

TURKISH TIME-PIECES.

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MANY years ago I ventured the opinion that the development of the mechanical clock was hindered for many centuries by the general use of the Roman system of hours. I am more than ever convinced of this. It is perfectly well known that prior to the Christian era trains of gearing and other mechanical expedients were in use whereby the hand of a clock could be made to travel with uniform motion on a dial. There was, to be sure, no true mechanical escapement, but Ctesibius had devised what I venture to call a water escapement, which, under certain restricted conditions, performed the true function of that element of the modern clock. But the ingenuity of the times was not adequate to the production of the varying movement necessary to keep time in a system in which the length of the hours was constantly changing; and so the clock waited many centuries until the system of hours was changed.

This subject has been brought quite forcibly to my mind by coming into the possession of a number of German and Swiss patents for clocks designed to keep Turkish time. It appears from the specifications that the Turkish system of hours is practically identical with that of ancient Rome, the day commencing and ending with sunrise, and the middle being at sunset, the two periods of day and night being divided into six hours each, which constantly vary in length with the change of season.

It is obviously impracticable to make up a railroad time-table on such a system, or to accommodate it to numerous other requirements of modern social life; and therefore the wonder is that anybody should think it worth while to construct a clock adapted to this system; but, as the patentees are in all cases residents of Constantinople, it may be inferred that, in devising these clocks, they are endeavoring to minister to a felt want of that capital.

The device employed is of the same character in all the patents, though in some automatic, in others requiring frequent attention. It consists in so adjusting the governing member (pendulum or balance-wheel) as to give it a faster or slower rate from month to month; that is to say, in the winter months, when the period from sunrise to sunset is short, to quicken the action of the movement so that the hand shall pass in proportionately less time over that portion of the dial which represents the hours of daylight than it does in summer, when the days are long. It is obvious at once that this does not accomplish the purpose sought for, and the inference is natural that in the German and Swiss Patent Offices the question of utility cannot have been raised on these applications. If the pendulum is adjusted to a slow beat in the month of June, when the hours from sunrise to sunset are long, it might measure time during the day, but that same slow beat will destroy its capability of measuring off the short hours of the night. A parallel statement is true for the month of December. For this reason these inventions are useless, though they may serve the purpose of the patentees by imposing on the credulous Moslem.

It does not seem impossible in the present state of the arts to construct a time-piece capable of marking off this kind of hours with reasonable precision. The exactness of an astronomical clock or even of an ordinary kitchen clock would be unnecessary. But the inventions above referred to do not approach a solution of the problem, the key to which is to be found in a clock presented to this Government by that of Japan at the close of the Centennial Exposition. In this the hand moves around the dial at a uniform rate throughout the year, the adjustment for different seasons being accomplished by shifting the figures on the dial. It is many years since I have seen this clock, but, as I recollect it, the top of the dial represents sunrise and the bottom sunset, the half-circumference on each side being divided into five hours by a set of figures which can be shifted in place as the seasons change so as to make the day hours long and the night hours short, and *vice versa*, the sunset hour being shifted also.

I see no great difficulty in producing this shifting of the sunset hour automatically to the right or left as the season may require, nor does it appear to me insurmountable to connect the intermediate hours with the sunset hour so that they shall be shifted proportionately with it. With such a contrivance an hour-hand

moving at an equal rate over the dial would point to the true hour by Turkish time at all seasons of the year, day and night. In fact, the problem seems to me so easy of solution that I can only explain the non-appearance of such clocks in the market by the supposition that no actual demand exists for them.

NOTES UPON THE ACTION OF DRUGS AND AGENCIES UPON THE RESPIRATORY MOVEMENTS.

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THE results of a research which I have recently completed in the laboratories of the University of Pennsylvania, although bearing very directly upon practical medicine, have, I think, sufficient scientific interest to be noted in the columns of *Science*.

Hitherto, the study of the action of agencies and drugs upon respiration has been made chiefly, if not solely, by noticing their effects upon the rate of respiratory movements. It is evident, however, that increased activity of rate does not necessarily imply increased activity of function, since the respirations, though more frequently repeated, may be so shallow as to have little effect. Aided by Dr. David Černa, now of the University of Texas, I have measured the amount of air taken in and out of the lungs of the dog under different conditions.

Emotional or nervous excitement was found to be a most potent agency; the dog seemingly expressing his feelings in his respiration as completely as a human being expresses his in his face; so that during excitement more than twice as much air is moved as during quiet. It has long been known that the dog, having practically no sweat-glands, cools himself through the respiration; and so it was found that heating the animal, by such arrangement of apparatus as not to cause pain, nor to bring hot air in contact with the lungs, nearly doubled the respiratory movement of air. Heat, therefore, is to the dog a powerful respiratory stimulant; when in excess, however, it depresses function, as it was found that if the heating were continued the air movement became almost null. The rapid respiration seen in human beings suffering from fever, indicates that they are affected by heat similarly to the dog.

Chloral was found to be a more positive, persistent, and certain respiratory depressant than the morphine salts; it always reduced the air movement, and the reduction, with repeated and increasing doses of chloral, was progressive, until finally respiration was completely arrested.

The actions of atropine, cocaine, and strychnine were studied both in the normal and in the chloralized dog. Each of these alkaloids was found to be a powerful respiratory stimulant, increasing most markedly the air movement. The rather unexpected result was reached that cocaine is probably the most powerful of the three, but that strychnine is the most persistent and certain in its action. Thus, whilst cocaine seemed to be almost powerless against overwhelming doses of chloral, the influence of strychnine never failed to be manifested.

The bearing of this research upon practical medicine is very evident. During the experimental preparation for my address before the Berlin Medical Congress in 1890, I discovered the great power of strychnine over the respiratory centres when almost completely paralyzed by chloroform or ether; a discovery which led to the universal practical use of strychnine in the treatment of the accidents of anæsthesia. Atropine has long been used in narcotic poisoning, but its value as a respiratory stimulant within the last year or two has been very seriously challenged. Our research, however, re-demonstrated its power as a respiratory stimulant. Cocaine has been used to some extent as a respiratory stimulant, but it seems to be much more efficacious than is generally thought. It was found in our research that in the deeply chloralized dog, after respiration had been brought up as far as possible by one respiratory stimulant, the second stimulant was able to still further increase the extent and power of the respiratory movements. I have apparently saved human life in respiratory failure, by adding cocaine to the strychnine which was being given in as large dose as was thought justifiable. Cocaine