

MANY CLOCKS OF MANY WAYS

BY WILLIAM T. WALSH

The first mechanical device for telling the time was the sun dial. Of use only on fine days, a substitute was necessary, and the sand-glass followed. Later came the water-clock, a curious device in use among the Egyptians, Chaldeans, Babylonians, and other ancient peoples of the East. This was the first approach to a clock as we now understand the term. It consisted of a basin of water set in some public place. At one end of the basin was a spout, from which the water dropped uniformly into a receiver having graduations for marking the hours, somewhat after the fashion of a thermometer.

The clocks of to-day do not surpass or even equal those of the fourteenth and fifteenth centuries in the wonder or beauty of their construction. Clocks are common things. Every householder has at least one. We do not have to depend upon the great time-piece of church belfry or of tower. Relatively, like everything else in this modern day, because of its common character, the clock has lost something in importance. Still the charm endures of creating unusual types.

For instance, in the very modern city of Chicago the spirit of the old clock-makers lives in the person of one Franz Bohacek, a native of Patzau, Bohemia. Twenty years of careful, patient labor have seen his efforts crowned by the completion of what is one of the most remarkable time-pieces ever seen in America. In it the maker has combined the artistic spirit of the craftsman of the middle ages with the accuracy of the twentieth century man of science.

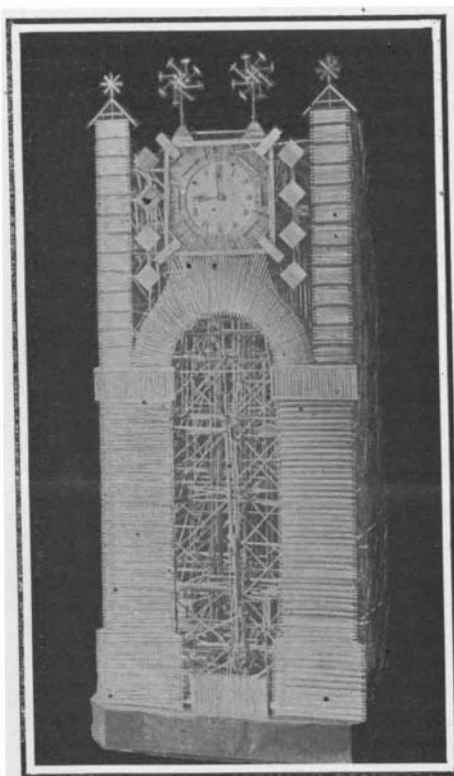
Bohacek's clock, made up of more than one thousand parts, is two stories high. Its weights are so heavy that two windlasses must be employed to wind them up. It is a very elaborate affair altogether and yet every part has a specific reason for being. It has five dials. The first of these is that of the ordinary clock—merely for telling the time of day. The second also is for that purpose, only in place of twelve numbers there are twenty-four, somewhat in the style of the old one-hand Italian clocks. On the next dial the day of the week, the day of the month, and the month of the year are indicated by three series of numbers and three hands. The fourth dial, six feet in diameter, represents the solar system, with the sun in the center and the various planets revolving about. These celestial bodies travel in exact accord with the real solar system itself. The fifth and last dial marks time, in exact, or practically exact, harmony with the laws of astronomy. As every one knows, the year consists of 365 days, 5 hours, 48 minutes, 46 seconds. Each month, thirteen in number, has therefore, 28 days, and each day consists of 24 hours, 4 minutes, 54 seconds. On Bohacek's clock, a second, as measured by ordinary clocks, is 0.00341275 of a second longer. This is not precisely right, being in a day 85/100 of a second slow—a slight discrepancy, all things considered.

This clock has many other remarkable features besides those already mentioned. There are figures that represent various events in American history. There are figures for all the Presidents of the United States, and one held in reserve. These figures appear at appropriate moments. This remarkable time-piece has many other extraordinary features, which lack of space will not permit to be chronicled here.

Another Bohemian, Joseph Bayer, a glass-cutter by trade, resident in the country of his birth, has employed glass as a medium for building a clock. With the exception of the spring every portion is of crystal glass. The three hands, hour, minute and second, as well as the apparatus for striking are all of glass. This clock is sixteen inches high.

An Italian, Sirio Tiburzi, of Fabriano, Italy, has tried his hand at a clock made solely of wicker work and poplar twigs. The dial, cord and weights are of wicker work, the remaining parts are of both wicker work and poplar twigs. The mechanism is similar to that of a tower clock with the exception of the striking parts, with which it is not equipped. It stands eight feet high and will run twenty-seven hours with one winding.

Another nationality and another sort of time-piece are represented by a straw clock of a German shoemaker. It is built wholly of this one material, of which several thousand pieces were used in the construction. There are eight pendulums. The mechanism is wound up by the pressing of a button, when it will run for five hours. The hands are set by means of another button. No spring is used. The weight of this ingenious bit of craftsmanship is seven ounces.



Bohemian clock made of straw.

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The flower clock, while not so novel as some others, is still a very interesting type of the unusual clock. The single floral clock of which England can boast began to run in the summer of 1907 and was started by

the Mayoress of Bridlington, where it is located. Ten thousand plants make up the dial, which is twelve feet in diameter, set in a circular bed nineteen feet wide. The dial numbers, the minutes, and the fifths of minutes are marked off, each by a different kind of plant.

A clock in a bottle is the unusual device of a German watchmaker, H. Rosin of Gommer near Magdeburg. The maker took a strong movement with a cylinder escapement measuring 45 millimeters (1.77 inches) in diameter, and began by sawing the plate into halves. The opening of the neck measures 15 millimeters (0.59 inch), and in order to get these halves into the bottle another segment was cut of each of the halves of the plate. For a resting place of the movement a sort of tripod was constructed, which was put together after its parts had been introduced into the bottle separately. This tripod was made in such a manner that it cannot turn during the winding of the movement. He fastened with screws to the platform attached to the tripod the four pieces of the plate, side by side, using for this operation a long screw-driver and other tools especially constructed for the purpose.

The plate having thus been restored to its original form, all parts of the movement were put in their original places with the motion wheels for the hands. Furthermore, he placed around the neck of the bottle a ring, of white metal, upon which was soldered a round plate, completely closing the opening. Upon this cover was fastened the arms in an inclined position, these being intended to serve for the support of the dial. The dial is made of a ground glass plate, having a diameter of 20 centimeters (7.87 inches). The figures are cut skeleton fashion, and cemented to the glass. The minute lines are painted in black. This arrangement permits the use of the timepiece for a night clock by placing a light behind the dial. The figures, which measure 2 centimeters (0.79 inch) in length, are sufficiently plain. An arbor or a staff which passes through the cover on the neck of the bottle carries at its lower extreme end a conical wheel, geared in the motion wheels, by means of which the hands may be turned. Another arbor enters the interior of the bottle until it reaches the movement, where it is connected with it by means of a hollow square, reaching the mainspring barrel and serving for the winding.

The bottle is made of transparent glass, exposing to view all the parts in the interior. Its height measures 25 centimeters (9.84 inches), and its interior diameter 7 centimeters (2.76 inches). The whole is placed upon a disk, to which it is fastened by three brackets, two of which are shown in the illustration.

As to the biggest clock, Jersey City, New Jersey, claims the honor of possessing the largest specimen in America. It crowns a factory building not far from the terminal of the Pennsylvania Railroad. The dial, which is 40 feet 6 inches in diameter, is made of yellow pine boards. Each board is 6 inches wide. The minute hand with its counterbalance weighs 640 pounds. Alone, the hour hand tips the scale at a quarter of a ton. The dial numbers are 60 inches high, and half that width. The dial works weigh 830 pounds. They are fitted with roller bearings.

A Wonderful Sensitive Balance.

Sir William Ramsay, the well-known English chemist, has recently installed at his laboratory at University College, London, what is probably the most sensitive scales that have ever been contrived, for they will weigh $\frac{1}{7,000,000,000}$ part of an ounce. So delicate

is the apparatus, which has been specially designed to weigh gases such as xenon, which Sir William Ramsay discovered, that it is housed in a special underground chamber, where it is safe from oscillation and climatic influences. The task of weighing has also to be carried out in semi-darkness, as the balance is disturbed by the heat radiated from an electric incandescent lamp at the opposite end of the room, and the operator has to leave the scales for a considerable length of time, and then read the indication instantaneously before variation in temperature can affect it. The scales are carried in a special metallic chamber. The short beam and its slender supports are made of silica, which is less susceptible to effect from heat than glass. The tray is suspended from the beam by a hair of silica fiber, and the gas used in weighing is in an infinitesimal though known quantity, sealed in a glass tube of diminutive proportions. When the tube with its gaseous contents is placed on the tray, the movement of the beam is so slight that the eye cannot trace it, and special recording arrangements are adopted. The slight movement of the beam caused

by the weight of the tiny tube causes a small mirror, upon which is focused a pinhole of light, to oscillate. Six feet away is a graduated black scale, upon which the pinhole of light is thrown from the mirror, and the weight of the tube with the gas is thus registered, but the operation has to be made instantaneously. The gas is then released from the tube, and the latter weighed once more. This time the scale registers one-seven-thousand-millionth part of an ounce less than it did before, which difference represents the weight of the above extremely infinitesimal quantity of xenon. It is impossible to secure weights less than the

$\frac{1}{1,400,000}$ part of an ounce other than by means of gases. The limit possible with metal for practical use is this minute fraction, and Sir William Ramsay possesses a fine strand of aluminium, finer than the finest hair, and one-twenty-fifth of an inch in length, which weighs this amount. It is possible, however, to obtain a section of aluminium weighing $\frac{1}{8,400,000}$ part of an ounce, but as such cannot be seen except with the microscope, it is of no practical value.

Cold Storage of Hailstones.

Prof. Weinberg, of Tomsk, Siberia, recently published a description of a method of preserving hailstones until winter by placing them in a little chamber, suitably protected against the influx of heat, and pro-

vided with double walls, the space between which was filled with a mixture of ice and copper sulphate. In this way the hailstones were kept, at a temperature slightly below the freezing point, until the temperature of the outside air had become low enough to allow them to be examined under the microscope without melting. In the course of two years Prof. Weinberg observed only one hailstorm, which occurred on August 15th, 1909, while traveling from Aland to St. Petersburg. The fall of hail continued three minutes. The hailstones were small, ranging from $\frac{1}{2}$ to $\frac{1}{8}$ inch in diameter. Weinberg collected several ounces of them and placed them in the cold storage chamber, after having immersed them in a mixture of equal parts of benzine and toluene, in order to prevent agglomeration. The hailstones, preserved in this way, were carried to Tomsk, and in December were brought to Moscow. After making this first experiment, Weinberg has concluded that it will be preferable to keep only a few hailstones, immersed in a very viscous liquid of density nearly equal to their own, such as cylinder oil, castor oil or vaseline. Last winter Prof. Weinberg made and polished three sections of the preserved hailstones, which he photographed on autochrome plates with a polarizing microscope. These hailstones showed no peculiarities of especial interest, but, by preserving better specimens and examining them in the same way, our very imperfect knowledge of the origin and formation of hailstones can, doubtless, be greatly improved.