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LEONARDE KEELER

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BIOGRAPHY OF LEONARDE KEELER

By

Viola Stevens*

Prologue

Charles Keeler, poet-teacher, and his beautiful young artist wife, had high hopes for their son, born in California on October 30, 1903. They named him Leonarde after the super-genius Leonardo da Vinci, hoping, no doubt, that Leonarde would become a master in one of the fields dominated by his namesake. Leonarde had two sisters, one older, one younger, following the birth of the latter, the young mother died. The three young children spent their early years in the care of their maternal grandparents and in boarding schools.

As a teenager, Leonarde had a serious illness which left him in a weakened condition. During his convalescence, his father introduced Leonarde to the Berkeley Police Department and to August Vollmer, noted pioneer in the then fledgling scientific crime detection methods of police procedures. Leonarde became fascinated with a rudimentary device known as a "lie detector" or "lie box" on which experiments were being conducted at that time. There, Leonarde met and worked with Dr. Larson, who also was interested in the device. Almost at once, however, the two men differed on the future use of the instrument, Dr. Larson holding that it should be used for medical purposes only, while Keeler believed that it should be made available to law enforcement agencies for investigative purposes and in the administration of justice in addition to its use for medical purposes. His disagreement with Dr. Larson was a source of deep disappointment to Keeler throughout his lifetime.

This is the story of Leonarde Keeler who, singlehandedly, introduced the polygraph or "lie detector" to the United States and to the world, and who by his skill in the use of the instrument and by his interpretation of the results of his many examinations using the polygraph, insured its use and acceptance by the overwhelming number of law enforcement bodies using it today. He was the originator of the Keeler polygraph technique (the proper use of the polygraph) which has changed little in the 30 years since his death.

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The story tells of his years of experimenting with and developing the crude original device into a fine instrument. In fact, Leonarde spent so much time on his polygraph during his college years that he did not graduate with his class but had to return for additional work later to earn his degree.

Gifted with an attractive and charismatic personality, Keeler was adored by women and admired and respected by men. The story mentions his marriage to and short stormy life with the beautiful and brilliant Katherine Applegate who eventually divorced him and, as a member of the WASP, flew a bomber into the ground when ferrying it from Texas to Ohio. The story recounts many of Leonarde's more famous cases.

Controversy has swirled about the polygraph and its use since it was first introduced 50 years ago and continues to this day but it has had little effect on the continued use and usefulness in the context in which Keeler envisioned it, i.e., as an investigative aid to law enforcement and as an aid to employers and employees in monitoring employee honesty.

Since his death in 1949, no one in the polygraph field has taken Leonarde Keeler's place, and it seems fitting that the story of his short life and accomplishments should be told. His sister, Eloise Keeler has, with affection and modesty, brought us the true story of the genius of the polygraph.

Viola Stevens
Deerfield Beach, Florida
1975

LEONARDE KEELER

On September 20, 1949, Leonarde Keeler, developer of the Keeler polygraph and originator of the Keeler polygraph technique, died at the age of 45 after suffering a cerebral hemorrhage. For twenty-five years he had worked unceasingly to bring the polygraph and technique to the attention of law enforcement officers and others concerned with the administration of law enforcement officers and others concerned with the administration of justice as a scientific aid to investigations. His efforts must be acknowledged as remarkable when we consider that an entire industry evolved based, to a great extent, on the research and teachings of Leonarde Keeler. Keeler's personal responsibility for the use and acceptability of the polygraph technique was evidenced by the fact that Chicago and the Midwest, where Keeler practiced for twenty years, was considered the center of the polygraph world. During a significant portion of the 20th century in no other location was the instrument and technique used so extensively.

There has been considerable criticism directed toward the use of the polygraph in the past two decades. At times, it appears that some ground has been lost, at least in public relations. The ever-increasing and successful use of the technique in the field of criminal investigation, however, indicates that criticism from persons having only a superficial knowledge of the technique and use of the instrument will have little effect upon the future of the polygraph among law enforcement agencies. Some constructive criticism might profitably be leveled against the practices of a few individuals in the field. The criticism should come from the polygraph examiners themselves, since the sincere member of the profession believes in both the polygraph instrumentation, as well as the technique and is concerned with their acceptance and scientific standing.

Leonarde Keeler was born in Berkeley, California in 1903, the second in a family of three children. His father was a poet, lecturer and civic leader, his mother an artist. When he was four, Keeler's mother died and Leonarde and his two sisters spent much of their early life in the home of their grandmother and in boarding schools on the East Coast.

Keeler had a tremendous drive and ambition which led him into many adventurous projects. During his school days he shipped to Australia on a freighter. He loved mountain climbing and with his boyhood friends, Doc Woolsey and Ralph Brandt, made many trips into the High Sierras in mid-winter as well as in summer. Later, as one means of earning money for his college education, Leonarde organized and led mountain-climbing expeditions. His attention to detail is found in the advance preparations for these trips recorded in the logs he kept. Before starting out on a trip, a schedule was drawn up, provisions needed were estimated and secured, meals planned and work delegated so that the trips would be pleasant and without mishap. During some of these summer trips, food was cached in designated spots to be used in the mid-winter trips when it was impossible to take much gear. Keeler was a daring climber and discovered a number of uncharted peaks in his climbs.

Much of the cost of Keeler's college education was paid for by his own efforts. When he found that rattlesnake venom was in demand for use in making a serum to combat snake bite, he and one of his classmates went out into the hills and captured rattlesnakes and "milked" them of their venom. This was accomplished by holding the snake's head under a forked stick and catching the venom in a jar.

When radio was in its infancy, Keeler built his own crystal receiving set. He tinkered constantly with it, built and rebuilt. During this period he spent many weeks in a hospital because of a serious illness. As soon as he had recovered somewhat, he had his radio set up and arranged to have it wired into the rooms of other patients so that they too might enjoy the wonders of the newly-developed radio.

Keeler's interest in crime detection and the polygraph was a result of his association with August Vollmer. The elder Keeler was a close friend of August Vollmer, Chief of Police,

Berkeley, California, an outstanding pioneer in the field of scientific crime detection and modern police science. Chief Vollmer had known Leonarde since he was a very small boy.

While in high school, Leonarde experienced a serious illness of long duration. Upon recovery he seemed to be lacking some of his energy and enthusiasm for life. His father took him to visit August Vollmer for the purpose of meet Mr. C.D. Lee, who was in charge of the Records Division in the police department. It was his responsibility to oversee all photography and photo-micrography conducted by the department during criminal investigations. This meeting stimulated Leonarde's interest and he made an appointment to return. During the same visit Chief Vollmer introduced him to Dr. John Larson who was conducting a polygraph test on a suspect in a burglary case, though the device was not at that time known as a "polygraph."

The first moment that Keeler witnessed a polygraph examination his life seemed to have new purpose. He would dedicate his life to that purpose. He accompanied Dr. Larson on visits to several state hospitals where tests were conducted on patients to identify the physiological responses of both abnormal and subnormal persons. That first polygraph was situated in heavy, cumbersome box. Keeler and Larson discussed the possibility and desirability of developing a more efficient and portable instrument. Eventually both Larson and Keeler independently developed portable instruments. Keeler's was manufactured and sold commercially. During his lifetime, purchases were only allowed by law enforcement agencies or for medical purposes with the exception of two or three instruments which were leased for personnel work.

Chief Vollmer left Berkeley in 1923 to go to Los Angeles to reorganize the police department. Keeler and his polygraph followed. He enrolled in the University of California but continued with experimental use of the polygraph. With the help of his father and some of his friends, Keeler made additional refinements on his instrument at that time. Some of his achievements during this period helped to lay the foundation for the acceptance of the polygraph technique in investigations. In one instance, from a group of 125 policemen, Keeler picked the one who had stolen a revolver. In another case he found the least expected girl in a sorority house was the culprit in a series of thefts, after running all the girls in the house. He was successful in obtaining a confession from a murderer. Several bank holdups were cleared as a result of his ability to show the guilty person how obvious his guilty reactions were.

When Vollmer left Los Angeles, Keeler transferred to Stanford University, where he majored in psychology, under the direction of Professor Miles. Keeler was busy during this period developing the model which was to be known as the Keeler Polygraph. He put so much time in on this project that he had to neglect some of his studies and did not get the necessary credits in order to graduate. He returned to take additional work for completion of his degree.

In the meantime he went to the Institute for Juvenile Research in Chicago, Illinois where he continued with his experiments and research in collaboration with Dr. Larson and others. During those years (1929-1930) Keeler and his associates examined on the polygraph 500

convicts in Joliet State Prison, all of whom claimed they were innocent of the crimes charged. The examiners found only two of the entire group innocent of the charges against them.

Later Keeler examined hundreds of inmates of mental institutions in Illinois and Minnesota. His research during this time centered around possible correlations between intelligence and physiological reactions; and further to discover whether there was any correlation between emotional instability and certain types of reactions, etc. Unfortunately the results of his research were never published due to the time constraints placed by his case work and the fact that he was much in demand as a lecturer on the use of the polygraph. In 1931, for instance, Mr. Keeler gave 78 lectures in a period of nine months to various groups in addition to his Northwestern lecturing and polygraph examinations.

In 1929, scientific crime detection was practically unheard of in the United States, and police departments in their fight against crime did not have access to the modern scientific laboratories that they do today. As a result of the 1929 "St. Valentine's Day Massacre" in Chicago when seven gangsters were lined up in a warehouse and cut down by the machine guns of rival gangsters, a group of concerned citizens, including Burt Masee, decided to establish a scientific crime laboratory. Mr. Masee contributed the large amount of money necessary to set up the first scientific crime detection laboratory in America.

The laboratory was given to Northwestern University Law School under whose sponsorship it functioned for nine years. Mr. Masee brought Calvin Goddard, pioneer firearms identification expert and authority on methods of scientific crime detection to head the laboratory and shortly thereafter Colonel Goddard asked Leonarde Keeler to join the staff.

Those first years at the Northwestern University Scientific Crime Detection Laboratory were exciting and fruitful years. Here a group of dedicated and enthusiastic young crime fighters applied science to the detection of deception and other phases of crime. Undoubtedly, this laboratory through its seminars for law enforcement officers, district attorneys, and others gave impetus to the modernization of police methods fostered by August Vollmer. Many of those who made up the original staff of the SCDL of Northwestern University are still active in crime detection work as of this writing (1975) though some are deceased. Among those who have died are Dean John H. Wigmore, master of legal jurisprudence, August Vollmer, Calvin Goddard and, of course, Leonarde Keeler and Katherine Applegate (Keeler) Dussaq.

Keeler married his college sweetheart, Katherine Applegate in 1930 and she became one of the foremost examiners of questioned documents in the country. Mrs. Keeler had phenomenal success in the document field for a number of years only to give up her business to take up flying seriously and during the war joined the WASP. She was killed during World War II when the plane she was ferrying crashed. The marriage of these two handsome young people who seemed to have so much in common appeared to be an ideal match, but it was destined to failure and in 1941 they were divorced.

During the eight years from 1930 to 1938, Keeler and others working with him at Northwestern continued to experiment with the polygraph technique. Among those in the laboratory at that time were Charles M. Wilson, who went on from the Chicago Police Department to establish the Wisconsin State Crime Laboratory in Madison and Fred Inbau, who was awarded a fellowship at Northwestern University School of Law to conduct research in scientific methods of crime detection. Inbau became interested in the polygraph and has written some of the most authoritative works to date on the subject. The American Journal of Police Science (later incorporated in the Journal of Criminal Law and Criminology) was started by the laboratory in 1930. Contributors to that first issue included August Vollmer, Calvin Goddard, Leonarde Keeler among others.

During those years, too, experiments were conducted in detection of deception though the use of scopolamine and other "truth serums." Keeler, after opening his own office, experimented with truth serums, using volunteers for his research. Although he never used drugs of any kind in his case work, he maintained an interest in truth serums.

Keeler developed questioning techniques which consisted of the specific response test (relevant-irrelevant), the peak of tension test, word association test, sensory tests, and psychopathic tests. When a subject reacted to the specific response test, the peak of tension test often followed with successful results. Keeler used the map test -- a form of peak of tension -- to solve a number of famous cases. It was used by him in Seattle, Washington in 1929 when Karl de Castro Mayer was under suspicion in the disappearance of James Eugene Bassett, a naval officer ordered to duty in the Pacific. No longer needing a car with his new assignment Bassett advertised his automobile for sale. Subsequently Bassett disappeared, however, his car was discovered in Mayer's possession. Mayer pleaded innocent and gave a plausible excuse for possession of the car. He offered to submit to a truth serum test to prove his innocence. Under the drug, he admitted nothing and then offered to take a polygraph test.

Mayer was a hardened criminal but when he saw his reactions on the polygraph, lost his composure and refused to answer any questions. Keeler continued to question him and even though Mayer made no verbal replies, his reactions to Keeler's questions concerning areas on the map, helped first to place the disposal of the body in Washington, then narrow it down to a section of the county. Later the body was located in the area where Mayer's reactions indicated it would be found.

In another case involving a map test, Keeler identified from thousands in the compounds the nine German POWs who had executed one of their number who had renounced the Nazi philosophy. One prisoner who refused to talk, by his reactions on the polygraph, narrowed down the "execution" area to one compound, and finally down to the nine prisoners responsible.

In still another map test, Keeler was called to Boulder, Colorado to aid in the search for the rape-slayer of an 18-year-old coed. When he arrived the authorities had in custody a man

whose wife had reported him to the police because she believed he was involved in the slaying. The suspect first disclaimed any knowledge of the crime, but under the questioning of Keeler on the polygraph, finally told an incredible story regarding a stranger who got into his (the suspect's) car with the girl, bludgeoned the subject (Walker) over the head and while Walker was unconscious, apparently killed the girl and disappeared. Using the map test, however, Keeler located the previously discarded gun which Walker had used in the slaying and the girl's school books, which he had thrown away after tearing her name from the books in an effort to avoid identification. A partial confession was obtained from Walker when confronted with his guilty reactions on the polygraph.

In 1933, Northwestern University Law School sold the Scientific Crime Detection Laboratory to the City of Chicago. Keeler, who had headed the laboratory for some time, decided not to go with the laboratory but instead opened his own offices on LaSalle Street in Chicago where he continued to handle criminal casework and personnel testing as he had done at Northwestern. Early associates with Keeler in the LaSalle Street offices were George Smith, George Haney, Lester Schreiber, and Alex Gregory.

During this period, Keeler trained a few police officers in the use of the polygraph. The officers were sent in by their departments, received two weeks of intensive instruction, after which they were advised to return to their departments and use the technique experimentally and to return to the Keeler Laboratory for additional training at the end of six months. Many of the trainees did so, but Keeler felt that the training period should be lengthened and the course expanded.

In one of Keeler's first classes was Colonel Ralph Pierce of the U.S. Counter Intelligence School in Chicago. Pierce was the first U.S. Army polygraph examiner. He attended several of the two-week courses and shortly thereafter the U.S. Army began to send additional officers for training as polygraph examiners. Polygraph instruments were purchased for use in several departments of the Army.

In 1946, Keeler was called to Oak Ridge to screen 850 employees, including scientists and top executives who were employed in or had access to the final products building of fission materials. The polygraph testing was continued for several years under one of the examiners who had participated in the original screening with Keeler.

Prior to the Oak Ridge screening, the United States Government had requested Keeler to screen a large group of German POWs being held at Fort Getty, Rhode Island prior to their being sent back to Germany to aid in the U.S. Occupation Forces' government of the American Sector of Germany. The group, in addition to Keeler, consisted of James Austin, Russell Chatham, David Cowles, Alex Gregory, Ralph Pierce, Paul Trovillo, and Charles Wilson. It was during this project that the predecessor association for what is now known as the American Polygraph Association was formed.

One of the most widely-publicized Army cases solved by Keeler and Pierce was the Hesse Crown Jewels Case. In this case, approximately \$1,000,000 in jewels unearthed in the Kronberg Castle in Germany by Army officers was recovered through the use of the polygraph, and the principals involved in the thefts were tried and imprisoned.

Keeler's success with the polygraph did not consist solely of exposing the guilty. In many cases the innocent were freed of suspicion through his use of the instrument. In two well-known cases, innocent men were freed from prison as a result of the polygraph examination and additional evidence uncovered. One of these, an examination of Joe Majczek who had been imprisoned for eleven years for a murder he denied committing, was made into a motion picture, *Call Northside 777*, in which Mr. Keeler played himself.

A tremendous amount of personnel testing and applicant screening for banks and business houses was done by Keeler. Whenever petty thievery was discovered on the part of an employee and the employee confessed, Keeler advised against discharge stating that such an employee taking cognizance of further testing invariably refrained from pilfering in the future.

There were times when it was not possible to prove the results of his examinations and these cases were often puzzling for want of an adequate explanation. At one time Mr. Keeler ran the entire personnel of a bank after \$12,000 in cash was discovered missing from a safe deposit box. It appeared that it had to be an inside job but all those tested ran clear records. For ten years the mystery remained unsolved and the \$12,000 remained missing. One day, some ten years later, one of the missing \$100 bills appeared in a customer's deposit in the bank in question. An alert teller spotted the bill and brought it to the attention of the president of the bank. The depositor, a wealthy woman, stated that she had taken the bill from her mother's safe deposit box which had not been opened for years. In reconstructing the mysterious occurrence, it appeared that the depositor who lost the \$12,000 had opened his safe deposit box sometime before the loss was discovered and had inadvertently left the cash and securities in a booth. Immediately thereafter the patron in whose box the missing money was found had apparently opened her safe deposit box in the same booth and had put the missing money back into her own box with her other papers and securities.

Increasing demands for Keeler's services in cases all over the United States began to take toll of his health in the form of constantly rising blood pressure, and he spent days in the hospital from time to time. In spite of his failing health, at the urging of his associates and others, he moved into larger quarters just a year and a half prior to his death, in order to train men for the Army, Navy, and other governmental agencies. Branches of the government were using the polygraph increasingly and these agencies requested that Keeler train men for the additional polygraphs they were purchasing. By this time a more comprehensive training program had been developed which was six weeks in duration as opposed to the earlier two week training program. Keeler's vision on training was never fully realized due to his untimely death before he had the opportunity to train more than a few for government service.

Biography of Leonarde Keeler

Early in 1949, Keeler suffered a minor stroke and was hospitalized in Chicago for weeks. He went to the Mayo Clinic for additional weeks, returning to Chicago in August. The first of September, his health apparently having improved, he went to Sturgeon Bay, Wisconsin to spend a week or two with C.M. Wilson, Superintendent of the Wisconsin State Crime Laboratory, who was vacationing at Jacksonport with his family. On September 7, Keeler suffered another more serious stroke from which he never rallied, dying on September 20, 1949.

* * * * *

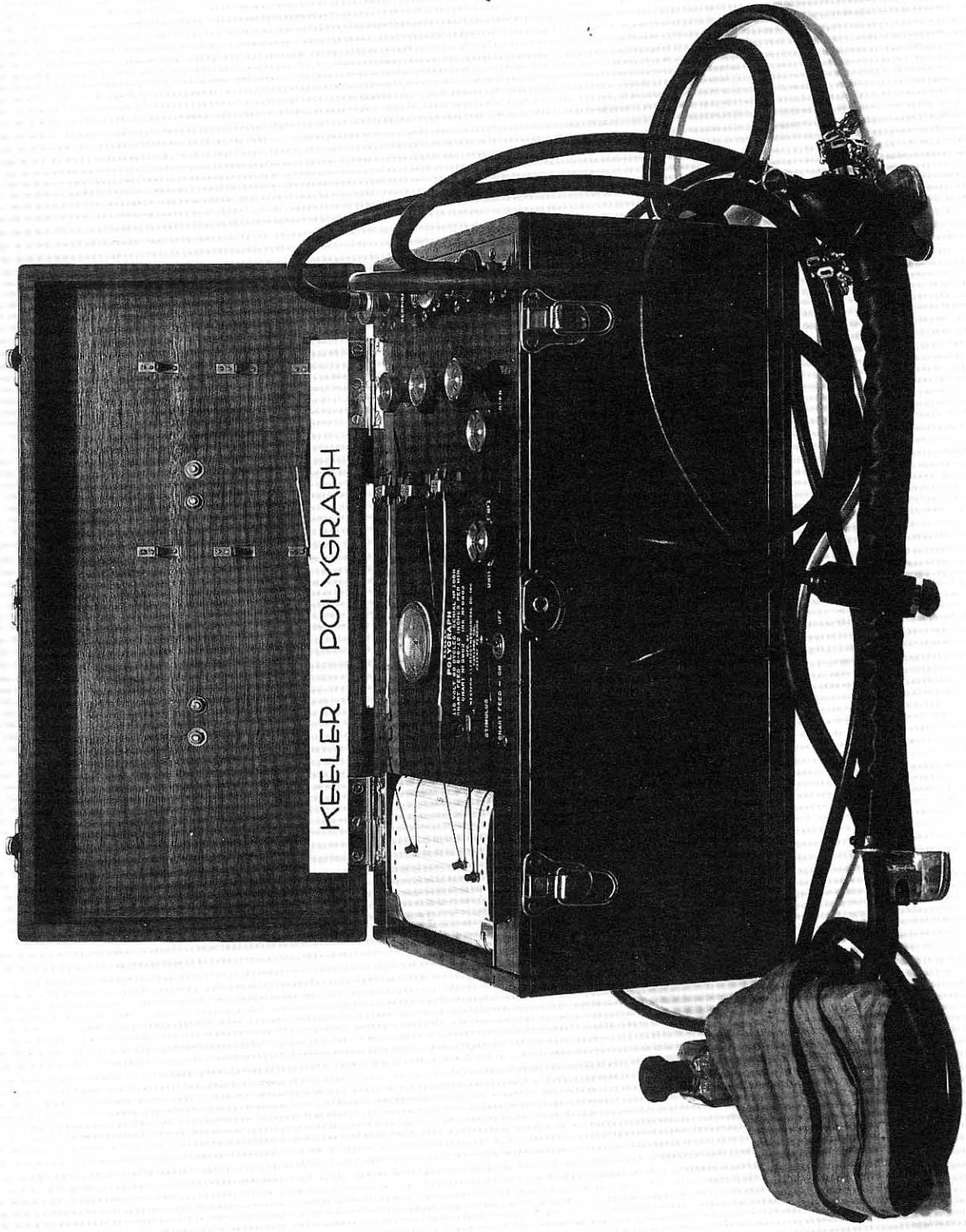


Photo courtesy of Berkeley Police Department

UNITED STATES PATENT OFFICE

LEONARDE KEELER, OF BERKELEY, CALIFORNIA

APPARATUS FOR RECORDING ARTERIAL BLOOD PRESSURE

Application filed July 30, 1925. Serial No. 46,986.

This invention relates to means for recording cardiac cycles and other oscillations in arterial pressure simultaneously. Sphygmographs are well known in the art. Sphygmograms, or the series of connected curves recorded by a sphygmograph, indicate cardiac cycles only, in which the up stroke is the systole curve and the down stroke the diastole curve. In addition to the pressure oscillations of the cardiac cycle, there are slower oscillations, which are more or less irregular and which may be superimposed on a considerable number of cardiac cycles. The slower oscillations in the arterial pressure may be due to various factors such as for example, respiratory movements, rhythmic variations in the activity of the vasoconstrictor center or in the cardiac activity. Heretofore, it has not been possible to record graphically a curve combining the cardiac cycle, which showed the systolic and diastolic pressures and dicrotic notch and the slower oscillations, and it is an object of this invention to provide means for accomplishing this purpose. The curves referred to will be better understood from the detailed description hereinafter in connection with the drawings in which such curves are illustrated.

My invention also has been found of great value in connection with making certain psychological tests based on arterial blood pressure variations. In such cases I have simultaneously recorded with means embodying my invention two curves taken from different parts of the body, such for example, as the two arms, two legs, one arm and one leg, etc. My invention may also record a respiration curve, which curve is recorded simultaneously with the two aforesaid curves. An apparatus of this character will be more fully described hereinafter.

It is an object of the invention to provide means whereby the sphygmogram or cardiac cycle may be recorded simultaneously with and be superimposed on the slower oscillations in the arterial pressure, whereby the characteristics of each as well as their relation to each other at any moment may be readily ascertained.

The invention possesses other advantage-

ous features, some of which with the foregoing will be set forth at length in the following description where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of device embodying my invention, but it is to be understood that I do not limit myself to such form, since the invention as set forth in the claims may be embodied in a plurality of other forms.

Referring to the drawings:

Figure 1 is a top plan view of apparatus embodying my invention.

Fig. 2 is a side elevation of the apparatus shown in Fig. 1.

Fig. 3 is an end view illustrating the mechanism of the kymograph.

Fig. 4 is an enlarged detail view illustrating the mechanism connecting a tambour unit with a stylus of the kymograph.

Fig. 5 is a cross-sectional view of a brachial cuff with the inflator and tubes shown in elevation; and

Fig. 6 illustrates an enlarged specimen of a graphic record obtained by my invention.

Apparatus embodying my invention is preferably mounted on a suitable base 1 and includes a kymograph 2, which comprises a motor 3 which drives a roller 4, having a plurality of teeth 5 on its periphery, through a suitable gear train indicated as a whole by the numeral 6. The kymograph is provided with a suitable supply roll 7, which carries smoked paper 8 or any other suitable medium for receiving records. The paper 8 is provided with holes 9 adapted to be engaged by the teeth 5 so as to draw the paper through the kymograph in a well understood manner. This apparatus is well known and does not of itself form a part of my invention as any standard type of apparatus for accomplishing the same result may be employed.

Records or graphs are traced on the paper 8 by a stylus of which three are shown, designated 9', 10 and 11, although it is to be understood that I do not limit myself to any particular number. Since each of the styli is actuated by similar mechanism embodying

Patent negatives courtesy of Charles H. Zimmerman.

Photographic prints by William J. Berndt, Jr.

my invention, a description of one will be sufficient, and will best be understood by referring to Figs. 1 and 4. The stylus 9' is secured at right angles to a small shaft 12, (Fig. 4) preferably at a point midway between the ends thereof, and the shaft is rotatably supported by two adjustable screws 13 and 14. Preferably the ends of the shaft are provided with conical depressions to receive the ends of said screws which are suitably pointed. The screws 13 and 14 are supported on a fixed vertical member 15 by two arms 16 and 17 and the axis of shaft 12 as it appears in Figure 1 is in a plane at right angles to the plane of paper 8, which is preferably horizontal as shown. The shaft 12 is provided with a small lever 18, positioned preferably at a point midway between the ends of the shaft. The lever 18 is provided with a hole 19 to receive a hook or L-shaped member 20. A plurality of holes 19 may be provided so that the member 20 may be placed in different ones for the purpose of adjusting the amount of leverage. The member 20 is connected in a manner hereinafter described to the end of a tambour unit 21, which comprises a series of metal tambours 22, whereby vibrations or motion transmitted to the tambours 22 may be transmitted to the stylus 9', the amplification of such motion or vibrations of course being determined by the lengths of the lever 18 and stylus 9'. The tambour unit 21 is supported at one end by an L-shaped member 23 and at its opposite end by a vertical member 24, as best shown in Fig. 2. The interiors of the tambours 22 are all in communication with each other. The tambour 22 adjacent the member 20 is closed, as indicated at 25 and the tambour 22 at the opposite end of the unit is open and connected with a pipe 26. For the purpose of maintaining the tambour unit 21 in any desired distended position, such for example as to correspond to a given pressure, adjusting means have been provided. These comprise the provision of a screw 27 which is swiveled on the end of member 20 and adapted to engage threads in the end 25 of the tambour unit 21, and a shoulder 28 (Fig. 4) bearing against the support 23. Thus when the screw 27 is rotated, the tambour unit 21 may be fixed in a given distended position with respect to the member 23. The L-shaped member is supported on a fixed vertical element 29 as shown in Fig. 2, and may extend through an opening in the member 24, not shown. The member 24 is pivotally connected to the base 1 at 30 and normally urged toward the fixed element 29 by a spring 31. The distance between the members 24 and 29 is regulated by a screw 32 in a manner readily understood. In this manner the end of the tambour unit adjacent the pipe 26 may also be held in a distended position. I preferably employ both the screws 27 and 32 for adjusting the tambour unit. The purpose of the adjustment

will be better understood from the following description. In Fig. 5, an arm of a person is indicated in cross-section at 33 which is partially surrounded by a rubber bag 34 held in position by a leather cuff 35. The rubber bag is connected by means of a suitable tube 36 with a pump 37 and with the pipe 26 which communicates with the interior of the tambour unit 21. The bag 34 is inflated by means of the pump 37 to a pressure at which pulsations impart a free motion to the stylus. As the stylus would now travel through a wide arc, and be likely to jump from the paper 8, the tambour unit 21 is adjusted in the manner described to a distended position corresponding to the pressure at this time. Thereafter the travel of the stylus is limited in a manner readily understood.

By means described, I secured a graphic record of the character shown in Fig. 6. Heretofore sphygmographs have been obtained showing the cardiac cycle which was similar to the first five cycles shown in Fig. 6 designated *a* to *e* inclusive, in which the upward line *a'* to the peak indicates the systolic pressure, the downward line *a''* the diastolic pressure and *a'''* the dicrotic notch. These cycles were uniform with respect to a given line. The applicant's invention, however, produces a new and additional result. While maintaining the individual characteristics of each cardiac cycle, the same are imposed upon a wave, which may rise or fall irregularly as shown in Fig. 6. It has been found that this wave may be varied by physical, psychological or emotional changes; however, the applicant does not undertake to analyze at this time the properties of the curve obtained. The same is the subject matter of study by the medical profession, and it is now known that the curve is different from any other curve heretofore obtained.

While my invention probably has its greatest application in the field of the medical profession, for purposes of illustration I have shown the same embodied in apparatus for making certain psychological tests. This apparatus is provided with two styli, 9' and 10, with associated mechanism similar to that above described; however, in one case the impulse transmitting means is connected with an arm and in the other case to the other arm or a leg or in each case said means are connected with a leg, whereby parallel records are obtained from different portions of the body. The stylus 11 is connected with means for recording a respiration curve. This apparatus may also comprise a clock-mechanism 38, which controls the circuit of an electromagnet 39 for indicating time intervals on the paper 8, said magnet actuating a stylus 39'. In carrying out the tests, the person under examination is subjected to questioning and his various reactions are

indicated in the graphs recorded. In order to indicate on the record the time when certain questions are asked, a time marking device is provided which comprises an electromagnetically actuated stylus 40, which may be controlled by a push button 41. Four other push buttons, 42, 43, 44 and 45 are also shown which control signal lamps 46, 47, 48 and 49 respectively so that a signal may be flashed to a remote point to indicate what the recorded graphs show. This arrangement is provided as the person conducting the examination may be at a distance from the device and not be able to read the indications, and thus avoid any conversation which may be heard by the person under examination. The particular construction shown is designed for use by the police in making criminal investigations.

I claim:

1. Apparatus of the character specified comprising a series of metal tambours, means for transmitting pressure to the same, a pivoted member supporting one end of said series, a fixed parallel member, means normally urging said pivoted member toward said fixed member, means for adjusting the distance between said fixed and pivoted members, a screw at the opposite end of said series of tambours, means for supporting said screw carried by said fixed member, a pin swiveled to said screw and an indicating lever actuated by said pin.

2. Apparatus of the character described comprising a pivoted indicating member, a series of connected metal tambours, means for transmitting pressure to said tambours, means for holding the tambours in a distended position, and means for transmitting the movements of said tambours to said indicating member, comprising an adjustable member secured to the end tambour of said series and engaging said indicating member.

3. Apparatus of the character described comprising a pivoted indicating member, a series of connected metal tambours, means for transmitting pressure to said tambours, means for holding the tambours in a distended position, means for transmitting the movements of said tambours to said indicating member comprising an adjustable member secured to the end tambour of said series and engaging said indicating member, and means for varying the position of the series of tambours with respect to said indicating element.

4. The method of indicating the psychological and physical condition of a patient comprising simultaneously recording both the cardiac cycle and general variations in blood pressure upon a single curve.

5. In a sphygmograph having pressure transmitting means adapted to be applied to the body of a patient for transmitting variations in blood pressure and a recording device; an actuating means interposed between

said first mentioned means and said recording device for actuating said recording device in response to blood pressure variations, said actuating means being so constructed and arranged that it is sensitive to fluctuations in the cardiac cycle and to fluctuations in blood pressure other than the cardiac cycle, whereby a continuous record is obtained comprising a curve of the blood pressure fluctuations having the cardiac cycle superposed thereon.

6. In a sphygmograph having pressure transmitting means adapted to be applied to the body of a patient for transmitting variations in blood pressure, and a recording device; an actuating means interposed between said first mentioned means and said recording device for actuating said recording device in response to blood pressure variations, said actuating means having freedom of movement over a range of pressure variations which includes the cardiac cyclic and arterial pressure variations, whereby a continuous record is obtained comprising a curve of the blood pressure fluctuations having the cardiac cycle superposed thereon.

7. In a sphygmograph having pressure transmitting means adapted to be applied to the body of a patient for transmitting variations in blood pressure, and a recording device; an actuating means interposed between said first mentioned means and said recording device for actuating said recording device in response to blood pressure variations, said actuating means having freedom of movement over a range of pressure variations which includes the cardiac cyclic and arterial pressure variations, and being substantially equally sensitive over said range, whereby a continuous record is obtained comprising a curve of the blood pressure fluctuations having the cardiac cycle superposed thereon.

8. In a sphygmograph having pressure transmitting means adapted to be applied to the body of the patient for transmitting variations in blood pressure, and a recording device; an actuating means interposed between said first mentioned means and said recording device for actuating said recording device in response to blood pressure variations, said actuating means comprising a series of metal tambours so constructed and arranged that the recording device is responsive to cardiac cyclic fluctuations and arterial pressure variations, whereby a continuous record is obtained comprising a curve of the arterial pressure having a cardiac cycle superposed thereon.

In testimony whereof, I have hereunto set my hand.

LEONARDE KEELER.

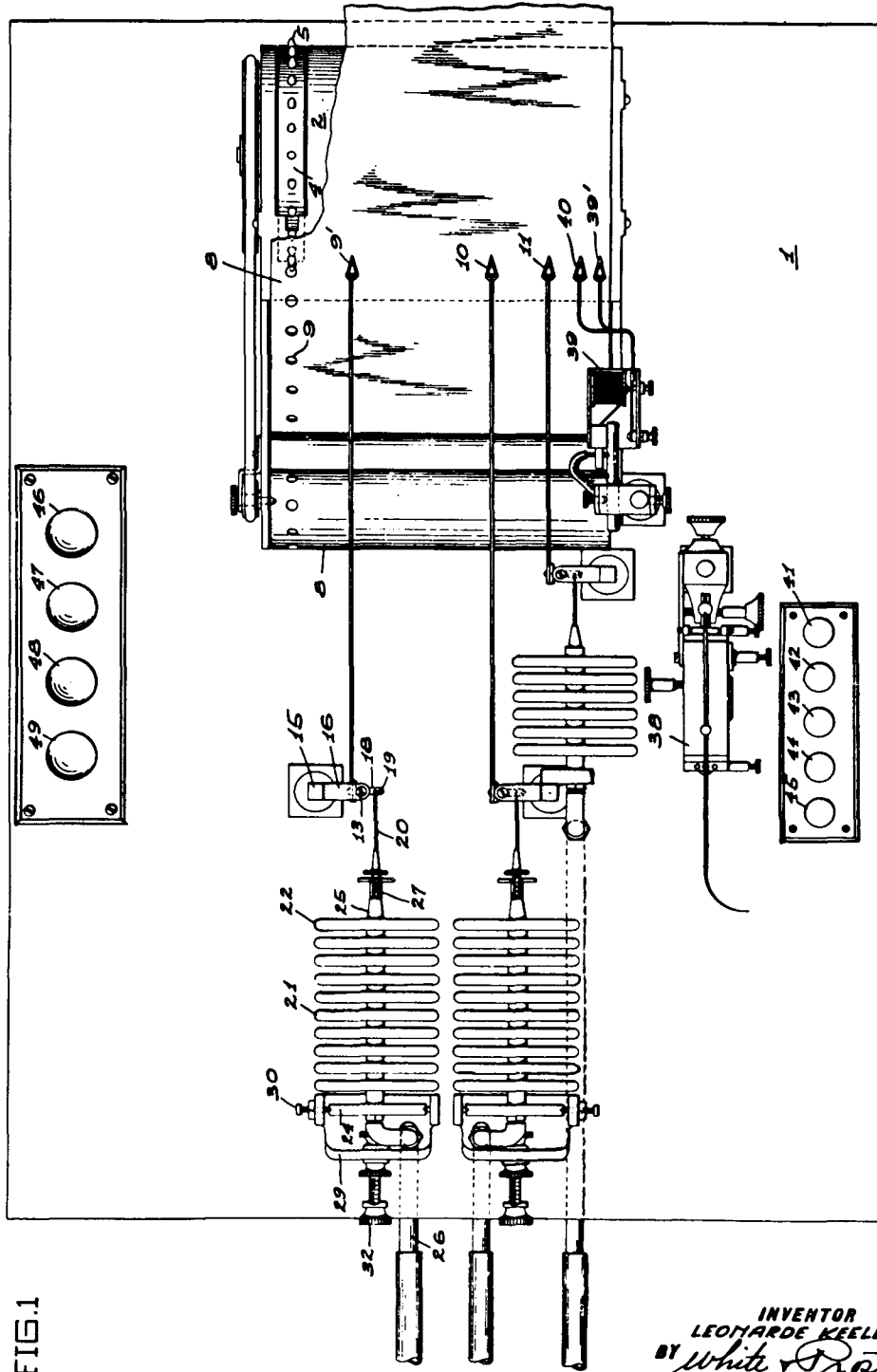


FIG. 1

INVENTOR
LEONARDE KEELER
BY *White & Hart*
his ATTORNEYS

FIG. 2

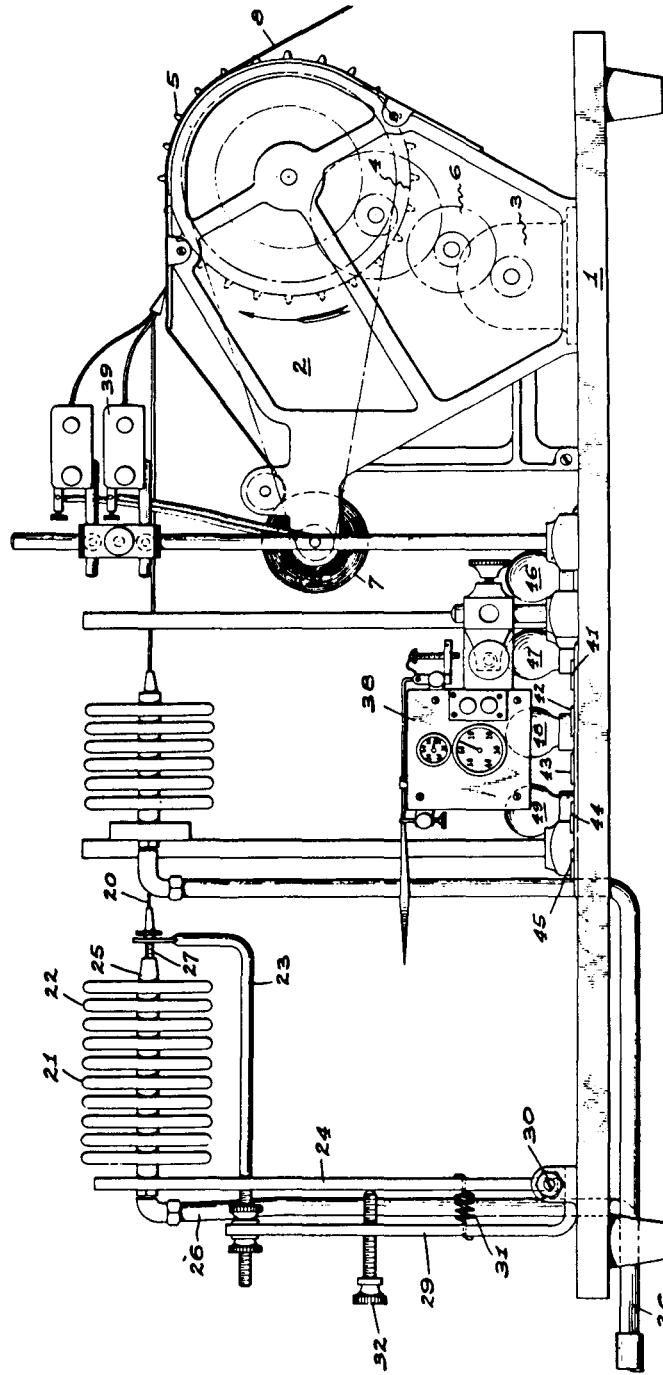
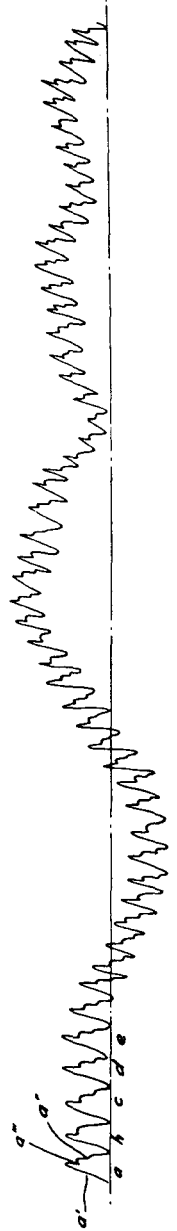


FIG. 6



INVENTOR
LEONARDE KEELER
BY *White & Frost*
his ATTORNEYS

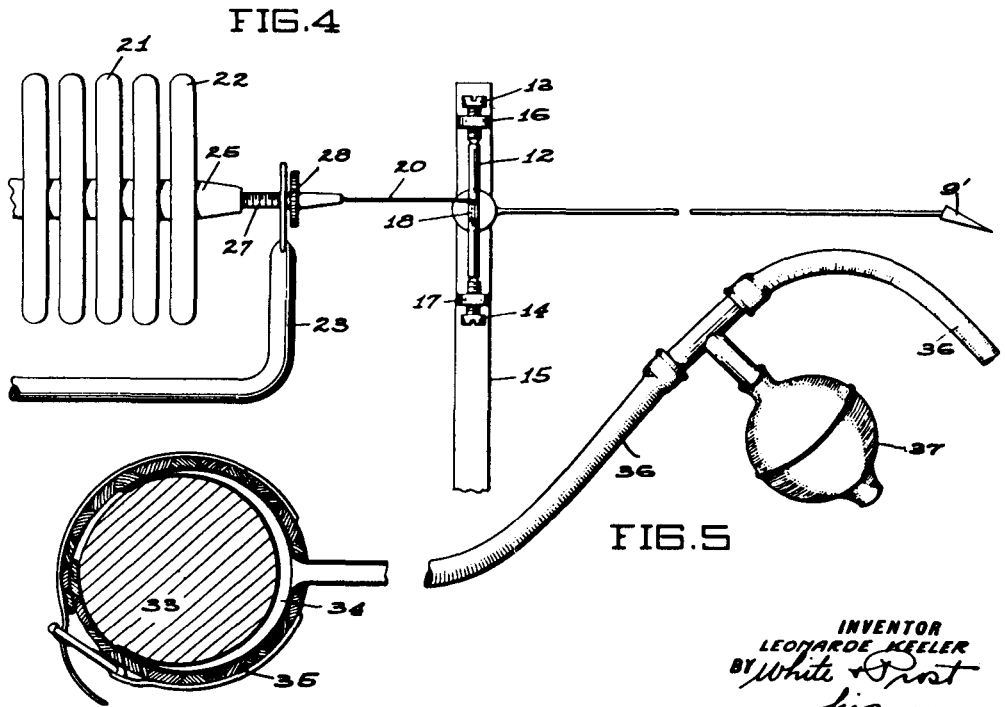
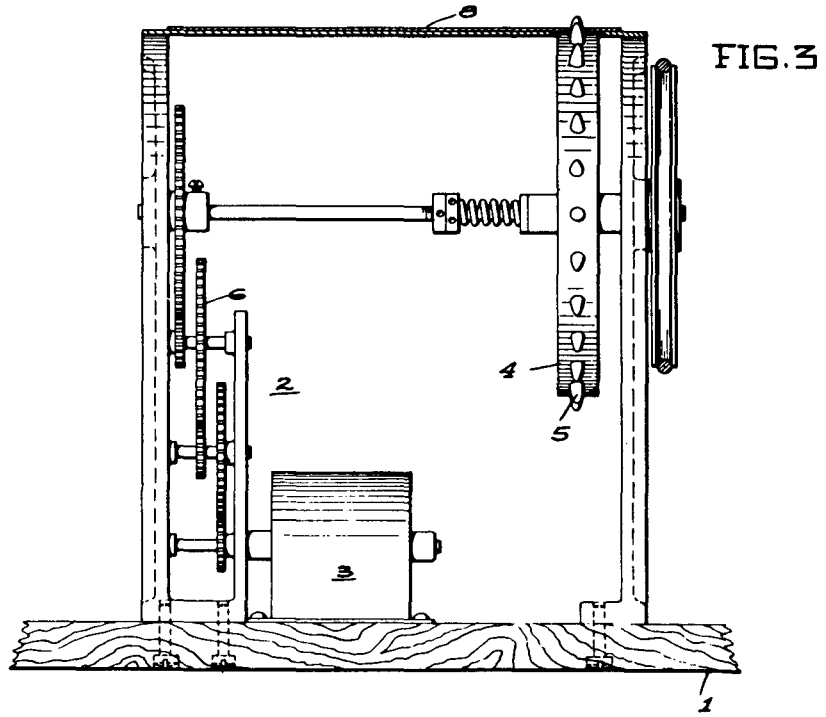


FIG. 5

INVENTOR
LEONARDE KEELER
BY *White Post*
his ATTORNEYS

A METHOD FOR DETECTING DECEPTION

By

Leonarde Keeler

Of the Institute for Juvenile Research, Chicago, and
The Criminologists' Bureau, State of Illinois

For some fifteen years, considerable attention has been given to deception tests using physiological methods for ascertaining emotional disturbances. Much discussion has grown from use of these methods, and the advocates of physiological deception tests have had a most difficult path to cut in the academic and practical fields. However, those who have experimented with such tests have become strong advocates, whereas those raising many objections are usually the men to consider the test merely from the theoretical standpoint, without experimental or practical experience on which to base their theory. No one maintains that any one test or group of tests is infallible, nor do they believe the technique has been more than touched upon, but those who have experimented in the laboratory and police departments are convinced the deception tests as now used are of value in ascertaining the guilt or innocence of an individual, and that the possibilities of developing such tests to a most practical basis are great.

History

Benussi's¹ work on practical deception tests is the first that is based on physiological changes in response to emotionality. He detected changes during deception in the inspiration-expiration ratio. N.E. Burt confirmed these findings, and further made studies of deception in which he emphasizes the changes in quantitative systolic blood-pressure as a criterion. Mosso and Fere worked with the plethysmograph and pulse tracings in the story of emotions. Lombroso

Reprinted from the *American Journal of Police Science*, 1(1), 38-52. This article was also presented as "Deception tests and the lie detector" at the International Association for Identification in 1930 and printed in their *Proceedings*, 16, 186-193. Note: Elizabeth Holloway Marston, wife of William Moulton Marston. Keeler was not acquainted with the Marstons.[Ed.]

¹ Benussi. On the Effects of Lying on Changes in Respiration. *Archiv. fur die Gesamte Psychologie*. 1914.

described experiments with the sphygmograph to test the sensibility to pleasure and suggested medico-legal possibilities.

E.H. Marston,² a member of the Boston Bar, and now with the American University of Washington, D.C., has made many careful investigations of the blood-pressure technique in the detection of guilt and innocence. He concluded that an increase in systolic blood pressure of 10 mm Hg or over was indicative of guilt. He plotted curves from intermittent readings obtained with the Tycos sphygmomanometer. He reported from 90-100 percent accuracy in his experiments, many of which were made upon students and actual court cases.

In 1913, W.M. Marston³ investigated the field of deception tests and conducted experiments in which he determined the systolic blood-pressure by oscillatory methods during deception. He reports finding definite changes in blood-pressure as the result of deception in criminal suspects. His researches were cut short by the war. Since then he has performed other experiments using the same method (intermittent blood pressure readings) which have borne out the conclusions of his preliminary tests.

In 1921, at the suggestion of Chief August Vollmer, Larson⁴ conducted tests on some 4000 criminal suspects in the Berkeley police department. He believed that, with the intermittent blood-pressure determination method as used by Marston, a lot of the physiological responses to emotional disturbances were lost because of the briefness of many of these. The response might occur and be lost before the blood-pressure determination could be made. Larson devised a modified form of the Erlanger sphygmograph by which a continuous blood-pressure and pulse curve could be obtained. The apparatus consisted of an ordinary blood-pressure cuff to be bound about the upper arm. A tube leading from the cuff connected to a heavy rubber bulb contained in a glass bulb. Leading from the glass bulb was connecting tube to a Marie tambour, which in turn actuated a lever arm which recorded its excursions upon a slowly moving smoked drum.

² Marston, E.H. Physiological Possibilities in the Deception Tests. *Jour. of American Institute of Criminal Law and Criminology*. Vol. XI, No. 4. Reaction Time Symptoms of Deceptions. *Jour. Exp. Psych.*, Feb., 1920.

³ Marston, W.M. Systolic Blood Pressure Symptoms of Deception. *Jour. Exp. Psych.* 2, 1917, pp. 117-163.

⁴ Larson, J.A. The Cardio-Pneumo-Psychogram and Its Use in the Study of Emotions, with practical applications. *Jour. Exp. Psychology*, 1922, 5, pp. 323-328.

The Cardio-Pneumo-Psychogram in Deception. Department Public Welfare Institution Quarterly. State of Illinois, December 1923.

Present Police and Legal Methods for Determination of the Innocence and Guilt of the Suspects. *Jour. Amer. Institute of Criminal Law and Criminology*. Vol. XVI, No. 2, August 1925.

The blood-pressure cuff bound about the subject's arm was inflated by means of a syringe bulb to a pressure just below the individual's systolic pressure. The pressure in the cuff, tubing, and heavy rubber bulb constituted a complete pressure unit in itself. The brachial artery now constricted by the inflated cuff pulsated against it, producing slight changes in pressure in the system. The heavy rubber bulb pulsated, closely following the pulsating artery. The expansion and contraction of this bulb in turn changed the pressure in the secondary system which included the delicate rubber tambour connected to a recording lever. The resultant curve consisted of the pulse beat (systolic stroke, diastolic stroke, and dicrotic notch) and certain indications of changes of arterial blood pressure. Because of the elasticity changes in the rubber diaphragm, due to distention, no quantitative blood-pressure changes were recorded. Recorded simultaneously with the cardiac curve was a respiratory curve obtained with a distendable tube tied about the chest which was connected to another delicate rubber tambour. Any change in chest circumference would change the pressure within the system, thereby actuating the rubber tambour.

With this instrument, Larson obtained a curve showing responses to emotional disturbances, and, through his technique of questioning and interpretation of resultant curves, was able to distinguish between nervousness of the suspect and actual guilt. The success of his methods was well borne out by the actual results obtained in these four thousand cases.

The author was most fortunate in being able to conduct deception tests under Chief Vollmer while in Los Angeles in 1924. More than 500 criminal suspects were tested with a similar instrument, using a modified pressure reducer designed by Edwards (1924, University of California at Los Angeles.) [This type of reducer is far superior to the Erlanger reducer, in that it permits the blood-pressure changes to be recorded over a far greater range.] The results were as gratifying as those obtained by Larson in the Berkeley Police Department. During this period, and later at Stanford University with Dr. Walter Miles, the author devised an instrument eliminating the rubber pressure reducer and rubber tambours.[1925, paper to be submitted in near future.] Briefly, the apparatus consists of three units, one recording continuously and quantitatively the blood-pressure and pulse; another giving a duplicate blood-pressure pulse curve taken from some other part of the subject's body or may be utilized for recording muscular reflexes of the arm or leg; the third unit recording respiration. The paper, perforated on its edges, is drawn by a sprocket feeder roll which is driven by a synchronous motor similar to that used in electric clocks. A differential gear train provides for three speeds and is easily shifted by the movement of a small lever. A ninety foot roll of paper supplies the recording chart, and the curves are recorded by means of combined lever arm and fountain pen.

A sphygmomanometer of the usual dial type is mounted on the panel and connected through a three way valve to either of the blood-pressure systems, providing a means for determining the actual pressure in either system. The metal bellows or tambour stack, which constitutes the reproducing element of each unit, is mounted in a horizontal position below the panel on sliding runs, and is moved forward or backwards (toward or away from the pivot shaft to which is attached the lever arm pen) by means of a rack and pinion, which is controlled by

a convenient knob on the panel. The position of the tambour unit in relation to the pivot shaft must be changed according to the pressure utilized in the system. The closed end of the tambour unit is kept at a constant distance from the pivot shaft. A signal magnet actuated by a push button at the end of a convenient length cord is mounted below the recording panel and the connected pen marks on the recording chart. The whole is contained in a carrying case measuring 16 x 8 x 9 inches. All accessories, the lead to the 110v outlet, signal magnet cord, blood-pressure cuffs and tubing, and pneumograph are carried in a compartment below the mechanism compartment. The instrument is portable and always ready for immediate use.

From calibrations made on this apparatus it has been found to give a continuous, quantitative differential blood-pressure and pulse curve. The actual systolic or diastolic pressures are not recorded, but the deviations from a known pressure are recorded in mm Hg. Therefore if the subject's systolic pressure is known to be 135 mm Hg then any change in that pressure can be determined from the recorded curves. There is a slight variation according to subject tested, but is constant for any one particular subject.

Laboratory Experiments

Much of the success of the blood-pressure technique in detection of deception and guilt has been attributed to the psychological effect such a test has on the suspect in bringing about confessions. As far as can be determined, seventy-five per cent or more of the guilty suspects have confessed to their crime after being subjected to the test. In order to ascertain the physiological responses resultant of deception, a simple experiment was devised which would eliminate the fear and anger features usually accompanying criminal deception. The experiment was conducted on university students in the Stanford University psychology laboratory.

Card Experiment (1926, Miles and Keeler)

Ten ordinary playing cards are presented to the subject, who is requested to choose one, noting down the number and suit which he retains mentally until the conclusion of the experiment. The cards are shuffled by the experimenter. The subject is requested to sit as quietly as possible, and is instructed to look at each card when held before him, and to the question "Is this the card you chose?" to answer in the negative for all cards including the one chosen. Under these conditions the subject tells one lie, and without fear or anger or other apparent emotional stress. Seventy-five subjects were tested, of which only four showed no response to indicate the chosen card. The usual curve obtained showed a slowly increasing blood pressure, and as each card was exposed a slightly greater increasing blood pressure ensued which rapidly dropped back to the general curve. When the chosen card was exposed, the pressure would rise as in the previous responses; sometimes to the same degree and sometimes higher, but following cards gave rise to no changes in pressure, while the general curve gradually descended. Variations of this type of curve were obtained, but all indicated a degree of tension during the test up to and including the chosen card, followed by release in tension, or relaxation.

The respiratory curve showed normal or slightly suppressed breathing up to exposure of the chosen card. Immediately following the exposure of this card, the breathing was usually suppressed still more, but subsequent to exposure of the following card the respiratory curve showed increased inspiration and expiration, probably due to the oxygen debt incurred during the previous part of the test. If the ten cards were shuffled so that the chosen one appeared first or last, the card could not be picked because of lack of adjacent record and responses for comparative purposes, and the test was repeated. The subjects reported in almost every case that they had endeavored to "fool the machine," and that, as each card was lifted from the table for exposure, they thought it might be theirs. In their very effort to suppress emotional responses and in their eagerness to win the "deception game" they "gave themselves away." Subjects tested again and again, have shown the same responses until such time that the test became monotonous and an ordeal. One subject repeated the test twelve times in as many days before he showed no response. He reported the task of submitting to the daily test was becoming a nuisance, and not caring any more, paid no attention to the procedure and didn't mind whether he was caught or not.

In the cases where the chosen card could not be determined, the subject reported not being particularly interested and not being concerned whether the machine worked or not. Those most interested, and endeavoring to "fool the machine" gave the greatest response throughout the test.

Another laboratory test of similar nature, with fear and other emotional features eliminated, consisted in the determination of which of three boxes had been looked into by a subject. Each box contained three or four different articles, such as a ruler, pen and flower in one box, a toy snake, pipe and book in the second, and a picture, knife and match-box in the third. Thirty students working in pairs performed the experiment. Each student was given a word association test by his partner. Fifty words were included in the list, among them scattered the names of the objects in each box. The subject, after viewing the contents of one box in a room apart from the one where the experimenter (his partner) is placed, heard each word on the list spoken by the experimenter and as quickly as possible responded with the first word which he associated with the stimulus word. The response word, and the reaction time--or time elapsing between the stimulus word and response word, were noted. The blood pressure and respiration changes were recorded during the association tests. In sixty-two percent of the thirty cases, the chosen box was detected by the experimenter partner, using as his basis for determination the response time and the response word. In 93 per cent of the cases, the blood pressure and respiration responses to significant words were such as to indicate clearly the contents of the box viewed.

Map Locations

An experiment closely resembling the card deception experiment involves the determination of a chosen location on a map. The experiment developed from the card experiment and subsequently has been found of value in criminal cases where the location of

hidden loot or a buried body is in question. In the experimental test, a hypothetical case is read to the subject who is instructed to imagine himself a murderer who has buried a body somewhere in the state. A map sectioned off into ten squares numbered from one to ten, is held in view of the subject, and as each section is pointed to, the question "did you bury the body in section one?" (or other numbered section as the case may be) is asked. The subject answers "no" in each case, or he may refrain from answering. The resultant curve is identical to that obtained in the use of the cards, tension indicated by increase in blood-pressure developing up to and including the chosen map section, followed by lack of interest and relaxation. Every section is gone over before the analysis of the record is made.

Determination of Guilt--True Deception

By true deception I mean reversal or change of a story as a protective measure or as a method of self-glorification. (The deception evolved in the experimental card tests and other controlled laboratory experiments might be included in the true deception group under self-glorification; there is a definite self-satisfaction in one's ability to win such a "game," but it differs in that there is no involvement of the protective factor.) In a criminal case, "self-protection" is the dominant factor. The suspect has his reputation, his liberty, his life or his money to lose if he is found guilty of an anti-social act, and so, if he is guilty of the act attributed to him, he will be dominated by fear. In a criminal case, the emotions of fear, anger and rage enter as important factors. A man either innocent or guilty, accused of a criminal act, will have a considerable degree of apprehension. He may fear false accusation and conviction, and may fear the treatment he believes is in store for him at the hands of the police. On the other hand, he may be angered by the accusation. The other emotions will play but an insignificant role in the general play of emotions. Responses to both fear and anger, in most cases, produce an increase in systolic and diastolic blood-pressure, and in consequence, the examination procedure must be so formulated with full consideration of all the possible factors involving emotional disturbance. The customary steps are as follows: The suspect is brought into the laboratory and immediately those in whose custody he had been are dismissed. In all probability, he has been "grilled" for some time before being subjected to the deception test, and has come to view these officers with suspicion. Immediately on entering the laboratory, he is surrounded by a completely new environment and different personnel. The case is reviewed from the investigating officer's reports, after which he is briefly interviewed as follows: "Well, old fellow, I can't see that they have much of a case against you. As far as I am concerned, you have as much in your favor, if not more, than these officers here. Tell me now, about this job you're supposed to have pulled." He is urged to tell his story. On completion he is asked if he would submit to a little test--one in which his blood-pressure and respiration are recorded. "If you're innocent of this charge, I'm sure that we can determine as much in just a few minutes. I'm sorry all this has happened. O.K.?" In only six cases out of some eight thousand have suspects refused to submit to the test. If a man is innocent, he has nothing to fear and is glad to help in any way to prove his innocence. If he is guilty, he fears that a refusal to submit would indicate his guilt. Of course, if the suspect has retained an attorney, the latter will instruct his client to refuse. In case

of a refusal, the suspect cannot be forced to submit to the test, and I might add here, the records have never been offered as evidence in court.

The subject is seated comfortably with his back to the apparatus, the arm cuff is bound about the upper arm or leg, the pneumograph tube tied about the chest or abdomen (depending on type of breathing), and the cuff system inflated to a point about halfway between the systolic and diastolic pressures (this point is ascertained easily on the machine as the point where maximum amplitude of pulse beat is obtained). The pressure is maintained at this level throughout the test. Any changes in the individual's pulse or blood-pressure will change the pressure of the system, thereby deflecting the needle accordingly. The pressure may at the outset cause a little discomfort, but very few complain, and on instruction most subjects will refrain from moving the arm. Any arm movement is recorded on the graph. A record is obtained for two or three minutes to ascertain the individual's normal fluctuations, heart condition and respiration. Following this brief period of silence a preamble is read: "This machine to which you are connected has been used for some years on criminal suspects, and so far has proved a very reliable means of detecting the innocence or guilt of a man, and I'm sure we will not fail in your case. Now sit as quietly as possible, and answer my questions just 'yes' or 'no.' If you have any explanations to make, reserve them until the completion of the test." During the reading of this preamble, an innocent person usually loses a certain amount of tension, relaxing and settling down to the task of answering the questions honestly. The guilty suspect becomes more tense however, as is indicated by an increase in general blood-pressure, on which are superimposed many rapid fluctuations in pressure. The pulse rate increases with the rising pressure. Following this preliminary statement, four or five irrelevant questions are asked so that the type of response in answering may be recorded. There may be such as, "Do you live in Chicago?" "Do you smoke?" "Are you married?" "Do you like to dance?" An innocent individual will seldom react in any marked degree to these questions. He regards them at their face value. A mentally defective (borderline), whether innocent or guilty, will show but slight disturbance to these questions. However, a mentally alert, guilty individual, will construe these questions as being camouflaged questions regarding his crime. He will respond considerably more than the innocent person.

Following these irrelevant questions, direct questions pertaining to the supposed crime are asked. "Did you dine with Jones Tuesday night?" "Did you return to Jones' apartment that night?" "Did you owe Jones some money?" "Did you discuss this indebtedness?" "Have you ever been in California?" "Did you shoot Jones?" "Do you own a Savage forty-five?" These questions are asked in a quiet monotonous voice. Time is allowed between questions for the bodily responses to occur and to return to equilibrium. Occasionally, irrelevant questions are interposed among the relevant ones, or several such questions may be interposed in a group, thereby directing the suspect's attention away from the case for a moment. During this interrogation, the innocent person may respond slightly to questions, especially the first few, but these responses do not indicate great emotional stress. The general blood-pressure curve drops and the superimposed fluctuations become fewer and of less intensity. The guilty individual, on

the other hand, becomes more disturbed as the test progresses, the general blood-pressure curve rising and the rapid fluctuations increase in intensity and frequency. The blood-pressure response to each lie causes an increase in both systolic and diastolic pressure of from four to ten mm Hg. Usually the diastolic pressure increases considerably over the systolic pressure. During a test lasting ten minutes, the general pressure rises from 8 to 20 mm Hg depending on the individual. The respiration becomes more rapid, and in most cases the subject attempts to control his responses at periods following deception. The majority tend to shorten their inspiration and expiration and to breathe slower. In consequence, there is a period of oxygen debit and on the following questions, if pertaining to the crime, an occasional deep breath is taken. If the post-questions are irrelevant to the crime, normal respiration is resumed, usually of greater magnitude than the preceding normal respiration. The innocent suspect has no such fear, and is not prompted to control his emotional responses. His respiratory curve becomes more regular as the test progresses.

A single test of ten to fifteen minutes is sufficient to ascertain the guilty or innocence of a suspect. If the suspect is determined guilty, he is subjected to more questioning under a slightly different procedure. At the completion of the initial test, he is shown his record which is carefully explained to him. The operator shows considerable concern over certain responses recorded thereon and asks the man to explain his emotional stress. The more the guilty man tries to explain, the more confused and entangled he becomes in his own story. For the second test, the guilty man is seated so that he can watch the excursions of the fluctuating needle; he is told to calm down, and to see if he cannot run through a test without such disturbances as shown in the first record. Generally the needles are intently followed.

The guilty individual now knows the machine recorded his lies and that, if he is unable to control his responses during the second test, he surely will be proven guilty. Due to his greater apprehension, his fear is accentuated and the second record will become far more tortuous than the first. His added effort to control his responses as he sees them appear on the record, will cause greater disturbance, and his fear of the tell-tale needles will only tend to magnify each excursion as he sees them recorded.

On completion of this second test, or one or two subsequent tests, about 75% of the guilty subjects confess. If a confession is not immediately obtained, a night incommunicado may result in confession. The only "torture" involved in such a test is self-induced through fear of being caught, and that fear exists whether the man is being cross-examined in the usual way or on a blood-pressure apparatus.

It is most important in this type of test that no methods shall be resorted to which will excite the suspect. All exciting factors must be eliminated, so that the responses will be due only to the case in question and not to physical or other psychological disturbances. The subject must be treated kindly and with respect at all times, in order to induce relaxation and as far as possible to eliminate emotional tension. Best results are obtained when the operator works on the theory

that the subject is innocent and attempts to obtain as regular a curve as possible. The guilty side of the situation will be well handled by the suspect himself.

Another type of case requires a slightly different testing procedure. In many criminal cases there are details which only the guilty person is aware of.

A burglar busily engaged in opening a safe in a private home was surprised by the sudden appearance of the owner. He jumped to a nearby window, pulled down a curtain in his clumsy effort to open it and, finding no escape, turned toward the door, shooting the owner as he ran. Fortunately the bullet caused only a slight injury. The owner called the police immediately, and before morning five suspects were in custody. It is possible that all five men were professionals, and all knew that they might be wanted for one job or another. Each man in turn was subjected to the deception test and questioned as follows:

1. Do you live in Balboa Park?
2. Do you live in the block the fire house is on?
3. Have you a fire escape leading from your parlor window?
4. Have you heavy curtains, that might be easily pulled down, on your windows?
5. Have you a safe in your parlor? Etc.

No direct reference was made to the crime or to any crime. It happened that the five men held that night responded to none of the questions. They were unstable, but to no questions did they show a violent emotional response. Two days later, two more suspects were apprehended--one of these ran a clear record; the other responded violently to each question which described the house robbed. Following the first test, another was given in which direct questions were asked: "Did you enter a private home in Elm Street?" "Did you attempt to open a safe?" "Did you shoot a man?" Etc. At the completion of the test the suspect confessed. He was later identified by the man he shot.

The innocent suspects knew nothing of the burglarized house and in no way related the questions to any crime they might have been wanted for. The guilty suspect immediately associated the question with the house he had burglarized, and in fear of being detected responded violently to each question.

A definite problem may arise in a case in which a man has been apprehended for murder, and in which sufficient evidence shows him to be guilty, his responses during a deception test indicate his guilt, and yet no confession has been obtained and there is no corpus delicti. The investigator now draws his procedure from the experimental laboratory. A large map

encompassing the territory in which the body must have been disposed of, is marked off in ten sections, the sections numbered consecutively. From the responses to previous questions it has been determined that the body was buried. The map is held before the suspect and various landmarks pointed out so that he will become oriented. As each section is pointed to the question is asked: "Did you bury the body in section ____ (Number of section pointed to)?" until all ten sections have been indicated. A curve similar to that of the experimental test will be obtained. The guilty suspect will react violently up to and including the section in which the body is buried, after which the tension will be partially removed and the pressure curve descend. The respiration curve often diminishes to one-third its usual amplitude immediately following the question pertaining to the correct section. A larger map of the section indicated on the original map is then prepared, and, after drawing in sectional lines, is used in the same manner as the first map. This process of elimination is continued until the area is narrowed down to within reasonable limits for conducting a search. As each new map including a smaller area is used, the responses become more violent.

Only one such case of this kind has come to the author's attention, and as the apparatus was badly smashed by the subject when the map had been reduced to a mile and half area, and the court issued an injunction against further use of the machine on that particular suspect, it will never be known whether the test was proving a success unless the body is found in the small area.

The case mentioned below is typical of at least a dozen that have been successfully solved with the use of blood-pressure technique. In a certain sorority house considerable petty thievery had been going on for some months. A total of one hundred and twenty dollars had been taken, all in bills, from various girls. The house president requested the aid of a psychology professor, and as a result she assumed charge of the situation, subjecting all of the thirty girl inmates to an association test. One newly initiated student responded with the word "bills" to the stimulus word "money." Her response time for this association was slightly longer than her other response times. This established her guilt in the minds of the girls, which subsequently led to her dismissal from the sorority and the university.

This girl, Miss W., pleaded with the police department for aid. The girls of the house consented to be tested. All were subjected to the same test. Much tension existed among some of the girls, others took it as a joke, and the house mother was much concerned over the possibility of having made a mistake in their accusation. Miss W. was most concerned and extremely tense; her reputation and social future depended on finding the guilty party. She gave an unstable record, but one that positively showed her innocence. The last girl to submit was the assistant house manager, an extremely popular girl, who received a bountiful monthly allowance from her family. According to the house mother and the other girls, "it was a waste of time to test her; she could not be guilty; the last one in the house to commit such acts." However, as a matter of routine she was subjected to the same test. While the "norm" was being recorded, the house mother jumped from her chair, looked at the rapidly cavorting needles, and

left the room. At the completion of the test, this girl confessed to all the petty thievery, besides the embezzlement of fifty dollars of the house funds. Her confession was free and voluntary after seeing her record in comparison with all others. In a similar case, Larson picked one girl from ninety.

Conclusion

In conclusion, the importance of having only well trained persons as operators must be stressed. This approach to criminal investigation can prove dangerous in the hands of the untrained, and much harm can be done to the future of scientific deception tests. The field is broken, and by slow, careful progress the proper cultivating tools may be put into the hands of all criminal investigating bodies. The future for such technique is unlimited, and there is still much room for careful research. In papers yet to be published, we shall learn of the uses of the physiological response tests in psychiatry, the diagnostic value of blood-pressure and respiration in insanity, in feeble-mindedness (Larson) and in borderline cases. The adoption by large department stores of such tests to stop stealing by employees, will be an important study, and the use of these in civil service and other employment agencies will prove of value.

* * * * *

"THE CANARY MURDER CASE"

(The Use of the Deception Test to Determine Guilt)

By

Leonarde Keeler

Research Assistant
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On October 6, 1929, a lonely woman committed suicide by turning on the gas in her bedroom. Neighbors entered the house the following day to ascertain the reasons for the unusual quietness in the little house, and, on discovering the tragedy, immediately notified the police. The coroner's verdict was death by asphyxiation (suicide). Police officers were dispatched to the residence of the dead woman to guard her personal property until relatives could be located to assume responsibility.

The following day, close acquaintances of the deceased notified the Judge of the Probate Court that a valuable trick canary and household articles, all of which were in the house at the discovery of the suicide, were missing. The Judge immediately opened an investigation, and because of much similar trouble with police officers in past assignments, pushed the inquiry to the greatest possible limits.

On the day after the first interrogation of the four police officers, one of them found a canary in a dark corner of a downstairs room. The bird which was quite limp, indicating a very recent death--probably only a matter of a few hours--was rejected by two close friends of the deceased, who claimed that it was not the same canary that had disappeared shortly after the suicide.

An autopsy was performed by a Coroner's Surgeon to determine the cause of death. The verdict returned was loss of life resulting from wringing of the neck, as two cervical vertebrae was broken and there was considerable congestion of blood in the neck region.

The four officers who had been assigned to periods throughout twenty-four hour shifts were questioned further. All denied knowing anything about the disappearance of the bird, or any article taken from the house.

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"The Canary Murder Case"

The Probate Judge in charge of the case, exasperated by the prevalence of police looting, sought, by conducting a rigid examination in this case, to put an end to further depredations. To this end he called in Professor August Vollmer and the author to test the four officers with the Polygraph. The men submitted with apparent willingness.

The test was conducted in the Judge's private chambers, the only other persons present being two associates, a court reporter, and the two scientists. Each police officer was called in turn, his test taking about ten minutes.

The questions, requiring a "yes or no" answer, which were submitted to each, were as follows:

1. Are you willing to take this test?
2. Were you born in this country?
3. Do you live in
4. Are you a member of the police force?
5. Are you attached to the Police Station?
6. Did you take the canary bird from
7. Do you know Officer G
8. Do you know Officer H
9. Do you know Officer D
10. Do you know who took the canary?
11. Is Captain R your commanding officer?
12. Did you take anything from

Officer T responded markedly to questions about the theft. His reactions to questions about his fellow officers clearly showed Officer G to have taken part in the robbery. At the conclusion of this first test, T was requested to wait in the anteroom, as his record clearly indicated participation, and verification through a second test seemed advisable.

Officer G was next. His blood pressure, pulse and respiration curves definitely indicated participation in the disappearance of the canary, and he also was requested to await another test. Officer H, the next to submit, gave a clear record throughout. He responded slightly to "G" and "T" but was dismissed.

Officer D gave a clear record except to question 12 ("Did you take anything from the house?") D was detained for a second test.

For the second series, the questions were rearranged and reworded:

1. Your name is
2. You are a police officer?
3. Did you take the canary? (By questioner -- "If you don't know the answer to the next questions, just answer 'No'.")
4. Did G take the canary?
5. Did H take the canary?
6. Did D take the canary?
7. Are you married?
8. Have you any children?
9. Do you know who killed the canary?
10. Did you take the canary?
11. Do you know who brought it back?
12. Did you kill the canary?
13. Did you take anything from the house?

Officers T and G again responded violently to significant questions. In both blood pressure and respiration great emotional disturbance was manifested.

At the conclusion of this second test, Officer D admitted he had stolen a lamp shade, valued at about sixty cents. Otherwise his record was clear, and he was dismissed.

"The Canary Murder Case"

Both officers T and G submitted to two further tests. Their reactions became more and more violent with each repetition, but both denied having had any part in looting the house.

After a careful study of the graphs obtained during the deception trial, the following report was submitted to the Judge:

"All of the defendants have some knowledge regarding the disappearance of the canary bird from Each defendant is guilty, or is an accessory to some thieving from the house.

"T shows marked tension regarding disappearance of the bird. This strongly indicates his participation in the theft.

"G shows decided tension regarding disappearance of the bird. This strongly indicates his participation in the theft.

"H shows less tension than the above two defendants, but records indicate definite guilty knowledge.

"D shows no tension on actual theft of bird, but marked tension on theft of another article or articles from the house. His tension on questions regarding the return of the bird indicates knowledge of the participant." At the conclusion of the test, D admitted taking a small lamp shade from the house.

Some weeks later, the Judge summoned the four officers before his court, and after reading the above report, found T guilty. Sentence was to be pronounced the following week.

The next day, Officer T called on the Judge protesting the verdict, and said he knew the person who had stolen the bird, and would bring the guilty one before the Court. The Judge replied that he (T) was a little late with his information, but that the Court would like to interview the man who actually stole the canary. A few days later Officer T ushered in Officer G who confessed to the crime, and of wringing the neck of a cheaper bird and placing it in the house at the time of the investigation.

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LIE DETECTOR APPLICATIONS

By

Leonarde Keeler

Northwestern University, 1931

I think I can best describe the working of the machine by telling you of just one or two small cases that we have had.

There was one case where a burglar was opening a safe in a second story apartment when the owner of that apartment came in. The burglar turned and fled for the window, and in his effort to get out, pulled down some heavy plush curtain. He couldn't make his exit, so he wheeled around, shot the owner of the apartment, and bolted out of the door.

Through the modus operandi system, they put their finger on four burglars the next day and brought them in, and did not tell them what they were suspected of. We put them on the machine, one at a time, and at first ran along normal about four minutes, to ascertain their reactions or their fluctuations which are normal to that individual. Then we asked three or four questions that had nothing to do with the crime. "Is your name Jones? Have you had breakfast? Do you own an automobile?" And other such questions, merely to find out how they respond, what fluctuations we obtain when they answer questions. Then we ask questions such as: "Do you own an apartment on Main Street?" That was the name of the street that this burglarized apartment was on. "Have you a second story apartment? Have you some heavy plush curtains on your windows? Have you a safe in your apartment?"

It happened that these four burglars were innocent of that job, and they thought we were crazy asking them such foolish questions. We were aware of where they lived, and why should we ask them such questions as those? But the next day a burglar was brought in. We gave him the test, and he responded violently, gave great fluctuations in blood pressure respiration whenever we mentioned any description on any point of that apartment house. On the third test we turned him around so he could watch the machine, and suggested that he watch the needles carefully, and told him what they would do whenever he lied. In the middle of the test he confessed and said that he saw he couldn't beat it, and he told us the complete story, which was later verified.

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Just the other day at the Burlington Railroad station outside of Chicago, while no one was present the safe was looted of \$720. The entrance had been made by a key for the outside door of the ticket office. The safe had been opened with the combination, and the inside bolt opened with a key. Of course, they suspected either the station agent or the assistant agent, and they were brought into the laboratory. We gave them the test, and both gave a perfectly innocent normal record.

So they brought in two other men who had worked there earlier in the summer. They said they didn't think either of those men could have committed the job because they had returned their keys, and they were supposed to be honest employees of the railroad. One of those fellows ran a very clear record, and the other an extremely bad one. He responded violently on the record to two questions about having keys made and to stealing money. He finally confessed and took us out to where the money was buried in a little woods behind his home.

I think such a technique as this is useful to eliminate innocent people in this way and to help us get it down to the one person who committed the crime. I think the value of the test is probably more for an inside job, such as in banks, where we have a large number of people, and we know that somebody in that institution must have taken the money.

We have been running a group of banks lately. We start with the president of the institution. We ask him only about eight questions. Then the vice-presidents, and on down to the janitors. So that we have tested everyone in the institution. Out of twelve banks altogether that we have tested, we have found none that didn't have three or more embezzlers within the bank. Of course, some of them were small embezzlers. In one institution of fifty employees we went in to look for a \$16,000 loss, and before we got through, we obtained nine separate confessions of embezzlement from that one bank.

In another bank, where there are only eleven employees, the bank had been held up, and the familiarity of the robbers made it seem evident that someone in the bank had tipped these robbers off. So we went in to find out if we could pick the man who had done it. No man responded to that question, but three of them responded to the questions of taking money from the bank, and the three confessed. The smallest embezzlement was \$50 and the largest about \$270.

We have one very simple little test. We have a subject choose a number between one and ten, and we ask them while they are connected to the machine, did you choose number one; and then thirty seconds later, did you choose number two, and so on, until we finish the group. The subject is instructed to answer no to every one of the questions. The response that we get in a case of that kind is that the individual wants to beat the machine. He becomes a little tense. His blood pressure slowly rises up to and including the chosen number, and after that he doesn't care about the rest of the numbers. He has told his lie, and so he relaxes, and the blood pressure goes down. You can pick the peak of tension, and that invariably or almost so is the chosen number.

We use that particular method in locating hidden loot, or in one case, a buried body. We prepare a map and divide the map into ten sections, and then present the map to the individual while he is on the machine, and we ask him: "Did you bury the body in section one? Did you bury the body in section two?" And continue until we complete all of the sections. The individual is nervous, excitable, and tense and trying to beat the machine up to and including the significant section where he buried the body, and after that he doesn't care about the rest of the sections; so he relaxes and the blood pressure goes down.

Then we obtain an enlarged map of that section, divide it into ten sections, and repeat the process, until finally we get down to a very isolated area. In one case we get down to a mile and a half, after we had covered three different states, when the man got up and smashed the machine all to pieces and confessed he had killed the man.

* * * * *

SCIENTIFIC METHODS OF CRIME DETECTION

WITH A

DEMONSTRATION OF THE POLYGRAPH

By

Leonarde Keeler

Almost four years ago we had the Valentine Day massacre in Chicago. Seven were lined up against a brick wall in a garage in North Park and mowed down with sub-machine guns; and at that time our coroner, Dr. Remberson, empaneled a jury that would go to the bottom of it. On that jury was Mr. Olson and other men of equal prominence in the business life of Chicago. They brought before this jury some seven lead slugs taken from the bodies of the gangsters, and also seventy discharged shells found in the garage. The jury immediately asked: "What can we tell from them, and why is he showing them to us?" It was suggested that they bring an expert before the jury to examine these bullets and determine what type of gun they came from. Unfortunately, Chicago had no such experts, and, as usual, the city was broke; so Mr. Massey volunteered to bring Colonel Goddard, who examined them and determined that some were from one Thompson machine gun, and the other fifty from another Thompson machine gun; and as at the time of the massacre there was a rumor that police officers had been seen fleeing from the scene of the crime, it was felt that policemen had committed the crime.

The colonel examined the machine guns belonging to the police department and compared their bullets with the bullets taken from the gangsters, but fortunately for every citizen of Chicago and the police, those were not the bullets that killed these hoodlums. At that time it was suggested by some of the citizens that Colonel Goddard be brought to Chicago to examine firearms in the murders there, and also to set laboratories for the examination and compilation of criminal evidence. He was sent to Europe to examine laboratories on the continent and islands, and came back with an exhaustive report of the methods used there for many years. Then he went to the coroner's office and asked of the coroner if he would like to have this laboratory affiliated with him. He said, "Yes, but the next coroner might not be interested in keeping it here." He went to the city attorney and police departments, and they said the same thing.

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Finally, Dean Wigmore of Northwestern University came and offered a site if it would be affiliated with the University Law and Medical School, and since then we have been afforded a laboratory for the examination of criminal evidence. The colonel is in charge of the institution and in charge of the firearms, but suspects came in such quantities that he had to add first one, and then two assistants. We have a toxicologist who examines all evidence pertaining to chemistry, to determine whether a stain is human or animal blood, and also to examine the vital organs of poison victims to determine the kind of poison, the quantity of poison and the possible origin of the poison. Another interesting method is that of restoring the numbers of guns that have been filed off. When the serial numbers of guns are stamped into the steel, the steel crystallizes and the structure is changed, so even if they are filed off they can be restored by a very simple etching process--the steel will etch out at a different rate from the surrounding steel.

In the case of Jack Lingle, the reporter who was murdered in the tunnel, the first man that picked up the gun used a handkerchief. The majority of men will pick up a gun with their bare hands and show it to their friends and the police reporters, but this man picked it up carefully and brought it into the laboratory. Unfortunately, there were no fingerprints present; the killer had used gloves. We fired a bullet from it into a basket of waste and recovered the bullet and examined it with a microscope and compared it with the bullet taken from Lingle's brain. Then they etched out the numbers which had been filed off of the gun; in about a half an hour the number was photographed and the Colt Company was called on the long-distance telephone, and they said the gun had been sold to a sporting goods man on the North Side, who was brought in and said that he had sold the gun to Frank Foster. Foster was brought back from Los Angeles and he admitted that he had purchased it and sold it to another hoodlum, Jack Guter. As he left and went down the street in the police automobile he was fired on from another automobile and escaped, but he was found later in Wisconsin, killed.

Then we have the physical laboratory to examine the various physical forces brought to bear. It might be an explosion, or the deflection of bullets, the fracture of glass, to determine what type of instrument was used, or from which direction a bullet came. I might mention a case where an abandoned car was picked up a short time ago, that had a number of bullet holes in the windshield. The first comment was that those fellows were badly shot up, but by careful examination it was easy to see that the bullets had been fired out of the car, and had been fired out through the windshield.

Then we have the document examiner, who determines whether a certain person has placed his signature on a certain document. As it happens, there are no two typewriters in the world that will type exactly the same as typewriters from the factory; they will give different impressions from any other typewriter taken from the same factory. In one case that came in a short time ago, the secretary of a railroad brotherhood wrote to the laboratory that he was accused of sending anonymous letters to the president, and sent a copy of the letter written on his typewriter and the anonymous letter, and would we please examine them and send back word to prove he was innocent. They were examined and it was found that the same typewriter was used

in writing the anonymous letter, and that the man had cleaned his typewriter between the time of writing the two letters, and we had to write back and say that his typewriter had typed the anonymous letter, inferring that because of the various idiosyncracies in the typing machines that he had written the letter himself. We sent a bill with the report, but so far we have not received pay.

Then photography is one of the most important cogs in the machinery of the laboratory. The photographer must photograph all the evidence that is brought in so that a permanent record may be made, especially if that evidence is to be used later in an examination in court. Every bullet that comes in is photographed from six to fifteen different angles. The photographs are enlarged and these matched up with the fine, microscopic marks in the barrel of the gun, and they may be compared and presented before a jury in court. Of course, jurymen are not familiar with microscopes, and they cannot be expected to look into a microscope and determine anything, but from an enlarged photograph they can see the differences that do exist. Then in the examination of documents for forgeries, they are photographed and the photographs enlarged and then the microscope is used. The ordinary police officer will pick up a hat that has someone's initials in it, a piece of paper and a dead cigarette, and thinks it is good evidence; but he forgets there is other evidence. The clothing of the victim is dusted, and that dust will tell a story which other evidence will not show. It can be examined under the microscope. A hit-and-run driver hit a seven-year-old boy and killed him. Some witnesses obtained part of the license number and the police rounded up several automobilists, and caught under the fender of one car they found a single strand of hair and two little bits of fiber from cloth. The hair was examined, and also the fiber of cloth. It happens that the age of an individual can be determined within three years, by the hair. The hair taken from this automobile showed that the person from whom it came was seven years old. The hair on the fender had the same number of rings as the hair of the boy. They were identical. The boy lived near a carbide factory, and on this boy's clothing there was a tremendous amount of carbide. Carbide was found on the strands of fiber and also on the single hair. When these facts were presented to the suspect he broke down and admitted that he was the one that hit the boy. He had been drinking and was afraid he would be caught, and he sped on.

A case we had a while ago was one where a beautiful Jewish girl disappeared and her body was found in a gunny sack with her head beaten in and her throat gagged with a white cloth, her hands and feet tied and she had been dropped off the bridge onto the ice. At that very point the snow had blown away and it looked like, from the bridge, that it was clear water. However, it was clear ice and the body remained on the surface. They brought the clothing and gag and the necktie and they were dusted and the dust placed under the microscope. It was found in the clothing that there were three types of hair--hair from three individuals. There was the remains of a certain type of automobile grease, graphite, and other substances, including corn fiber, which we could not identify. It seems that the girl was taken into a garage and put in a truck. We went to Rock Island and examined the members of the family, including a suspect. A ransom note which had been left at the girl's home was written on the edge of a newspaper,

stated that "We have your Rosy, and we want two thousand dollars. Your Rosy is OK. Will let you know more tomorrow." That was a common expression in the family. She was always referred to by the father as "your Rosy", and it was known that she had two thousand dollars in her name; so it was thought that it was someone familiar with the girl's home life that had kidnapped her. Examination of these individuals by the polygraph by pulse and respiration was made and one of the uncles in the family who had known the girl for many years, responded as having killed the girl and written the note. We did not have any evidence on him. We had him print a number of duplicate notes and sent them to the examiner to study. We went back to examine this man further, and he had disappeared. He owned a Ford truck, and in that truck we found thirty species of debris that were found on the body; also some boxes made of corn husk material which compared exactly with the material found on the girl's shoes. The man was found in California and brought back and confessed. This was his story: He saw the girl coming home from the street car, and he picked her up in his truck and took her to his cleaning establishment, where he wanted to show her a picture. When he came out he found that she had stepped out of the truck and fallen on the ice, and he tried to revive her, but could not. He became panicky and decided he would make it look like a kidnapping, and put her in a gunny sack, beat her on the head, put this rag down her throat, pulled a necktie off of the rack and tied around her mouth and took her and dumped her off of the bridge and wrote the ransom note. This story didn't hold up well and they decided that he had killed her. The coroner said she hadn't died until she was thrown off of the bridge and landed on the ice. He was given ninety-nine years. That was a case where the man suspected was a very close friend of the family. The polygraph and the evidence found in the truck absolutely proved his guilt, along with the handwriting samples obtained.

Now the work that I am particularly interested in is that of the interrogation of criminal suspects. As long as we have had civilization we have had lawlessness, and we have had individuals who tried to detect it.

They tell a story which is supposed to be true about a case being tried in the Cook County Court where one lawyer became angry and raised his voice and called the other the biggest liar in Chicago. The other became red in the face and says, "You are the biggest damnable liar in the State of Illinois." The judge rapped on the desk and said, "Gentlemen, you forget I am here." It is hard to tell, sometimes, who is the biggest liar. In about between 1500 and 1600, Benvenuto Cellini, the Italian sculptor and goldsmith, writes that he left home at an early age because his father wanted him to study music and especially to play the flute, and that while away he became interested in sculpture, but came down with a fever. He came home and his father nursed him back to health. He said, "My father had considerable learning in Greek and metaphysics, and he would sit at my bedside and question me as to my activities while away, and as he did that he held his fingers on my pulse, and each time he would approach my music he left my bedside in tears, for he knew I was lying." That is the first time this test was mentioned. The Hindus have a test that has been used in recent years. They have the suspects go into a dimly lighted room where there is a jackass and each is to grasp the tail of the jackass and when the guilty one does so, the jackass will bray loudly. The tail of the jackass was covered with soot,

and when the guilty individual came out his hands were perfectly clean. The guilty individual was afraid that the sacred mule would bray, and he was afraid to tackle it. But the Chinese were really the earliest scientists. They invented a process which is even a more modern method. They work on the assumption that a guilty individual, because he was under tremendous emotional strain, would have a less secretion of the salivary glands. The Chinese had their suspects chew a handful of rice powder. The guilty one would be unable to chew it and get some in his windpipe and choke. The innocent individual would have a copious flow of saliva to mix with the rice powder and get rid of it. In more recent years psychologists and physiologists have attacked the problem scientifically. In 1700, Vinsuti in examining suspects, introduced a certain respiration process. His work was forgotten for some time until in 1914 a man in Boston took the blood pressure of a suspect as a physician does today and determined the systolic pressure. He claimed a change of eight to fourteen millimeters of mercury, systolic pressure, was indicative of guilt. In more recent years we have found that even innocent suspects, due to their fear and excitement, will show changes of not only eight to ten millimeters of mercury but often thirty to forty, even if innocent. You know that when you go to a physician to have your blood pressure taken, it is quite above normal. That is because you are afraid you may have high blood pressure and that fear of not obtaining insurance will cause the increase. Practically every young man who goes up for an aviation examination has increased blood pressure of fifteen to twenty millimeters of mercury, because they are afraid they will not pass. So with every suspect brought into the laboratory, the blood pressure will be above normal. The test is based entirely on certain bodily changes which accompany the emotions. Impulses go from the brain over the nervous system to the viscera and internal organs of the body. We have impulses that go to the muscles in the walls of the small arteries which cause certain contraction, and this causes increased blood pressure. Then we also have these sympathetic impulses to the various ductless glands, increasing the secretion of the ductless glands which, in turn causes an increase in the blood pressure, and practically every organ of the body responds to that. If we can record these bodily changes to common questions in a certain characteristic way, we are able to eliminate practically all the various emotional changes except those involved under observation. I will tell you of a few cases. One was a case we had in Los Angeles in 1923 where a burglar was opening a safe in the second story of an apartment when the owner came in. He turned and ran to a window where there was a fire escape. In his efforts to open the window he pulled down some heavy curtains and while entangled in them pulled his revolver and killed the owner and fled out of the door. The police have in their files the modus operandi of criminals, and they knew that this type of crime was committed by one of several individuals. They were all arrested and brought in and told what was wanted of them. Each one in turn consented to take the test. Of fourteen or fifteen thousand individuals sought to be examined by this technique, only eight have refused to take the test. Seven were proven guilty, and the eighth was Aimee Semple McPherson, and we don't know yet whether she is innocent or guilty. As the suspect is brought into the room the test is explained and they are told how it works, and they have an opportunity to watch the test. They obtain normal after three or four minutes' trial to see how disturbed he is, and to see if he has any cardiac lines, and to obtain his normal for the period of time. Then we ask a few questions that have no bearing on the case, just to get his

response to answering questions. "Is your name Jones?", and thirty seconds later, "Do you live in Los Angeles?" "Do you own an automobile?" and then a few questions on the crime itself. Instead of asking "Did you burglarize such and such an apartment?", we ask "Do you live on Maple Street?" That is the street of the burglarized apartment. "Do you live in an second-story apartment?" "Have you heavy draperies at your windows?" "Have you a safe in your apartment?" and then rest and some more questions describing the apartment. The first few brought in gave no more response to questions describing the apartment house than to other questions. In fact, they thought we were foolish, for they were well aware that we knew that they didn't live in that street. They brought in some more men. One gave a clear record, and the other responded violently to every question that described that apartment house. Then we turned the instrument around and told him to watch the fluctuations of the instrument, and about half way through the test he says, "All right; I'm all through." "You know," he said, "the first time I didn't expect anything to happen, and the needles went up, and the second time, they went twice as high." The reason was that the man was educated. He saw the very things happening that he feared, and we had these exaggerated responses.

Now, there was another case that we had a little over a year ago for the little town of Black Creek, Wisconsin. Two men walked into the bank and identified themselves with credentials and wanted to obtain what delinquent accounts they had for collection purposes. The bank president was satisfied, and gave them two accounts. They left and went elsewhere in the community. That afternoon, about closing time, the two men walked into the bank and this time, instead of credentials they produced automatics and stole a large amount of cash and securities and fled. When the authorities arrived, the woman cashier told them that she could positively identify the men as the same two men that were there in the morning. They arrested these two men in Green Bay and brought them back to be inspected, and this woman positively identified them. Five men positively identified them and two men who were just leaving the bank positively identified them. They had no alibi witnesses, and could not prove where they were, and when they were tried these five witnesses positively identified them. However, their lawyer believed, for some reason or other, that the men were innocent, and they asked if we would examine these men with the polygraph, and if innocent, have the records introduced. Both ran clear records. One gave a greater reaction to the question, "Did you graduate from college?" than anything else, and we thought there was more reason to believe there was something in connection with his college life than with the crime he was charged with. We went before the judge and prosecutor and explained the technique of the polygraph and what the results were. As a matter of fact, we put the assistant prosecutor on and caught him in a little lie. The prosecutor objected on the ground that we were usurping the rights of the jury, and that they could not have anyone come from Chicago and tell them what to do. He said the technique was too new and he didn't know enough about it, and it hadn't been tried enough and he didn't dare to use it. However, two days before the case was turned over to the jury, two men were arrested in Minneapolis who admitted that they robbed the Black Creek Bank, and surrendered certain securities. They sent the men over to be identified, and they said, "Yes, those are the men." One of them spoke up to the woman in very uncomplimentary terms: "You were lying on your

stomach, hysterical and yelling, and you couldn't see me." She admitted that she was, and that she just thought that they were the men, and through imagination she became positive, and through her positiveness convinced the other people. They all were mistaken. I asked this one man afterwards, who responded so violently to the question, "Did you graduate from college?" to clear up the record for our own satisfaction. I said, "What did you do in college; what happened while you were in college?" and after a little while he told me. He said, "While I was in high school the second year, I went to war, and four years later I went back and wanted to go to college, but I couldn't unless I went back to high school and finished the last two years, and I couldn't stand to go back with those kids and go through the elementary stuff to finish my college education. Anyway, the old high school building burned down and all my credentials burned, and I got duplicates and forged them and went to college--but, honest to God, I graduated!"

I could go on and tell you any number of cases, but I want to go into another field, and that is personnel work. Some years ago we were asked to go into a bank in Chicago and examine a certain teller who had lost sixty-five thousand dollars from his cash. They were sure he was guilty, but could not understand how anyone could get in and steal the money. We could not get any response from the sixty-five thousand dollars. He responded to taking overage in small amounts, but not to the sixty-five thousand. In justice, we ran everyone in the bank. We started with the president and vice president and ran through fifty-seven employees, and when we were through, we had twelve employees who indicated disturbance, and we could not understand how twelve men out of fifty-seven could be stealing from one bank. We went ahead and examined them and obtained nine confessions of stealing from the institution. Some were petty amounts, overage, and amounts that they could get away with without its showing. At that time they fired every man who confessed to taking money, and on general principles they discharged the other three who gave bad records but didn't confess. Since then, we have examined the personnel of nine banks, and we have found ten per cent or over guilty of stealing money from the bank. After two or three experiments we thought that seemed a bad condition that prevailed. A good many seemed to be fine types of high character. We tried an experiment, and instead of discharging those men who only stole twenty-five or thirty dollars a year, after they had confessed they were kept in the bank and given another chance to see if they would steal in the future. After several years of this, we have only had two or three individuals who confessed that went back to stealing money, and those institutions are examining them, and new candidates. We find when they are once gotten to tell the truth, they don't continue stealing except in rare instances. We had a boy come in as an applicant and gave a bad record, and finally admitted stealing over \$250 from another bank in 1924 and 1925. He cleared up his record and showed that he regretted having made a mistake, and we recommended him for the bank position. The bank and insurance company accepted him, and I am sure that the man will be one of the most trusted of their employees. He would not dare to steal because he knew he would be caught. This shows the work we are doing. One of the larger insurance companies have given a ten per cent reduction on embezzlement insurance to a bank that has been examined by this method.

Then we are using it in malinger cases. A man was injured in a taxicab, and claimed he was blind in one eye and suffered from trauma. We connected him with the instrument and with another instrument called the aperiodic galvanic reflex, which is more scientific than blood pressure. While he was connected with the instrument we had the good eye blinded and showed him a picture of a mountain scene, and some time later a picture of a street scene, and later a pornographic picture, and you should have seen the reaction. The needle went completely off the scale and the blood pressure went up considerably. Now this individual, if he was blind in one eye, would not have responded to that picture any more than any other, but he responded to that picture, and responded to a repetition on several occasions, and did not respond to a normal picture. When he looked at the record he, with a foolish grin, admitted that he could see. Other cases of pain in the back, which is difficult to get at, will not respond to galvanic reflex. So all we are attempting to do is to apply these various methods. We don't claim that they are infallible in crime detection, but we give these instruments and tools and these methods to the law-enforcing agencies to help them in their fight against crime.

I brought the blood pressure machine with me, and we are very fortunate in having a member of the group here consent to take the test. I find that this individual is contemplating marrying in the very near future, and it is suggested that I ask him some of the circumstances relative to this fact, and some other questions. But we find that we will not have to take a member of the bar. It would be best not to, so we have an actual case that will be brought to us this afternoon. There is one thing that I would ask, that no side remarks are made during the test. I understand that there was an automobile accident today out here on the highway about forty miles, and they found some blood in the car, quite a number of new tires, three or four flash lights and other things that appear to be stolen goods, and a little later two hitchhikers were picked up. The automobile had a Texas license plate, and these boys were picked up, and finally, on being questioned, admitted that they were riding in this automobile--that is, one of the men. The other, however, would say nothing about it, and says that he hadn't seem the automobile before, and doesn't know anything about it. The first man has changed his story and doesn't know anything about this car, and both of them are just little hitchhikers, going to the World's Fair. It is suggested to examine these individuals with the polygraph, and if these men will consent to take the test, I think it might be more interesting to have an actual subject who has something at stake, than someone of the Association who has nothing at stake.

(At this point two young men are brought forward, and while Mr. Keeler is assembling his polygraph preparatory to making a test, continues as follows):

I might add that these tests, when they are given in the regular fashion, are always given in an almost sound-proof room, so that we have no outside influences, and we never have more than one or two individuals in the room while the test is given. We give him every opportunity to show if he is innocent, and if guilty, we want to prove him guilty. We have to have his permission. You can't use third degree methods. If I bark out at this fellow or punch him in the neck, the response means nothing. They are responses to violence and not to courtesy, and an

individual, to give him every chance to run a clear record we sit down and give him a cigarette and talk it over, and tell him that if he is innocent it is to show his innocence, and if he is guilty, to show his guilt.

(Explaining instrument.) This tape here shows the respiration. We put this about the chest so that any changes in the breathing will be recorded there on the instrument. Of course, during the test, we can't have the individual smoke, because it will change the respiration. Then an ordinary blood pressure check is placed about the upper arm, to record the diastolic and systolic pressure. We warn the subject that his hand may "go to sleep" a little, due to the pressure, but that it will not do any harm, and that it will come back to normal just as soon as we finish the test. Now, we are recording on this the heart beat. If there is any increase, it will go up, in this direction, and any decrease in this direction. This records the respiration.

(To subject): Inhale and exhale. I am going to give you a rest for a moment, so you will see how it works, and then I will pump it up again and ask you questions. Now sit perfectly quiet. I am going to ask you a few questions, and you can answer them by "yes" or "no". "Did you have lunch today?" "Yes." (After a pause of several seconds): "Is you home in Kansas?" "No." (Pause.) "In the last week and a half or two weeks, have you committed a burglary?" "No." (Pause.) "Is this other fellow your partner and have you known him for a long time?" "I never saw him before."

(At that point Dwight Thacher Harris, reporter for the Topeka State Journal, addressed some remark to the subject, which the reporter did not hear, and the subject declined to proceed further with the test. The following colloquy then occurred between Mr. Keeler and the subject.)

Q. You don't care to continue the test?

A. I don't believe I do; I thought it was nothing to bear on my case.

Q. I told you I was only going to ask you about a burglary and that automobile. I wouldn't ask you anything else but irrelevant questions. What is your name?

A. Bill Berry.

Q. Let me show you your record. (Exhibiting tape to subject.) Here is your first question. Look what happened when I asked you about a burglary. Do you see this line shoot up? and this line shoot up here?

A. It would do like that at any time.

Q. If I had gone on I would have asked you some more irrelevant question, and I would have asked you about the automobile, and if you were driving. From the record it is obvious that

you have been into something about a burglary. This can't be used in court against you, you know. How do you explain that? (No answer by witness.)

(By Mr. Keeler, continuing): Now, when I started this test I told him to answer the questions "yes" or "no", and not to move his arm. Then I first asked him irrelevant questions, whether he had had his lunch, then as to his home, and then whether he had committed a burglary; and notice what happened--a very rapid change, it went up over fifteen millimeters, and he tried to cover it up and in that effort to cover it up, he did that voluntary stuff. That is why we have the respiration. And no innocent person has any reason to end it. A guilty person tries to alter his bodily reactions. Then I asked him another irrelevant question and it remained perfecting straight. It cannot be used against you, but I am convinced that you were in a burglary.

* * * * *

THE DETECTION OF DECEPTION

By

Leonarde Keeler

History

There are many age-old practices in the Orient, for determining innocence or guilt. The Chinese requested suspects to chew rice powder during an interview, then to spit it out for examination--if the rice were dry the suspect was considered guilty because the tension of guilt supposedly caused a cessation of salivary gland secretion. In India the movement of the suspect's big toe is supposed to be indicative of deception. Another test attributed to the Hindus depended on the superstitious beliefs of the natives. The suspects were told that a sacred ass would bray when a guilty subject grasped its tail. The crafty Hindu investigator had dusted the animal's tail with lamp-black previous to the test. Because of the belief in the animal's supernatural powers the guilty suspect, when sent alone into the chamber with the guilt-detecting ass, passed it by without grasping the tail, whereas the innocent subject grasped the tail according to instructions, thereby covering the palm of his hand with the soot. The guilty subject, therefore, came from the chamber with clean hands.

It is interesting that Benvenuto Cellini (1558-1561) records in his autobiography the following observation concerning his father:

I was ill about two months during which time my father had me most kindly treated and cured, always repeating that it seemed to him a thousand years till I got well again, in order that he might hear me play a little. But when he talked to me of music with his fingers on my pulse, seeing he had some acquaintance with medicine and Latin learning, he felt it change so much if he approached that topic, that he was often dismayed and left my side in tears.

In more recent years psychologists and physiologists have conducted research in the detection of deception.

The article was written in 1936 or earlier. It was subsequently incorporated into the publication *Outline of Scientific Criminal Investigation*, Ann Arbor, Michigan: Edwards Brothers, 1938. The Outline was prepared as a guide for attorneys attending courses and seminars offered by the Scientific Crime Detection Laboratory of the Northwestern University School of Law. Previously reprinted in *Polygraph*, 5(4)(December 1976), 293-302.

Munsterberg (1904) advocated restricted use of instruments for recording pulse, blood pressure and respiration.

Marston (1915) tested 200 subjects experimentally, measuring the systolic blood pressure at frequent intervals. His results indicated that systolic pressure constituted an accurate means for detecting deception.

Benussi (1914) and Burt (1921) recorded respiration of subjects while lying. They concluded an apparent change in the inspiration-expiration ratio (E/I) was indicative of deception.

Lombroso, Jung, Munsterberg, Crossland, and others advocated the use of a word association test. Under this test a list of stimulus words is read to the subject who has been instructed to respond as quickly as possible with the first word or group of words which comes to his mind. The response and the time interval between the stimulus and the response are noted.

House (1915) experimented with various drugs such as scopolamine, hydrobromide, morphine, and chloroform, which were administered to produce a condition of anesthesia in the subject. Cerebral activity is depressed to a point of unconsciousness. The subject gradually emerges from the influence of the drug and is interrogated as soon as he is able to understand the questions. Inhibitions are removed and due to the depressed consciousness, inventive or creative ability is absent while memory for past events remains intact.

Experiments performed at the S.C.D.L. of Northwestern University have indicated the advisability of administering scopolamine without morphine and chloroform. In approximately 25 experimental tests the majority of the subjects responded truthfully to all answers. In actual criminal cases the truth has been ascertained in approximately 50% of the cases. Other anesthetics are used as "truth serums." Sodium amytal seems not to be so successful as scopolamine because of the rapid recovery of the subject.

Larson (1921), working under Chief August Vollmer, Police Department of Berkeley, California, used an Erlanger sphygmomanometer in combination with a Pneumograph. Some four hundred suspects brought into the police station were subjected to the test. Larson reports high accuracy of results, but has not treated his material statistically. Since, he has made tests on convicts at Joliet and on others.

At Stanford University (1925) (Psychology Department) and later at Northwestern University (S.C.D.L.)(1930) a Polygraph was developed eliminating rubber tambours for recording continuously, blood pressure, pulse and respiration. Being added to this are units for recording pulse frequency in an integrated curve, and for recording the psychogalvanic reflex.

Emotional Factors in Deception

Methods for the detection of deception are based on the fact that various autonomic and voluntary bodily changes accompany deception, particularly when the subject is aware of the examination procedure and purpose of the test.

(1) Although little is known concerning the mental processes involved in deception, the apparent effect is observed in the bodily changes accompanying the emotion of fear--primarily fear of consequence of exposure. Awareness on the part of the guilty subject of the procedure and resultant physiological changes intensifies this fear, thereby further accentuating the accompanying bodily changes.

(2) Often a conscious effort is made to prevent exposure. A subject will frequently attempt to suppress the physical changes and in so doing will effect certain semiautonomic voluntary muscular movements, particularly those of respiration.

(3) If the test procedure is properly controlled, the innocent subject will give no symptoms of fear, or if symptoms of fear exist at the onset of the examination, they will disappear as the examination proceeds. Furthermore, without fear symptoms no conscious effort will be made to control them.

(4) In simple experimental tests where the only consequence of detection is defeat in a game, fear may persist as a minor factor but attention to the situation and anticipation resulting in emotional and therefore physical tension followed by relief, will exist as a major factor.

(5) In other situations, the arousing of memories of experiences, either pleasant or unpleasant may produce an emotional tone similar to that existing with the experience itself.

(6) After the disturbing conscious factors have been removed by confession, emotional equilibrium is usually restored.

Physiological Variations that Accompany Emotional States

Changes in blood pressure accompany emotional states. With fear there is an increase in blood pressure and heart rate. Excessive fear may cause shock and a decrease in blood pressure and heart rate (fainting). Accompanying embarrassment there may be a dilation of peripheral vessels and therefore a drop in blood pressure (blushing). The sympathetic and parasympathetic nervous systems have direct influence on contraction and relaxation of arterioles and on the activity of various endocrines (ductless glands) such as thyroid and adrenal bodies and

ducted glands (salivary and lacrimal, etc.). Other bodily changes accompanying emotion are: increase in blood-sugar (liberated from liver), decrease in blood-clotting time, decrease or increase of peristaltic movement of stomach and intestines, increase or decrease in activity of sweat glands (psychogalvanic reflex), variation in pupillary diameter and increase or decrease in respiratory rate and amplitude and voluntary muscular reflexes.

Of the above, blood pressure, heart rate, respiration, psychogalvanic reflexes and voluntary muscular reflexes can be conveniently recorded.

The Polygraph Method

The present apparatus used at the S.C.D.L. consists of three units; one recording continuously and quantitatively the blood pressure and pulse; another giving a duplicate blood pressure pulse curve taken from some other part of subject's body, or may be utilized for recording muscular reflexes of the arm or leg; and the third unit recording respiration.

(1) The cardiosphygmomanometer unit is composed of a blood pressure cuff connected by rubber tubing to a bellows. The metal bellows or tambour stack is mounted in a horizontal position below the panel on sliding runs. It is moved forward or backward (toward or away from the pivot shaft to which is attached the lever arm pen) by means of rack and pinion which is controlled by a convenient knob on the panel. The position of tambour unit in relation to pivot shaft must be changed according to the pressure utilized in the system. (The closed end of tambour unit is kept at constant distance from pivot shaft.) A pressure gauge of the usual dial type (sphygmomanometer) is mounted on the panel and connected through a three-way valve to either of the blood pressure systems, providing a means for determining the actual pressure in either system.

(2) Pneumograph unit: A light rubber tubing supported by a one foot length, 3/4 inch diameter spring with end pieces (one end closed; the other open with tube nipper) constitutes the pneumograph chest tube. This is connected by rubber pressure tubing to a metal bellows unit which is mounted under the panel of apparatus similar to the blood pressure tambour mounting. No pressure gauge is used in this unit.

(3) Kymograph: The chart paper, perforated on its edges, is drawn by a sprocket feeder roll which is driven by a synchronous motor. A differential gear train provides for three constant speeds (3-6-12 inches per min.). The various physiological changes which vary the pressures in the systems are recorded by means of combined lever arms connected to pivot shafts which are linked to the tambours.

Operation of the Polygraph

The blood pressure cuff is snugly wrapped about the upper arm (preferably the right arm). The pressure system is inflated to a point midway between systolic (maximum) and diastolic (minimum) blood pressure. This point is the mean pressure. When the dicrotic notch appears in the middle of the pulse wave, the pressure in the system equals mean pressure. When the dicrotic notch appears at the top of the wave, the pressure in the system equal diastolic pressure. When the dicrotic notch appears at the base of the pulse wave, pressure in the system equals systolic pressure. These relations of the dicrotic notch position and blood pressure hold only in cases where the subject's pulse frequency is within normal limits. In cases where the subject's pulse rate is over 100 per minute, the dicrotic notch may not vary in position. Greatest pulse amplitude should then be taken as equal to mean blood pressure. When the system has been inflated to a pressure equal to mean blood pressure, valves are closed to prevent leakage. The pressure in the system then remains constant except for variations produced by the subject's pulse and blood pressure. These are recorded continuously for the duration of the test.

The tambour position is adjusted so that tracing is obtained on the lower half of the recording paper.

The pneumograph tube is adjusted about the thoracic or abdominal region (depending on subject's type of breathing) so that it fits snugly but not too tight to interfere with normal respiratory movements. The position of the tambour is then adjusted so that the tracing is obtained in the middle region of the upper portion of recording paper.

Experimental Test Procedure

The chief factors involved in the experimental procedure are increase and decrease in tension (blood pressure, pulse, and galvanic reflex) and conscious control (respiration). The test procedure is explained to the subject and instructions to remain as quiet as possible are given. In the usual experimental test a "normal" of the subject is obtained, 1 1/2 - 2 minutes depending on extent and frequency of normal variations. The subject is then instructed to answer all questions by "yes" or "no" or to refrain from giving verbal responses.

Types of simple experimental tests:

(This type of test is also valuable in obtaining information in criminal cases).

(1) Card Test

(2) Map Test

(3) Number Test

- (4) Name Test
- (5) Age Test

Procedure: Example (Card Test):

- (1) Test procedure is explained to subject.
- (2) Subject chooses 1 card from a group (8-10 cards convenient).
- (3) Arm cuff and pneumograph are adjusted.
- (4) Apparatus is set into operation.
- (5) "Normal" of subject is obtained.
- (6) Subject is instructed to answer "no" as each card is presented. It must be emphasized that the verbal response to *all* cards including the chosen one must be "no" so that subjects answers truthfully to all cards excepting the chosen one.
- (7) The cards are exhibited to the subject one at a time, ten to twenty seconds apart as the question is asked. "Did you choose the ten of hearts?" "Did you choose the ace of spades?", etc. The graph is marked at the point each question is asked.
- (8) A "normal" of 30 seconds or more is obtained following the last question. The test may be repeated once or twice for verification.
- (9) The cuff pressure is released and appliances removed from subject.

Interpretation of Simple Experimental Deception Polygrams

One or more of the following factors are indicative of point of deception:

[Blood Pressure Pulse]

- (1) Peak of tension (highest point on blood pressure curve)
- (2) Decrease in pulse frequency usually followed by slight increase.

The Detection of Deception

- (3) Greatest variation in blood pressure curve, immediately following stimulus.
- (4) General irregularity of blood pressure curve preceding point of deception followed by a smoother curve.
- (5) General gradual rise in B.P. curve following point of deception (rare type of response).

[Respiration]

- (6) Regular normal respiration to point of deception, suppression (decrease amplitude and rate) during period between deception stimulus and next stimulus followed by relief (deeper and more rapid respiration).
- (7) Suppressed respiration during entire period preceding deception stimulus followed by deeper respiration for remainder of test.
- (8) Respiratory blocking (apnea) at deception stimulus. (Subject stops breathing in expiration for one or more respiratory cycles.)
- (9) Regular respiration preceding and including period following deception stimulus followed by irregular respiration for remainder of test.
- (10) Irregular respiration preceding deception stimulus followed by regular respiration for remainder of test.

[Muscular]

- (11) Muscular movement after the stimulus following deception stimulus.

[Psychogalvanic reflex]

- (12) Decrease in apparent skin resistance up to and including period of deception, followed by increase in resistance (peak of tension).
- (13) Greatest response (apparently change in skin resistance) following stimulus.

Test Procedure in Criminal and Personnel Cases

- (1) **Peak of Tension Test:** Practically the same procedure as an experimental test is followed. This test may be used particularly in cases in which

pertinent facts are unknown to the subject. Tests of this type most commonly used are:

- (a) Name Test
 - (b) Amounts Test
 - (c) Object Test
 - (d) Map Test
 - (e) Age Test
 - (f) Type of Crime Test
- (2) **Specific Response Test:** (relevant and irrelevant questions).

(a) **Short Series Test:**

Three questions are prepared in advance, the first two irrelevant and the third relevant. Subject is shown the questions previous to the test. The question series is repeated three times before test is concluded. The resultant curve of a guilty subject may indicate peak of tension at relevant question, specific response or combination of both.

(b) **Long Series Test:**

Following the recording of subject's "norm" two or three irrelevant questions are asked; then one or two relevant questions followed by another irrelevant question, etc. Eight to twenty or more questions are sometimes asked in a single series. Subject is not informed as to nature of questions previous to test. Following the question series; a short "norm" is obtained.

Peak of tension is not significant in this type of test. Resultant curves contain specific responses to questions in blood pressure, pulse, respiration or galvanic reflex, or a combination of all, when subject is guilty or has guilty knowledge. Always two or more tests should be made before diagnosis is attempted. An innocent subject may give specific responses to questions in

the first test, but after discovering the nature of the questions gives smoother curves in the second and succeeding tests. The guilty individual may give relatively slight responses to questions in first test, but become increasingly responsive in the second and succeeding tests.

The nature of the resultant curves depend entirely on the emotionality of the subject, therefore controls must be obtained. Irrelevant questions are asked and separate experimental (e.g., card test) tests are made for this purpose.

(3) **Word Association Test:** Tests similar to that mentioned under association tests are given while subject's bodily responses are recorded. A complex reaching consciousness, or a conscious blocking, will cause bodily responses.

(4) **Sensory Tests:** In detecting malingering it is often important to record visceral responses to physical stimuli. The following tests may be used:

(a) **Pain:** The sudden awareness of pain will cause rapid pulse, increased blood pressure, and a marked decrease in skin resistance. In stimulated pain these changes will not occur.

(b) **Blindness:** Subject's good eye is blindfolded while innocuous pictures followed by sensual pictures are held before the purported blind eye. If subject responds to certain visual stimuli which would produce an emotional state, vision is obviously intact.

(c) **Deafness:** The ear tips of a stethoscope are placed in subject's ears. The examiner standing behind the subject whispers into the stethoscope bell, first pinching the tube going to one ear then the other. A few neutral statements are made as controls. Then, some statement which would ordinarily produce an emotional response is made so that it can only be heard in the purported impaired ear. If hearing is intact, a visceral response will be recorded. Later, the same statement is made so that it can be heard only in the good ear. The responses to stimuli of each ear are compared. If hearing in both ears is reported impaired, neutral statements

with an occasional emotion producing statement interposed, are asked.

(5) **Psychopathic Tests:** Psychopathic patients give emotional responses which differ from those of more emotionally stable individuals. The majority of psychopaths exhibit abnormal irregularities in their respiration. Certain types of respiration predominate in certain forms of psychopathia. No definite conclusions have been arrived at, but studies are now in progress.

Reliability of Polygraph Tests

Exact statistics cannot be derived in actual cases because of the impossibility of verifying all test results. However, wherever follow-ups have been made or confessions obtained at the time of the test which were subsequently verified, the test has been found to be extremely reliable. Although accurate statistics of all examinations are not available, samplings of various groups indicate that laboratory experimental tests, the results of which are of no consequence to the person, are correctly analyzed in approximately 75% of the experiments. In personnel cases for banks and department stores, the results of which are of immense importance to the persons, approximately 80% of those given test-results indicating deception have made confessions later verified, or have otherwise been definitely proved guilty. In criminal cases, approximately 62% of those giving test-results indicating guilty have made verified confessions or otherwise have been proven guilty. In three cases brought to the writer's attention, individuals diagnosed as innocent were later proven guilty, but in no case has an individual been diagnosed guilty who was later definitely proved innocent. In approximately 10% of the cases the test results are of such nature that no definite diagnosis can be made.

Conditions for Polygraph Tests

Because polygraph detection of deception tests depend on the subject's emotional responses to certain stimuli, it is necessary to control the conditions under which they are made. The greatest accuracy is obtained when the suspect has not been given all of the details of the crime. If a polygraph test is anticipated for a given suspect or witness, the investigating officials should withhold from all suspects, witnesses, and the public as many details as possible. Under these conditions certain tests may be given which will prove extremely reliable in determining the innocence or guilt of the suspect.

For example, in a certain burglary case four diamond rings, two watches (Waltham and Elgin) and a ruby breast pin were taken. The burglar dined himself from the ice box, eating some raspberry pie and drinking a glass of milk. Except for the victims and the police, the only

person who knew the description of the stolen property and of the food consumed was, of course, the burglar himself.

Three suspects were brought in for polygraph examination. None were told of what they were suspected. The first test consisted of the following questions which were read to the suspect before the actual test was made.

1. Within the last two days did you steal an auto?
2. Within the last two days did you steal a bicycle?
3. Within the last two days did you hold-up someone?
4. Within the last two days did you burglarize a house?
5. Within the last two days did you pass a bad check?
6. Within the last two days did you rob a bank?

Two suspects gave no specific responses to pertinent questions. The other, who later confessed, gave specific responses to not only questions about the burglary, but to those describing the stolen jewelry and the consumed pie.

If the subject being tested is guilty of the burglary he will respond in blood pressure and respiration to the question about burglary. The same test is repeated twice to insure the elimination of accidental responses. Because the peak of tension appears at the burglary question it does not necessarily indicate the suspect's guilt of the particular burglary. However, if in another test during which questions about different types of jewelry are asked the subject responds specifically to questions pertaining to the stolen jewelry, indications of his guilt become stronger. If, in yet another test during which ten types of food are mentioned as having been eaten at the time of the burglary, the subject responds to pie and milk the operator can safely make a diagnosis of guilt in the particular case. The innocent suspects could not respond specifically to each one of the pertinent factors, burglary, particularly pieces of jewelry and pie, but the guilty individual having this information will usually respond specifically, indicating his knowledge of these factors. This particular procedure (peak of tension test) is only reliable when the facts mentioned in the tests have not been divulged directly by the investigators or through the press.

Other polygraph procedures may be followed in cases where all information has been divulged to the suspect, and although helpful in making an investigation, are not so reliable as those tests in which undivulged facts may be incorporated into series of questions.

Because of the influence of environmental factors on the test results it is desirable, whenever possible, to have the suspect brought to the university laboratory for the test. Although the tests can be made in any quiet room the results have proved more uniform in those cases in which the suspects have been examined under the ideal conditions afforded at the laboratory. Whenever tests are made elsewhere, the operator should be permitted to work with the suspect in a quiet room, out of the presence of any other person or persons.

References

House, R.E., "The Use of Scopolamine in Criminology," 2 *American Journal of Police Science*, 328-337 (1931).

Keeler, L., "A Method for Detecting Deception," 1 *American Journal of Police Science*, 38-52 (1930); "Debunking the 'Lie-Detector'", 25 *Journal of Criminal Law and Criminology*, 153-160 (1934).

Inbau, F.E., "The 'Lie Detector'", 40 *Scientific Monthly*, 81-87 (1935); "Detection of Deception Technique Admitted in Evidence". 26 *Journal of Criminal Law and Criminology*, 262-271 (1934).

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PROBLEMS IN THE USE OF THE 'LIE DETECTOR'

By

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To begin with, there is no such thing as a "lie-detector." There are no instruments recording bodily changes, such as blood pressure, pulse, respiration, or galvanic reflex, that deserve the name "lie-detector" any more than a stethoscope, a clinical thermometer, or a blood count apparatus with a microscope can be called an "appendicitis detector."

However, deception, guilt, or innocence can be diagnosed from certain symptoms just as appendicitis, paranoia, or any other physical or mental disorder can be diagnosed. In every case, the examiner must make his diagnosis from tangible symptoms, using whatever mechanical aids he has at his disposal. For instance, a patient is found to have a temperature of 102 degrees F., rigidity, and pain in the appendix region, and a high leucocyte count. From this combination of symptoms the physician concludes that his patient is suffering from an infected appendix. Or, in another case, the patient has delusions of persecution, either systematized or ever changing fantasies, and various other symptoms, which lead the psychiatrist to render a diagnosis of schizophrenia or some other psychopathic condition.

There are many age-old practices in the Orient for determining innocence or guilt. The Chinese requested suspects to chew rice powder during an interview, then to spit it out for examination; if the rice was dry, the suspect was considered guilty because the tension of guilt supposedly caused a cessation of salivary gland secretion. In India the movement of the suspect's big toe is supposed to be indicative of deception. Another test attributed to the Hindus depended on the superstitious beliefs of the natives; the suspects were told that a sacred ass would bray when a guilty subject grasped its tail, the crafty Hindu investigator having previously dusted the animal's tail with lamp-black. Because of belief in the animal's supernatural powers, the guilty suspect, when sent alone into the chamber with the guilt-detecting ass, passed it by without grasping the tail, whereas the innocent subject grasped the tail according to instructions, thereby covering the palm of his hand with the soot. The guilty subject, therefore, came from the chamber with clean hands.

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In detecting deception, the same general procedure as in medical diagnosis is followed. Certain situations or conditions produce emotions which are accompanied by bodily changes. The flushing of anger and the paling with fear, for example, need no introduction. But to discover, measure, and evaluate the less obvious bodily changes which accompany the emotions involved in deception require just as much specialized care as the physician must exercise in making a complicated medical diagnosis.

There are five main factors involved in the diagnosis, all of which must be considered in conducting the tests. These are:

- (1) mental processes involved in the act of conscious deception;
- (2) voluntary and involuntary changes in the physiological processes which accompany the mental processes;
- (3) a suitable combination of instruments for recording bodily changes involved in the deception syndrome;
- (4) an examination procedure for stimulating the mental processes in order to touch upon guilt complexes without otherwise disturbing the psychophysical equilibrium;
- (5) an experienced examiner properly to conduct the examination and interpret the resulting combination of symptoms.

Mental Processes

Although little is known concerning the mental processes involved in deception, the apparent effect is observed in the bodily changes accompanying the emotion of fear, primarily fear of the consequences of exposure. Awareness on the part of the guilty subject of the procedure and of the resultant physiological changes intensify this fear, thereby further accentuating these bodily changes. Then, too, a conscious effort is often made to prevent exposure. A subject, familiar with the principles underlying the deception test, will frequently attempt to suppress any physical changes and, in so doing, will affect certain semi-autonomic muscular movements. If the test procedure is properly controlled, the innocent subject will have no fear symptoms and, therefore, will make no conscious effort to control nonexistent physical disturbances.

In simple experimental tests where the only consequence of detection is defeat in a "game," fear may persist as a minor factor, but attention to the situation, resulting in physical tension followed by relief, will exist as a major factor. In other situations, the arousing of memories of experiences, either pleasant or unpleasant, may establish an emotional tone similar

insanity, specific emotional responses are nonexistent, and therefore this method for diagnosing deception is of no value.

Even though little is known of these mental processes in deception, diagnosis is still possible through recognition of the products of the processes--just as insanity can be diagnosed from symptoms although the basic mental processes are unknown, and cancer can be diagnosed although the cause of the disease is still a mystery.

PHYSIOLOGICAL PROCESSES

The impossibility of observing or recording mental processes as such, necessitates the indirect method of recording the bodily changes which accompany most mental activity. Physiologists and psychologists have endeavored, with a fair amount of success, to correlate physiological and cerebral manifestations. It is well known that most conscious mental disturbances have their physical correlatives--although absolute specificity is as yet undetermined. Certain of these physical changes are under voluntary control, such as changes in the skeletal muscles; others are quite autonomic and involuntary, such as in pulse rate, blood pressure, activity of the sweat pores, salivary glands, pupillary reflex, blood-chemistry, etc.; respiration is also involuntary but consciously controllable to a certain degree. All of these involuntary physiological processes--and often the voluntary musculature--come into play with mental activity. Mental and physical processes are integral parts of the whole animal mechanism, the functioning of one depending upon the other. Therefore, in determining the processes involved in deception and concealment, certain of the voluntary and involuntary bodily processes are recorded and used as criteria for diagnosis.

This system of diagnosis is no more infallible than other diagnostic methods. Sometimes symptoms are not sufficiently pronounced and sometimes one of the seemingly specific symptoms is lacking. Often, tests subsequent to the first will reveal symptoms previously unrevealed.

As to the reliability of polygraph, or "lie-detector," tests, exact statistics cannot be derived in actual cases because of the impossibility of verifying all test results. However, wherever follow-ups have been made or confessions, subsequently verified, obtained at the time of the test, the test has been found to be definitely reliable. Although accurate statistics of all examinations are not available, samplings of various groups indicate that laboratory experimental tests, the results of which are of no consequence to the person, are correctly analyzed in approximately 75% of the experiments. In personnel cases for banks and department stores, the results of which are of immense importance to the persons, approximately 80% of those giving test results indicating deception have made confessions, later verified, or have otherwise been definitely proved guilty. In criminal cases, approximately 62% of those giving test results indicating guilt have made verified confessions or have otherwise been proved guilty. In several cases brought to the speaker's attention, individuals diagnosed as innocent were later proved guilty, but in no

case has an individual been diagnosed guilty who was later definitely proved innocent. In approximately 10% of the cases, the test results are of such nature that no definite diagnosis can be made.

DIAGNOSTIC AIDS--INSTRUMENTS

The greater the number of symptoms observable, the more accurate will be a diagnosis. In the dawn of science, certain outward manifestations accompanying fear, anger, rage, and other emotional states were noted; in more recent years many additional symptoms of emotionality have been observed and recorded with highly developed physiological and chemical techniques. Many police investigators, and even jurists, based their judgements of innocence or guilt on behavior symptoms. Judges in court are permitted by law to call to the attention of the jurymen these various physical manifestations of witnesses or defendants. Frequently these outward manifestations are symptoms of deception or guilt, but they may also be confused with embarrassment or fear.

Psychophysical patterns are more easily and accurately revealed when all of the known symptoms can be observed and continuously recorded for study. Many outward manifestations can be controlled--hence the necessity of using instruments for recording the internal involuntary changes. The more of these physiological processes recordable, the more complete will be the symptomatic pattern. Nerve impulses, blood chemistry, stomach or intestinal peristalsis, glandular activity, etc., cannot be easily studied without discomfort or injury to the subject; but certain secondary changes related to these more obscure manifestations can be recorded quickly, accurately, and harmlessly. In the polygraph a number of instruments are combined into one. The cardiograph records the pulse wave, the sphygmograph records the blood pressure, the galvanograph records the electrodermal variations (which closely follow the activity of the sweat glands), and the pneumograph records the respiratory movements. The whole is technically referred to as a pneumo-cardio-sphygmo-galvanograph, more commonly as a polygraph (many graph instrument), but erroneously called a "lie-detector." Various instruments of this type have been devised and used for experimental and diagnostic purposes. Some have included two recording units of one combination or another, and others three or four units.

EXAMINATION PROCEDURE

During certain physical examinations, the physician demands definite conditions. Before a basal metabolism rate can be taken, the patient must refrain from eating or drinking for several hours; he must rest quietly for fifteen or twenty minutes before, and must be undisturbed during the test. If any of these conditions are ignored, the test results may be unreliable. Other examinations must be conducted in darkened rooms or in quiet surroundings. All sorts of conditions are required for conducting properly various diagnostic tests.

The same is true in the conducting of deception tests. Man responds almost continuously to his immediate environment, to other individuals, to sounds, odors, pain, and other stimuli. Therefore, since the value of the deception test depends upon bodily responses to certain stimuli, all attending circumstances must be devoid of irrelevant factors. External stimuli that cannot be eliminated must be kept constant throughout the examination.

Because polygraph detection of deception tests depend on the subject's emotional responses to certain stimuli, it is necessary to control the conditions under which they are made. The greatest accuracy is obtained when the suspect has not been given all of the details of the crime. If a polygraph test is anticipated for a given suspect or witness, the investigating officials should withhold from all suspects, witnesses, and the public, as many details as possible. Under these circumstances, certain tests may be given which will prove extremely reliable in determining the innocence or guilt of the suspect.

For example, in a hypothetical burglary case, four diamond rings, two watches, and a ruby breast pin were taken. The burglar dined himself from the icebox, eating some raspberry pie and drinking a glass of milk. Except for the victims and the police, the only person who knew the description of the stolen property and of the food consumed was, of course, the burglar himself.

Three suspects were brought in for polygraph examination. None was told of what he was suspected. In order that the subject might be familiar with the questions, they were read to him before the test. The first test, which was given again when the polygraph was in operation, consisted of the following questions:

1. Within the last two days did you steal an auto?
2. Within the last two days did you steal a bicycle?
3. Within the last two days did you hold up someone?
4. Within the last two days did you burglarize a house?
5. Within the last two days did you pass a bad check?
6. Within the last two days did you rob a bank?

A similar type of test (peak of tension) was given with a list of jewels, including those that were known to have been stolen, and another test with a list of food substances, including those that were eaten by the burglar. Each test was repeated twice to insure the elimination of accidental responses.

Two suspects gave no specific responses to pertinent questions. The other, who later confessed, gave specific responses, not only to questions about the burglary but also to those describing the stolen jewelry and the consumed pie.

If the subject being tested is guilty of the burglary, he will respond with a peak of tension indicated in the blood pressure and respiratory curves to the question about burglary. Because the peak of tension appears at the *burglary* question, the suspect's response does not necessarily indicate his guilt of the particular burglary. However, if the subject responds specifically to questions pertaining to the stolen jewelry, indications of his guilt become stronger and if, in addition, the subject gives a peak of tension to the specific food eaten, the operator can safely make a diagnosis of guilt in that particular case. This procedure (peak of tension test) is only reliable when the facts mentioned in the tests have not been divulged directly by the investigators or through the press.

In order that the effect of existing environment, the present emotional state, and the physical condition of the subject may be determined, a polygraph recording is made for some minutes, during which time no questions are asked. Whatever the existing physiological and emotional conditions might be, the resulting polygraph curves indicate the "norm" for the period of the test. After this "norm" has been established, two or three irrelevant questions are asked--then questions pertaining to the crime, intermingled with other irrelevant questions. Each question must be worded briefly and call for a "yes" or "no" answer. The examiner's mode of asking questions must be uniform as to rate, volume, and inflection of speech, all through the test. Although there are several test procedures to be used, depending upon the circumstances involved in a particular situation, in all of them general conditions must be kept uniformly controlled and carefully standardized.

COMPETENT EXAMINERS

The stethoscope is an indispensable instrument to the physician. With its aid, the average individual can hear heart and respiratory sounds, but the sounds are quite meaningless; to the physician, however, with his extensive training and experience, they mean health or disease. The instrument is used to aid the physician in discovering physiological or pathological conditions which are outwardly obscure in the diagnosis of tuberculosis, pneumonia, and cardiac disorders. But no matter what diseased condition is being sought, the instrument is still called the stethoscope, and not a T.B. detector, a pneumonia detector, or a leaky heart valve detector. It is merely a diagnostic aid to an experienced examiner.

Almost anyone can operate a polygraph as well as he can hear sounds through a stethoscope, but only individuals with training and long experience can interpret the resultant recorded curves. The inexperienced operator cannot diagnose deception with a polygraph any more than he can diagnose a cardiac murmur with a stethoscope.

A surgeon obtains his skill through many years of training in basic medical subjects. Biology, physiology, chemistry, and physics lay the foundations for his actual medical training; anatomy, bacteriology, and pharmacology lead him on to clinical studies; and finally, after eight long years, he is ready to learn the art of surgery by practice. He commences as an assistant, and sometimes spends years before he finally becomes a competent surgeon. What a sad human tragedy it would be if anyone could purchase a few diagnostic instruments, some scalpels, forceps, and accessories, hang out his shingle, and commence practicing on suffering patients! Yes, anyone can purchase medical instruments, but fortunately, the State forbids his using them--even on dogs! And anyone can purchase or build a polygraph or any other medico-legal apparatus and paraphernalia, but *no one can prevent him from shouting aloud that he is an expert or from practicing on the unsuspecting public.*

Competent men of integrity must be carefully trained to conduct various types of medico-legal examinations, and each should have his background in the particular branch of the profession he is to practice. The legal psychologist must have a background of psychology, physiology, and the more basic sciences upon which they are founded, before he starts his apprenticeship in the various legal-psychological practices.

Some day, it is hoped, the State will license--*but keep free from politics*--medico-legal technicians just as it licenses lawyers and physicians today; but in the meantime it rests with the honor and integrity of each member of a profession to keep the profession purged of incompetency and dishonesty.

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THE LIE-DETECTOR PROVES ITS USEFULNESS

By

Leonarde Keeler

Fifteen cities and eleven state agencies make effective use of the polygraph both for detecting criminals and exonerating innocent people.

The polygraph or lie-detector, first used by the police department of Berkeley, California, in 1921, has made good copy for newspapers from the beginning, because it has broken sensational and unusual cases. But many misconceptions and misunderstandings as to the use of this instrument have resulted from this wide publicity.

The polygraph, as its name implies, is a collection or composite of instruments. It is made up of three units, one of which measures and records the subject's breathing, another which records changes in his pulse rate and blood pressure, and still another which measures the minute electrical changes in the apparent resistance of the skin. All of the bodily responses are recorded simultaneously on a moving strip of paper driven by a synchronous motor, but each unit is a separate entity and can be operated independently. The three units operated at once constitute the polygraph or lie-detector.

Principle of the Polygraph

The polygraph is not a mind reader, nor does it ring bells, flash lights, or shock the subject when he lies. It is simply an apparatus that records the physical changes in the subject's body which accompany his emotional changes. In ancient times, the Chinese observed that fear of detection inhibited the flow of saliva in the mouths of the culprits. From this observation came the old Chinese test of guilt. Suspects were given rice flour to chew and then spit out; the culprit expectorating dry rice flour was deemed guilty. Centuries later an experimenter, Cannon, confirmed this early observation of the Chinese. Cannon, working with dogs as subjects, found that fear, anger, and pain inhibited the flow of saliva, completely stopped peristaltic movements in the viscera, and arrested the flow of gastric juices into the stomach. He also found that these changes were due to the secretion of adrenalin flowing from the ductless adrenal glands of the excited animal; and that this secretion likewise caused

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the breathing to quicken, the blood pressure to rise, reaction time to shorten materially, and the blood itself to receive a substance which caused it to coagulate more quickly when the animal was wounded. In other words, adrenalin better prepared the animal for fight or flight.

It seems a far cry from early Chinese and dogs to the modern polygraph and its uses in the detection of deception; yet these same observations form the basis for the measurement of those physical changes accompanying the emotions of fear of detection in the operation of the present-day polygraph.

It would be profitless in this article to follow step by step the research in the field of detection of deception. It is sufficient to say that the work of Marston, Larson, Burt, and Benussi early pointed the way and that the work of the writer and others has modified and improved the technique and greatly improved and simplified the equipment.

Trained Operator Necessary

The polygraph as an instrument is not a lie-detector in itself.¹ Rather, it is a diagnostic instrument for the detection of deception. As the physician's fever thermometer and stethoscope are diagnostic aids in discovering a patient's diseased condition, so the polygraph is an instrument or aid to the personnel consultant in his analysis of the subject's truthfulness. In the hands of a highly trained operator, the polygraph offers very reliable and extremely critical data for the separation of truth from falsehood. But, as in the case of the physician's diagnostic aids, the interpretation of the data is the important portion of the process. The careful training of the polygraph operator therefore is as important in the detection of deception as the exact training of the physician is in the field of medicine.

The common concept is that the lie-detector catches criminals; yet its most valuable use both in the police and commercial field is in the elimination of innocent persons. Time, money, and effort saved in narrowing down the limits of the investigation are considerable. To spare the feelings of innocent persons and consequently to preserve their good will are important and vital points when considering the use of the polygraph.

The Polygraph Solves a Case

Chief J.A. Greening of Berkeley likes to think of this device as an instrument which can quickly and accurately prove the innocence of people, particularly where some theft has been committed in a store, fraternity, sorority, rooming house, shop or other place where any number of people could be under suspicion. Usually, in matters of this kind, the logical conclusion is the correct conclusion as far as the people affected are concerned, so they immediately suspect

¹ The manufacturer of the recently improved Keeler Polygraph is the Associated Research, Inc.

the person who was the closest to the article or money taken or who most frequently entered or occupied the room in which the theft occurred. Chief Greening relates the following incident as an example of the use of the polygraph in clearing an innocent person.

Over a period of several months, various amounts of money and articles of jewelry were missed from sleeping rooms in a fraternity house. These were reported to a member of the fraternity who acted as house manager and traps were set by the students to catch the thief, whom they believed to be another student, a nonmember who was working his way through college by waiting on the table and making up the members' rooms. The traps were never sprung, but additional thefts took place while they were set. The group did not want to report it to the police, but finally the student worker himself had his watch stolen and he did report it to the police and also told about the other thefts. When the investigating officer arrived at the fraternity house, he was told by the house manager that the group suspected the student worker of merely reporting a theft from himself to cover up his own guilt. After talking to several other members, the police officer suggested that they all submit to the lie-detector test. All but three, including the house manager, who thought it was an outrage, agreed.

The first boy run was the student worker, and he ran a clear record indicating that he was innocent. The officer ran several more with negative results. Each time he made an appointment to run the group, the house manager, who set the time, had a class and could not be present. The officer became suspicious and the next time went up, unannounced, at dinner time, and was able to catch Mr. House Manager. After considerable stalling and boeing by his fraternity brothers, he submitted, and the detector registered guilt. He vigorously denied it. His fraternity brothers were incensed. They said the machine was a fake and refused to be convinced and the police were 'on the spot.' What to do? Three watches in addition to the student worker's watch had been stolen. We had, by this time, obtained the numbers of them and had begun checking pawn shops in this and nearby cities and located three of them. The description of the person pawning them, as recorded by the pawnbroker, fit the house manager fairly well. The names signed in each case were different but the initials were the same as the house manager's. The handwriting on the pawn books was compared with the suspect's and found to be identical.

The officer, realizing how difficult it was going to be to convince these youngsters that this was not some trick, induced two of the pawnbrokers who had bought the watches from the suspect to go with him to the fraternity house at dinner time for the purpose of pointing out the young man from whom they had bought the watches. When they arrived the boys were in the middle of their meal. When the officer and the pawnbrokers walked into the dining room, the suspect

The Lie-Detector Proves Its Usefulness

fainted, and they didn't have a chance to point him out. After he came to, he confessed and cleared up some other irregularities. The lie-detector was vindicated in the eyes of the students and an honest, hard-working young man got his watch back and was saved considerable embarrassment. The other students' losses were also taken care of, thanks to the polygraph.

Saving Time and Money

It is difficult to estimate the money saved for governmental agencies by the use of the polygraph in police investigations.² Lieutenant Harold Mulbar of the Michigan State Police estimates that the state of Michigan saved \$25,000 in trial cost alone by the use of the polygraph in 1938. During that year he tested 253 persons; of these, 69 confessed. 35 additional persons ran records indicating guilt, and 129 were cleared. It is evidence that Mulbar bases his estimates of the \$25,000 savings on the subsequently shortened trial and conviction of his 69 confessees. Still Mulbar does not mention the time, effort, and money saved as a result of the elimination of needless investigation of the 129 innocent.

In 1938 it was reported that Wichita had given 1,551 persons a total of 2,900 polygraph tests during the past year. Of this number, 1,163 were found to have clear records; 63 indicated deception; 221 confessed; 51 persons were prosecuted whose records indicated deception but who would not confess; and 15 records indicated insanity.

Other Uses of the Polygraph

The degree of community protection offered by the polygraph is certainly an important factor to be considered. A few years ago in Berkeley, California, an 11-year-old girl was raped by an unknown person. The only description of the rapist that could be given by the child was that he was attired in work clothes, similar to those worn by men working on a government relief project. The first 120 workers from a camp near the scene of the crime were given the polygraph test, none of whom gave reactions indicating guilt. The polygrams of the 121st denoted his guilt and, when his records were shown to him, he confessed. The time and effort necessary to clear this case by ordinary investigation procedure would have been long and arduous. Under the circumstances, the case would have been practically impossible to solve without the polygraph.

² The police departments using the polygraph service are: Berkeley, California; Chicago, Elgin, Evanston, and Wheaton, Illinois; Indianapolis, Indiana; Honolulu, Hawaii; Wichita, Kansas; Kansas City and St. Louis, Missouri; Buffalo, New York; Cincinnati, East Cleveland, and Toledo, Ohio; and San Antonio, Texas. The polygraph also is used by the United States Department of Justice and by the state police or other state agencies in Illinois, Indiana, Michigan, North Dakota, Pennsylvania, Rhode Island, and West Virginia.

It is common police experience that prominent citizens are sometimes charged with crimes by irresponsible persons or neurotic children. Frequently the crimes charged are of a sexual nature--an exceedingly serious type of charge to face. The polygraph test has again and again protected law-abiding citizens from just such situations by examining both the person charged and the one making the charge.

In Evanston, Illinois, and Wichita, Kansas, all applicants for police positions are required to take a polygraph test; in East Cleveland, Ohio, all applicants for civil service positions must submit to it. It has turned up many a criminal record and revealed otherwise undesirable backgrounds. The Chicago Park District Civil Service Commission examines policemen against whom a charge is placed or on whom suspicion is cast. The honest police officer welcomes the chance to exonerate himself of charges, and the public is protected from actions of irresponsible public servants.

The lie-detector has been found useful in locating stolen property; in testing fugitives from justice who are wanted elsewhere; in testing persons suspected of crimes who are found innocent but who have guilty knowledge and can be of aid in locating and convicting the actual offender; in checking on fictitious reports of burglaries, robberies, holdups, and other offenses made to the police to cover offenses made to the police to cover up defalcations and indiscretions; and in testing witnesses whose testimony is believed to be false, colored, prejudicial, or biased.

The polygraph has established itself as one of the most useful pieces of equipment owned by police departments. It is a saver of time and money, a formidable weapon against the criminal, a definite help in personnel work, and a force conducive to honesty among city employees.

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LEONARDE KEELER, A BIBLIOGRAPHY

Compiled by

Norman Ansley

Leonarde Keeler (1930, January-February). A method of detecting deception. *American Journal of Police Science*, 1(1), 38-52.

Leonarde Keeler (1930). Deception tests and the lie detector. *International Association for Identification Proceedings*, 16, 186-193.

Leonarde Keeler (1930, July-August). The canary murder case. The use of the detection test to determine guilt. *American Journal of Police Science*, 1(4), 381-386.

Leonarde Keeler (1931). Lie detection applications. In Donald C. Dilworth (Ed.) *Silent Witness*. Gaithersburg, Maryland: International Association of Chiefs of Police, 1977, pp. 184 [The Keeler article was reprinted from the 1931 *IACP Proceedings*.]

Leonarde Keeler (1932). How science solves crimes: The polygraph. *Hygeia*, 10(8), 740-7444.

Leonarde Keeler (1932, October 22). How science solves crime: The polygraph *Literary Digest*, 114, 22+.

Leonarde Keeler (1933, August). Scientific methods of crime detection with polygraph. *Kansas Bar Association Journal*, 12, 22-31.

Leonarde Keeler (1934, May-June). Debunking the lie detector. *American Journal of Police Science*, 25(1), 153-159.

Leonarde Keeler (1935, February 23). Catching criminals with the "lie detector." *Literary Digest*, 119, p. 17.

Leonarde Keeler (1936, September). Some modern trends in the detection of crime. Part I. *The Claim Investigator*, 6(8), 57-58, 62. Part II. *The Claim Investigator*, 6(9), 65.

Leonarde Keeler (1938). The detection of deception. In L. Keeler, C.W. Muelberger, L.M. Wilson, F.E. Inbau, K. Keeler, & M. E. O'Neill. *Outline of Scientific Criminal Investigation*. Chicago: Scientific Crime Detection Laboratory, Northwestern University School of Law. Ann Arbor, Michigan: Edwards Brothers, Inc. Reprinted in *Polygraph* (1976) 5(4), 293-302.

Leonarde Keeler (1939). Problems in the use of the "lie detector". *Police Yearbook 1938-1939*. Washington, D.C.: International Association of Chiefs of Police, pp. 136-142.

ARTICLES ABOUT LEONARDE KEELER

A BIBLIOGRAPHY

Compiled by

Janet Kay Pumphrey

"Comment on his lie detector." *New York Times*, January 13, 1935, VIII, 4:1.

"Criticizes lie detector." *New York Times*, August 30, 1938, 2:5.

"How good is any lie? Keeler Polygraph." H.F. Pringle. *Reader's Digest*, (November 1936), 29, 75-78.

"Lie Detection: Keeler Polygraph." F.E. Inbau. *Science Monthly*, (January 1935), 40, 81-87.

"Magic lie detector." A. Johnston. *Saturday Evening Post*, (April 15, 1944), 216, 9-11+; (April 22, 1944), 216, 26-7+; (April 29, 1944), 216, 20+.

"Obituary - Leonarde Keeler." *New York Times*, September 21, 1949, 31:3 [includes portrait]

"Obituary - Leonarde Keeler." *Newsweek*, October 3, 1949, 34, 60.

"Obituary - Leonarde Keeler." *Time*, October 3, 1949, 54, 65.

"Polygraph use reviewed." *New York Times*, July 28, 1935, IV, 11:3.

"Por. v. rev. of book: Science versus crime." *New York Times*, September 15, 1935, VI, 4:4.

"Scientific detection of lies; Keeler Polygraph." T.H. Jaycox. *Scientific American*, (June 1937), 156, 370-373.

"Wins medal for invention of lie detector." *New York Times*, January 21, 1933, 17:7.

* * * * *

Norman Ansley

Leonarde Keeler (1940). The lie detector proves its usefulness. *Public Management*, 22, 163-166.

Leonarde Keeler (1940, July). The lie detector proves its usefulness. *Pennsylvania Chiefs of Police Association Bulletin*, p. 19.

Leonarde Keeler (1949, March 15). The Theresa Foster rape-slaying. [letter-report].

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