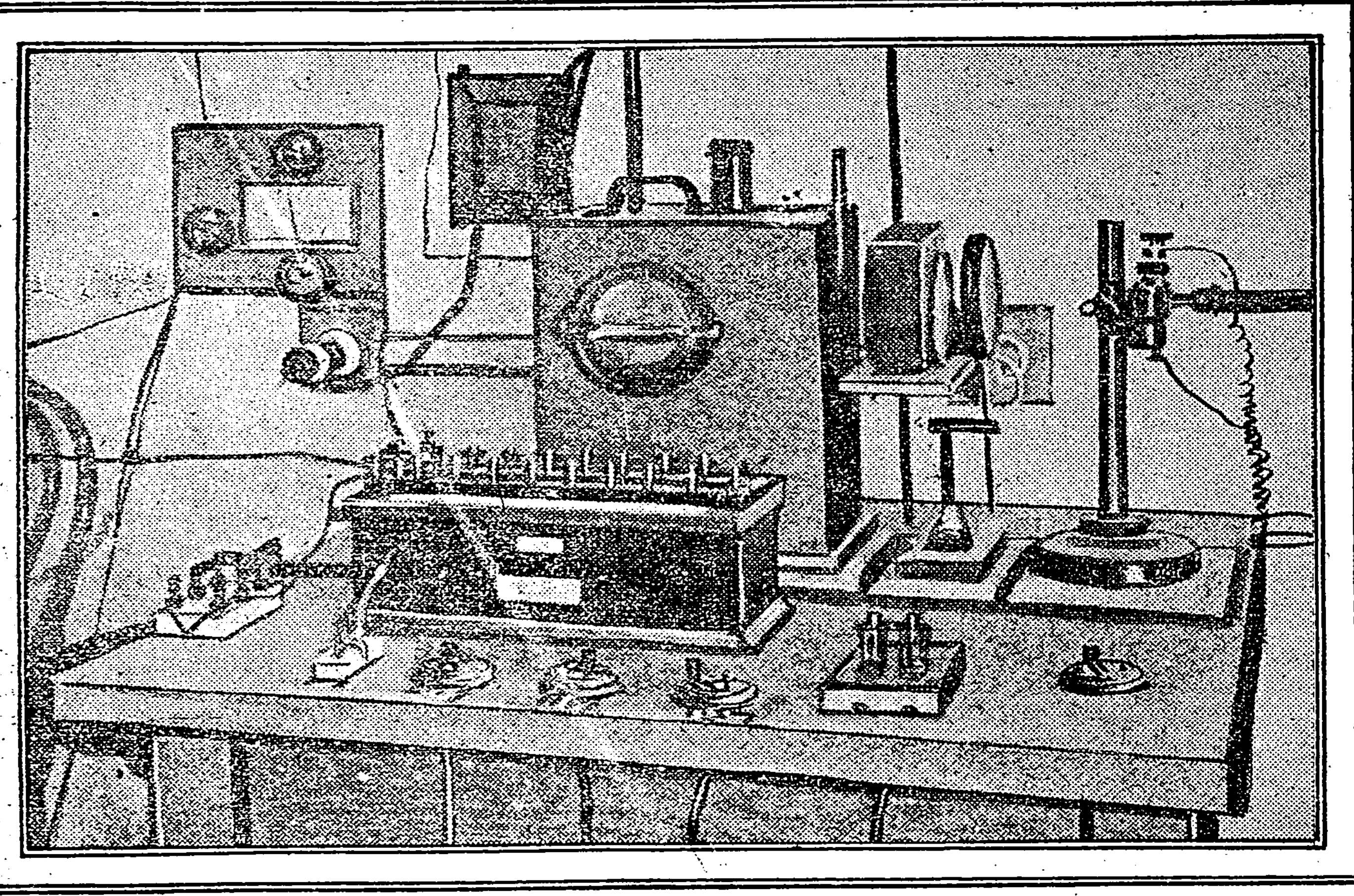
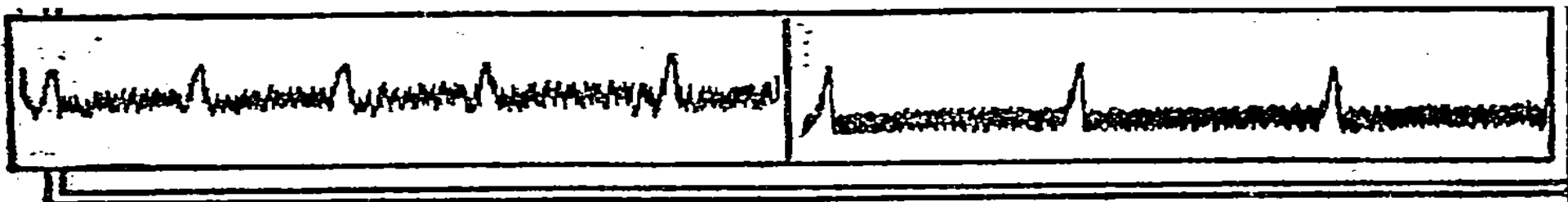


# CAN RECORD THE BEATING OF YOUR HEART MILES AWAY

## Delicate New Instrument Brought to This Country Accurately Registers Every Cardiac Motion—Test by Human Ear Will Be Supplanted.

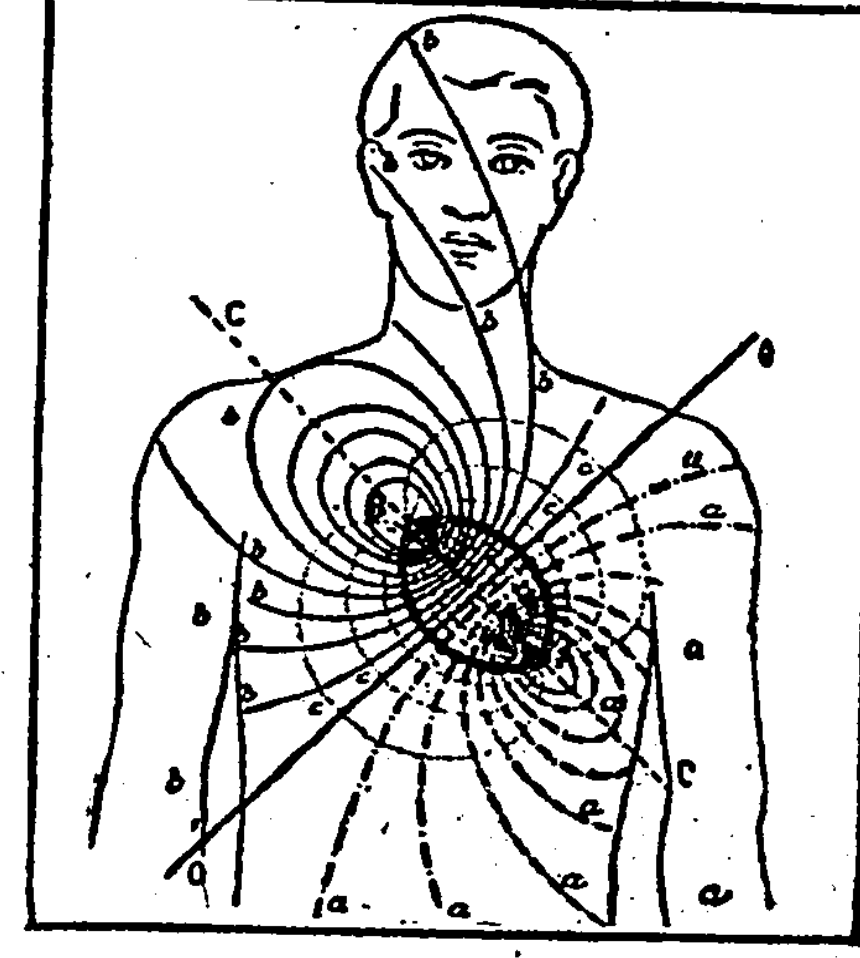


Enlarged View of Galvanometric Table of Station.



So-called Splintering of the Curve in Electrocardiogram with Loss of T Wave in Myocardial Disease.

moved, no matter how infinitesimally small its movements were. And what makes the scope of the development of the



Distribution of Electricity from the Heart on the Surface of the Body.

University Hospital, in Baltimore, Dr. Llewellyn F. Barker, Dr. Arthur H. Hirschfelder, and Dr. George S. Bond, the three scientists who are in charge of the "heart station," are about one ordinary city block removed from the ward occupied by the patients whose hearts they are studying.

The laboratory is in the basement of the big building and contains the string galvanometer and its accompanying apparatus of lights and wires, electro-magnets and switches, photographic camera and dark room for the development of the pictures produced.

Up stairs in the great sunny ward, where the patients are to be found, are the other ends of the electrical wires. These wires are attached to such patients as the physicians desire to examine when they are ready for their experiments, and the same photographic camera that produces the pictures of the heart waves also automatically numbers the films taken, so that the negatives become a permanent record of the individuals' heart health. Thus

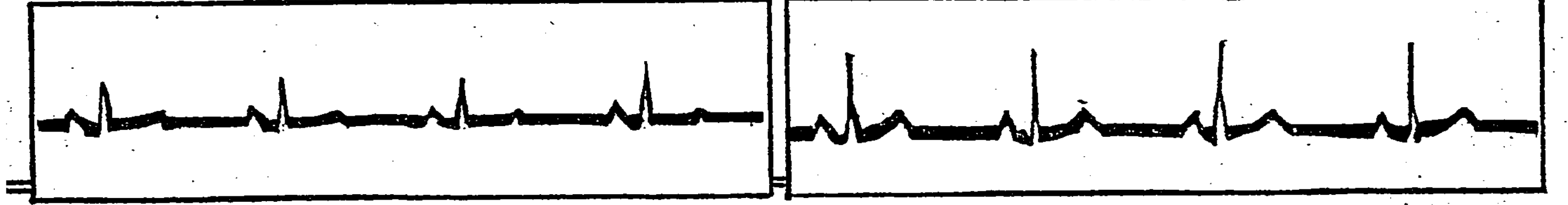
place between the light and the camera. The faintest breath of air circulating in the room will break them, so before beginning work here I always shut the doors and cover my mouth and nose with a cloth, to prevent my own breath from starting a devastating wave. Every portion of the apparatus must be absolutely in position. First, they must all be leveled with a spirit level, and then adjusted so that the light shall pass through the lenses and over the platinum thread without the variation of a thousandth part of an inch. To accomplish this I sight through a number of pinholes from the are light, through the microscopes over the platinum thread and to the camera.

"The photographic film that takes the heart impressions is 200 feet long, and is revolved by a little motor, so in some respects it resembles the ordinary moving-picture camera. As a rule we do not use more than a few inches of film on each patient at a test, and as we finish taking each set of impressions, cut the

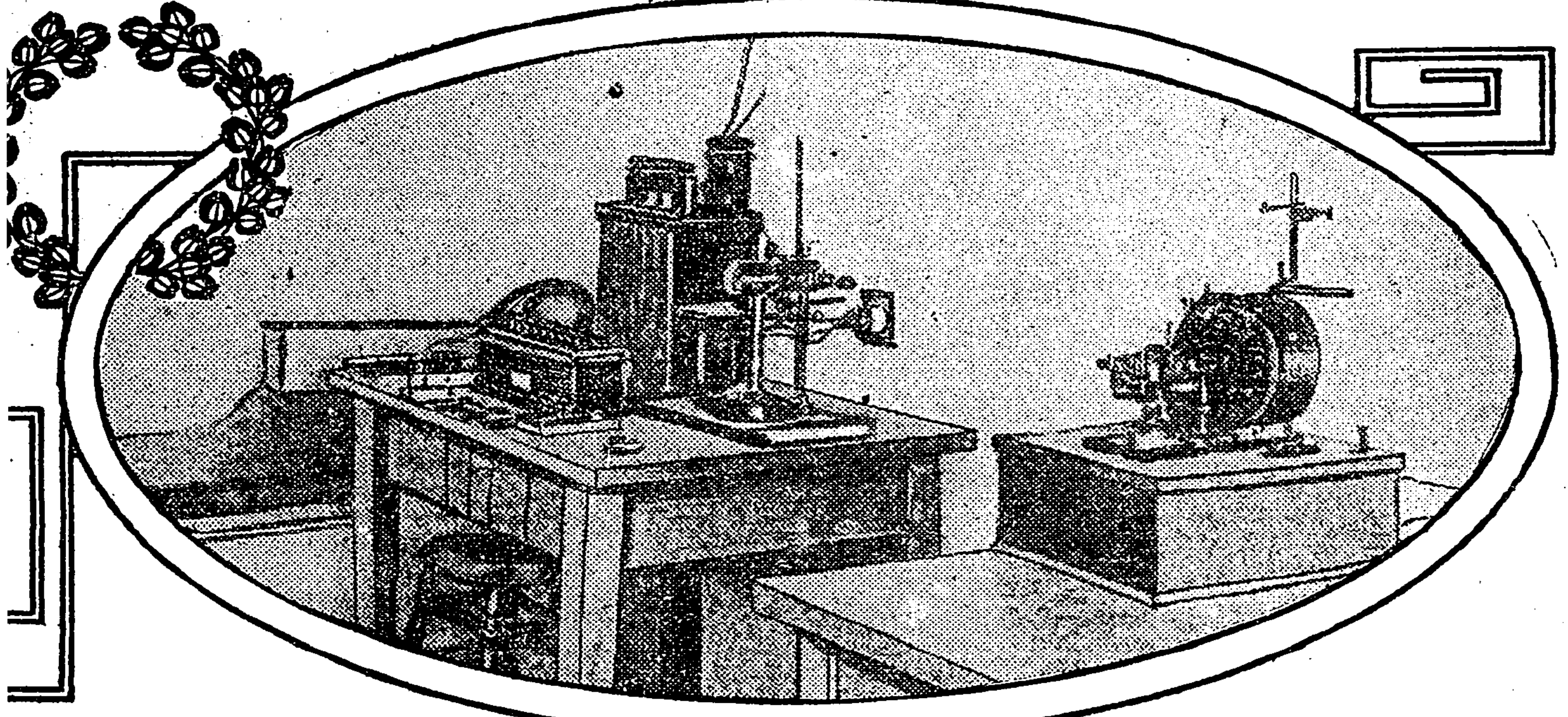
den laid wires from his laboratory to the Loyola Hospital, a distance of a mile or more, and took tracings from patients with good results. Of course, where the patient is very distant from the instruments induced currents en route might interfere with the perfect behavior of the apparatus.

"Among the "clinical conditions"—which by the by, is a polite way the physicians have of referring to the various diseases which afflict our poor flesh—in which the electro-cardiograms have been studied are mentioned: hypertrophy of the atria in mitral stenosis; hypertrophy of the right ventricle; hypertrophy of the left ventricle; ventricular extrasystoles; the tachycardia of exophthalmic goiter; heart block cases; congenital heart disease; atrial paralysis; gallop rhythms; and paroxysmal tachycardias.

In addition to experiments with human beings and man's best friend, the dog, the scientists have utilized the string galvanometer to produce pictures of heart beats from different creatures. Until this



If Your Heart Makes Tracings Like These It Is Normal.



Another View of Heart Station.

day by day or month by month a record can be made and the progress of whatever disease is being studied may be kept.

Dr. Einthoven's little thread of platinum, which is the sensitive recorder in the apparatus, is stretched vertically between two powerful electro magnets, yet so delicately is it poised that a wave of thought will almost cause it to swing back and forth. It is marvelously sensitive to electrical impulses, and is so placed that one-three-thousandth of a volt of electricity that comes from the patient in the ward can be followed in its footbeats. Weak as is the voltage from the patient's heart, it is strong enough to cause that minute thread to sway back and forth, and as it sways it is photographed upon a continuous film. To get the picture it is necessary, of course, to magnify the thread a great many hundreds of times before its shadow is thrown upon the paper. This is accomplished by placing the platinum filament in front of a powerful microscope.

"Any one who thinks that the handling of these films is not a ticklish and delicate job is badly mistaken," remarked Dr. Bond, who set up a "heart station" at Johns Hopkins. "I frequently break three or four of them before I get one in

film off. Before it is cut off from the roll, however, it is given a number automatically, so we can make it part of our permanent record.

"The entire cost of our 'heart station' has probably been in the neighborhood of \$1,500. The same apparatus, however, would cost the ordinary individual a great deal more, for he would be obliged to pay duty on the pieces of mechanism imported. We did not pay any duty, of course, as we are exempted under the law.

"In his experiments along this line Dr. Einthoven, as well as the others who have followed in his footsteps, has had recourse to some extent to vivisection, the dog being most frequently used. As an aid to diagnosis we regard it as a very valuable discovery indeed, and hope to accomplish a great deal of good through the use of the galvanometer.

"The fact that it can be stationed at a considerable distance from the patient is likely to be very beneficial at times. A patient with serious cardiac trouble might be too ill to be removed from the ward to the 'heart station. Again, there might be instances where an electro-cardiographic station might be set up at a considerable distance from the hospital where a record was wanted. Dr. Einthoven in Ley-

den apparatus was used no one knew, for instance, how often the hearts of birds ordinarily beat. A hen's heart beats 270 to the minute; a gold finch's 300 to 325; the sparrow's 745 to 850; pigeon's 141 to 225, and the green finch's 170 to 210.

"The exact position of the heart in the body can also be ascertained by the electro-cardiograph, as the height of the waves produced, shows where the heart's axis is located. You often hear the expression, "So and so's heart is in the right place," but unless the person who makes that statement has taken an electro-cardiogram of the heart talked about, he really doesn't know whereof he speaks. The hearts of individuals, like their thoughts, often wander about.

"At the same time that American and Continental scientists are experimenting with the electro-cardiograph, to write the beats of the heart, the physicians of the London Hospital are going ahead with a long distance telephonic apparatus for the transmission of the heart's "thumps." By means of this instrument physicians on the Isle of Wight have distinctly heard the heart sounds produced by a person in London—a distance of more than 100 miles.

**H**ELLO! Is this Heart Station No. 1,000?"

"Yes; who is this and what will you have?"

"This is John Smith. Just hitch me up to your apparatus, take an electro-cardiogram, diagnose my case, and send me a prescription. I really haven't time to go around and see you. Thanks. Good-bye."

The patient pauses in his business rush long enough to attach his right arm and left leg to the wonderful electric machine with which his office, like all other up-to-date establishments, is equipped. The operator at the Heart Station takes the photograph of his heart action in a jiffy, and Mr. Smith goes back to his work.

In a few hours, or as soon as the heart expert has had time to examine the cardiogram he has taken, Mr. Smith receives the scientist's diagnosis and knows whether the symptoms he has been experiencing are merely the temporary effects of some undue excitement he has recently undergone or are the more serious manifestations of some dreaded heart affection that will end his days unless he mends his steps and places himself under the physician's care.

Such, in brief, may be the way our children and grandchildren will order physicians to examine their hearts when those important little pumps get out of kilter, for, with the aid of the marvelous electro-cardiograph, that is now a practical success, the doctor can examine his patients and accurately diagnose their cases when miles removed from their presence.

Not only that, but the diagnosis they reach—with the aid of this instrument, when they cannot even see or hear their patient, is far better than that determined upon by the old methods of personal examination. The old way depended for its success or failure upon the ears and judgment of the physician; the new way is absolutely accurate and truthful, for the photographic lens makes the record upon a film which tells the story of health or disease, and there can be no guesswork or doubt as to the decision reached.

Two "heart stations" are now equipped for business on this continent, one in the laboratory of Dr. Walter B. James of the Presbyterian Hospital, New York City, and the other at Johns Hopkins University Hospital in Baltimore.

almost all branches of industry, the workmen of the United States have not been able to make the most delicate instruments used in the sciences.

If there is anything more delicate than the chief recording instrument of the little machine used in the "heart station"—Dr. Einthoven's string galvanometer as it is known to the scientists—it must be small and fragile indeed.

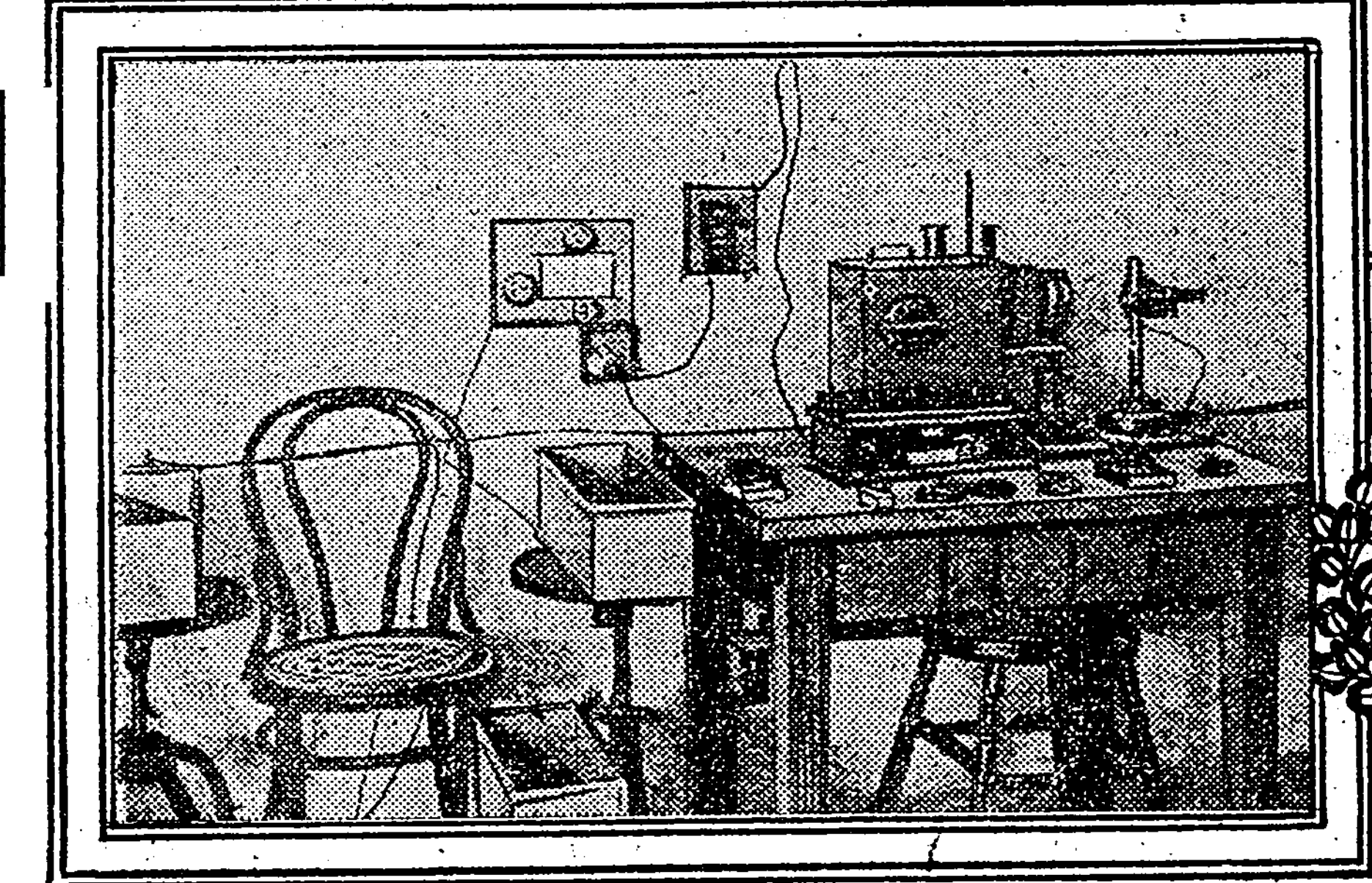
That part of the mechanism which first receives the impressions and in its turn records them on the photographic film is a thread of quartz or of platinum one twelve-thousandth of an inch in thickness. "Imagine the finest cobweb strand you ever saw, and then imagine a string only a hundredth as thick as that, and you have an idea of Einthoven's string galvanometer." is the way Dr. George S. Bond of Johns Hopkins describes the fairy thread with which he is experimenting.

But before Dr. Einthoven of Leyden, Holland, constructed his galvanometer and made the electro-cardiograph possible, he had to go back a century and make his bow to Galvani, who was the first to announce the existence of animal electricity.

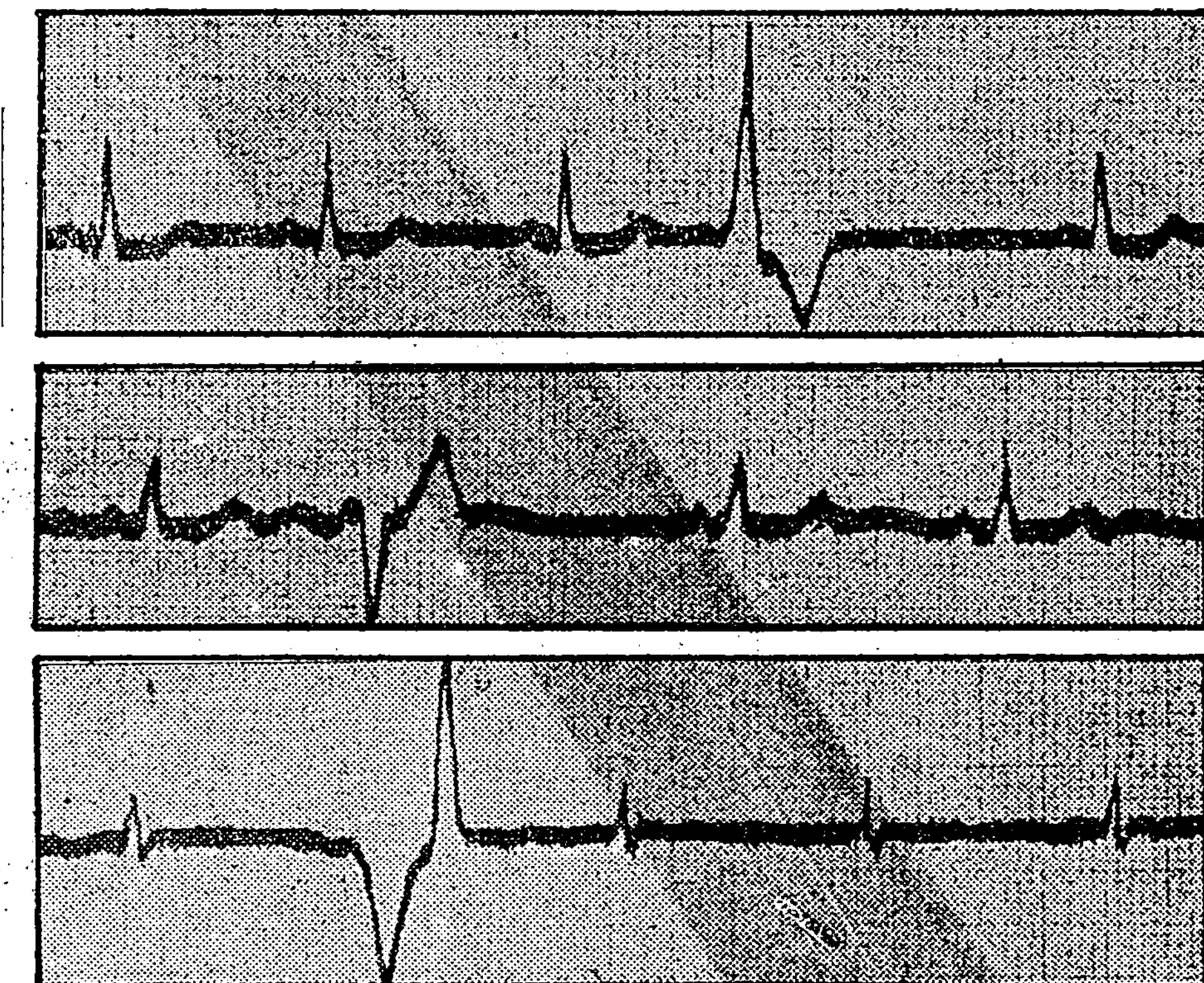
Not only did he agree with Galvani that the human body is just as truly an electrical machine as a dynamo in a modern power house but by his apparatus he proceeded to measure the exact amount of mysterious "juice" the human heart produces.

Your heart, if you are an average adult with an average heart, makes about one-three-thousandth of a volt of electricity at every beat. It would take the simultaneous heart beats of 220,000 men to make an ordinary incandescent electric light, or of some 2,000,000 men to create current enough to run an electric car. So the gentlemen who are in control of the lighting and transportation concerns need not lie awake nights worrying about the approach of that day when every man will become his own electric light and power plant.

When Einthoven set about photographing the electric waves from the human heart he started a new line of research. All previous measurements of the heart had been directed toward the "thumps" heaped by the organ on the blood that it pumped through the arteries. Such recording instruments as had been used upon the pulse, for instance, merely reg-



View of Heart Station in Medical Clinic of Johns Hopkins Hospital.



These Three Diagrams Show an Extrasystole or Atypical Heart Contraction.

istered the pressure of the blood at the point of contact with the instrument.

Einthoven and his American workers, with the string galvanometer, proceeded to measure the electrical waves sent out by the heart, and by so doing found that they could get an absolutely accurate and exact report from the organ every time it

discovery so far-reaching, they found that the electric wire would tell the story from any distance, just as it does when it leaps from New York to San Francisco to inform Mr. John Jones that John Jones, Jr., has presented his first tooth to an admiring world.

In the laboratory of the Johns Hopkins

# IN "BOUNDER-LAND," WHERE SMALL TIPS ARE USUALLY SCORNE

## Some Pertinent Reflections on a Great American Custom as Casually Described by an Experienced Diner-out.

**A**BOUT every so often some free American citizen breaks into print, usually in the small type portion of the editorial page of THE NEW YORK TIMES, and rages over the scornful attitude of the tipped waiter. Sometimes a vein of intense sorrow threads his tale, sometimes he rhapsodizes in anger, and sometimes he lifts his hands and howls a plain howl, but the purport of the thing is always the same—this wicked, sinful, un-American system of tips must stop! And, sure enough, the very next day all tipping stops. You may have noticed how it stops.

Most often the story of the scornful waiter is something like this: "I and a friend were dining at the Golden Spoon last night. My check came to \$2.45, and when my waiter brought me my change I laid a fifty-cent piece on his tray. This I meant to be his tip. It was all for him. I relinquished all claim to that fifty-cent piece and gave it to him. It was his, from then onward, without let or hindrance. I gave it in the most generous Christian spirit. I was thinking no evil. I simply laid the fifty-cent piece on his tray, and then lay back in my chair to see the glad smile of joy flash over his countenance. But no! Instead of evincing any sense of joy that waiter pushed that fifty-cent piece toward me, and said, in utter scorn: "'Say, I guess you need that more than I do.' Now what do you think of that?"

Did I not know waiters so well, my first impression would be that that half dollar was a lead Canadian coin, placed in three places. If any one gave you a coin of that kind, accompanying it with the air of a deprecatingly conferred freedom on a deservingly slave, you, too, would be scornful. But, knowing waiters, I cannot refuse to believe that that waiter was dissatisfied with an excellent fifty-cent piece. The truth forces itself upon me. That over-tipped waiter had expected a dollar, or two dollars, or ten dollars, or a thousand dollars. Heaven only knows what he expected. The waiter himself does not know, and that is why a tip is so often a shock to a waiter, over-coming his placidity by its smallness or greatness. But it is noted that the greatness of a tip does not, usually, cause the waiter to faint. An average New York waiter can stand quite an inflated

tip without uttering cries of pain. He is stoical up to ten dollars; above that he sometimes loses control of himself that he smiles a pale, thin smile.

There is always something in that dear old story of the man who has his fifty-cent piece shoved back at him that causes thought. One is that he always receives the rebuff at dinner, never at luncheon or breakfast. The other is that he writes about it.

If I am in the habit of dining at the Gilded Caf6 Hotel and a waiter insults me in any way, whether by pouring hot soup down my collar or by pushing back good half-dollars at me with scorn, I do not write to a newspaper. I do not go into public convulsions. I hit a thin, artistic finger and make the slightest beckoning motion to the lordly head waiter. I say three words about the naughty waiter, and never again does that waiter dare approach me without kneeling and knocking his forehead three times on the floor. I can give that waiter a penny after that, and he will take it.

That is if, I say, I am in the habit of dining at the Gilded Caf6 Hotel. As a matter of fact, if I am in the habit of dining there the waiter never pushes back my half-dollar. I am in a way his steady income. I am his gold bond, and he does not expect a high rate of interest from me. He gives me good service, and the tip is his just reward. There is nothing in the menu that says I am to have ten glasses of water and eight pats of butter, but I have had them. For the hour he has been an employee of the hotel he has to me.

But suppose I enter the Gilded Caf6 Hotel followed by my friend and our wives—or other wives—or two ladies who are no one's wives yet. At the door we stop and look over the brilliant dining room. We see aristocracy and wealth and the great in it. Only we don't! What we see is a crowd of bouncers. Here and there may be a few real ones, but they are few. The head waiter can smell the moth balls on my unaccompanied dress suit at forty rods. The common waiter knows us as far as he can see us. We are few. The head waiter can smell out. It is our monthly spree of spending more than we can afford—the one great New York diversion. It is our night

of spreading it on thick. For this one night we are doing the millionaire act. And we talk to the waiter in that tone of voice, when we get him. Oh, joy! We are bounding among the real bouncers.

Noblesse oblige. The real bouncer, at the close of his meal, shows his bounciness by dropping a two-dollar bill on the waiter's tray with the air of a careless Prince. All bouncers do it. And our poor waiter, who knows us to be of that class for the moment, when he receives our paltry 50 cents is ashamed for us. He knows we are not living up to good bouncers. Not to insult us, therefore, and not because he does not want the money, but to protect the laws and customs of bouncerland, he rebukes us. And then, in all likelihood, turns away and takes a 25-cent tip from a regular patron and hands him a smile of thanks. When a bouncer is in bouncerland he must do as bouncers do. If he so far forgets the duty of his caste as to write to the paper about the surly waiter he deserves never to be permitted to bound again. He should be compelled to eat forever at his usual 40-cent hash house.

There was a St. Louis hotel where 50-cent breakfasts were served, and the waiters were negroes. In that dining room a 5-cent tip would bring the most Chesterfieldian bow and most appealing smile. But I never enjoyed them. They were nothing but a survival of the slavish servitude of before-the-war days. A free-born American citizen should be made of sterner stuff. To smile and bow for 5 cents is the roughest kind of hypocrisy. No man can be thrilled to his inmost nature and stirred to undying gratitude by a nickel. Man's nobler nature should speak in his actions, and the waiter that takes a 5-cent tip with eye-

dences of hysterical joy is lying; he is debasing his better self; he is selling his bright independence for a mess of pottage. We should be ashamed of that sort of citizen.

The greatest objection to the tipping system (I have read this) is that it tends to lower and debase the tiptaker. It makes a cringing lackey of him; a grinning semblance of a man. For that reason we should halt the waiter that pushes the 50-cent piece away with scorn as a splendid waiter type. Each time he asserts his manhood and refuses a large tip he is upbuilding his character. Often I give a waiter an insufficient tip merely to carry forward the good work of upbuilding the waiter's character. If all of us did this we would in time have a race of waiters so upbilled that every member of it would arise in scorn and push back every tip. Then tipping would be an act of virtue, like giving up tobacco or sending zinc tooth combs to the heathen.

The custom of tipping arose when the middle class of Europe usurped the eats and drinks and doings of the nobility. To the nobility all were servile, but the middle class required an evidence of servility to tickle their vanity, and they gave tips. In Europe, the tips which caused so much consternation among American voyagers at first, is no longer a thing to dread. It is reckoned a part of the daily expense; it can almost be demanded legally. The cost of a thing is not the list price; it is the list price plus the tip.

Many barbers in Paris do not take tips; they so announce in a placard prominently posted in their shops, but in those shops a shave or a haircut costs the usual price plus the usual tip. Wages are based on the tip system, and a man is paid what the job is worth, and what

he should normally receive in tips. In some of the bouncer eating places the waiter pays for the privilege of holding the job, paying a regular sum to the management, for he can afford to do so out of his tips.

This is all well enough. Time and custom have regulated the system until it is no more unjust or objectionable than any wage system. That we Americans, while abroad, are made to rob ourselves in giving larger tips than are given by the natives is merely because we are regarded as a nation of bouncers, and made to pay the bouncer grade of tips. And there can be no doubt that our method of giving tips here at home justifies the belief that we begin to bound the moment we leave our private environs.

The worst feature of the tip in America is not the large amount of it. It is that the tip is un-American. It is that, by the way we give tips, and by the amount we give, we show only too plainly that we are trying to be what we are not. We are attempting to make of ourselves for the moment an upper class. I enter a restaurant and call the waiter. He is merely a workman, doing his own particular work, just as my banker does his work or my coal man does his. I do not give the tip in order to assure myself better service than another patron may receive. If so I would give the tip before the meal. I eat. I drink. I order the waiter to do thus and so.

When the meal is finished I have managed to make myself believe that this man that has been attending to his business in some way my slave, and I open my hand and give him a beggar's blessing-money. I do not give it, as it is given in France, as a recognized wage. I give it as a blatant evidence of my lordly generosity. I lose my purse to the

slave, so to speak. And the slave, who has a home and wife and perhaps children, and who knows that money means comfort, takes it. He knows I am bounding along merrily, and that if he does not get my money some other man—or woman—will. If he does not know this he would take the tip anyway, because he could hardly live on his wage, unsupported by tips.

The whole trouble is that the American (the moment he enters a showy eating place or a showy sleeping car or any showy place wants to be showy himself. He wants to be the slowest thing in sight. He can't eat much more than he can comfortably hold, and his only outlet is to give a foolish tip to the waiter. He cannot make the other eaters or sleepers think he is their superior; because they, too, are eating or sleeping in the same place. He cannot impress the management of the restaurant or the conductor of the sleeping car; they are used to having people in this place; it is their daily experience. But the waiter! Ah! We will stun the waiter! We will give the waiter such a gratuity that he will think we are at least a second cousin to Rockefeller in wealth and a brother to Charlie Schwab in free-handedness. The only trouble is that every other bouncer does the same thing. The waiter is hardened to it, and he is not at all furred by big tips. He is only jarred when the bouncer has eaten in the bounding place and then refuses to bound tipping.

The trouble is not with the waiter. No amount of waitorial grouch can make the man who tips low reverse his system and tip normal and received with at least placidity by the waiter. In the bounding places, at dinner or after-theatre supper hours, 10 per cent is scorned. Ten per cent is merely theoretical; in actual practice it does not work. Where the food served is the barest sustenance no tip is expected; where the food served is the normal eating of a well-to-do man, 10 per cent is not far amiss; but where the bouncer congregates to be showy, the tip must be showy, too. It is useless to say that 10 per cent, on invested money is more than a normal interest return. Tips have nothing to do with investments.

Somewhere, and somehow, the idea has started that 10 per cent of the bill for served food is the proper normal tip. This is one of the quaintest superstitions of modern days. If we go into a hash-house and have a cup of coffee and a piece of pie for 10 cents, we do not give the waiter a copper cent piece on the theory that 10 per cent of our bill is a legalized tip. We do not give the waiter anything at all, and he does not expect anything. If we believed as firmly as we pretend that 10 per cent is a sort of holy tipping amount we should give that waiter his cent.

But if we go into an ordinary hotel, or even a bounding place, at breakfast or luncheon time, we find the 10 per cent tip normal and received with at least placidity by the waiter. In the bounding places, at dinner or after-theatre supper hours, 10 per cent is scorned. Ten per cent is merely theoretical; in actual practice it does not work. Where the food served is the barest sustenance no tip is expected; where the food served is the normal eating of a well-to-do man, 10 per cent is not far amiss; but where the bouncer congregates to be showy, the tip must be showy, too. It is useless to say that 10 per cent, on invested money is more than a normal interest return. Tips have nothing to do with investments.

We should not be too harsh in our judgment of the waiter. Think of the crustal suspense he must be under during a meal when his customer is a generous-looking man with a rather shabby dress coat. How his pulse must vibrate between hope that the tip will come up to the generous look and fear that it will fall to the shabbiness of the coat! I would not be a waiter for all the tips. I could not stand the anxiety, and if I had captured a generous-looking man of the real bouncer type and after my most servile waiting that man had pushed a half dollar sneakingly toward me, I, too, would reflect it with scorn. It might be the emotion of the moment; it might be indignation from inhaling the fumes of hot food; it might be inborn cussedness; but I would make that man know that the bouncer has some duties he cannot escape. A man cannot bound without incurring the penalty.