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DEPARTMENT OF COMMERCE
Bureau of the Census
WASHINGTON

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January 12, 1937

Detailed Description of Census Bureau's New Photographic Equipment

The specially built photographic equipment installed by the Bureau of the Census is a product of the experimental laboratories of the Eastman Kodak Company. No cameras capable of doing this work were available and the machines had to be designed and individually built to meet the Bureau's needs.

Two of the new cameras will be used to photograph Census records without removal of the pages from their bindings. Volumes to be photographed are laid on a carriage, which moves on a track across a table. The photographing mechanism has its position above the book, supported by a tall column on which the mechanism can be pushed up or down.

When a book is lying, open, on the carriage, a metal rod can be moved up under the center of the binding so as to elevate the bound edges of the two pages to be level with the other parts of these pages. The surface to be photographed is then flat.

Illumination for the exposure is provided by four 200-watt lamps, inside frosted. The exposure time is one second and the film is safety stock. This film is extremely fine in grain, to resolve a very sharp miniature image. It is panchromatic, so that colored ink can be copied, if necessary.

Pages of any shape can be photographed and are copied as miniature images on film just as wide as motion-picture film. Inside the camera there is an auxiliary light which can be turned on to shine through the aperture and lens. This throws a rectangle of light on the page that is to be copied. The camera moves up and down the supporting column until the width of the page is exactly covered by the rectangle of light.

Then a screw on the front of the camera is rotated until the other dimension of the rectangle of light just covers the height of the page to be copied. With this adjustment, the camera will be set so that the width of the page is just included in the width of the film, and so that the film will be advanced, with each exposure, just the right amount to take in the height of the page. This arrangement avoids the waste of film and permits the greatest possible number of miniature images to be included on a roll.

When these adjustments for the size of the page have been made, the lens is focused according to a magnification scale marked on the column up and down which the camera has been moved. Then, the pilot light is turned off, and the four photographing lights at the side are turned on, by one switch.

With the book opened at the first pair of pages, and with the carriage in such a position that the left-hand page is beneath the lens of the camera, a foot treadle is pressed. That actuates the shutter. Automatically, after the shutter has closed again, the carriage rolls over to the position in which the opposite page of the book is under the camera. When the foot treadle is pressed again -- or if the foot has been left continuously on the treadle--the shutter operates again, and the carriage rolls back to the original position.

As the carriage is rolling back, the operator turns the page by hand, and then repeats the operation with the foot treadle for the next pair of pages--and so through the book.

If, instead of photographing individual pages, it is desired to photograph two pages--the opposite pages--in one exposure, the apparatus can be adjusted to do that. It is simply a matter of throwing a switch to disconnect the mechanism that moves the carriage back and forth. Thereupon, the foot treadle actuates the shutter without moving the carriage.

Two cameras will be used to photograph Census records not bound into volumes. These machines photograph their copy on the run. During the photographing operation, both the page copied and the film on which it is being copied move at relative speeds in opposite

directions, with the lens between. Because photographic lenses reverse light, the effect is the same as though the copy and the film run along together and so nullify motion.

The apparatus consists of a constantly rotating drum to carry the pages past the lens of a camera. The drum is perforated all over with small holes. Through these holes air is sucked, so as to hold the paper firmly down on the roller for photographing.

The suction also serves to synchronize the movement of the film with the pages. The pages are fed down a sloping tray to the drum. When a page is carried to the point where it is about to be photographed, enough air is cut off from the drum by the paper to operate a bellows, which in turn forms an electrical circuit to start the movement of the film.

Thereby--so long as any part of the census-record sheet is on the roller --a gear system is engaged and the film in the camera continues in motion past a slit through which the picture is made. As each page moves over the roller, it is recorded on the films through the slit in a manner that might be likened to a stationary paint brush daubing a moving strip of material--only this daubing is done with light. As soon as the other end of the paper reaches the end of the focal field, the return of air to the drum stops the movement of the film.

The illumination is provided by two rows of bulbs on either side of the slot above the roller on which the pages are exposed.

Pages of any length are fed successively into the machine as rapidly as the operator can handle them, and by these means just the exact amount of film required for each document is exposed.

Like the two machines first described these cameras use 35-millimeter safety film. On a 100-foot roll, 825 to 850 pages, newspaper size, can be photographed.

The forty projectors purchased by the Census Bureau are of a type that have been used in libraries and newspaper offices for several years for reading files from miniature images

on film. They can be loaded with a roll of film in a fraction of a minute, and cast the enlarged page on a screen so shielded that subdued light for reading the projected page is unnecessary.

Any page on a reel can be thrown into view upon the screen in a matter of seconds, and the whole of any page can be scanned more rapidly than if the page were actually handled. The reason for the latter fact rests in the construction of the projector. Although, on the screen, each typed word is 50 percent larger than the original typing, the area of the screen is only one-fourth that of the whole enlarged page. A lever in a position easily reached manipulates the projection in such a way that a touch shifts any part of the page to the screen area. The reading matter is brought to the eyes rather than having to be sought by the eyes.

The cards transcribed from the 1900 census are being copied by photographic apparatus of a type standard with banks and business houses for recording large numbers of checks, statements, and correspondence. The film for these smaller machines is 16-millimeter, less than half the width of standard motion-picture film, but it can be read, enlarged, on the same projectors as the wider film.

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January 12, 1937.

Anticipating the heavy demand for proof of age in connection with social security benefits, the Bureau of the Census today started copying in microscopic size on film the 50,000,000 names recorded in the 1,024 volumes of the census of 1880, according to an announcement by Director William L. Austin. Photographic equipment especially built for the Bureau is being used.

At the same time, machines of a different type are recording on film the 76 million names returned in the census of 1900, which have been transcribed on 33 million cards from the original volumes.

It is these two censuses - 1880 and 1900 - which contain the facts that will be of greatest value to people attempting to qualify for benefits under the new Social Security Act, as well as under similar legislation in force in the various States. The volumes of the intervening census - 1890 - were destroyed by fire and water. The volumes in the Census Bureau form the only documentary birth record of many Americans, since registration of births by local authorities was not general prior to 1915, even though New Hampshire has birth records on file dating from 1640.

Miniature copying of Census records by photography will serve several purposes. First, the original documents of the human history of our country will be preserved from the wear and tear of frequent handling; second, the serious problem of storage will be solved, as one roll of film less than four inches in diameter will record the 70,000 names contained in a census volume twice the size of a large dictionary; third, the present method of searching for names in the 25-pound census volumes, which have to be removed from vaults for the purpose, will be eliminated; fourth, existence of duplicate records on safety film will be

an added precaution against loss by fire or water.

Although the new apparatus copies the large census-record pages on film only as wide as motion-picture film with the individual names thus reduced to pin-head size, the records can be read from the film by means of projectors which enlarge the writing to half again its original size. Forty projectors have been installed by the Census Bureau for this purpose.

After the 1880 census has been copied, the Bureau will apply the photographic apparatus to putting other censuses on film. The original documents containing the record of all residents of the country since its formation and which include such illustrious names as Washington, Jefferson and Lincoln will, of course, be preserved intact. However, availability of the film copies for reference will take the original volumes out of active use. Genealogists and historians make extensive use of Census records. The Bureau hopes to work out a program which will make available to national and state historical organizations and other responsible groups the older Census records in film form in order to facilitate this reference work. The films will be furnished approximately at cost.

Cameras eleven feet high are doing the major copying job. Two were designed for photographing loose sheets. A suction roller carries the pages under the lens of this apparatus as rapidly as they can be fed down a sloping tray, and the sheets are filmed "on the move." The other two cameras photograph pages in bound volumes, with a carriage moving the large books back and forth automatically to let each of the two facing pages be "shot" successively.

The specially built cameras being used are products of the experimental laboratories of the Eastman Kodak Company. No equipment to do the work was

available and the machines had to be designed and individually built to meet the Bureau's needs.

A special film has been made for the Bureau which is extremely fine in "grain" and which is "panchromatic", that is, sensitive to any color of ink used by Census enumerators throughout the years.

The cards transcribed from the 1900 census are being copied by photographic apparatus of a type standard with banks and business houses for recording large numbers of checks, statements, and correspondence. The film for these smaller machines is 16-millimeter, less than half the width of standard motion-picture film, but it can be read, enlarged, on the same projectors as the wider film.

It is estimated that a 95 percent saving in storage space will result from putting the Census records on film. The 8,700,000 pages of Census reports now in storage occupy almost a mile of shelving. Copied on film, all of the records could be stored in 28 standard-size file cases.