

THE MONIST

ORIGIN OF THE MARINERS' COMPASS IN CHINA*

THE reign of Ch'öng-wang (B. C. 1115-1079) has been quoted by Chinese and foreign authors alike as being the period during which the north-, or as the Chinese say, south-pointing qualities of the magnetic needle were discovered. In the sixth year of his reign, so the legend runs, Ch'öng-wang received the news that the ambassadors of a distant foreign kingdom, called the tribes of Yüé-ch'ang, had arrived with presents to do him homage. They were at home in the south of the country of Kiauch'i, i. e., the present Tungking. Later Chinese historians placed them at the very spot where, during centuries at the beginning of our era, the embassies from India (T'ién-chu) and Syria (Ta-ts'in) disembarked, in order to be conveyed to the Chinese Court, and where, according to the *Shui-king-chu*, a geographical record of the fifth century A. D., ships used to start for the journey south to the countries of the Malayan Peninsula. This place clearly marks what may be called the terminus of Western navigation as described on the Chinese side, which is probably identical with Ptolemy's city of Cattigara, the terminus of shipping enterprise in the Far East according to western classical authors. The emperor gave orders that the Yüé-

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ch'ang ambassadors should be conducted to the court and that great honor should be paid them. The ambassadors were accompanied by interpreters speaking different languages and brought pheasants and the tusk of an elephant as tribute. Since they were in doubt as to how to find their way back to their home, the Duke of Chóu, the Emperor's uncle and prime minister, is said to have presented them with five chariots provided with a south-pointing contrivance (*ch'i-nan-kü*, i. e., "south-pointing chariots"). Thus they found their way back "to the seas of Fu-nan and Lin-i," the last named country, well known during the Han Dynasty, containing the territory from which they had come, as Legge (*Shu-king*, p. 535, *seq.*) has pointed out.

No trace of this embassy and the south-pointing chariots mentioned in connection with it is contained in the *Shu-king* and the *Shi-ki*. Legge, therefore, looks upon it as a myth. Nevertheless we possess early traces of the belief in such an invention, as being made, if not by Chóu-kung, at least by some one among the old rulers. The philosopher Han Fei, who died in 233 B. C., says in one of his essays (*Han-fei-tz'i*, chap. 2, p. 4): "The early kings constructed the *ss'i-nan*, i. e., 'the south-pointer,' in order to fix the position of morning and evening." And a still earlier philosopher, Kui-ku-tz'i, who lived in the fourth century B. C., refers to the people of Chöng (K'ai-föng-fu) as having made use of the "south-pointing chariot" (*ss'i-nan-kü*), when sending for jadestone (s. *Kui-ku-tz'i*, sec. 10 of his book). Kui-ku-tz'i, whose little work is not completely preserved, is also quoted in the *T'ai-p'ing-yü-lan*, a cyclopedia of the tenth century, as having said:

"The Su-shön (which is the same name by which, many centuries later, the Nü-chön, Ju-chi, or Djurdjen Tartars, the Tungusic ancestors of the Manchus, were known, but in this case probably represents an unknown barbarous tribe somewhere near the Chinese dominion mentioned in

the *Shu-king*, Legge, p. 12, par. 56) offered a white pheasant to Wön-wang. Lest they might lose their way on the journey, Chóu-kung constructed the 'south-pointing chariot' to accompany them" (Legge, *Shu-king*, p. 537).

Possibly Wön - wang and Ch'öng - wang were con-founded in this passage. Kui-ku-tzī's text contains yet another passage (p. 4B), in which he speaks of "loadstone attracting a needle," but since this need not necessarily involve a knowledge of the magnetic compass, I would lay no stress on it. From all this it would appear that as early as the fourth century B. C. some sort of a contrivance indicating southern direction either existed or was believed to have existed formerly. In the later literature, the term *chī-nan* (from *chī*, "to point with the finger," and *nan*, "south," and identical with *ssī-nan*) is occasionally used metaphorically, for instance in the History of the Three Kingdoms (*San-kuo-chī*: Shu, chap. 8, p. 4B), from which it would appear that the term was quite current in the sense of "a guide" about the year 200 A. D. Yet we have no indication whatever to show what the south-pointing chariot, or *chī-nan-kü*, was in reality. We do not hear of the magnetic needle being used as a compass in connection with it any more than on board ship for several centuries after the downfall of the Chóu dynasty, and if the needle was at all at the bottom of those chariots, the invention of which was attributed to the Emperor Huang-ti in one, and to Chóu-kung in another passage of the *Ku-kin-chu*, a work of the fourth century A. D., we possess no record showing how they were constructed. From an account of the history of this invention contained in the *Sung-shu*, a historical work of the fifth century (chap. 18, p. 4) it appears that the secret of the "south-pointing chariots" had been lost for many centuries, when the eminent astronomer Chang Hōng, who died in 139 A. D., re-constructed it. In the troubles causing the downfall of

the eastern Han dynasty his model, too, was lost and consequently forgotten.

Since the third century A. D. renewed interest began to be taken in these mysterious allusions of the ancient literature, which led to repeated attempts to reconstruct what the would-be reconstructors apparently mistook as a mechanical contrivance, and it appears that all that was turned out was a machine consisting of certain wheels, possibly registering the movements of the axle of a chariot in such a manner as to cause an index hand to point in the same direction, whatever direction the chariot might take. I do not know whether such a construction is actually within the range of possibility; if so, I would be inclined to think that these re-inventions were used as mechanical toys to be kept in some Imperial museum as models supposed to correspond with Chóu-kung's chariots and doomed to oblivion as being practically useless. I find it stated in the *Sung-shu*, to which account Prof. H. E. Parker has drawn attention in the *China Review* (Vol. XVIII, p. 197), that certain models made under instructions from Shī Hu, the emperor of a short-lived foreign dynasty in the middle of the fourth century, and from Yau Hing, an emperor of the later Ts'in dynasty (about 400 A. D.), fell into the hands of the Sung Court in A. D. 417, but "the machinery being too coarse, the south-pointer showed so often in the wrong direction that men were required to set it aright again." Subsequent attempts are spoken of as having been more successful, but as I understand the *Sung-shu*, the author of this account thinks of "machinery" and is not aware of the real agent, although he casually remarks that, during the Tsin dynasty (265-420 A. D.) there was also a *chī-nan-chóu*, i. e., "a south-pointing ship." The Emperor Yau Hing's contrivance is more clearly described in the biography of its engineer (*Nan-ts'i-shu*, chap. 52, p. 15), which says it had no machinery at all, but that,

whenever it was put in motion, a man had to step inside to move the apparatus. Trying to read between the lines, I am inclined to assume that this remark strongly suggests the use of a compass, the man who had to step inside giving the chariot the direction ascertained from it. Yet we find in the *Sung-shī* (chap. 149, p. 15) the detailed description of the model of a "south-pointing chariot," seriously submitted to the Emperor Jōn-tsung as late as 1027 A. D., based on a most complicated system of cogged wheels, diameters and numbers of cogs being given, and said to have been originally constructed about 806 A. D. A similar machine, also described in the *Sung-shī*, was constructed in 1107 A. D., when it was submitted to the Emperor Hui-tsung. At this time we can, from other sources, show reason that the magnetic needle must have been well known, if not as a guide to mariners, at least as an instrument seen in the hands of geomancers for centuries before that date. Dr. Edkins, in his paper "On Chinese Names for Boats and Boat Gear," quotes Mr. Wylie in showing that the Buddhist priest and Imperial Astronomer I-hing at the beginning of the eighth century knew not only the south-pointing qualities of the magnetic needle, but also its eastern deviation (*Journal of the China Branch, Royal Asiatic Society*, N. S., Vol. XI, p. 138). Since no references are given, I am not able to confirm the fact, but I am certain that the deviation of the needle was well known in China about the year 1115 A. D., when it was described in the *Pōn-ts'au-yen-i* (quoted in the *Ko-chī-king-yüan*, chap. 49, p. 12B). It was then stated that, if you rub a needle with loadstone, it will point to the south, but that it will always deviate a little to the east and not show due south. To prepare the contrivance one had to single out a fine thread from a new skein of silk floss and fix it with half a candareen of bees' wax on the middle of the needle, the latter to be hung up where there was no wind. The

needle would then always point to the south. By sticking the needle through a piece of lamp wick (which in China is made of pith) and thus causing it to float on the water, it would also point to the south with a slight deviation, which the author tries to explain from the mystic point of view of Chinese natural philosophy. Shön Kua, who wrote about the middle of the 11th century, gives us a still clearer account of the contrivance, which according to his own words was used by the *fang-kia*, or geomancers, and he says absolutely nothing about its use in navigation. He also describes the deviation of the needle, without any attempt at explanation. For, "the reason, why loadstone points to the south, just as cypresses point to the west, cannot be explained" (*Möng-k'i-pi-t'an*, chap. 24, p. 7B). Since Shön Kua was a native of Hangchow, where lively traffic existed in those days with Arab and Persian traders, it seems quite possible that the latter have seen the needle used for geomantic purposes somewhere in that neighborhood, if not in Chinchew (Zai-tun) or Canton, learned the secret of its preparation from the Chinese and discovered its further use in navigation.

The *Ch'au-yé-ts'ién-tsai* (a work of the eighth century A. D. quoted in the *Ko-chü-king-yüan*, chapter 29, p. 25) states that in 692 A. D. a mechanic was sent to court from Hai-chóu, a seaport on the coast south of Kiau-chóu (Shan-tung), who had constructed a "chariot showing the twelve hours of the day" (*shü-ir-ch'ön-kü*) by the shaft being turned due south. It looks very much as though the magnetic needle had something to do with it, too. It may have been a mechanical toy to be used indoors, somewhat like another "south-pointing chariot," so styled and described on the preceding page of the cyclopedia referred to as being only seven and a half inches long and about fifteen inches high, and not a chariot in the ordinary sense.

The earliest unmistakable mention of the use of the magnetic needle as a guide to mariners I have been able to find in Chinese literature, is probably as old as the knowledge of its use in Europe. It occurs in a work of the twelfth century, entitled *P'ing-chóu-k'ó-t'an* and compiled by one Chu Yü, a native of Hu-chóu in Chö-kiang. In the second chapter of this work the author has inserted a series of notes on the foreign trade at Canton, which, previous to the arrival of the Portuguese in Eastern waters, was in the hands of Arab and Persian navigators. Since, from what we know of the author's lifetime, he has never himself lived at Canton, whereas his father, Chu Fu, had held office there at the end of the eleventh century, the critics of the great Catalogue of the Imperial Library at Peking (*Ts'ung-mu*, chapter 141, page 15 *et seq.*) hold that his information about the foreign trade in Canton is based on accounts of Chu, the father, and that it, therefore, dates from the latter part of the eleventh century A. D. This view is supported by the fact that the years A. D. 1086 and 1099 are mentioned in Chu Yü's paragraphs referring to Canton in other connections. Among these interesting notes I find (chap. 2, p. 2) one referring to the foreign ships by which trade was carried on between Canton and San-fo-ts'i (Palembang) on the coast of Sumatra and farther on to the ports in Arab countries, including India. It runs as follows:

"In clear weather the Captain ascertains the ship's position at night by looking at the stars, in the daytime by looking at the sun; *in dark weather he looks at the south-pointing needle (chü-nan-chön)*. Sometimes he will make use of a rope, ten chang in length, to hook up mud from the bottom of the sea, the smell of which will tell him where to go to. In the open sea there is no rain, and when it rains, they are nearing land," etc.

The wording of the passage is of such a kind that it

does not give us any clue whether the Chinese at the time were, or were not, familiar with the use of the compass on board ship. I am inclined to think, however, that attempts to use the needle on board must have been made in China about as early as it was known there to geomancers, but that it was abandoned as a useless luxury by the conservative junk masters, who were accustomed to steer their ships by taking bearings and soundings and scarcely ever required a compass for their coasting trips. Navigation on the high seas in those days was in the hands of foreigners (Arabs and Persians), and this may be the reason why we first hear of them as having turned the old Chinese invention to practical use on shipboard.

We have seen that, apart from the great probability of the magnetic needle being known in high antiquity, instances are on record of its being used during the middle ages for geomantic purposes. If my assumption that the magnetic needle was seen by Arab traders on the coast of China in the hands of geomancers, applied by them to navigation and then brought back to China as the "mariners' compass," proves correct, the history of this invention may be looked upon as perfectly analogous to that of gunpowder, the preparation of which was probably known to the Chinese long before they learned its application to fire-arms through Europeans.

ABSTRACT OF DATES.

- B. C. 2704-2594. The invention of the "south-pointing chariot" ascribed to the legendary Emperor Huang-ti according to the *Ku-kin-chu* (4th cent. A. D.).
- B. C. 1231-1135. "South-pointing chariots" were presented by Wön-wang to certain ambassadors. The passage, which may be wrongly handed down, is contained in the *Kui-ku-tzï*, a work of the fourth century B. C.
- B. C. 1115-1079, under Ch'öng-wang. Legend of the arrival of ambassadors from the south, conducted home by the aid

of "south-pointing chariots." No indication is on record to say what these were. The entire account is legendary and not backed by contemporaneous records.

- B. C. 4th Century. The philosopher Kui-ku-tzī speaks of the "south-pointing chariot" as being used by the people of Chōng. He knows that loadstone will attract a needle.
- B. C. 233. The philosopher Han Feī speaks of a "south-pointer" by which the position of east and west may be ascertained.
- A. D. 139. The astronomer Chang Hōng tries to reconstruct the old "south-pointing chariot." His model, however, became lost and forgotten.
- A. D. 200. The term *chī-nan* ("south-pointer," or "compass") is used figuratively in the sense of "a guide." *San-kuo-chī*.
- A. D. 350-400. The Emperors Shī Hu and Yau Hing are in the possession of apparatuses pointing south, but the "machinery" being coarse, they point wrong (*Sung-shu*), and in Yau Hing's contrivance a man is required to move it (*Nan-ts'i-shu*).
- A. D. 265-420. "South-pointing ships" (*chī-nan-chōu*) are mentioned.
- A. D. 692. A south-pointing contrivance showing the hours of the day is invented.
- A. D. 700. The Buddhist astronomer I-hing is familiar with the eastern deviation of the magnetic needle. Edkins, quoting Wylie. Wylie, in a paper entitled "Magnetic Compass in China," reprinted in *Chinese Researches*, (Shanghai, 1897), p. 155, says:
 "A passage from the life of Yih-hing, a Buddhist priest and imperial astronomer at the commencement of the eighth century, will show that the subject had engaged attention at least 900 years earlier [than the seventeenth century]. It is said, that 'on comparing the needle with the north pole, he found the former pointed between the constellations *heu* and *wci*. The pole was just in 6 degrees of *heu*, from which the needle declined to the right (east) 2° 95'. As it declined to the right of the north pole, it was neces-

sarily to the left of the south pole.' ” I have not succeeded in finding this passage in the lives of I-hing I was able to consult, but take it for granted on the excellent authority of the late Mr. Wylie that it is contained in some other Chinese text, which I hope to be able to hunt up some day. Unfortunately neither Mr. Wylie nor Dr. Edkins have given us chapter and verse of this passage so very important in the history of our subject.

- A. D. 806. A south-pointing contrivance consisting of cogged wheels is said to have been constructed in the *Sung-shü*.
- A. D. 1027. A “south-pointing chariot,” described as a mechanical contrivance, is submitted to the Emperor Jön-tsung. *Sung-shü*.
- A. D. 1030-1093. Lifetime of the encyclopædist Shön Kua, who speaks of the magnetic needle and its deviation as used for geomantic purposes.
- A. D. 1100, or sooner. Probable first unmistakable mention on record in Chinese literature of the “south-pointing needle” on board ship as being used by foreign (Arab and Persian) navigators at Canton.
- A. D. 1107. A “south-pointing chariot,” also described as a system of cogged wheels, etc., is submitted to the Emperor Hui-tsung.
- A. D. 1115. The magnetic needle is described in detail and its deviation mentioned in the *Pön-ts'au-yen-i*, where no allusion is made to its use on board ship.

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