

of the heart and pulse, in disease, would far exceed the limited time at our disposal this evening, I shall confine my remarks entirely to the indications which have been made apparent by this instrument.

It is evident that few of the characters of a pulsation, occupying, as it does, but the 70th part of a minute, can be ascertained by the sense of touch alone.

This fact has been appreciated by Physiologists; and within the last few years, in order to accurately study this important subject, several instruments for registering the impulse felt by the arterial system have been constructed, to enable us to accurately analyze the dilatation or movements of the vessels.

The Sphygmograph of Marey is an apparatus of this kind, securely fixed upon the forearm, so that the spring is directly over the radial artery. The movements of the pulse are transmitted to a long and light wooden lever, and registered upon a plane surface, which is moved at a known rate by clock work.

THE PULSE.

The pulse is the sensation given to the finger by a change in the pressure to which an artery is subjected during a revolution of the heart.

Numerous theories have been proposed, from time to time, to explain this phenomenon. M. Flourens attributed it to the dilatation of the artery; but this theory is not sufficient, for the dilatation which takes place in an artery is extremely slight, and this is proved, beyond doubt, by applying the finger lightly on a denuded vessel. When no pulsation will be perceived, unless the pressure is increased; neither is the elongation of an artery the cause of the pulse—for this is a phenomenon synchronous with pulsation, but not the cause of it.

But the real cause of the pulse is a change, an augmentation of pressure, due to the systole of the ventricle.

Let us see what takes place by a change of pressure, as shown by experiments made by such instruments as the Manometer and Cardiometer.

The cardiometers of Bernard and Magendie are both good, and give excellent indications of the action of the vessels, as well also as that of Buisson; nevertheless M. Cheveau thinks that

they may prove a source of error by exaggerating the dichrotism; and to avoid this inconvenience he produces a narrowing at the point where the reservoir is in communication with the tube of the indicator.

By this means the mercury finds its level more slowly, and is less subjected to oscillations.—When these instruments are applied to various arteries in man, it is found that the mean pressure on the mercury is equivalent to 12 centimetres. When the manometer is applied, you find in the first place a rapid ascension of the mercury, which rises to 12 centimetres, and in the horse to 20 centimetres. Then (in the horse) the column descends in one stroke to 15; here a slight oscillation, sometimes a little jerk or jump, takes place, which causes the mercury to rise, after which it descends to 13, to begin again a new revolution.

The sudden ascension of the mercury denotes the systole of the ventricle; and it rises higher in proportion as the arterial tension is less strong; therefore, to the theory of M. Harvey, the amplitude or fulness of the pulse is in inverse ratio to the tension of the artery.

The descent of the mercurial column coincides with the diastole of the heart, and the moment of arrest, with the closure of the sigmoid valves, which produces the phenomenon of dichrotism; and this has been abundantly proved by the researches of M. M. Buisson and Marey.

THE THEORY OF DICHROTISM.

M. Marey attempted to explain it by supposing it to arise from the shock produced by the column of blood striking the bifurcation of the iliac arteries and returned by the same means to the heart, but, afterwards having discovered the same action in the femoral arteries, he admitted that dichrotism is produced by the closure of the sigmoid valves, which produces throughout the whole arterial system a momentary lessening or decrease of the tension.

Dichrotism exists in the healthy and normal condition of the heart, and if it is not perceptible to the finger of the observer, it is because the sense of touch in the finger is not sufficiently fine to perceive a sensation so faint and evanescent.

In certain pathological conditions it is increased, and then it is appreciable by a practised