges. Since shutter speed and the condition of the lens also affect film density (and these vary from camera to camera), light meters were installed on each camera, and the light meter reading which would result in film density closest to the required standard was determined for each. To avoid deterioration of the unprocessed film, air conditioners were installed in the building used for the microfilming operation. To obtain control of lighting intensity, each microfilm camera location was screened; for this purpose, black curtains were hung to make a cubicle around each camera and operator.

Microfilming Operations

A high degree of specialization was utilized in the microfilming operation. Camera operators photographed the breaker sheets and the schedules in the enumeration books; camera loaders loaded, unloaded, and tested the cameras; laborers delivered enumeration books to the cameras and removed them after microfilming.

Although the work performed by the camera operators was of a routine nature, it required the ability to work steadily and carefully. Carelessness on the part of the operator could result in improperly photographed schedules, necessitating remicrofilming and costly delays in FOSDIC and computer processing.

A unit of work was one 100-foot reel of microfilm, ually containing 100-percent data for 20 to 25 ED's, sample data for about 10 ED's. A work unit always ntained ED's from the same State. 100-percent and mple data were never included in the same work unit. ich camera had a unique alphabetical designation, and ch work unit was identified by this designation followed a number assigned in sequence by the camera operator each new reel of film.

lm Development

The census microfilm exposed in Jeffersonville was veloped in a commercial laboratory in Washington, C. On the basis of various tests, it was determined at the best and most consistent film density would sult if the film was developed between 30 and 48 hours ter exposure. To accomplish this, all film exposed ch day was sent that same day to Washington by special livery airmail; the film arrived the next day and was ocessed that night. The developed film was then de- vered to the Census Bureau the following morning.

PROCESSING OF SUPPLEMENTAL FORMS RECEIVED LATE

Most of the forms containing information for transients id persons who were away from home during the enu- eration were sent to the ED of the persons' permanent sidence, and were transcribed to FOSDIC schedules in e Census District Offices if a search of the enumeration oks failed to find the person recorded. In all areas rved by large post offices, ED numbers were assigned these forms by the local post offices, which used ED aps supplied by the Census Bureau. Small post offices nt the forms to the local Census District Offices. Forms t assigned to specific ED's either by the local post fices or the Census District Offices were sent to Jef- rsonville. Supplemental forms received in the District ffices too late to be transcribed to the enumeration oks were also mailed to Jeffersonville.

The largest group of supplemental forms received Jeffersonville consisted of the following:

1. Advance Census Reports.--These forms were distributed to householders by mailmen in advance of the census, and were to be filled in and held for the enumerator's visit. In the normal course of the enumeration, the enumerator transcribed the information from these forms to FOSDIC schedules in enumeration books, so the Advance Census Reports were no longer needed. However, some people, e.g., those who expected to be away from home when the enumerator called, filled the Advance Census Reports and mailed them to the census office in their district. Some of these Advance Census Reports were not received until after the District Office had mailed the enumeration books to Jeffersonville, so the Advance Census Reports had to be sent on to Jeffersonville for transcription to the enumeration books as necessary.

2. Individual Census Reports.--These forms were completed by the enumerator when he encountered visitors in private homes who believed that no one at their home address would supply the information for them. The forms were then mailed to the District Offices responsible for the home communities of the visitors, to be transcribed to the appropriate enumeration books if the visitors really had not been enumerated at their home addresses. However, some of the forms arrived after the enumeration books had been sent to Jeffersonville, so the Individual Census Reports were sent on to Jeffersonville for search and transcription. In addition, in some cases the home address given by the visitor was inadequate, so it could not be determined in which enumeration book the information should be entered; these forms were also sent to Jeffersonville.

3. Reports for Guests at Hotels, Motels, Etc.- These forms for transients in hotels and motels and guest houses were also mailed to the "home" District Offices. As in the case of the Individual Census Reports, the addresses on some of them were inadequate for identification, and others were received after the enumeration books had been sent to Jeffersonville, so they too were sent on to Jeffersonville.

4. "Were You Counted?" forms were printed in newspapers near the end of the enumeration period, and people who believed they had not been enumerated were requested to cut them out, fill in the information, and mail them to the local census office. As in the case of the forms mentioned above, the ones that could not be taken care of in the District Offices, because they were received too late or had inadequate addresses, were sent to Jeffersonville for processing.

A total of 105,408 of these four types of form were received by the Jeffersonville Operations Office. Where possible, samples of these forms were examined as a basis for taking action. The forms were sorted by State, county, and by places of 9,500 inhabitants or more and the rest of the county outside these places. The counts were transmitted to sampling statisticians for decisions as to whether forms for specific areas were to be processed further or discarded. In this initial review, the criteria used to determine the need for further processing were (1) whether the number of persons on these forms represented a statistically significant percentage of the population of an area, or (2) whether these persons were from a "critical" area which might move from one size class to another, in the size classes to be used in the published reports, if the persons on the supplemental forms were added to the population of the area. When it was decided that it was necessary to investigate to see if some of the persons on the forms should be added to the area, a sample of the forms was drawn for search in the enumeration books. In those cases where there was no ED number on the form, the ED number had to be determined from the address entered. Upon completion of the search, the percentage of persons not found was used to determine how many persons were to be added. Persons to be added were selected on a random basis from the forms received. They were added to those ED's having above the average population of all ED's in the area. Additions to an ED never exceeded 5 percent of the average ED population of the area.

In the case of Individual Census Reports and Reports for Guests at Hotels, Motels, Etc., that had not been given ED numbers in the field, all the persons listed, instead of only a sample, were added to an area, once the decision was made to transcribe data for persons on supplemental forms to the enumeration books. These forms were not allocated and searched to establish a proportion for addition because (1) Individual Census Reports were obtained only for the visitors who believed they would not be reported at their usual address, and (2) most of the Reports for Guests of Hotels, Motels, Etc., which were

received in Jeffersonville were for persons whose reported addresses were inadequate for the assignment of an enumeration district by the local District Office.

Information for persons to be added was not always transcribed to the original enumeration books. In most cases, especially if the original enumeration books had already been microfilmed, the information on the supplemental forms was transcribed to special books, referred to as ICR-ED books (Individual Census Reports ED books). The ICR-ED books were treated as separate ED's through all the processing operations; then the information in them was added to the tallies for the basic ED's.

For all States, the total number of persons reported on the various supplemental forms referred to above was 155,462, from 4,888 areas. Of these, it was determined that 34,722 were to be added to 1,399 ED's located in 125 areas, and that the remainder represented persons already covered in the census.

Another group of supplemental forms was received in Jeffersonville as the result of a special supplemental field enumeration designed to improve coverage. This special enumeration was carried out on "Notice of Enumeration" forms in 33 cities. It covered cases where, after three visits at which no one in a household was found at home, the enumerator had obtained the required information from a neighbor or servant, and then left a Notice of Enumeration form at the household to be filled out and mailed to the census office if the members believed the information already supplied might be incorrect, and where the forms had not been returned to the census office. When the group of forms resulting from the special followup enumeration was received in Jeffersonville, they were all transcribed to the original enumeration books prior to microfilming. (Transcription of persons from the Notice of Enumeration forms to the ICR-ED books would have resulted in duplicate counts of these persons, who would have been counted once as imputations by the computer and again as ICR-ED additions to the tallies for the ED.)

Finally, a special field followup operation resulted in obtaining 70,932 supplemental sample Household Questionnaires for transcription, when necessary, to the sample enumeration books in Jeffersonville.

PROCESSING OF FORMS FOR CREWS OF VESSELS

As part of the planning for the 1960 Census of Population, special arrangements were made with the Maritime Administration, Navy Department, and Coast Guard to distribute to merchant, naval, and coast guard vessels the "Reports for Military and Maritime Personnel." These forms, referred to subsequently as crews-of-vessels forms, were questionnaires for individual crew members. Reports from naval and coast guard vessels were mailed directly by each ship's captain to Jeffersonville, whereas the Maritime Administration received and transmitted to Jeffersonville the completed merchant marine crews-of-vessels questionnaires.

Control lists were prepared of all naval, coast guard, inland-waterway merchant, and ocean-going merchant vessels, and coast guard lightships, light stations, and light attendant stations, believed to be in active service. Normal complements of personnel of these vessels and light stations were shown on the control lists. As packages containing the forms were received, a count was made of the number of forms received for each vessel and entered on the control list. If this number was less than 80 percent of the normal complement, the package was held aside for investigation. In some instances additional forms were received for these vessels; however, in most of these cases it was found that the original receipt represented the total crew complement.

Forms for vessels with 80 percent or more of their normal complement reporting were checked for location of the vessel on the date of enumeration, April 1, 1960. If the vessel was not berthed in a U.S. port on this date, the forms were included for processing with the overseas reports (see "Overseas Crews-of-Vessels Forms" below). Vessels berthed in U.S. ports on this date were assigned ED numbers, and the packages of forms for each vessel were identified by ED.

As the transcription supervisor assigned packages of crews-of-vessels forms for transcription, he issued new enumeration books, numbering them serially beginning with "1" within each State. If the control records showed a previously issued crews-of-vessels enumeration book for the ED, transcription of forms for this vessel was made to the same enumeration book. As in the case of the supplemental forms, the crews-of-vessels data were handled as add-on parts of ED's in the computer.

During the 100-percent transcription operation, every crews-of-vessels form transcribed to a sample FOSDIC line (every fourth line) was marked and separated for sample transcoding. "Transcoding" was the term used for a combined operation in which some items were transcribed whereas the codes for others were assigned and entered directly in the FOSDIC enumeration book without being entered on the crews-of-vessels forms.

It was decided to enter the industry and occupation codes directly on the crews-of-vessels sample forms to avoid going to the same pages of the enumeration book more than once. A single industry code, 517, was used for all merchant marine personnel, and only a few occupation codes were needed for this water transportation industry.

After industry and occupation coding, the sample crews-of-vessels forms were turned over to verifiers who used a 50/10 "dodge" plan in their verification. Under this plan, the first 50 forms in each ED were verified on a 100-percent basis; if no errors were found in the first 50 forms, only every 10th form thereafter was verified. When an error was found during the verification of every 10th form, the verifier reverted back to 100-percent verification for the next 50 forms.

After verification of industry and occupation coding, the sample crews-of-vessels forms were assigned to general coding clerks for transcoding to sample FOSDIC enumeration books. These clerks copied the industry and occupation codes when they transcoded the other information from the forms. Verification of the transcoding was accomplished with a 50/10 dodge plan similar to the one described above for the industry and occupation coding verification.

The enumeration books were handled as add-on ED's for each State in the computer, to avoid interference with the regular sample coding and microfilming operations. In processing the crews-of-vessels sample forms, priority was given to forms from those States scheduled for completion early in the regular coding and microfilming operations.

A total of 167,402 crews-of-vessels forms for vessels berthed in U.S. ports were received and processed through the 100-percent transcription operation. Forms for 41,107 of these crew members were processed through the sample industry and occupation coding and transcoding operations.

PROCESSING OF FORMS FOR OVERSEAS POPULATION

In addition to the supplemental forms received from persons residing in the United States, two types of supplemental forms were received from Americans residing abroad. One was the Report for Military and Maritime Personnel on which crews of vessels on the high seas or in foreign ports were reported (as distinct from those for crews of vessels berthed in U.S. ports, the treatment of which is described above). The other was the Overseas Census Report, on which other Americans living outside the United States were requested to report.

Overseas Crews-of-Vessels Forms

The forms for all crews of vessels on the high seas and in foreign ports were mailed to Jeffersonville by the ships' masters. After check-in, the forms were sent for editing and coding. The items which were edited and coded on these forms were as follows: Color or race, date of birth, marital status, place of birth, mother tongue, parent's birthplace, year moved onto ship, residence in 1955, highest school grade attended, date of marriage, hours worked, occupation, place of work, means of transportation, weeks worked, income, and veteran's status. Unknown ages and unknown marital status were allocated, using separate allocation charts for military personnel and civilians; for all other items, "not reported" was an acceptable entry, or the missing entry was inferred from other items on the schedule. Upon completion of the coding operation, the forms were transmitted to Washington for card punching and tabulation. A total of 124,769 of these crews-of-vessels overseas forms were received and processed.

Overseas Census Reports

Overseas Census Reports were sent to Jeffersonville from U.S. embassies abroad and from military installations outside the United States. As the forms were received, they were counted and listed on control sheets by country and by name of service unit. The major additional editing task for these forms which was not required for crews-of-vessels forms was the elimination from these questionnaires of foreign nationals who were living as dependents in households of American citizens. The same items were coded and edited except for some items not included on the Overseas Census Report (e.g., income, place of work, means of transportation, etc.), and items required only from the persons reporting on the Overseas Census Report (e.g., when the person last left the United States, college degrees held, local language spoken, etc.). The Overseas Census Reports also were sent to Bureau headquarters in Washington for card punching and tabulation. A total of 546,405 Overseas Census Reports were received and processed.

PROCESSING FOR OUTLYING AREAS (EXCLUDING PUERTO RICO)

As part of the Eighteenth Decennial Census program, censuses of population and housing were conducted in Guam and the Virgin Islands, and a census of population in American Samoa and the Canal Zone. The schedules used in enumerating these areas were conventional household schedules, rather than FOSDIC schedules. After the enumeration, the schedules were shipped to Jeffersonville for processing.

In the general coding operation, the coders were required to edit and/or code the following 100-percent and sample items on the form:

Item	Coding and editing required
Relationship to head of household	A 2-digit code was assigned identifying both household and family relationships for persons in regular households and group quarters. Coders were required to infer probable relationship where the enumerator had failed to make this entry.
Sex	No coding was required. Missing entries were inferred from name and relationship.
Color or race	This was precoded on the schedule for the most common categories, the coder assigned "other race" codes. Race was inferred from entries for other members of the family if the enumerator had failed to make this entry.
Month and year of birth	Blanks in this item were referred to the unit supervisor for allocation.
Marital status	For married persons, the coder was required to assign a code if the spouse was absent from the household. Missing entries were inferred on the basis of other entries for this person and entries for other members of the family.
Place of birth	Coded for all entries written in on the schedule.
Whether under 14 years of age, or 14 and over	Precoded by enumerator; if blank, entry for birth date was used to complete this item.
Year last worked	Entries here were used to determine whether industry and occupation coding was required.
Income	The individual income items were edited and totals established for individual earned income, total individual income, and family income.

Industry and occupation coding was almost identical to that for the FOSDIC schedules used in the United States.

Verification of both coding operations was done on a 100-percent basis, and all errors discovered by the verifier were corrected.

Data for approximately 160,000 persons from these four U.S. possessions were edited and coded. After completion of coding, the schedules were sent for preparation of punch cards and tabulation of the data on the punchcard equipment.

QUALITY CONTROL

The primary concern of the quality control program, like that of the other census activities, was to produce a high quality census, on schedule, and at a reasonable cost. Statistical quality control was applied during the data-processing operations in Jeffersonville to the receipt and check-in of enumeration books, preparation of breaker sheets, editing and coding, and microfilming.

In addition to statistical quality control, other important quality control techniques were used. Among these were--

1. Careful selection of candidates for clerical positions

2. A thorough training program, in the course of which obviously unqualified clerks were eliminated (The statistical quality control plans also called for the removal of clerks if the quality of their work deteriorated.)

3. Continuous and prompt updating and clarification of written instructions to avoid ambiguity as to work requirements

4. Use of consistency checks for data on personal, household, and geographic area characteristics

The statistical quality control plans applied to the coding and microfilming operations are described briefly below.[1]

Coding Control

In earlier censuses in the United States, control of the quality of coding operations was based upon dependent verification. Under dependent verification, the verifier reviews the work of a coder and determines whether or not the correct codes have been assigned to the coded items. The effectiveness of dependent verifiers in the 1950 censuses was evaluated by using a system of error planting and error noting. That evaluation indicated that a dependent verifier may fail to find as many as half of the errors in the work he verifies.

A system which would eliminate the possibility of a verifier's judgment being influenced by entries the coders had made or by the coder's quality of output was developed for use in the 1960 census operations. Because the system required the services of three different coders for the same information, and because none of them saw the coding done by the others, the system was called three-way independent verification. Under this system--

1. A sample of enumerated households was selected from each enumeration book. In general coding, the sampling rate was 1 household in 80; in industry and occupation coding, the rate was 1 household in 40. Since roughly one-half the persons in the households had worked in the past 10 years, the effective number of persons in the two samples was about equal.

2. For a given type of coding, three different coding clerks independently coded the data for persons included in the quality control sample. The first and second coders entered the codes on specially prepared cards called "pench cards" (see form 13, appendix J) by punching out perforated circles corresponding in position and size to the circles on the FOSDIC schedules. The third coder then entered the codes on the FOSDIC schedules by marking the circles on the schedules, during the regular coding operation. The third coder coded all schedules, those which fell into the quality control sample and those which did not.

3. A clerk called a matcher compared the pench cards with each other and with the sample FOSDIC schedule by laying one pench card over the other and laying both over the FOSDIC schedule, to determine differences between the codes entered by the three coders for the same item. Errors were defined in terms of a "majority rule," thus, where all three of the coders agreed on a code, all three were considered to be correct; if two of the clerks agreed and the third differed, the two agreeing were considered to be correct and the third was considered to be in error. Cases in which all three coders disagreed were excluded from the computation of errors; the proportion of such cases was very small. Another type of case excluded from the computations was that in which two of the coders referred the case as a problem to an expert.

The system described above provided a means not only of measuring the quality of the census coding but also the quality of the two pench coders who were used as the control. In addition to controlling the quality of individual clerks, the statistics obtained were used to control the quality of each coding section.

An error-planting scheme was used to determine the extent to which matchers were missing coding differences. For every 25th pench card prepared by the first pencher, an erroneously penched card was substituted before the matching operation. Following the matching operation, the planted error cards were removed, the original cards returned, and a record posted showing the total number of planted errors and how many of the planted errors had not been found by the matchers.

The quality control plan had the following characteristics:

1. It provided for two phases: During qualification, the coder was required to achieve a prescribed sequence of accepted work units within a limited production or be removed from the operation. A decision to accept was based upon the results of both the independent verification using the pench card sample and a 10-percent dependent verification. Work units which were rejected during the qualification period as a result of the verified samples were subjected to subsequent 100-percent dependent verification and review. After qualification, only the pench card sample was used to verify the coder's work.

2. In order to guard against deterioration of quality after qualification, a point system of quality control was used. Under the point system, the coder was given an initial stake of three points. At the end of a sequence

[1] These two quality control plans, as well as those used for the other data-processing operations and for preparatory census activities, are to be described in detail in a later publication.

of 10 decisions made on the basis of independent samples, a coder who had a net score of 3 or more points reverted to the initial stake of 3 points for the next production span of 10 sample decisions. On the other hand, a coder who had a net score of 1 or 2 points began the next sequence with that balance. Whenever a coder's net point score reached 0, he was removed from the operation.

3. As an added safeguard against the acceptance of poor quality coding, sample findings for each ED coded by a given coder were cumulated on a weekly basis. Based on the sample results for the week's production, coding suspected to be of poor quality was 100-percent dependently verified and corrected. After 100-percent dependent verification, a sample of the coding for those ED's was verified on an independent verification basis.

Microfilming Control

The procedures and techniques used during the 1960 censuses to control the quality of the microfilming operations were designed to detect and overcome two general categories of defects:

1. Defects caused by camera malfunctioning, such as out-of-tolerance density and spacing between exposures, were kept within acceptable bounds by use of the following:

a. Dip tests, or the evaluation of spacing and focus.—Dip tests were made in order to insure that the microfilm cameras were maintaining the required spacing between frames and that the images had the required clarity and sharpness. The dip test called for the following steps: A sequence of 46 test exposures was made on each microfilm camera once each shift; the film containing these exposures was developed by using a portable film developing apparatus; the developed test film was visually inspected for focus and spacing; if the measurements for focus and spacing for all the exposures were within the limits, the production run continued; on the other hand, if the focus and/or spacing of one or more exposures in the sample was out of the prescribed limits, the camera was stopped, the production reel then in process was removed, further tests and adjustments were made, and the camera was kept out of production until it was again producing exposures within specification tolerances.

b. Density checks.—Federal Standard Color Chips as well as work unit identifications were filmed several times at the beginning and ending of each roll of film. After development, the last two sets of chips and identification were cut off and delivered in a separate package with the film. These clippings were then measured on a "densitometer" and thus the precise density of the film was known without unwrapping the film roll itself. The density measurements were used to decide whether or not to send the film to be run through FOSDIC, and whether or not the camera lights needed adjusting.

2. Defects caused by intermittent camera failure or by errors on the part of the camera operator, e.g., hands in exposure, enumeration book upside down, or light-meter shadows, were kept under control as follows:

a. Control of the operator.—For the first 6 weeks of the microfilming of enumeration books containing 100-percent data, each reel of film rejected by FOSDIC was inspected for operator defects. A sample of 30 exposures was selected systematically from each rejected reel and the number of defective exposures in the sample was counted. The operator's performance was considered unsatisfactory if three or more defective exposures were found in the sample. It was considered satisfactory if no more than two defects were found. After the initial 6-week period, the formal inspection procedure for reels containing 100-percent data was suspended because the error rate was so low that an informal system of assurance could be used. However, early in the microfilming of enumeration books containing sample data, the rate of rejects by FOSDIC became excessive. At that point the control plan was reactivated, to identify those camera operators with unacceptably high error rates. After those operators were identified and removed, the number of reels rejected by FOSDIC again fell within the acceptable limits, and the plan was terminated.

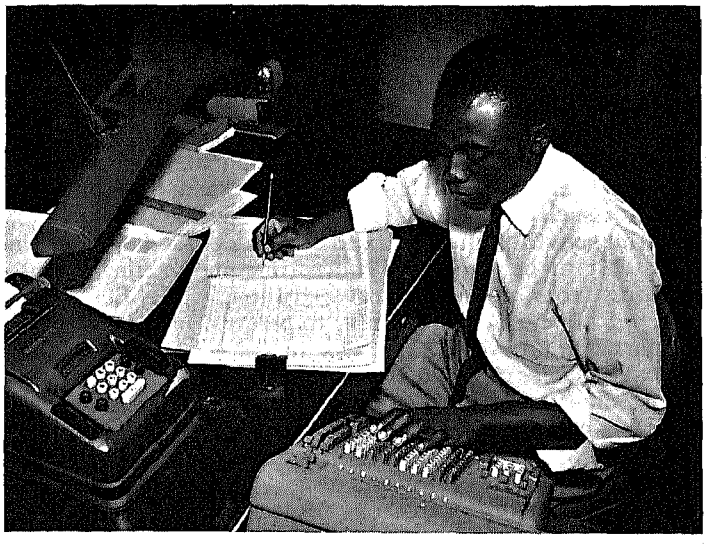

Figure 5. Preparing Analytical Chart for Quality Control. Analytical charts were prepared in Washington for control of the microfilm operations in Jeffersonville.

b. Other controls.—At all times, operator errors and machine faults were recorded on the basis of FOSDIC rejects. If FOSDIC could not accept a reel of film, the reel was tallied by operator and by camera number. If either the operator or the camera started showing a large number of rejects, the film was analyzed and either the operator was notified of the errors or the camera was repaired.

Other Types of Quality Control Activities

Quality control methods used in the other data-processing operations generally consisted of conventional dependent verification either on a 100-percent or a sample basis. For a description of another type of verification, see the description of the breaker sheet preparation and verification activities in the section, "Preparation of Breaker Sheets," in this chapter. The editing and eval-

uation programs and the "diary review" activities after the data were run through the computers are discussed in the next chapter, "Electronic Data Processing."

CONTROL RECORDS AND PROGRESS REPORTS

The production controls used in the Jeffersonville data processing involved a system of document control and document routing designed to assure an orderly flow of millions of pieces of paper through the various processing operations and to permit location of required documents at any time. The progress reporting system was based upon the production control system, and was designed to utilize fully the data collected for other purposes, such as maintaining production standards and administering the quality control systems. Such reports enabled management and operating officials to make decisions with respect to rate of progress of the work, the cost of work completed at any date as compared to the budget for the job, and the need for changes in staffing.

One of the basic problems encountered in establishing and maintaining an effective control record and progress reporting system was in determining the proper work units or measures to be used. A unit which was preferable during one phase of the processing sequence was not always meaningful at some later stage. Geographic units such as States or prefix areas, necessarily employed as work units for many operations, varied too much in size for use in judging work progress. Furthermore, some units, such as ED's, which were near enough the same size for judging work progress, varied too much for such purposes as measuring individual production. In Jeffersonville, the prefix area was decided upon as the basic unit to be used for controlling and moving batches of work from operation to operation, while ED's were selected as the common units to be used in reporting and evaluating total work progress in the major operations. Still more specific and detailed units of work were used within the various operations for production standards progress reporting; e.g., exposures, in the microfilming operations, and population coded, in the coding operations. The various units of measure could, when necessary, be converted to approximations of other measures, e.g., 25 ED's per stage-1 work unit.

In the Jeffersonville processing, the Advance Transmittal Listing mailed in by the Census District Office was used as an inventory record of the ED's and enumeration books in the prefix area, and it accompanied the enumeration books through the various processing operations.

When an Advance Transmittal Listing was received, a routing slip was prepared and stapled to it. The routing slip, known as the ATL Routing Record (see form 4, appendix J), consisted of a set of detachable coupons, each representing a major operation in the processing work. As each operation was completed, the corresponding coupon was detached, signed, and dated, and sent back to the progress reports unit. As coupons were received by this unit, completion dates were posted to a control record which was maintained for each State and which listed each prefix area (in the stub) and each operation (in the column headings). Thus, the location of the enumeration books of any particular prefix area could be determined from this record. Information on the coupons was tabulated daily to provide the data for the Daily Summary of Operations and the Weekly Summary of Operations (see form 12, appendix J).

In addition to this consolidated record, control records showing the progress of work by State and prefix area were maintained in each of the major operating units. These records were used as operating tools by the supervisors of the operating units in assigning work, determining priorities, locating work in process in the unit, and the like. The consolidated record was used for overall management control purposes, such as preparing progress reports, determining the status or location of enumeration books for specific prefix areas, etc. The duplicate record system was considered worthwhile since the records served different purposes at the different locations and they were simple and economical to maintain.

The microfilm camera operators maintained control records, for each camera, of work unit numbers assigned. The work unit number of each ED was indicated on the Advance Transmittal Listing, which accompanied the shipment of reels to Washington. The exposed microfilm was shipped to the film development center, and copies of the Advance Transmittal Listing and the film transmittal form (see form 3, appendix J), showing work unit numbers, were mailed to the processing unit in Washington.

The production control system for processing the sample data was basically the same as the system described above for the 100-percent data. However, the ATL Routing Record for sample enumeration books included two additional coupons corresponding to general coding and to industry and occupation coding.

The principal progress reports used during the census period were the following:

1. Operation Work Schedules.—Prepared in Washington to indicate for each operation (1) the schedule of staff authorized and units to be produced each week and cumulatively, (2) the estimated total workload and man-week and cost requirements, (3) the expected average production per man-day, and (4) the man-week cost rate. (See form 5, appendix J.)

2. Weekly Report of Work Processed by Operation (table 1).--Prepared in Jeffersonville from operation work schedules and production standards performance data. Compared actual units produced, currently and cumulatively, against work schedules, for all operations with a measured workload. (See form 6, appendix J.)

3. Production Per Man-Day, by Operation (table 2).--Prepared in Jeffersonville from production standards performance data. Listed rates of production per man-day--expected, current week, preceding week, and cumulative—for each operation with a measured workload. (See form 7, appendix J.)

4. Weekly Production and Quality Report (table 3, Summary).--Prepared in Jeffersonville from production standards performance data and quality control information. Listed, for each operation, the staff assigned, weekly production rate, production, man-hours, and current and cumulative error rates. (See form 8, appendix J.)

5. Operation Input and Production by Week (table 4).--Prepared in Jeffersonville from production standards performance data. Listed weekly and cumulative man-weeks, cost, and production as related to the total program estimate for each operation with a measured workload. (See form 9, appendix J.)

6. Cumulative Report of Production, Man-Weeks and Cost by Operation (table 5).--Prepared in Jeffersonville from production standards performance data. Consolidated, in one report for all operations (with or without measured workload), a comparison of work done and man-weeks and budget expended as compared with the total estimated workload, man-weeks, and budget. (See form 10, appendix J.)

7. Daily Summary of Operations.--Separate reports for stage I and stage II (form for stage I is reproduced in appendix J--form 11), prepared in Jeffersonville from ATL Routing Record coupons. Listed, by operation, daily and cumulative ED's processed, and percentage of work accomplished to date against total workload.

8. Weekly Summary of Operations.--Separate reports for stage I and stage II (form for stage I is reproduced in appendix J--form 12), prepared in Jeffersonville from ATL Routing Record coupons. Listed, by State and operation, weekly and cumulative ED's processed, and percentage of work accomplished to date against the total workload by State.

An example of each of the eight forms described above is reproduced in appendix J.

PRODUCTION STANDARDS

Development

Production standards technicians used copies of the written procedures, standard time data, and information obtained through on-the-job time-study observations, to develop production standards for those operations which required the work of a number of people for a fairly long period of time and for which the output could be measured objectively. The written standards were given to the clerks and supervisors, with a transmittal letter explaining how the standard was to be used in evaluating an individual's performance.

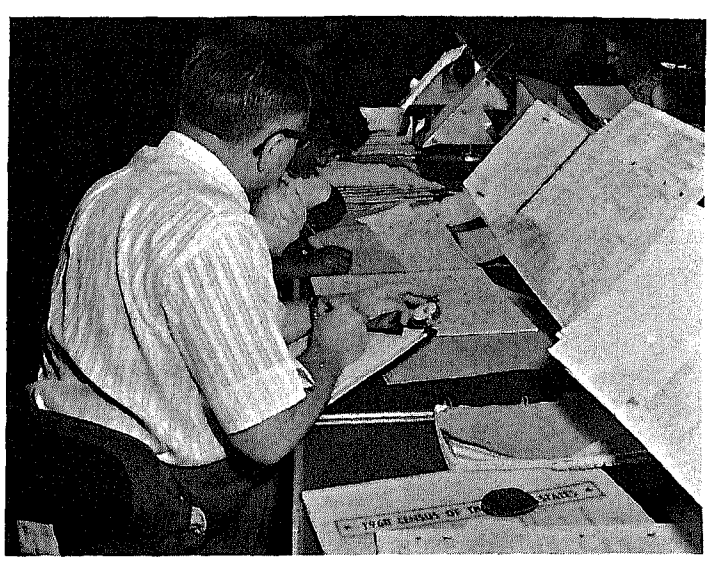

Figure 6. Production Standards Analyst Making Observations.

Application

The production standards were used as a tool of management planning and control to assist in the following activities:

1. Budgeting for measured operations
2. Developing work schedules, staffing requirements, and staff schedules
3. Evaluating alternative processing procedures
4. Providing employees under measurement with realistic, attainable production goals
5. Preparing recommendations for incentive awards
6. Selecting employees for promotion or reassignment
7. Identifying employees with unsatisfactory records

Coverage

As many clerical operations as possible were measured by production standards. Operations were excluded only when--

1. There was no homogeneous, measurable product; e.g., supervisory, administrative, and professional work, recordkeeping, and maintenance of files were not under production standards.

2. The job was to be of such short duration that it did not merit the development of production standards.

3. The job involved so few employees that it did not merit production standards.

The following operations were subject to individual official production standards:

Check-in of stage-I enumeration books
Check-in of stage-II enumeration books
Screening for replication of households for the sample
Replication of households for the sample
Breaker sheet preparation, stage I
Breaker sheet preparation, stage II
Breaker sheet verification, stage I
Breaker sheet verification, stage II
Counting and sealing enumeration books
General coding (separate standards by State)
First general pench coding
Second general pench coding
General coding match
General match--key punch
Industry and occupation coding
First industry and occupation pench coding
Second industry and occupation pench coding
Industry and occupation coding match
Industry and occupation match--key punch
Microfilming, stage I
Microfilming, stage II
Remicrofilming, stage II
Reloading microfilm cameras
Survey of Components of Inventory Change (Housing) pre-enumeration transcription
Survey of Components of Inventory Change (Housing) transcription verification

During peak operations in Jeffersonville, approximately 700 employees were under production standards, spending on the average approximately 90 percent of their total available time under standards.

Relationship to Quality Control

Operations to which production standards were applied were also subject to quality control to assure that acceptable levels of accuracy were maintained. Employees who failed to maintain minimum acceptable levels of either production or accuracy were given warnings, and if they failed to improve they were removed from the operation. In selecting employees for promotion, in-

centive awards, and separation, both productivity and work quality were considered.

Benefits and Problems

Production standards were used as an aid in budgeting, staffing, work scheduling, controlling, and evaluating the Jeffersonville operations. Generally speaking, the standards were accepted as accurate measures by the management staff, supervisors, and employees.

In some cases the standard for an operation included a number of workload elements for which separate work counts had to be reported to obtain composite performance rates; e.g., the number of exposures, ED's, and prefix areas, for microfilming. In both general coding and industry and occupation coding, standards for States and standard metropolitan statistical areas were accepted as a compromise between a single U.S. coding standard, which would have had serious geographic inequities, and production standards for still smaller units, such as counties, which would have been impossible to administer. In other cases, procedural changes necessitated revisions of existing standards.