A BABYLONIAN VASE INLAID WITH IVORY AND PRECIOUS STONES DATING FROM 4500 B. C.

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It may seem to the layman that the Assyriologist and Egyptologist are rivals in the efforts to bring to light the earliest traces of civilization, for during the past decades each has startled the world by announcing that he has discovered traces of civilized man of five, six, and even ten thousand years ago. In confirmation of his statements, he produces strange objects from the ruins of Babylonia or Egypt. Yet such extremely ancient antiquities are rare. At Bismya, the ruin in central Babylonia which, as field director of an expedition from the University of Chicago, I recently excavated, and which has proved to be the remains of the oldest known city in the world, was discovered, among other remarkable things, a blue soapstone vase richly engraved with human figures and inlaid with ivory and precious stones.

The vase, when found, was in fragments, three of which were recovered from among hundreds of fragments of vases of other stone. All were lying in an ancient refuse heap of the temple, where they had been thrown. The position of this heap of rubbish, buried beneath the ruins of structures known to date from 3800 B. C., and containing a number of inscriptions and bricks, as well as the style of art, point to a date not far from 4500 B. C. The original diameter of this vase of blue soapstone was about twenty-two centimeters (8¾ inches); the height of its nearly vertical walls was about twenty centimeters (8 inches), and the three surviving fragments represent somewhat more than a quarter of the vase.

One of the most remarkable features of the vase is that it is unlike anything ever before discovered in any ancient ruins. Upon the three fragments are represented at least thirteen human figures, either entire or partly broken away. The two central figures are musicians, who are playing upon their five and seven stringed harps as they are marching along. If for no other reason, the engraving is remarkable because it gives us the picture of the musical instrument of more than six thousand years ago. Behind the musicians marches a person of importance, possibly the king, for from his hat project three rays to distinguish him from the others in the procession. Behind him are two other figures. One, judging from his size, is a boy; the other is holding up his hands in the attitude of worship. Before and above the musicians are figures, who are represented as running to meet the procession. One man holds in his hand a branch of a tree, while other branches are scattered about among the figures. The engraving may represent one of the religious processions common in later Babylonian history, when the gods were carried about the city. Yet the running figures more likely indicate the triumphal procession of a victorious king, accompanied by music, and an occasion of great joy is represented.

Still more remarkable is the execution of the engraving. While the field of the picture is represented by the blue stone of the vase, the figures are partly composed of inlaid materials. When found, the inlay, with the exception of a few pieces of lapis-lazuli in one of the tree branches, was missing, yet the deep grooves into which it had been set remain to show where it had been. Later I discovered a square piece of ivory, which formed the skirt of the figure bearing the branch. From this one ivory dress we may infer that the dresses of all of the figures were of the same material. The faces, arms, and feet are represented in relief, and the long braids of hair and the hats are also of the stone of the vase. Judging from other objects found in the Bismya temple, it would seem that the eyes were inlaid with blue stone. The material employed to represent the bracelets and head bands and other inlaid parts cannot be known, yet from the dump small pieces of red and blue stone, mother-of-pearl, and engraved ivory appeared. Some of them may have been used in the missing parts of the vase.

A chief peculiarity of the art is that the figures are represented with enormous noses, imparting to the face the grotesque appearance of a caricature. The few specimens of early Babylonian art at hand, while representing the nose in a straight line with the forehead, fail, with the exception of a few terra-cotta statuettes, to exaggerate to such an extent. The faces of the figures are shaved; the hair is braided and hangs down behind. A hat, either with or without a band and rays and a ribbon, is worn; the rays probably distinguish the rank of the wearer. Apart from the hat, the one other piece of wearing apparel represented on the fragments of the vase is the short skirt, which is known to be the Babylonian costume of about 4,500 B. C.

This unique vase of the greatest antiquity, so different from anything previously discovered, therefore opens a new study in the history of early art; it is one of the most highly prized objects from the most ancient civilization of Mesopotamia.

TWO FRAGMENTS OF VASE INLAID WITH IVORY AND STONES FROM BISMYA DATING FROM ABOUT 4500 B. C.

SKETCH OF THE DESIGN ON THE VASE.

THE GYROSCOPE AS A COMPASS.

BY A. FREDERICK COLLINS.

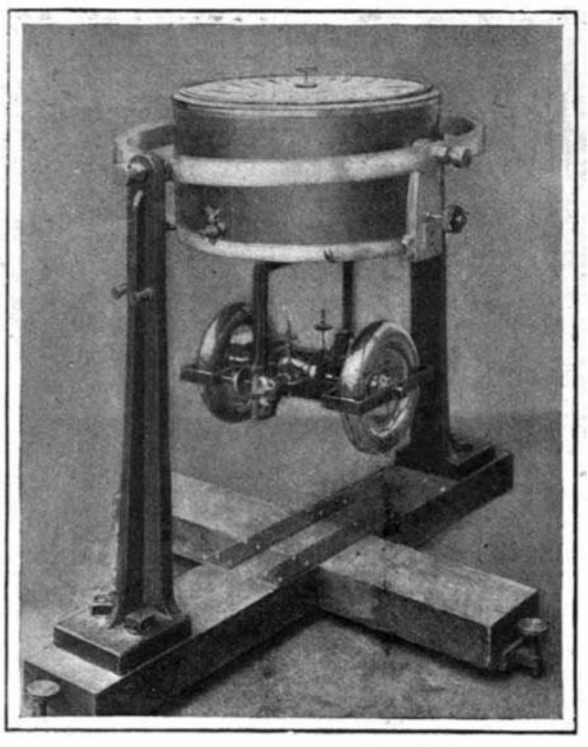
Since the invention of the gyroscope by Foucault, to demonstrate the rotation of the earth upon its axis, this mechanism has been constructed in many modified forms, and the principles underlying it have been utilized for various purposes. But it is doubtful if a more ingenious construction has ever been devised, or a more useful application been found for it, than the one herein described. The Anschütz gyroscope takes its name from the inventor, Dr. H. Anschütz-Kämpfe, and was designed for the purpose of replacing or supplementing the ship's compass, where the latter for any reason is rendered useless or inaccurate. Two models of the gyroscope have been built by a Kiel firm of instrument makers, and both of these are shown in the accompanying illustrations. The second form possesses several improvements over the earlier construction, though the general design is the same in both.

In the compass the needle assumes a fixed position under the influence of the earth's magnetic attraction, while in the gyroscope, on the other hand, there is a rotating system affixed to a horizontal axle, which can turn freely in all directions. The spindle of this device has a strong tendency to retain its momentary direction, and when the binnacle, which is an integral part of the vessel, turns with the movement of the vessel, the indicator carried by the spindle will correspondingly turn against the binnacle, or in the opposite direction. Thus the indicator will point out in degrees, or fixed lines of a scale, the variations in the course of the ship.

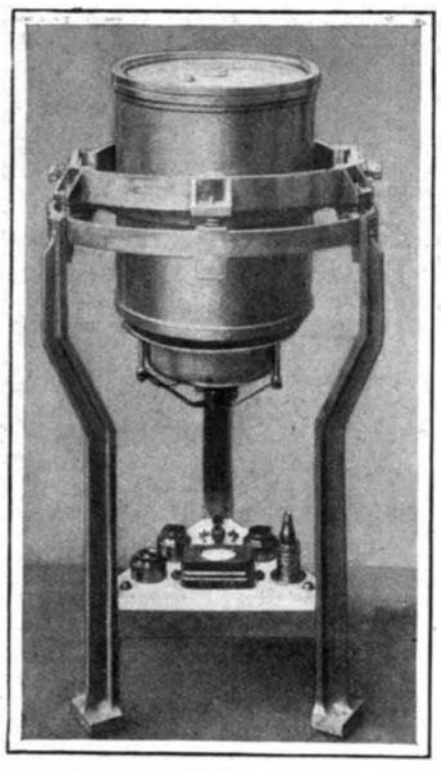
The mechanical construction of the instrument is comparatively simple, and most of the important parts can be recognized in the first illustration, where the lower cover has been removed. The strong iron bases of the binnacle carry a holder suspended in gimbals and filled with liquid. In this liquid is a float fixed to a vertical axle, on which it can revolve. The rose or compass scale is secured to the float, and is controlled by the attached gyroscopic system proper. This system consists of two balls or disks, which are driven by a motor lying between them, the current being communicated by means of brushes. The frame containing the balls and motor is attached to a horizontal axle on ball bearings, which rest on the float. The diameter of the holder is 18½ inches, while the height of the whole instrument is 35 inches. The construction of the new model differs from the old chiefly in that the system does not depend from the float, but is contained within it. The float has a capacity of about 22 quarts, and also contains a pair of electromagnets. It revolves easily on a vertical axle in the basin, and its weight on this axle is almost compensated by the supporting power of the liquid. The basin is hung in gimbals to a strong metal ring, which rests on springs attached to the stand. The latter is three-legged, and is made of bronze. Between the three legs is a small marble shelf, which contains the measuring instruments, ruler, etc. The dimensions of the new form of apparatus are approximately: height 43 inches, diameter of basin 14 inches, and the largest diameter 23½ inches. An improvement consists in a small motor with a perpendicular axle, upon which a bell-shaped balance is placed. The bell-shaped balance is seen below the cylindrical holder in the second engraving. This motor is started simultaneously with the system, and attains a velocity of 3,000 revolutions per minute. Its purpose is to retain the basin in a perpendicular position by means of its rotary force, or at least to permit only slow and slight movements, thus considerably increasing the efficiency of the apparatus. In both instruments the gyroscopic system rotates at the rate of 3,000 revolutions per minute.

Both the compass and the gyroscope possess disadvantages as well as advantages, but fortunately one instrument appears practically to supplement the other. The compass is not subject to certain untoward influences which are liable to affect the gyroscope, because of fundamental differences in action. The compass needle under the magnetic action of the earth assumes one fixed position. The gyroscope, on the other hand, tends persistently to maintain any position in which it is placed, until acted upon by other forces. Obviously, there are opportunities for error to slip into calculations based upon this apparatus, particularly after it has been in use for some time without resetting, and it consequently appears that occasional adjusting would be necessary. Owing to the revolution of the earth upon its axis, the gyroscope's spindle would have an additional gradual movement of rotation, and the rate of this movement would depend on the latitudinal position of the ship. It is interesting to note that this movement would amount to one degree in four minutes at the north pole. The spherical form of the earth also influences the instrument, and in consequence the gyroscope would turn slowly toward the course of the vessel, in accordance with its longitudinal position. The compass, however, is practically unaffected by latitude or longitude.

The disadvantages of the compass may be briefly summed up in saying that it is strongly affected by shocks, vibrations, moving masses of steel or iron, or even by unequally distributed, fixed masses of metal, while the gyroscope is influenced in no way whatsoever by these considerations. The deviations of the compass needle due to the above causes have been only partially overcome by systems of compensation. It is of course impossible to obviate the disturbing causes mentioned, especially in the case of war vessels. Here the compass is often rendered erratic by high speed under forced draft, particularly in torpedo boats, by swinging davits, cranes, guns, or turrets, and by the concussions due to gun discharges. In submarine work the compass is often almost use-



Anschütz Gyroscope. First Model.



Anschütz Gyroscope. Final Form.

THE GYROSCOPE AS A COMPASS.