age fluctuations resulting from changes of arc length, so we have some degree of regulation.

The mechanism will work the positive carbon down to about $3^5/_8$ inches, when consumed to the limit. There have been many attempts to devise ways of saving carbons; but using such heavy currents as we do in the high-intensity lamps, perfect conductors are required to get the current to the tip of the positive carbon.

MR. MISENER: Are the motors sealed?

MR. RICHARDSON: They are entirely enclosed, and require very little servicing. In fact, I do not believe that, of 250 lamps we have in operation, more than 10 have ever required servicing. Eventually brushes will have to be replaced; but if the motor is used, say, two hours a day, the brush life should be quite long.

MR. CRABTREE: We read in the newspapers about the high temperatures existing in the Hollywood studios. What is being done in the way of air conditioning?

MR. RICHARDSON: That question has been asked a number of times. I have not heard of the terrific heat, except that the temperature does get rather high at the studios in the San Fernando Valley. The outdoor summer temperature there is occasionally 100 or over. As far as I know the stages are not refrigerated, although many of them pass the air through water sprays, which have some cooling effect.

MR. TASKER: Many stages are now equipped with blowers for changing the air during takes. There are three conditions under which the heat becomes uncomfortable: when one is working in a small closed room, particularly for photographic reasons; when the actors are wearing arctic or winter costumes on the stages; and when working with color.

MR. RICHARDSON: A large cold-storage company in Hollywood had an enormous ice storage building that had become obsolete due to the activities of the electric refrigerator manufacturers. They conceived the idea of turning it into a cold stage, and installed refrigerating equipment. When you see Columbia's *Lost Horizon* you will see the actors walking about with vapors coming from their nostrils—a very convincing arctic scene, because the temperature may be as low as 20 degrees, even on a summer's day.

THE SCHWARZKOPF METHOD OF IDENTIFYING CRIMINALS*

J. FRANK, JR.**

During the past two years experiments have been conducted that have resulted in a recognized contribution to the science of sight identification. This paper describes the background indicating the need for such a method, some of the ex-

* Received October 9, 1936; presented at the Fall, 1936, Meeting at Rochester, N. Y.

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periments conducted, the equipment and technic finally agreed upon, and some of the results to date.

There are two systems of identifying human beings: sight and positive. The law enforcement officers must use both types in apprehending criminals. The positive system is applicable only when a criminal is in custody. It consists in taking measurements, recording tattoo marks, scars, and other features, and comparing the records with any previous records the individual may have. Frequently during the process of establishing the records for positive identification, full-face and profile still pictures are taken of the individual.

Identification by sight is, on the other hand, applied to criminals who are at large and are wanted by the police. The field of development of sight identification has been sadly neglected. It is necessary for the law enforcement officer to identify a wanted criminal by sight first, and then take him into custody before positive identification can be effective. With improved modes of transportation, improved methods of disguise, and increasingly larger crowds in cities, more highly scientific methods of sight identification are required.

In the earlier days, law enforcement officers had only verbal descriptions of the wanted criminal to guide them. A few of the officers might have actually seen the criminal when he was previously in custody. Then came the printed description, with reproductions of photographs, the familiar "Wanted" circular, with its full-face and profile views. The "Wanted" circular, because it is inexpensive and can be widely and quickly distributed, is a useful tool. At the very best, however, the halftone reproductions on the printed circular are several steps removed from the original photograph, and represent the subject as he appeared during only a fleeting moment—the fraction of a second during which the camera exposed the film—and during which the criminal may have distorted his countenance somewhat.

To compensate for the deficiencies of the still-picture likenesses, modern large city police departments use the "line-up." The advantages of the line-up are that the police see the criminals in action; they see his characteristic gestures, the way he stands and walks; and hear his voice. This is the most effective means of promoting sight identification. The disadvantages of the line-up are that only a handful of all interested law enforcement officers can be present at the line-up while the criminal is in custody.

As the modern and most effective method known of familiarizing law enforcement officers with the identifying characteristics of wanted persons, the New Jersey State Police, working in collaboration with the RCA Manufacturing Co., the J. M. Wall Machine Co., and the International Projector Corp., have developed a method of using talking motion pictures—the Schwarzkopf method of identifying criminals. Experiments were made using 16-mm. sound motion picture equipment, which demonstrated the great value that such records would have in assisting in establishing identification by sight. Further development was carried on with 35-mm. equipment of both the single- and double-film type over a period of more than six months.

Because the films are to be used for identification, the first requirement for police work is realism in the projected picture and reproduced sound. The pictures must have clear, sharp details, and the sound must reproduce in recognizable form the inflection, pitch, and other characteristics of the subject's voice.

The equipment must be so simple that one person can operate it without considerable training, and must be so designed as to be easily transported and quickly set up at any place where electric current is available.

The experiments resulted in the decision to use, for high-quality results, double-film recording equipment originally designed for location and industrial purposes. For certain other applications the 16-mm. equipment fulfilled the requirements. Further development of a single-film system employing a noise-reduction system will result in a satisfactory set-up at lower cost.

Recording equipment, camera, and illuminating equipment were modified for this particular application. Ease of focusing and suitable acoustical conditions were attained by using a floor mat of canvas and gray cloth drapes forming a triangle open at the apex. The floor mat has fixed sockets for the legs of the

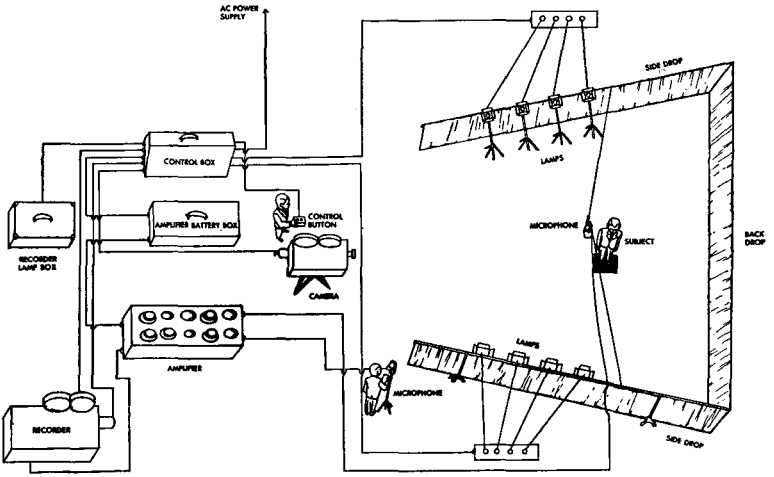

FIG. 1. Complete set-up of equipment and stage.

camera tripod, and the proper location for the subject is marked so that he will not get out of focus or out of the range of the camera lens. The side and back drapes provide a suitable photographic background, concentrate attention upon the subject, and eliminate echoes or reverberations that might be picked up by the microphones. The positions and the wattages of the necessary lamps are predetermined to provide the proper lighting.

Setting up the equipment requires perhaps fifteen minutes. When all is ready and the subject is placed in the position marked upon the floor mat, with the microphone suspended immediately above and in front of him, the inquisitor takes his position at the other microphone and the operator standing at the camera presses the control button that he holds in his hand. At once the subject is brightly illuminated by the flood lamps. To allow the subject to regain his composure, and to give the operator time in which to glance at his lights and meters, the automatic controls have been so arranged that a lapse of three seconds

occurs between the instant the lights go on and the instant the camera and recorder are started. The inquisitor then puts his questions and directions to the subject, according to a prearranged plan, so that the interview requires three minutes and uses approximately 300 feet of film. Three minutes has been found, after considerable experimenting, to be sufficient time in which to describe the subject from four different angles, using long, medium close-up, and close-up shots, as well as to ask the customary questions and have the subject perform certain distinguishing actions.

In most cases, portable reproducing equipment will fulfill all requirements,

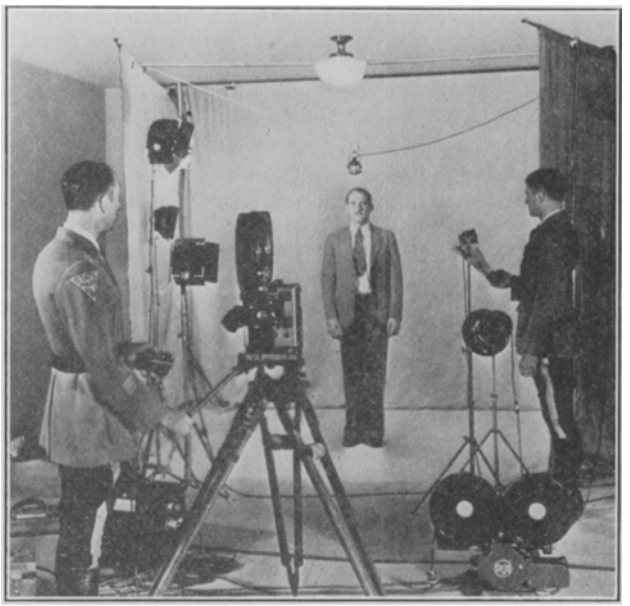

FIG. 2. Stage and equipment in use.

with the advantage that showings may be made in various locations. In some police headquarters in the larger cities it may be desirable to have one of the permanent installations such as is supplied to theaters.

The possibilities of the Schwarzkopf method of identifying criminals indicate that it is an important step forward in police methods. It is the plan to locate recording apparatus in the large cities, and in the possession of State police authorities as required to meet the needs of the State. Each State and Federal prison should be likewise equipped. Sound motion pictures of criminals should be made when they are apprehended, when they arrive at prison if convicted, and immediately before their release, to insure getting accurate likenesses of the prisoners' voices and customary appearances. Habitual criminals and those suspected of more serious crimes will be photographed and recorded upon film as a

matter of routine, just as they are now fingerprinted. At regular intervals police officers will be shown sound motion pictures of all criminal persons known to be in the vicinity.

The police departments of even the smaller towns are to have reproducing equipment, either for standard 35-mm. or for 16-mm. film. Large cities should have 35-mm. reproducers in each precinct police station as well as at headquarters. Instead of having only a few headquarters' police officers and detectives see the criminals when they are picked up, every law enforcement officer, from the patrolman on the beat to the highly trained detective, can see and hear the wanted persons, not after they are in custody, but when they are wanted; and not only in the headquarters of the police force that arrested them, but anywhere or everywhere they are likely to be. They can see and hear the picture monthly, weekly, or daily if they desire.

Undoubtedly, in these days of fast travel, when criminals roam from one end of the country to the other, some means of coördinating the sound-film activities of local police departments will be needed. Probably this may be achieved by a national library, which will maintain files of films just as fingerprint files are now maintained. Local police would record the criminal on film and have made whatever number of projection prints may be required. The original negative would then be sent to the national library, which would supply prints, either 35-mm. or 16-mm., to the various police departments as needed.

In the cases of the more notorious criminals, their pictures could be shown even in the theaters of the country, as part of the newsreels. Newsreel producers have already indicated their eagerness for such films. What chance of escaping detection would a "public enemy" have when every police officer and millions of citizens have seen him in action and have heard him talk?

A demonstration was held on May 27, 1936, at Trenton, N. J., under the sponsorship of Gov. Harold G. Hoffman before an audience of 500 persons representing the most important law enforcement agencies in the United States, England, and Canada. Four pictures of actual criminals in New Jersey were made for this demonstration.

On August 25th, John A. Byers escaped from the Middlesex County workhouse. It happened that Byers was one of the four criminals whose pictures had been taken. Before it was possible to complete arrangements to use the picture to assist in capturing him an extraordinary thing happened.

On September 5th, Byers telephoned to a friend from a pay-station in Asbury Park. County Detective Drosdick, a former state trooper, who had never actually seen Byers but had seen the motion picture of him once, received the information and decided to drive to Asbury Park to look for him. On the way, 35 miles from Asbury Park, he passed a man who had a definitely familiar appearance; he turned around, looked again, and arrested John A. Byers. The only thing that he had to rely upon was his memory of the sound motion picture he had seen of Byers. He certainly did not expect to find him 35 miles from Asbury Park, but the impression left by the motion picture was so complete that, from a passing automobile, he made an identification and picked up the man he was looking for.

(*Following the paper, sound motion pictures of male and female actor-criminals going through the required technic were shown.*)

DISCUSSION

MR. RICHARDSON: I wonder whether, when the criminal realizes what is going on, he will act very naturally.

MR. FRANK: I think so. There is some feeling on the part of law enforcement officers that so many persons want to get into the movies that they will commit crimes just to have their pictures taken. Furthermore, law enforcement officers tell me that they have pretty good control of the criminals, and that taking the pictures at different times, as suggested, will doubtless overcome the difficulty.

MR. ELLIS: Is monitoring necessary? If so, I suppose a second person would be required for handling the equipment.

MR. FRANK: No; we do not require monitoring.

MR. PRESGRAVE: Why is a double system necessary?

MR. FRANK: The only reason why the double system has been used is that we did not have a single system available employing a ground-noise reduction system. Because of the high quality of speech required, that is the only system that has been used.