# T H E

# H A R O L D  C .  E R N S T

# COLLECTION OF PORTABLE SUNDIALS

by

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and

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I n

M e m o r i a m

Dr. Harold Clarence Ernst

( 1855 - 1922)

Ernst Col.

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# P R E F A C E

We like to think of this small volume not as a catalog but as a contribution to the literature on the subject and as a handy reference book for all those who are interested in sundials; and we hope that it may induce interest in others. To that end, certain material has been included that would not as a general rule be a part of a catalog.

The sundial is the most ancient scientific instrument to come down to us unchanged. As such it is deserving of a better position in life than that of an ornament. It has played a vital part in the life of man for many thousands of years, and even today it serves us well where the mechanical watch fails.

We wish particularly to draw your attention to the system of classifying, labelling, and cataloging sundials, described in Chapter II. This is the first attempt to bring order out of confusion in sundials.

Public acknowledgement too must be made of our gratitude for the generosity and kindly help of Dr. Albert E. Navez of Milton Academy, who provided the equipment and made the basic photographic catalog; to Dr. Serge Elisseeff, Professor of Far Eastern Languages in Harvard University, and to Dr. James Ware, Associate Professor of Chinese in Harvard University without whose help many of the oriental dials would still be a mystery; and to the Harvard-Yenching Institute for its kind cooperation in loaning the necessary characters for use in Chapter IV.

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# I

## INTRODUCTION

The most important period in the history of sundials is that from the 16th to 19th centuries -- four hundred years -- a period in which the portable sundial became as common as the watch is today. Many factors contributed to this great production and widespread use of small solar timepieces. The clock had been invented and by the end of the 15th century the use of equal hours had been accepted generally; astronomy and mathematics had become sound sciences; the printing press and movable type were introduced; and the mariner's compass was in use. Of these, astronomy and mathematics contributed most to the construction and use of the sundial as a timekeeper.

Although it was known early in the Christian Era that greater accuracy in timekeeping by the sundial could be obtained by using a sloping gnomon (lying parallel to the earth's axis) the concave hemisphere of Berosus (ca.350B.C.) with its unequal hours remained an important timepiece in many places until late in the Renaissance. Similar hemispherical and concave dials of recent vintage may be obtained in China and Japan today.

The temporary hours, also often referred to as the unequal or natural hours, are derived by dividing the period of daylight into equal portions. Because the period of daylight varies in length, it follows that if it is divided into 12 equal parts throughout the year, the parts would have a longer duration in summer than in winter.

The unequal hours are often found on concave Chinese and Japanese dials; and as additional lines on may 16th century European dials. These additional lines on European dials are frequently labelled "Horae Ab Ortu Et Occasu", but they are easily distinguished if not labelled.

In many 17th and early 18th century works on ~~this subject~~ dialling three types of hours are frequently mentioned together with their relation to the ~~un~~equal hours sudh as we use today. These are the Jewish, Babylonian, and the Italian hours. The Jewish hours are the unequal hours mentioned above. The Babylonian and Italian hours may be distinguished by the numerals markingthe hours, for the Babylenians counted their hours from 1 to 24 from sunrise to sunrise, whereas the Italians counted theirs from 1 to 24 from sunset to sunset. Therefore the Babylonian hours are usually numbered from 1 to 12 (~~or from 22 through 24 to 34~~); and the Italian from 12 to 24 (~~or from 10 through 24 to 22~~).

By the middle of the 17th century the use of temporary hours was pretty much a thing of the past in the western world. Equal hours were well established. At the same time many other changes had been wrought, particularly in man's relationship with his neighbors. Travel was constantly increasing and man's horizon was extended. These conditions also had a direct influence on the sundial. A pocket dial with only two or three hour bands, or perhaps three or four, would hardly suffice. Extensive travel required an instrument that could be used anywhere -- such are the universal dials.

Printing, travel, astronomy, mathematics, and the compass -- all contributed to the general use of the sundial. Therefore it is only natural that the major portion if not all of any collection of portable dials would represent the period from the 16th to the 19th century. At the close of the 19th century, the watch was the accepted pocket timepiece, The use of apparent time was succeeded by local mean time, which in turn gave way in 1884 to Standard Time; but sundials kept up with the march of time and today they are made to tell Standard Time, even in portable form.

In the spring of 1938 the Harvard College Observatory acquired the Harold C. Ernst Collection of Portable Sundials, which does more than prove the widespread use of sundials and show a variety of types typical of certain periods. Although it covers the period from 1575 to 1922, it also shows the development of the sundial over a period of 2000 years -- from the simple dial of Berosus (ca. 350B.C.) to the modern dial giving Standard time. It is also representative of the artistry and craftsmanship of the period, in both the occident and the orient. All methods of employing the sun for timekeeping purposes are clearly portrayed. This colorful array of pocket solar timepieces used by our forefathers makes one a little bit envious -- it is more than a mere collection of antiques.

The instruments are arranged compactly in two large floor cases where the student or casual visitor may study them comfortably either as a whole or in part. Various features were borne in mind -- educational, artistic, craftsmanship, etc.-- so that no matter how short a time the visitor may have, that feature most interesting to him will be obvious. Special attention has also been paid to the ease with which instruction may be given to school groups (public and private) that from time to time visit the collection.

A short summary of the contents together with a few notes supplementary to the descriptive catalog may add to a better understanding of the instruments themselves and to the illustrations. The numbers refer to the individual pieces in the descriptive catalog and to the illustrations which have been placed together at the end in numerical order, for convenience. In order to facilitate the use of the catalog and for ready reference, the types, materials, makers, and so forth have been summarized at the beginning of the descriptive catalog, where they are keyed to the catalog and the illustrations.

The Ernst collection contains everything from the simple noon mark to multiface dials; in form, from tablets and cubes to spheres; in material, from paper to gold; and so far as we know, the largest aggregation of Oriental dials in the world. The individual pieces vary in size from a tiny dial mounted on a finger ring (No.50) to a large one four inches square mounted on gimbals for use at sea(No. 42). There are dials that tell time in the same manner as the one in your garden--by hour angle (No. 36); others make use of the sun's position in either altitude (No. 15) or in azimuth (No.224). Some make use of a thread to cast a shadow (No.45), some a perpendicular pin (No.224). Others make use of a ray of light (No.60), or a lens to focus the sun's rays (No.21). There are also dials that enable you to tell time by the light of the moon (No. 88) as well as by the sun. Some are designed for particular localities (No. 82), others that may be used anywhere in the world (No. 12). Some are plain (No.36), others beautifuly embellished with colorful floral designs and inlaid pearl (No. 88).

Is it any wonder that such a glittering array has attracted and held the attention of many thousands of visitors, both young and old? But, even the most enthused are sometimes skeptical. "Are they accurate?" we are often asked. The only answer is -- they are as accurate as their construction, because the principle by which the sundial tells time is based on the sun, as is the watch. Small portable dials have been made that tell time as accurately as the ordinary watch. A sundial will show whatever time is desired such as apparent, local mean or Standard Time; or all three combined in one instrument.

A statement frequently made is "What if they are accurate. We don't have enough sun to use them." This is a challenging remark. Consequently we have kept careful records as to the amount of time during the day that a shadow is cast. The result for the vicinity of Boston is shown in the accompanying diagram, and we are sure that similar conditions exist elsewhere. Because most of us use a sundial from March to October more than any other period, only those months are shown. A full black square denotes that shadows could be seen on buildings, sidewalks, etc. all day long; the half black squares, for at least four hours, but not all day; and the white squares for less than four hours. The presence of a white square does not necessarily mean that the sun did not shine or that shadows were not cast sometime during the day, but rather that we felt anything less than four hours duration would not be sufficient to make the use of the sundial practical as a timekeeper. Thus the diagram disproves the statement there is not enough sunlight to use a sundial.

(Insert diagram showing Duration of Shadows)
Fig 1

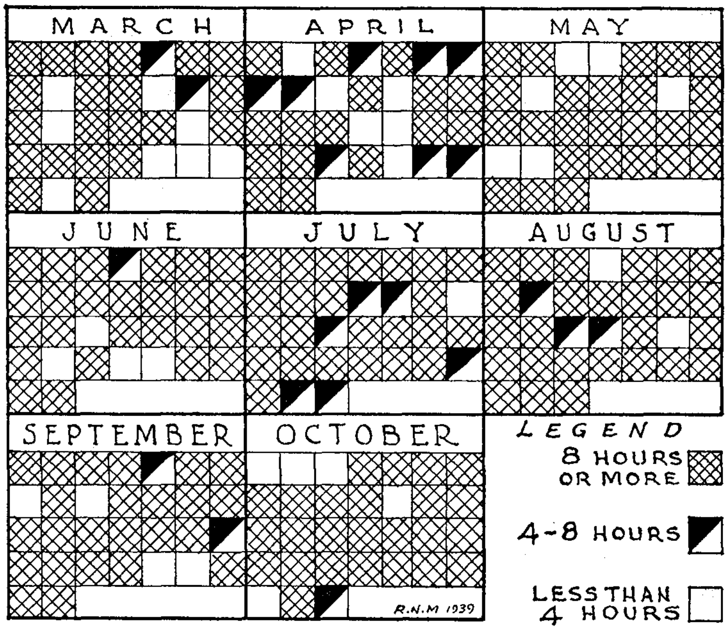



CHART SHOWING DURATION OF SHADOWS

Courtesy "HORTICULTURE"

FIGURE 1

NOTE - LINE CUT AVAILABLE.

The selection of instruments used in the notes to follow does not imply they are the most interesting or important in the collection -- each is equally ~~important~~ interesting and important.

The oriental dials are always a source of attraction for the ladies. These dials are for the most part very small and to the western mind they have an air of femininity expressed by color and delicate workmanship. This is particularly true of the concave dials with unequal hours, of which there is a preponderance. No. 79 is a small silver dial and compass not as large as a watch. Note the delicate engraving.

A somewhat larger instrument, No. 213, is very suitable for a lady. It is decorated with inlaid pearl and carried in a gold brocade satchel.

In many ways the oriental instruments lead us to believe that their makers considered design and beauty paramount to practicality and the primary function of any sundial, which is that of keeping time. Note the beautifully carved fish (No.78) with a dial on one side and a compass on the other, in the position of the gills. Then too, there is the clam-shaped affair (No. 99) surmounted by a crab. When the clam shell is open a dial in one half and a compass in the other are exposed.

In other ways the sundial seems to be one of the necessities of life to the Oriental. No. 215 is a pistol and to the rear of the hammer, in the butt, is a small concave dial. Another instrument of this kind is No. 242, which ~~contains~~ consists of a beautifully polished olivewood box containing scissors, writing implements, awl, stylus, knife, inkwell, compass, ~~and~~ sundial, and counting apparatus (abacus). Could any more be desired?

The more modern Oriental dials are similar to those of the Occident; but there is a sharp contrast between all Oriental dials and those of the west. The Europeans never seem to have allowed design or embellishment overthrow the primary function of a sundial. The European dials are remarkable for their accuracy and at the same time they reflect a just appreciation for beauty. An excellent example of this will be found in No. 97, a small ivory dial carefully executed and beautifully engraved. Attached to this dial is a lunar calculator whereby the time at night may be obtained by the light of the moon, by using the same dial that is used for telling time by the sun. The ingenuity of the European dial makers is obvious.

Universal armillaries draw their share of attention. As many rings may be used as are required -- usually two and not more than ten. These rings represent and show ~~the~~ various circles of the terrestrial sphere in their proper relation, one to the other. The two ring armillary with an axial bar through the center is most common (No. 71). One ring represents the meridian, which is graduated in degrees and used to set the dial to any latitude. This adjustment automatically brings the equatorial ring and the~~ri~~ axial bar into their proper ~~relation~~ position. A pierced slide, which runs up and down the bar, may be set in accordance with the day of the year. Thus set, a ray of light passing through the hole in the slide will indicate the hour of the day on the inside of the equatorial ring.

Another interesting European type is the vertical altitude dial in the form of a cylinder (NO. 14), often referred to as a poke, cylinder, pillar, or shepherd dial. This type of dial may be found in use today, in the Pyrenees. Vertical parallel lines on the cylinder represent the ~~hours of the~~ days of the year. Across these, curved lines represent the hours of the day, which result by plotting the altitude of the sun each hour of the day throughout the year. The gnomon extends out perpendicularly from the side of the cylinder, and it is attached to a cap which can be rotated about the axis of the cylinder. When the gnomon is set over the proper day of the year, the time may be observed by the position of the end of the shadow when the shadow is parallel to the date lines.

Among horizontal azimuth dials, perhaps the most curious and rare are those that tell time by the position of a magnetic needle. Fortunately there is one in the Ernst collection (No. 40). At first glance one might mistake it for a compass, but on closer inspection, concentric circles crossed by curved lines, apparently radiating from the center, will be observed in the place of the usual rhumb card. The method of using the dial is to turn the block, in which it is mounted, until the east and west sides cast no shadow; then the time is indicated by the position of the magnetic needle corresponding to the proper day. This is not a very accurate dial, but nevertheless effective and interesting.

The signal gun (No. 21) cannot be passed by without a word. Above a small cannon is a double convex lens, which is adjustable to the declination of the sun throughout the year. When properly set, the lens focuses the sun's rays on the touch hole where a small amount of powder will be ignited at noon, thus setting off the charge in the cannon. Truly one of the most fascinating sundials. Such dials, on a much larger scale, are still in use in various places throughout the world.

The foregoing brief descriptions of a few of the pieces in the Ernst collection can only be a palliative prior to an examination of the originals; and the catalog serve to beckon or recall an entertaining visit.

No other scientific instrument has so ancient a lineage as the sundial. It still serves as the principle timekeeper in many parts of the world. Of all sundials the portable dials are the most expressive. Kings and Queens have prized them; collectors have sought them; they have found their niche in our museums, as objets d'art; and their use extends o'er land and sea.

The collecting of portable dials need not be confined to a few. Anyone can collect them. There are many who find it impossible to collect anything in the usual way, but their passion is satisfied by making the things ~~desred~~ desired. Portable sundials are easily made. For the benefit of those who may wish to pursue the subject farther, a few books together with brief notes concerning their contents, are listed below.

SUNDIALS - How to Know, Use, and Make Them. By R. Newton Mayall and Margaret L. Mayall (~~Hale, Cushman & Flint, Boston, Mass. 1938 $2.00~~)

Sky Pub Corp 1976

A recent book telling of the history of dials, the construction of all kinds of dials, a chapter on time, and interesting dials of the world. Written for the layman. Includes list of collections in the U.S.A. Profusely illustrated.

Sundials and Roses of Yesterday. By Alice Morse Earle. Macmillan, New York, 1922)

This book is out of print but can be found in almost any library. An interesting and romantic story, profusely illustrated.

SUNDIALS. By Mrs. Alfred Scott Gatty, Revised by Eden and LLoyd. (Longmans, London, 1900)

This book is out of print, but can be found in most libraries. It is profusely illustrated and contains the largest collection of mottoes with notes concerning them.

EARLY SCIENCE IN OXFORD and EARLY SCIENCE IN CAMBRIDGE ) By R. T. Gunther. (University Press, Oxford, 1937)

Extensive treatment of old instruments in these two universities. To be found in most large libraries. Profusely illustrated.

# II

## C L A S S I F I C A T I O N

The acquisition of the Ernst collection and the subsequent work of arranging and listing the various items brought out the fact that there is a definite need for a simple, positive and consistent guide to the classifying, labelling, and cataloging of sundials. No critical method exists, to which one can refer. The status quo is clearly seen by glancing through published catalogs of large collections. For example -- two dials that look alike, but made by different persons, may be listed thus: one as a "horizontal dial", the other as a "compass dial". Then again two dials of altogether different types may be listed as "compass dials". But one glaring inconsistency comes to mind, where five dials all similar in appearance and identical in type are noted as being of different kinds, thus: 1,"horizontal dial"; 2, "compass dial"; 3, "tablet dial"; 4, "pocket dial"; 5,"octagonal dial" -- yet ~~they~~ all are horizontal dials, all tell time by recording the hour angle of the sun, all are made for particular places, and all have compasses.

The problem of classifying, labelling, and cataloging sundials is important to any depository, whether public or private. There are many types, a vast variety, and various methods of telling time by the sun, which may in part be the cause of the present haphazard entries and inconsistencies that lead only to confusion and doubt.

The system devised and finally adopted for use in cataloging the Ernst collection has proved to be simple, positive and consistent. It has been tested by the examination of thousands of dials both stationary and portable to be found in this country and abroad. So far we have not found a sundial that cannot be placed in a definite class in accordance with the guide outlined below.

In the beginning it soon became apparent that classifying, labelling, and cataloging could be made to dovetail. That is, the act of either classifying, making labels, or entering the items in the catalog, supplied certain basic information that was common to each division. Therefore the catalog cards were so laid out that the necessary information for the labels appears on the first line of the card. The method is critical and based on the premise that all dials may be relegated to their proper categories by reference to a specific list of types, which includes no "miscellany". We shall describe the system in detail so that it may be studied at leisure and that those institutions having expressed a desire to adopt it will be supplied with the necessary information for its proper application. In order to facilitate its use, a separate outline "Key" sheet has been inserted. The system may be applied to stationary dials as well as to portable dials.

C L A S S I F Y I N G

The classifying of individual pieces in any collection requires some knowledge of the subject concerned. In the case of sundials it is necessary to know the principle upon which the instrument works. The basic principle of the sundial is the assumption of a sun that travels at a uniform rate along the celestial equator, thus marking off equal intervals of time; and that the style (shadow casting edge of gomon) points to the celestial pole. With this principle in mind it is obvious that the relation between certain parts of a dial (such as gnomon, style, substyle, and dial plate) are fixed for all dials, whether spherical, conical or plane; and whether shade of light is used as an indicator. Therefore it is possible to use the dial plate to determine the type. This is rigidly adhered to, except in a few instances where the form is such that a more descriptive term is used to identify a special type; for example, as the armillary, which has a very definite form, although the dial plate is "equatorial" (that is, lies parallel to the plane of the equator).

In order to determine the type of a sundial, it is only necessary to know the position in which the dial plate lies when in use; and the form or appearance of special dials like the armillary. Basic type nomenclature, descriptive of the position or form, is used in the list below, wherein is given the names of various types in which all dials may be placed. For convenience the list of types is divided into two groups -- ordinary and special. The ordinary types are usually obvious, whereas the special group comprises those terms or dials which require detailed explanation or specific definition. For this reason each type is briefly described, immediately following the list.

L I S T O F T Y P E S

| Ordinary | Special |
| --- | --- |
| HORIZONTAL | HORIZONTAL-VERTICAL |
| VERTICAL | ARMILLARY |
| DECLINING | ANALEMMATIC |
| RECLINING | SIGNAL GUN |
| INCLINING | CONCAVE |
| DECLINING-RECLINING | CONVEX |

DECLINING-INCLINING CONICAL

EQUATORIAL

POLAR

MULTIFACE.

Description of Types

HORIZONTAL - Most prevalent of all dials. May have multiple hour bands. Fixed or folding gnomon. Style, solid or thread. Usually fitted with compass (portable form). For universal use, fitted with fixed style, quadrant, and single hour band.

VERTICAL - These dials are upright and face the cardinal points of the compass. Usually single hour band with fixed style. On north and south dials the substyle lies in the plane of the meridian (12 o'clock line). The east and west dials have parallel hour lines and a fixed style elevated above and parallel to dial plate. Substyle is the six o'clock line.

DECLINING - Vertical dials that do not face the cardinal points of the compass. The substyle is not the 12 o'clock line (meridian).

RECLINING - Usually found on multiface dials and often used on sloping roofs, wall copings, and so forth. They face the cardinal points of the compass and lean from you as you look at them. The polar and equatorial dials are reclining dials, but they are separated and named in accordance with the plane in which they lie. The north and south recliners have the substyle on the 12 o'clock line. The east and west recliners have the 12 o'clock line horizontal, and the substyle is not on the 12 o'clock line.

INCLINING - Usually found on multiface dials. These are the opposites of the reclining dials and ~~similarly~~ similarly identified. They lean toward you as you look at them. They face the cardinal points of the compass.

DECLINING-RECLINING - These are neither vertical nor do they face the cardinal points. The 12 o'clock line is not perpendicular and the substile is not the 12 o'clock line. Usually on multiface dials, but also used on roofs, wall copings, and so forth.

DECLINING-INCLINING - These are the opposites of the declining-reclining dials and are similarly identified. Usually found on multiface dials.

EQUATORIAL - The hour lines are equally spaced except in certain forms such as those in the form of a star or cross. Other common forms include concave and convex half-cylinders or bands, full and split rings, convex and concave hemispheres, and globes. For universal use, fitted with quadrant. May be inscribed on upper and lower surface of the plane variety. In the case of rings either a double needle gnomon is used or a single reversible needle, or a pinhole sight. Some (particularly standard time dials and heliochronometers) are fitted with an alidade. (See reclining)

POLAR - The hour lines are parallel. Fixed style elevated above and parallel to dial plate. For universal use, fitted with quadrant or scale of latitudes. Usually found on multiface dials. Dial plate lies parallel to axis of earth.

(See reclining)

MULTIFACE - These dials comprise only those solids (or hollow solids) with two or more faces inscribed with hour lines. A common form is the cube, which is also made for universal use (fitted with quadrant and plumb line). Combination dials such as horizontal-vertical-polar, or horizontal-vertical-equatorial, belong in this class and may be found among stationary dials.

HORIZONTAL-VERTICAL - A definite type of portable dial, usually in the form of two hinged tablets. The horizontal dial plate often has multiple bands. Solid or thread gnomon. For universal use, fitted with quadrant and single hour band. The universal type is rare and recently brought into use in exploration. Stationary dials of this type are few.

ARMILLARY - A definite form comprising a system of rings (from 2 to 10) corresponding to the major circles of the terrestrial and celestial spheres. The axis of the sphere is the style. Hour lines are equally spaced on the equatorial band or ring. For universal use, the meridian ring is graduated in degrees. Often a ray of light serves as an indicator, which passes through a pierced slide that may be adjusted to the proper day of the year.

ANALEMMATIC - A specific type of horizontal dial comprising a combination of HORIZONTAL and HORIZONTAL (Azimuth). Easily distinguished by the elliptical form of the hour band and the perpendicular style which moves

~~in a~~ in a north-south direction on the meridian or minor axis of the ellipse. The gnomon is set to the corresponding day of the year. NOTE - If the elliptical band is separate or alone, the class is then, HORIZONTAL (Azimuth).

SIGNAL GUN - Often combined with a horizontal dial. A lens is used to focus the sun's rays on the touch hole of a cannon which is so placed that the charge is set off at noon, apparent time. The lens is adjustable to the declination of the sun.

CONCAVE - This type includes those dials inscribed on concave surfaces that cannot be relegated to one of the foregoing types. Many equatorial dials are concave but the position of the dial plate determines the type. The hemisphere is typical of the concave type, as are many of the "sunk" dials of the Renaissance.

CONVEX - Includes dials on convex surfaces that cannot be placed in one of the above types. Many equatorial dials are convex.

CONICAL - Comprises all dials in the form of a cone, either partial or full. The so-called goblet or chalice dials are conical dials. They tell time by recording the altitude of the sun and they are easily distinguished. A vertical pin in the center, or the edge of the rim may be used to cast the shadow.

## L A B E L L I N G

The educational value of any collection is enhanced by the labels. Labels are used to tell a story and ~~is~~ as is so often the case, that story must be told as completely as possible in a minimum of space which allows for no superfluous words. In the case of sundials, what story should the label tell and how can it best be ~~t~~ told?

The story can be told by the use of six words descriptive of the information required to be placed on the label, The necessary information should answer the following questions.

1 - What kind of a dial is it?

2 - Where is the dial used?

3 - How does it tell time?

4 - What is used to indicate the time?

5 - Where was it made?

6 - When was it made?

Note - If space permits, the makers name and other information of particular interest may be added.

These questions in the order in which they appear on the label may be summed up as follows.

1 - Type. (Concordant with foregoing list of types)

2 - Use. (Whether for a particular place or places; universal use; or specific, as a noon mark.)

3 - Method. (How does it tell time -- by hour angle, altitude, or azimuth).

4 - Indicator.- (Shadow, light, magnetic needle).

5 - Country. (Origin of dial)

6 - Date. (Specific or period).

How does this work ~~ou~~ out in practice? Examine a label made out in accordance with the above outline --

42 - EQUATORIAL, Universal - France - 1750

The label tells this story--

Item No. 42. The dial is an equatorial dial, with the dial ~~pat/~~ plate lying parallel to the ~~equat/~~ plane of the equator. It may be used anywhere (Universal) by adjusting the dial plate. The time is told by recording the hour angle of the sun, by means of a shadow. It was made in France in 1750.

In this case, three words and a date are all that is necessary to tell a complete story. The makers ~~na/~~ name and other interesting information may be added if space allows.

Another example of a different character will give a better insight into the system of labelling, described in detail a little farther on.

HORIZONTAL (Azimuth) Magnetic - England - 1800

The above label indicates that the dial plate lies in a level position and is for use in a particular place. The method of telling time is by recording the position of the sun in azimuth, which is indicated by a magnetic needle. The dial was made in England in 1800.

From the foregoing examples the system becomes apparent. ~~The/is/~~ That is, The type of dial is given first (capital letters); then the use of the dial separated from the type by a comma; Following the use, the method by which the dial tells time is given in parentheses; then follows the means by which time is recorded. Separated by a wider space or dash, the country of origin is noted; and the date is separated by a wider space or dash.

In the first example, the "method" and "indicator" do not appear on the label. In the second example the "use" is omitted from the label. This is done in accordance with rules devised to tell a complete story with as few words as possible. Seldom is it necessary to include all the items. The omission of any item is accomplished by adherence to the following rules.

1 - Type - Never omitted. Always in capital letters. Should conform to "list of types".

2 - Use - Separated from "type" by a comma. Dials are made for a particular place or places; for universal use; or for specific purposes. If the dial is made for a particular place or places, this fact is not noted on the label or in the catalog. Its omission implies that. All other uses are noted, such as "ARMILLARY, Universal", which indicates an armillary so constructed that it may be used anywhere. "HORIZONTAL, Noon Mark" indicates that it is a horizontal dial that records only the noon hour.

3 - Method - Always in parentheses. If the method of telling time is by means of recording the hour angle of the sun, this fact is omitted on the label and in the catalog. All other methods are noted, such as "HORIZONTAL (Azimuth)", which indicates the recording of the hours by the position of the sun in azimuth. Similarly "VERTICAL (Altitude)" indicates that the time is noted by recording the position of the sun in altitude.

4 - Indicator - Various methods are used to indicate the hour. If a shadow is used, this fact is omitted from the label andthe catalog; its omission implies shade. All other indicators are noted, such as Light, which may be a ray, beam, or focused by means of a lens. The time may also be indicated by the position of a magnetic needle among the hour lines, as referred to in the second example above.

5 - Country - This ~~ref~~ refers to the country in which the dial was made, not bought. If not definitely known, it is better omitted, or if doubtful followed by a question mark.

6 - Date - This refers to a specific date or period in which the dial was made. If not known, omit. If doubtful follow by question mark.

Assignation of a number for each instrument is often made but it does not have to appear on the label unless some definite purpose is served. Institutions invariably number individual pieces and it is good practice for the private collection. When the number is used on the label it precedes all other information.

Thus it can be readily seen that a combination of entries 1 to 4 inclusive gives not only the basic type of a dial but further classifies it into varieties in a simple, positive, and consistent manner requiring little effort.

## C A T A L O G I N G

The labels are the outward expression of that vital part of all collections -- the catalog, which is a complete and accurate record of individual pieces; that part of the collection that may be used for reference and study. Today many catalogs are composed of two parts, the written and the photographic, each serving its specific purpose. The basic catalog of the Ernst collection is composed of photographs and a written record of each piece. This is done on standard 3" x5" library index cards, ruled to comply with the system of classifying. The record is written in telegraphic form. A completed card is shown below.

(Insert Figure 2.)

A glance will show the advantage of this form for reference and study, and for making labels. All the salient facts about the instrument are given in the first three lines. Then follows a complete description, which in turn is followed by any pertinent notes concerning acquisition and so forth. Note that the first line contains all the information needed for the label.

The second line contains the material on which the hour lines are inscribed -- that is, the dial plate. At the right, on the same line, the overall dimensions of the instrument are given.

The third line is reserved for the maker's name. A sample card in outline form is given below.

(Insert Fig. 3 )

In this way the work of classifying, labelling and cataloging dovetail. There is no hunting for information or wondering what information should appear on the labels, or where it ought to appear on the cards.

| | |
|---|---|
| 15-VERTICAL (Altitude) France 1830 | NO. TYPE , USE (METHOD) INDICATOR-COUNTRY-DATE |
| Paper 32 mm. diam. x 127 mm. high | MATERIAL ______ SIZE ______ |
| Henry Robert, Paris, France | MAKER |
| Dial plate printed on paper, pasted on wood cylinder. Hinged tin gnomon attached to removable cap. Computed for latitude 49°. Inscribed: "Henry Robert, au Palais Royall 164, a' Paris - 1830". | DESCRIPTION |
| Bought in Paris, 1902. | NOTES |
| FIGURE 2 | FIGURE 3 |

# III

## F U R N I T U R E

European dials, both portable and stationary, frequently contain additional lines, scales, calendars, symbols, and other parts which are not directly connected with the primary function of the dial. All such parts or lines are considered as "furniture". Lines of declination, signs of the zodiac, analemma, and lines of altitude and azimuth comprise the furniture commonly found on stationary dials; but on portable dials the common furniture includes all of the foregoing together with the compass, windrose and vane, lunar calculator (two types), nocturnal, Babylonian hours, Italian hours, Jewish hours, and perpetual calendars of various sorts.

The compass and windrose are obvious. The windvane, however, is usually missing.

The lines of declination show the position of the sun north or south of the ~~equator~~ celestial equator and, if so marked, the day of the year. The signs of the zodiac are generally indicated by symbols at the extremities of the lines of declination. The zodiacal symbols signify the ~~constellation and~~ sign in which ~~the~~ the sun is located and also refer to the date upon which the sun enters the sign. Therefore the lines of declination generally represent the date of the sun's entrance into the Signs. The symbols , Signs, and date of the sun's entrance into each sign is given in the following table.

| Symbol | Name | | | Date of Sun's Entrance |
|---|---|---|---|---|
| ♈ . . . . | Aries. . . . . . | Ram | | March 21 |
| ♉ . . . . | Taurus . . . . . | Bull | Spring | April 20 |
| ♊ . . . . | Gemini . . . . . | Twins | Signs | May 21 |

| | | | | |
|---|---|---|---|---|
| ♋ | . . . . Cancer. . . . . | Crab | Summer Signs | June 21 |
| ♌ | . . . . Leo . . . . . . . | Lion | | July 23 |
| ♍ | . . . . Virgo . . . . . . | Virgin | | August 23 |
| ♎ | . . . . Libra . . . .. . | Balance | Fall Signs | September 23 |
| ♏ | . . . . Scorpius . . . . | Scorpion | | October 24 |
| ♐ | . . . . Sagittarius . . | Archer | | November 22 |
| ♑ | . . . . Capricornus . . | Goat | Winter Signs | December 22 |
| ♒ | . . . . Aquarius . . . . | Water-Bearer | | January 20 |
| ♓ | . . . . Pisces . . . . . . | Fishes | | February 19 |

The analemma is a device used to make a sundial record local mean time, or Standard Time. It usually appears in one of two forms -- a figure 8, or linear (in the form of a scale). Sometimes a two dimentional chart or a table is appended to the ordinary dial. Sometimes the analemma is incorporated in the hour lines, causing a deformation, in which case it is not classed as furniture.

The lines of altitude and azimuth are used to show the height of the sun above ~~an~~ the horizon and the angular position of the sun from the meridian as measured on the horizon. The former is generally noted by degrees, the latter by the points of the compass.

Lunar calculators are of two kinds -- those that require a previous knowledge of the age of the moon; and those by which the age of the moon can be determined (often called lunar phase dials). The calculator is used to determine the time of day (without mental calculation) by observing the shadow cast by moonlight on the ordinary ~~dial~~ sundial.

The nocturnal is not a sundial. It is a portable dial used to tell time at night by means of the stars, and it consists of a base plate or disk bearing the days of the year, on which ~~rotates~~ a rotating hour disk and an alidade are mounted. A hole is made in the center. The nocturnal is usually calculated for use with the Pole star and the bright star at the end of the Little Dipper, or the Pole star and one or both of the "pointers" in the Big Dipper. The hour disk is often notched to permit reading the dial in the dark by counting the number of notches between the reference point of 12 and the sighting edge of the alidade. This instrument is frequently incorporated in ~~a~~ portable sundials.

The Babylonian, Italian, and Jewish hours may be recognized by their appearance and the accompanying numerals. The Babylonians counted their hours continuously from 1 to 24 from sunrise to sunrise; the Italians counted theirs ~~from~~ continuously from 1 to 24 from sunset to sunset. Thus the Babylonian hours are noted from 24 to 12, whereas the Italians are noted from 12 to 24. The Jewish hours are frequently referred to as the "old unequal planetary hours" or the "temporary" hours. This arises from the division of the day from sunrise to sunset, into 12 equal parts. Because this period varies in length throughout the year the summer hours will be of longer duration than the winter hours. Similarly the hours of night will be ~~of~~ ~~is~~ just the reverse -- longer in winter than in summer.

Calendars are of many different kinds serving as many different purposes -- from fixed annual calendars to perpetual, and from the simple to the complex. Some enable one to determine for any given year the golden number, dominical letter, epact, cycle of the sun, the time of new moon, and so forth.

Oriental dials seldom have furniture, except for the compass. However, lunar calculators and calendars will occasionally be found on some dials.

# KEY TO MAYALL SYSTEM OF CLASSIFYING, LABELLING, AND CATALOGING SUNDIALS

| |
|---|
| NO. TYPE , USE (METHOD) INDICATOR-COUNTRY-DATE |
| MATERIAL ______ SIZE ______ |
| MAKER |
| DESCRIPTION<br><br>(NOTE-"Material" refers to dial plate only.) |
| NOTES |

OUTLINE CATALOG CARD

## FOR LABELS

Use information given on first line of catalog card. See also outline below keyed to divisions.

If space permits, maker's name and other interesting features may be added.

## OUTLINE FOR LABEL

(NUMBERS KEY TO DIVISIONS LISTED BELOW)

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| NO. | TYPE, | USE | (METHOD) | INDICATOR- | COUNTRY-DATE |

## ① LIST OF TYPES

| Ordinary | Special |
|---|---|
| HORIZONTAL | HORIZONTAL-VERTICAL |
| VERTICAL | ARMILLARY |
| DECLINING | ANALEMMATIC |
| RECLINING | SIGNAL GUN |
| INCLINING | CONCAVE |
| DECLINING-RECLINING | CONVEX |
| DECLINING-INCLINING | CONICAL |
| EQUATORIAL | |
| POLAR | |
| MULTIFACE | |

## COMMON FURNITURE

Compass
Windrose and Vane
Lines of Declination
Lines of Altitude
Lines of Azimuth
Signs of Zodiac
Lunar Calculator (two types).
Nocturnal.

Babylonian Hours (1-24 sunrise to sunrise

Italian Hours (1-24 sunset to sunset)

Jewish Hours ("unequal" 1-12 sunrise to sunset and sunset to sunrise
Calendars — Analemma

## ② USE

(Preceded by comma)

a- Particular place or places (omit)
b- Universal
c- Specific (such as Noon Mark)

## ③ METHOD

(Always in parentheses)

a- Hour angle (omit)
b- Altitude
c- Azimuth

## ④ INDICATOR

a- Shade (omit)
b- Light
c- Magnetic

# IV

## O R I E N T A L   D I A L S

Because of the great number of oriental dials in the Ernst collection, a few words must be written about them. No less interesting than the dials themselves are the characters and the old method of reckoning time before the adoption of the 24 equal hours day, which has been used by the western world for many centuries. Furthermore one's appreciation ~~for~~ of any instrument is much greater if the notations on it can be interpreted. German, French, Spanish and other modern languages can be translated easily by anyone with the proper dictionary. On the other hand the language of China and Japan is not so easily deciphered, and very few even attempt it. Therefore we shall give here the characters usually found on oriental dials, together with the corresponding English meaning.

Lack of understanding of the characters has led to a misunderstanding of the purpose of some dials and of their construction. One example is the portable equatorial dial, quite common in China. This dial is inscribed on the upper surface of the dial plate, which is hinged to the base and may be held in position by a leg that can be set in notches cut in the base. All references that have come to our attention refer to this type of dial as one that can be"adjusted to latitude"; but a translation of the characters, beside the notches in the base, show the dial plate is adjusted to seasons rather than to latitude. This becomes obvious once the meaning of the characters is known, for if the dial is to be used all year round the plate would have to be inscribed on both the upper and under sides,, unless it is fitted with an alidade. There is no alidade, therefore the notches are so placed that the dial plate may be raised and lowered as the sun travels north and south of the celestial equator, thus always allowing the shadow of the needle gnomon to fall on the upper face.

Other characters also have a different meaning from what one might judge by a casual inspection of a dial. Therefore it is necessary to make a careful examination of an oriental dial before deciding how it is used. A brief summary of the meaning of the various characters frequently encountered will aid in a better understanding of the construction and use of Chinese and Japanese sundials.

Although the western method of timekeeping and the western calendar were adopted by Japan in 1873, there are still many parts of China that cling to the old. So complete has been the change in Japan that many well educated young Japanese are not familiar with the old system, and they express great curiosity and interest in instruments reminiscent of the past.

There are several differences between our system of time-keeping and that of the east prior to westernization. Where we say 6 o'clock, the oriental would refer to the middle of the 6th hour. To us, 6 o'clock refers to a specific instant or the beginning of a certain interval of time, whereas the oriental thinks in terms of a full interval and refers to it as such. We divide our day into 24 equal parts either continuously or into two series of 12; the orient divides the day into 12 parts in two series of 6 equal parts, from sunrise to sunset, and from sunset to sunrise, which results in equal intervals of constantly varying length, like the Jewish or unequal hours of the west, the difference being in the number of parts into which each period is divided.

There is also a difference in the notation of the hours. We number the hours either continuously from 1 to 24, or from 1 to 12 in two series. The oriental hour is a much longer interval corresponding to two of our hours, and they are numbered in a descending order beginning with 9 to 4 inclusive. The table below shows the western notation in the upper line with the eastern notation in the lower line, together with the corresponding characters.

A. M. P. M.

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 十二 | 一 | 二 | 三 | 四 | 五 | 六 | 七 | 八 | 九 | 十 | 十一 | 十二 | 一 | 二 | 三 | 四 | 五 | 六 | 七 | 八 | 九 | 十 | 十一 | 十二 |
| Occident | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Orient | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 9 | | 8 | | 7 | | 6 | | 5 | | 4 | | 9 |
| | 九 | | 八 | | 七 | | 六 | | 五 | | 四 | | 九 | | 八 | | 七 | | 六 | | 五 | | 四 | | 九 |

(NOTE TO PRINTER - Characters in keyed galleys will be loaned by Harvard-Yenching Institute)

This table will, at a glance, decipher the characters on most dial plates. However, the Chinese and Japanese made use of a system of callation called the "Sexagenary Cycle", which comprises 60 pairs of characters, so arranged that no repetition occurs. This is accomplished by associating symbols for the signs of the zodiac with the five elements (wood, fire, earth, metal, and water). The 12 sign symbols are called the Horary or Terrestrial Branches and they bear the names given the signs. The five elements are considered as having a primary and a secondary state (called Elder and Younger Brother) thus giving ten characters referred to as the Celestial Stems.

The sign symbols are associated with the hours and the oriental is more apt to speak of the Tiger Hour, or Horse Hour, etc. Therefore the characters representing the signs often appear on the dial plate instead of the hour numeral characters, or both may be found on the same dial. The sign represents the middle of the hour or interval to which it i~~a~~s alloted. Furthermore the characters for the signs are also associated with the points of the compass, and the sexagenary system was applied to daily, weekly, monthly, and yearly calendars. The following table shows the correlation between the signs of the zodiac as we know them; the characters for the signs with the corresponding English equivalent; the month and hour associated with each, together with the corresponding western hour; and the associated points of the compass.

INSERT TABLE I - without title

(NOTE TO PRINTER - Characters in keyed galleys will be loaned by the Harvard-Yenching Institute.)

For a detailed account of the sexagenary ~~system~~ cycle we must ask you to refer to other books on the subject~~s~~. Briefly stated, the characters representing the signs are placed in a column. Beside these characters are placed those of the ten celestial stems, beginning by pairing wood-rat (see table above), wood-bull, fire-tiger, and so forth. It is obvious that if each combination represents a year, the system will not repeat itself for 60 years.

In the beginning we ~~referred to~~ mentioned characters that refer to the seasons of the year. These are 24 in number, derived by dividing the solar year into 24 parts or seasons, which were given names descriptive of agricultural activities or of expected

# T A B L E I

| Occidental Name | Character | Oriental Name | Month | Oriental Hour | Occidental Hour | | Point of Compass |
|---|---|---|---|---|---|---|---|
| Aries Ram | 子 | Rat | March | 9 (midnight) | 12 | | N |
| Taurus Bull | 丑 | Bull | April | 8 | 2 | | NNE |
| Gemini Twins | 寅 | Tiger | May | 7 | 4 | A. M. | ENE |
| Cancer Crab | 卯 | Hare | June | 6 (sunrise) | 6 | | E |
| Leo Lion | 辰 | Dragon | July | 5 | 8 | | ESE |
| Virgo Virgin | 巳 | Serpent | August | 4 | 10 | | SSE |
| Libra Balance | 午 | Horse | September | 9 (noon) | 12 | | S |
| Scorpius Scorpion | 未 | Goat | October | 8 | 2 | | SSW |
| Sagittarius Archer | 申 | Ape | November | 7 | 4 | P. M. | WSW |
| Capricornus Goat | 酉 | Cock | December | 6 (sunset) | 6 | | W |
| Aquarius Water-Bearer | 戌 | Dog | January | 5 | 8 | | WNW |
| Pisces Fishes | 亥 | Boar | February | 4 | 10 | | NNW |

weather. Below are listed the season characters with their English meaning and the corresponding approximate date.

| Season Character | English Meaning | Approximate Date |
|---|---|---|
| 春分 | Mid-spring | March 21 |
| 清明 | Bright | April 5 |
| 穀雨 | Seed rain | April 20 |
| 立夏 | Beginning of summer | May 5 |
| 小滿 | Little overflow | May 20 |
| 芒種 | Planting of rice | June 5 |
| 夏至 | Mid-summer | June 21 |
| 小暑 | Little heat | July 7 |
| 大暑 | Great heat | July 23 |
| 立秋 | Beginning of autumn | August 7 |
| 處暑 | Local heat | August 23 |
| 白露 | White dew | September 8 |
| 秋分 | Mid-autumn | September 23 |
| 寒露 | Cold dew | October 8 |
| 霜降 | Hoar frost | October 23 |
| 立冬 | Beginning of winter | November 7 |
| 小雪 | Little snow | November 22 |
| 大雪 | Great snow | December 7 |
| 冬至 | Mid-winter | December 22 |
| 小寒 | Little frost | January 6 |
| 大寒 | Great frost | January 20 |
| 立春 | Beginning of spring | February 4 |
| 雨水 | Rain-water | February 19 |
| 驚蟄 | Awakening of insects | March 5 |

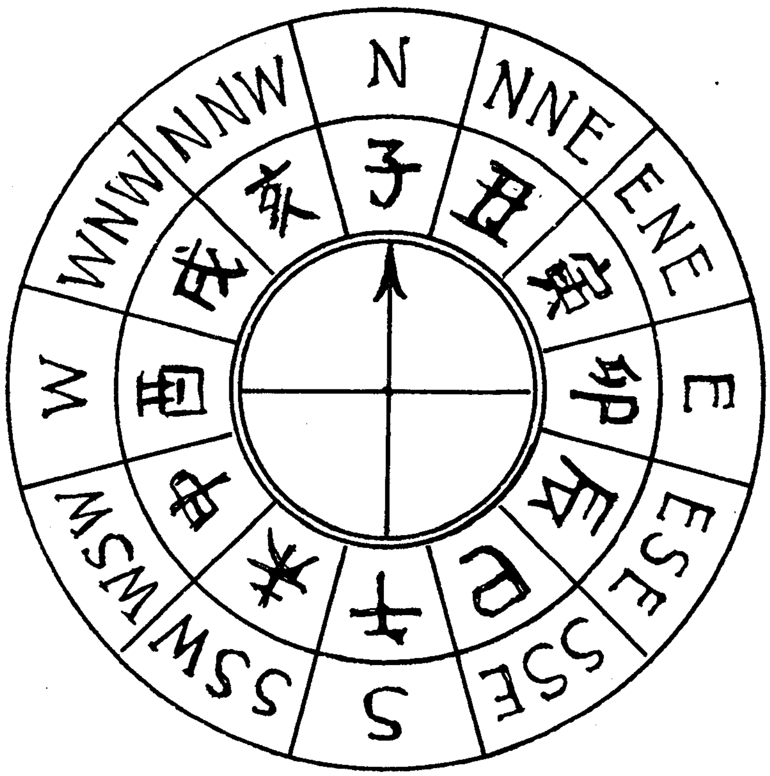
(NOTE TO PRINTER Characters in keyed galleys will be loaned by Harvard-Yenching Institute)

An examination of the names of the seasons recalls the fact that we of the west are the ones who erroneously call the beginning of summer June 21, and similarly refer to the other seasons. Summer is that period of about three months when the sun is highest in the heavens or farthest north of the celestial equat~~ial~~or as seen in the northern henisphere. June 21 really is not the beginning of summer but rather the middle of summer.

In order to complete the reference list of characters u usually found on Chinese and Japanese dials, we must list the points of the compass, for practically every oriental dial has a compass whether it is needed or not.

(Insert Figure 4 )

Timekeeping and callation in China and Japan are engrossing subjects for study. We regret the necessity for treating ~~it/in/~~ them in this brief manner.




POINTS OF THE COMPASS

FIGURE 4

# V

## DESCRIPTIVE CATALOG

The Harold C. Ernst Collection of Portable Sundials is located in the transparency room of the Harvard College Observatory in Cambridge, Mass. Dr. Ernst was an eminent Boston physician with many interests. He had only started collecting watches when one day in a Paris shop he noticed a small ivory sundial. This small sundial was fatal to his watch collecting which soon gave way to what he thought was a more fascinating hobby -- that of collecting portable sundials. He sought and bought dials wherever he happened to be. His endeavors resulted in the present collection of about 150 pieces -- all portable -- covering the period from the 16th century to 1921, and representative of the development of the sundial over a period of 2000 years.

The collection may be subdivided into two sections -- the occidental and the oriental. So far as is known Dr. Ernst's collection comprises the greatest aggregation of oriental dials, in one place, in the world

The collection presents a wide distribution of country of origin, a great variety of types, forms, and materials, as well as a generous assortment of pieces signed by mastercraftsmen of the periods represented. For this reason a brief summary of the contents will facilitate reference and be an aid to visitors, collectors, and others interested in sundials.

### Countries Represented

Total number of dials from each country of origin.

| | | | |
|---|---|---|---|
| China | 6 | Italy | 1 |
| France | 25 | Japan | 84 |
| Germany | 14 | Portugal | 1 |
| Great Britain | 7 | U. S. A. | 3 |
| Holland | 1 | Doubtful | 2 |

## Of Particular Interest

In any collection there are always a few pieces that ~~of~~ are of particular interest. It may be because of their beauty, intricacy, craftsmanship, or for many other reasons. The catalog numbers of those pieces worthy of special attention are as follows : - 1, 7, 9, 12, 21, 30, 35, 40, 42, 45, 50, 59, 60, 62, 64, 68, 70, 74, 76, 78, 79, 81, 82, 97, 99, 100, 213, 215, 225, 241, 242. This selection should not be construed as comprising those dials of superior quality.

## Types

Although there are relatively few types of dials, there is however an infinite variety in each type. Therefore, because dozens of horizontal dials are listed together it does not mean they are identical or similar in either appearance or function. The following list of types, together with the catalog numbers of the dials ~~in~~ of each type, is consistent with the classification given in Chapter .

HORIZONTAL - 17, 21, 29, 30, 34, 36, 40, 41, 43, 45, 52, 55, 58, 59, 72, 73, 82, 84, 86, 89, 90, 91, 92, 93, 94, 97, 100, 202, 204, 205, 206, 207, 220, 224, 229, 232, 237, 241, 243, 244.

HORIZONTAL, Noon Mark - 6, 11, 19, 42, 44, 47, 49, 79, 203, 209, 226.

VERTICAL - 14, 15, 16, 69, 70.

EQUATORIAL - 1, 12, 13, 20, 22, 24, 25, 48, 50, 80, 214, 216, 225, 234.

MULTIFACE - 2, 3, 85.

HORIZONTAL-VERTICAL - 37, 38, 39, 87, 88, 238, 239, 240.

**ARMILLARY** - 56, 57, 60, 71.

SIGNAL GUN - 21

CONCAVE - 4, 7, 8, 9, 18, 23, 26, 31, 32, 33, 35, 51, 53, 54, 61, 62, 63, 64, 65, 66, 67, 68, 74, 75, 76, 77, 78, 81, 83, 95, 96, 99, 201, 208, 211, 213, 215, 217, 218, 219, 221, 222, 223, 227, 230, 231, 233, 236, 242,

Forms

Below are listed the forms, other than the usual , together with the corresponding catalog number of each piece.

Block - 2

Cube - 3, 85.

Cylindrical - 14, 15, 16.

Floating (or Magnetic) - 91, 202, 204, 206, 229, 243.

Ring (not Armillary) - 70

Spherical - 28, 56, 57, 60, 71.

Tablet - 30, 37, 38, 39, 40, 41, 87, 88, 94, 97, 237, 238, 239, 240.

Watch case - 8, 9, 10, 18, 23, 26, 29, 31, 32, 33, 43, 61, 63, 67, 74, 75, 76, 77, 95, 231.

Method (other than hour angle) and
Indicator (other than shade)

The ordinary dial tells time by recording the hour angle or distance of the sun from the meridian, in time. Portable dials make use of other methods such as recording the altitude of the sun (angular distance above the horizon); and by recording the position of the sun in azimuth (angular distance on horizon between south point and the foot of the perpendicular from the sun to the horizon). Also the ordinary dial generally indicates the time by the position of a shadow. Again, portable dials make use of other indicators such as light (spot, ray, or beam ) and the magnetic needle. Still others are provided with a calculator so that time may be observed at night by the light of the moon. Such dials are listed below, with the corresponding catalog number.

Altitude - 14, 15, 16, 70.

Azimuth - 40, 97, 224.

Light - 21, 56, 57, 60, 71.

Magnetic - 40

Lunar - 10, 30, 97, 238.

## Miscellany

Few collections are without a few miscellaneous items and the Ernst collection is not unusual in this respect. However, it is interesting to note that with the exception of three pieces and two that are missing (212 and 228, given to friends), the remainder in this group are attached by a chord or chain to a sundial. Therefore their inclusion was more from necessity than preference, but nevertheless of interest. The miscellaneous items are Nos. 5, 10, 27, 28, 46, 98, 210, 212, 228, and 235.

## Materials.

A variety of materials will be found in the collection. The materials listed apply only to those of which the dial plate is made.

Brass - 1, 4, 6, 7, 9, 19, 20, 21, 24, 28, 29, 31, 32, 34, 36, 42, 43, 45, 48, 49, 50, 53, 55, 56, 57,

58, 61, 64, 66, 69, 70, 71, 76, 77, 80, 93, 95,
96, 100, 203, 205, 211, 218, 219, 233, 236.

Bronze - 10, 27.

Clay - 98

Copper - 18, 23, 26, 51, 63, 75, 99, 208, 213, 231.

German-Silver - 12, 13,

Gold - 79

Ivory - 25, 30, 35, 41, 54, 78, 81, 84, 87, 88, 94, 97,
214, 221, 222, 223, 226.

Lead - 72, 215

Paper - 3, 15, 37, 38, 40, 52, 85, 86, 89, 90, 91, 92,
202, 204, 206, 207, 229, 232, 243, 244.

Pewter - 73

Porcelain - 17, 59

Silver - 5, 10, 22, 60, 62, 67, 68, 74, 82, 83, 220, 225, 241.

Silver-bronze - 33

Silver-plated - 26, 31, 61, 63, 75, 76, 77, 99, 213, 231.

Steel - 216

Wood - 2, 8, 14, 16, 39, 44, 47, 65, 201, 209, 210, 217,
224, 227, 230, 234, 235, 237, 238, 239, 240, 242.
(Bamboo - 234; Boxwood - 14, 16 ; Olivewood - 201, 242).

- Makers -

No less important are the names of the makers given below, together with the catalog number of the instruments bearing their signatures. (change to alphabetical order)

| | | |
|---|---|---|
| David Beringer - 3, 85 | J. B. James - 5 | Society Lumietieres - 12 |
| Henry Robert - 15 | Johann Schretteger - 20 | Mr. Magot - 21 |
| Johann Martin - 22 | Lorenz Grassel - 24 | Kokusai - 25 |
| Hans Tucher - 30 | E. C. Stockert~~s~~ - 37, 90 | Pierre LeMaire - 45, |
| Andreas Vogel - 48 | P. de Bomberg (Debombourg) - 55 | Johann Willebrand -56 //241 |
| Jacques Baradelle - 58 | T. Harris & Son-71 | Tsurugi - 78 |
| Andreas Vogler - 80 | Nicholas Bion - 82 | J.L.D.Sullivan & Son -89 |
| Charles Bloud - 97 | Ansonia ClockCo. - 100 | Pepys - 46 |

## THE CATALOG

(NOTE - Several instruments were given by Dr. Ernst to his friends -- namely, numbers 11, 212, 228, and 236. These are listed in the catalog as 'Missing', together with whatever information can be obtained from Dr. Ernst's own catalog, which was started just before his death. We hope that the missing dials will some day find their place once more in the collection. The numbering of the pieces was done by Dr. Ernst and there seems to be no reason for change.)

1 - EQUATORIAL Japan ca. 1700. Brass. 90 mm diameter. Circular brass dial plate inscribed with unequal hours on upper surface, and fitted with pointer adjustable to the seasons. The gnomon is a semicircular arch mounted on the polar axis. The use of the unequal hours causes a deformation of the hour lines. Time is obtained by setting the pointer to the corresponding day of the year and observing the position of the pointer among the deformed lines when the shadow of the arch falls along the centerline of the polar axis.

2 - MULTIFACE France. Wood. 125mm x 152mm x 82 mm. Wood block with nine dials. Fashioned in the general form of the famous Kratzer dial. Mounted on wood base supplied by Dr. Ernst.

3 -, MULTIFACE, Universal ~~France~~ Germany Late 18th Century. Paper. 66mm cube. Made by David Beringer (Augsburg). Five hand-colored dial plates printed on paper pasted on sides of wood cube, which is attached to a hinged support. Brass triangular gnomons. East face has quadrant fitted with plumb line for adjusting cube to latitude. North face signed "D. Beringer". Compass in base. Hand-colored ornament on paper base plate.

4 - CONCAVE Japan. Brass, silver-plated. 48mm diameter. Dial and compass in watch case form. Compass needle painted with luminous paint on north end. Unequal hours. Attached to No. 5.

5 - WATCH ~~Japan.~~ England ca 1730 Silver. 50 mm diameter. Made by J. B. James, London. An English watch to which movable Japanese hours have been added. Outer case, brass. From Negoya. Attached to No, 4.

6 - HORIZONTAL, Noon Mark Japan. Brass. 60mm x 30mm. Hinged perpendicular style, held in place by brass bar on east side. Thread gnomon. Compass in dial plate. Metal plumb bar set in perpendicular style. Dial plate fitted with two brass levelling screws.

7 - CONCAVE Japan. Brass. ~~Brass~~ 33mm diameter (attached to case 140x12x10mm). This instrument contains dial, compass, ruler, lunar calculator, ink well, and writing brush. Case lead. Ruler, compass and dial, brass. Unequal hours.

8 - CONCAVE Japan. Wood. 38mm x 40mm. Dial and compass in form of watch case. Unequal hours. Cloisonne on outside. From Kyoto.

9 - CONCAVE Japan. Brass. 48mm diameter. Dial and compass in form of watch case. Unequal hours. Case simply engraved. Attached to No. 10

10 - LUNAR CALCULATOR and COMPASS. Japan. Bronze and silver. 37mm diameter. Lunar calculator for use with sundial, to tell time at night by the light of the moon. Cloisonne on outside. Watch case form. Attached to ~~number~~ No. 9.

11 - Missing. This is a small HORIZONTAL, Noon Mark, with elaborate ornamentation. Made in Japan. Hinged perpendicular style, fitted with suspended plumb. Thread gnomon. Compass in center of dial plate.

12 - EQUATORIAL, Universal France Early 20th Century. German-silver. 88mm square. Made by Society Lumietieres (Paris). Fitted with german-zilver quadrant to adjust split ring hour circle to latitude. Dial and quadrant mounted on wood base fitted with hinged cover. Single, reversible, brass needle gnomon. Compass in base. Latitude of 30 cities, throughout the world, printed on paper attached to inside of cover. This type of instrument was being issued to French army officers at the time it was purchased.

13 - EQUATORIAL, Universal France Early 19th Century. German-silver. 120mm square. German silver quadrant enables ring hour circle to be adjusted to latitude. Dial and quadrant mounted on wood base~~,~~ fitted with hinged cover. Compass in base. ~~Compass~~ Single, reversible, brass needle gnomon.

14 - VERTICAL, (Altitude) France Early 18th Century. Boxwood. 13mm diameter x 79mm high. Lines and figures incised on wood cylinder, filled black. Hinged brass gnomon attached to removable cap. Typical of the so-called "shepherd," "poke", or "pillar" dials.

15 - VERTICAL, (Altitude) France 1830. Paper. 32mm diameter x 127mm high. Made by Henry Robert (Paris). Dial plate printed on paper, pasted on wood cylinder. Hinged tin gnomon attached to removable cap. Computed for latitude 49°.

16 - VERTICAL, (Altitude) France Late 19th Century. Boxwood. 21mm diameter x 97mm high. Lines, letters, and figures, incised in wood cylinder. The numerals and letters are filled red. Hinged tin gnomon attached to removable cap. Typical of so-called "shepherd", "poke", or "pillar" dials.

17 - HORIZONTAL China Late 19th Century. Porcelain. 85mm x 130mm. The dial plate has black lines and numerals, with red characters, on a band of porcelain 10mm wide, shaped in the form of a horseshoe and set in a brass base. Thread gnomon passes through hole in hinged perpendicular style, to plumb bob. Compass in engraved base plate. Base is fitted with three levelling screws studded with red glass ornaments, cabachon cut. Four blue cabachon cut glass ornaments,with gold character, set ih base. Spirit level let into base plate.

18 - CONCAVE Japan. Copper, silver-plated. 38mm diameter. Dial and compass in form of watch case. Unequal hours. Dial and compass, silver-plated.

19 - HORIZONTAL, Noon Mark Japan. Brass. 56mm x 30mm. Thread gnomon. Hinged perpendicular style held in place by brass bar on east side. Compass in dial plate, with red characters noting the cardinal points. Metal plumb bar set into perpendicular style. Dial plate fitted with two brass levelling screws.

20 - EQUATORIAL, Universal Germany ca.1740-1750. Brass. 50mm diameter. Made by Johann Schretteger (Augsburg). Quadrant allows adjustment of ring hour circle to latitude. Dial and quadrant mounted on octagonal, engraved brass base.

Compass in base. Bottom of compass case inscribed: "Johann Schretteger in Augsbu". Complete with leather carrying case. Single, reversible, needle gnomon.

21 - SIGNAL GUN, (Altitude) Light France(?) Late 19th Century. Brass. 90mm diameter. Made by (?) Mr. Magot. A double convex lens, mounted in brass cell, focuses the rays of the sun on touch hole of cannon. At noon, apparent time, a small quantity of powder placed in the touch hole of the cannon, is ignited, thus setting off the charge. The brass cannon is painted black, and mounted on a brass carriage. The lens is supported by two brass arms attached to brass quadrants mounted on a nickel-plated brass base. The lens may be adjusted in accordance with the declination of the sun each day in the year. A horizontal dial is inscribed on the base, south of the cannon. Two spirit levels set at right angles to each other are let into the base. Beneath the cannon is inscribed: "Mr. MAGOT".

22 - EQUATORIAL, Universal Germany ca. 1700. Silver. 47mm diameter. Made by Johann Martin (Augsburg), Quadrant allows adjustment of split ring dial plate to latitude. Dial plate and silver quadrant mounted on octagonal brass base. Single, reversible, silver needle gnomon. The latitudes of various cities ~~is~~ are inscribed on the bottom of the compass box, which is set in the base. Base is inscribed: "Johann Martin Augsburg"

23 - CONCAVE Japan. Copper, silver-plated. 48mm diameter. Dial and compass in form of watch case. Unequal hours. Compass needle painted with luminous paint on the north end. From Kyoto.

24 - EQUATORIAL, Universal Germany ca. 1730-1740.
Brass. 50mm diameter. Made by Lorenz Grassel (Augsburg). Quadrant allows adjustment of ring hour circle to latitude. Dial and quadrant mounted on octagonal, engraved brass base, with compass. Bottom of compass case inscribed: "ELEV POLI FRANKFORT AM MAYN 50 ZURICK L. Grasl" Single, reversible, brass needle gnomon.

25 - EQUATORIAL Japan ca.1800. Ivory. 72mm x 34mm. Made by "Kokusai". Contains dial, compass, and lunar calculator. Dial adjustable to seasons by means of ivory support attached to under side of dial plate, and notches cut in base. All lines incised -- hour and cardinal characters filled black; all other characters filled red. Complete with black bone carrying case.

26 - CONCAVE Japan. Copper, silver-plated. 40mm diameter. Dial and compass/in form of watch case. Unequal hours. Copper case with brass rim. Compass needle painted with luminous paint on north end. From Mijanoshita. Attached to No, 27.

27 - BOX Japan. Bronze. Attached to No. 26.

28 - SIGHTING INSTRUMENT Japan. Brass. 10mm diameter. Spherical form. Separable hollow hemispheres are connected by woven brass wire chain. Contains compass, folding style and plano-convex lens.

29 - HORIZONTAL Japan. Brass. 39mm diameter. Dial and compass in form of watch case. Separator ring between halves. Folding brass gnomon. Small compass in center of dial plate.

30 - HORIZONTAL Germany ca. 1575. Ivory. Oval, 70mm x 55mm. Made By Hans Tucher (Nurnberg). Tablet form. Thread gnomon. Dial plate delineated with five hour circles computed for latitudes 42°, 45°, 48°, 51°, and 54°N. Compass in center of dial plate. South part of dial plate bears the work mark of Hans Tucher -- an H and T separated by a coiled snake. Top of cover fitted with lunar calculator with brass indicator. On bottom of dial tablet, a brass hand indicates the day's length and the various signs of the zodiac. All lines, letters, and figures are incised - filled black, blue, and red.

31 - CONCAVE Japan. Brass, silver-plated. 21mm diameter. Dial and compass in form of watch case. Unequal hours. Silver-bronze case. Simple engraving on case and around dial.

32 - CONCAVE Japan. Brass. 47mm diameter. Dial and compass in form of watch case. Unequal hours. Dragon engraved on case. Medallion attached to case.

33 - CONCAVE Japan. Brass, silver-plated. 47mm. diam. Dial and compass in form of watch case. Unequal hours. Charm attached to case. From Nara.

34 - HORIZONTAL England 18th Century. Brass. 40mm diameter. Folding brass gnomon. Hand-colored paper rhumb card pasted in bottom of base. Cover screws on case. Top of cover, under side of dial, and bottom of case bear the Roman numerals XIV.

35 - CONCAVE Japan. Ivory. 57mm x 75mm. In form of physician's medicine case. Hollow spaces in both halves of case fitted with ivory lids. Unequal hour lines in gold. Gold (painted) floral

decorations. Exterior ornamented with mice painted in gold and silver. Carved ivory medallion attached.

36 - HORIZONTAL France. Brass. 80mm square. Dial plate is mounted on wood base. Compass in base. Hand-colored rhumb card. Folding gnomon. Computed for latitude 49°47'N.

37 - HORIZONTAL-VERTICAL Germany Early 19th Century. Paper, 46mm x 79mm. Made by E. C. Stockert (Bavaria) Dial plates printed on paper pasted on two wood tablets. The horizontal dial has three hour circles for use in latitudes 45°, 50°, and 55°N. Vertical dial computed for 50°N latitude. Compass in center of horizontal dial plate. Hand-colored rhumb card. Thread gnomon. Latitude scale on vertical dial marked every two degrees from 34°-56°. Various cities in America, England, Spain, France, Italy, and Germany, with their latitudes, printed on card pasted on reverse of vertical tablet. Vertical dial plate signed: "STOCKERT a Bavaria".

38 - HORIZONTAL-VERTICAL Germany Early 19th Century. Paper. 110mm x 72mm. Hand-colored dial plates printed on paper, pasted on two wood tablets. Horizontal dial has four hour circles for use in latitudes 58°, 50°, 45°, and 40°N. Vertical dial computed for 50°, with latitude scale marked every two degrees from 36°-56°. Thread gnomon. Compass in center of horizontal dial. Various cities and their latitudes printed on card pasted on reverse of vertical tablet. Probably the work of Stockert.

39 - HORIZONTAL-VERTICAL France Early 17th Century(?). Wood. 110mm x 64mm. Hour lines and numerals incised ~~on~~ in two wood tablets. Hour lines alternating red and green; numerals filled black. Thread gnomon, and ~~plumb~~ plumb. Compass in center of horizontal dial.

40 - HORIZONTAL, (Azimuth) Magnetic France 1629. Paper. 120 x 114mm Two wood tablets with horizontal (azimuth) dial mounted in the lower tablet. The time is observed by noting the position of the magnetic compass needle among the hours when the east and west sides of the tablet cast no shadow. Hour lines (deformed) printed on paper plate pasted in metal cell. Outer circle marked in degrees numbered consecutively in a counterclockwise direction, beginning with the 12 o'clock line. Computed for latitude of Dijon, or 47°. Dated, 1629. The tablets bear hour lines traced in ink. These were undoubtedly added at a later date.

41 - HORIZONTAL Italy 1624,5. Ivory. 62 x 66 x 25mm. Eight-sided tablets. Compass set in center of dial. Hand-colored rhumb card marked with English directions. 1624 incised on inside of upper tablet; and 1625 incised on bottom of dial. Thread gnomon. Lunar calculator (without indicator) inscribed on outside of vertical tablet. Formerly the property of an old Italian monastery.

42 - HORIZONTAL, Noon Mark Japan. Brass. 162mm x 118mm x 100 mm high Dial plate mounted on gimbals, for use at sea. Thread gnomon. Folding perpendicular style fitted with plumb bar. Thread gnomon held taut by means of adjustment screw on underside of

dial plate. Brass weight hangs by four point suspension beneath dial plate. Instrument may be dismantled and packed in wood box, which serves as a base when in use.

43 - HORIZONTAL Japan. Brass. 39mm diameter. Dial and compass in form of watch case. Separator ring between halves. Folding brass gnomon. Small compass in center of dial plate.

44 - HORIZONTAL, Noon Mark Japan. Wood. 131mm x 43mm. Dial plate fitted with two brass levelling screws. Fixed perpendicular style fitted with plumb bar. Thread gnomon. Compass in base. This instrument was used in the Imperial Post Office at Kyoto. The postmaster, from whom the instrument was purchased, states in a letter that "it is more punctual than cheap watches."

45 - HORIZONTAL France ca. 1650. Brass. 90mm x 58mm. Made by Pierre LeMaire (Paris). Dial plate has three hour circles for use in latitudes 43°, 47°, and 49°N. Folding perpendicular style graduated from 40° to 55°, and fitted with a brass slide used to adjust gnomon to latitude. Gnomon passes through slide to plumb bob. Dial plate is fitted with four levelling screws. Compass attached to bottom of dial plate. Compass arranged for adjustment to magnetic variation of needle for use in setting dial on true meridian. Magnetic setting scale reads to 30° either side of the meridian. Bottom of compass box engraved with cities and their latitude. Signed: "Pre Le Maire Paris". Complete with leather case, lined with green velvet. Height of plummet and tautness of gnomon may be adjusted by screw affixed to bottom of dial plate.

46 - WATCH ~~Bought in Germany~~ England. ~~Made in London,~~ made by ~~J~~ Pepys, London
This, together with item No. 5 afford an interesting comparison with the pocket sundials of the same period. The pocket sundials fit the pocket as easily and were much lighter and more beautiful in appearance than the jumbo watches of the day.

47 - HORIZONTAL, Noon Mark. Japan . Wood. 43mm x 131mm.
Dial plate fitted with two brass levelling screws. Fixed perpendicular style fitted with plumb bar. Compass set in base. Thread gnomon.

48 - EQUATORIAL, Universal Germany ca. 1730. Brass. 65mm diameter. Made by Andreas Vogel (Augsburg). Quadrant and ring dial plate mounted on octagonal brass base. With compass. Base fitted with three levelling screws. Latitude of various cities inscribed on bottom of compass case. Single, reversible, brass needle gnomon. Signed: "Andreas Vogel". Complete with leather carrying case, and instructions for use printed in both German and French.

49 - HORIZONTAL, Noon Mark Japan. Brass. 51mm x 26mm.
Dial plate fitted with two brass levelling screws. Thread gnomon. Folding perpendicular style fitted with plumb bar; held in position by brass bar on east side. Compass fitted with bevel edged glass cover. Complete, with leather carrying case.

50 - EQUATORIAL Japan. Brass. 10mm diameter. Dial and compass mounted on finger ring (25mm diam.). The dial plate folds down over compass, both being protected by a hinged cover, on top of which is engraved a crest. Hours engraved on both sides of dial ~~plate.~~ plate. Under side of dial -

plate has scale for adjustment to seasons. Double brass needle gnomon.

51 - CONCAVE Japan. Copper. 50mm x 22mm. Dial and compass in form of pair of spectacles. Unequal hours. Brass ornament attached to top of copper case.

52 - HORIZONTAL Japan. Paper. 68mm x 34mm. Dial plate printed on paper pasted on brass base. Base fitted with two brass levelling screws, and compass. Hinged perpendicular style fitted with loop through which thread gnomon passes to plumb bob in well, in base.

53 - INKWELL Japan. Brass. 175mm x 8mm x 8mm. Typical letter writer's instrument with inkwell, wadding, and brush. Attached to No. 54.

54 - CONCAVE Japan. Ivory. 25mm diameter x 40mm high. ~~Dd~~ Drum-shaped. Dial and compass in heads. Unequal hours. Side has four cut-outs with inset seed pearls. Heads bound with brass wire. ~~Cutouts~~ Cut-outs and other incisions, red. hour lines incised, filled gold. Attached to No. 53.

55 - HORIZONTAL France 17th Century. Brass. 64mm x 71mm. Made by P. Debombourg (Lyon). Dial plate engraved in corners. Sides of folding gnomon engraved, Compass in center of dial plate with gnomon mounted over compass window. Complete with leather case, lined with green velvet. Inscribed: "P. Debombourg, ALyon".

56 - ARMILLARY, Universal Germany ca. 1720. Brass. 85mm diameter. Made by Johann Willebrand (Augsburg). Meridional and equatorial ring engraved with names of cities and their latitudes. Meridional ring divided in degrees in one quadrant only. Collapsible. Meridional ring inscribed: "Johann Willebrand in Augsburg."

57 - ARMILLARY, Universal Portugal. Brass. 73mm diameter. Various cities and towns and their latitude engraved on meridional ring. Collapsible. Meridional ring inscribed with degrees in two opposite quadrants. Complete with leather carrying case.

58 - HORIZONTAL France ca. 1750. Brass. 70mm x 65mm. Made by Jacques Baradelle (Paris). Eight-sided dial plate with compass and folding gnomon. Dial has four hour bands for use in latitudes 52°, 49°, 45°, and 40°N. The gnomon is adjustable, the indicator cut and engraved in the form of a bird. The latitude of various cities is engraved on bottom of the compass box. Dial plate inscribed: "Baradelle Paris".

59 - HORIZONTAL China Late 19th century. Porcelain. 175mm x 115mm. The dial plate has black lines and numerals, and red characters, on a band of white porcelain, 10mm wide, ~~shaped~~ which is in the form of a horseshoe set into a brass base. Thread gnomon passes through hole in hinged perpendicular style to plumb bob. Base plate engraved. Compass let into base. Spirit level in center of horseshoe, at right angles to meridian. Levelling accomplished by means of rack and screws. Adjustment screws studded with red, cut glass. Four blue glass ornaments, cabachon cut, with gold characters, set in base.

60 - ARMILLARY, Universal Germany Early 17th Century. Silver. 72mm diameter. Cities and their latitude inscribed on meridional ring. Equatorial ring bears hall mark - a G circumscribed by two concentric diamonds. Collapsible. Meridional ring divided in degrees in two opposite quadrants.

61 - CONCAVE Japan . Brass, silver-plated. 48mm diameter. Dial and compass in form of watch case. Unequal hours. Silver-bronze case, ~~heav~~ heavily ornamented with dragon, on one side.

62 - CONCAVE Japan. Silver. 20mm x 24mm, x 30mm high. Four lozenge-shape pieces, stacked on on the other, ~~and~~ held together and hinged by a post at either end of the major axis. Engraved brass end plates and plain separators. Contains dial, compass, magnifying glass, and smoked glass; each mounted in brass cell. Unequal hours.

63 - CONCAVE Japan. Copper, silver-plated. 35mm square. Dial and compass in form of watch case. Unequal hours. Brass case engraved with row of stars or asterisks around edge of cover.

64 - CONCAVE Japan. Brass. 22mm diameter. Dial,compass, and two magnifying glasses in form of pair of spectacles. Two tiers -- compass and magnifying glass in one half; dial and magnifying glass in the other half. Unequal hours. Case engraved.

65 - CONCAVE - Japan. Wood. 60mm diameter. Dial and compass in lacquered case. Unequal hours. Dial painted gold with black hour lines.

66 - CONCAVE Japan. Brass. Elliptical, 37mm x 52mm. Dial and compass set in wood base. Unequal hours. Base painted silver, and cut to fit elliptical brass box fitted with hinged lid. From an old country house near Lake Biwa.

67 - CONCAVE Japan. Silver. 32mm diameter. Dial and compass in form of watch case. Unequal hours. Brass case with heavily worked dragon.

68 - CONCAVE Japan. Silver. 70mm x 35mm. Three parts hinged together. Each part consists of two circular pieces tangent to one another. First part contains four segmental silver ink wells with covers; a folding writing brush fits in slot between ink wells. The second part contains two ink wells, one for black ink, the other for red ink; two small knives are attached to the back of this part -- one has a brass blade, the other, steel. The third part contains a silver dial with unequal hours, and a silver compass. When closed, the instrument resembles a pair of goggles.

69- VERTICAL England 1751. Brass. 78mm x 49mm. Leaf-shaped, with folding gnomon. Dated 1751.

70 - VERTICAL, (Altitude) England 16th century (?). Brass. 40mm diameter. Hour lines inscribed on elliptical arc fitted inside of ring, which is fitted with a pierced slip ring adjustable to daily declination of sun inscribed on outside of ring.

71 - ARMILLARY, Universal England . Brass. 156mm diameter. Made by T. Harris and Son (London). Degrees marked on meridional ring, in two adjoining quadrants. Axial bar engraved on both sides for direct use in southern latitudes. Collapsible. Inscribed: "T. Harris and Son, 52 Great Russell St. Bloomsbury, London".

72 - HORIZONTAL England. Lead 115mm diameter. Computed for 42°N latitude. Dial plate stamped.

73 - HORIZONTAL England. Pewter. 77mm diameter. Computed for 42°N latitude. Dial plate stamped. Bears initials "N M".

74 - CONCAVE. Japan Early 19th Century. Silver. 34mm diameter. Dial and compass in form of watch case. Unequal hours. Both halves simply engraved. Leaf motif engraved around dial. Silver chain with old tear bottle attached.

75 - CONCAVE Japan. Copper, silver-plated. 36mm diameter. Dial and compass in form of watch case. Unequal hours. Case bronze. Inlaide enamel on one side(green and red).

76 - CONCAVE Japan. Brass, silver-plated. 37mm diameter. Dial and compass in form of watch case. Unequal hours. Brass tinder box with flint and steel, attached.

77 - CONCAVE Japan. Brass, silver-plated. Elliptical, 47mm x 38mm. Dial and compass in form of watch case. Unequal hours. Dragon carved on copper case. Simple engraving around dial.

78 - CONCAVE Japan ca. 1600. Ivory. 180mm x 30mm. Made by "Tsurugi". Carved wood fish. Dial and compass set in position of gills. Unequal hours. Small compass is fitted with magnifying lens window. The eyes of the fish are pearl inlay. From a country house in the region of Lake Biwa.

79 - HORIZONTAL, Noon Mark Light. Japan. Gold. 12mm x 22mm. Silver case with hinged cover. Slit in cover allows passage of light, Fitted with small compass. Taken from Japanese officer killed at Port Arthur.

80 - EQUATORIAL, Universal Germany ca. 1730. Brass. 70mm diameter. Made by Andreas Vogler (Augsburg). Quadrant and ring dial plate mounted on octagonal base with scalloped edges. Base engraved and fitted with plumb bob and compass. Cities and their latitude on bottom of compass case. Signed: "And. Vogler". Complete, with leather carrying case.

81 - CONCAVE Japan. Ivory. 43mm long. Violin shape. Dial painted gold with black hour lines. Unequal hours. Fitted with compass and ivory cover.

82 - HORIZONTAL France ca. 1700. Silver. 52mm x 62mm. Made by Nicholas Bion (Paris). Eight-sided dial plate, fitted with folding gnomon adjustable to latitude. The beak of an engraved bird serves as an indicator. Dial engraved with landscape and three hour bands for use in latitudes 49°, 45°, and 40°N. Compass let into dial plate. Bottom of compass bears engraved landscape with winged boy and the word "sans eclat et sans bruict". Latitudes of various cities inscribed, and the letters F P scratched on bottom of dial plate. Numerals and space between hour bands

filled black in the manner of Champleve'. Signed: "N. BION - A - PARIS".

83 - CONCAVE Japan ca. 1800. Silver. 33mm diameter. Dial and compass in bronze case in form of teapot. Unequal hours. Animals embossed on case.

84 - HORIZONTAL Japan. Ivory. 52mm x 56 mm. Two eight-sided hinged tablets. Common needle compass on one side and floating rhumb card on the other side. Folding gnomon missing. All lines and characters incised, and filled black. Rhumb cards hand-colored.

85 - MULTIFACE, Universal ~~France~~ Germany ca. 1775. Paper. Cube, 68mm. Made by David Beringer (Augsburg). Five paper dial plates pasted on sides of wood cube mounted on hinged support. East dial fitted with plumb line and scale of degrees for adjustment to latitude. Hand-colored ornament on dial plates. North dial signed: "D. Beringer". Compass in base.

86 - HORIZONTAL Japan Late 19th Century. Paper. 60mm diameter. Paper dial plate pasted on wood base. Compass in base. Folding brass gnomon held in position by string. Hours in Roman numerals. Fitted with separable wood cover.

87 - HORIZONTAL-VERTICAL France ca. 1650. Ivory. 34mm x 45mm. Tablet form. Wood separator between two thin ivory plaques compose horizontal tablet. Thread gnomon. Incised lines and numerals. Horizontal dial has compass with double convex lens window, blue lines, and black arabic numerals. Vertical dial

has blue hour lines and black Roman numerals. Incised ornamentation on both dial plates, filled red. Outside of vertical tablet has lunar calculator with brass indicator, black and red incisions.

88 - HORIZONTAL-VERTICAL France. ca. 1650. Ivory. 45mm x 58mm. Tablet form. Wood separator between two thin ivory plaques, compose horizontal tablet. Compass in center of horizontal dial plate. All lines and numerals incised. Horizontal dial - blue lines, black Arabic numerals. Ornamented with phases of moon (quarters yellow, full and new moon red). Vertical dial -- blue lines , black Roman numerals; lines emanate from red half sun emitting red and yellow fingers on semicircular blue field. Half hour positions marked by red asterisks on both dials. Outside of vertical dial fitted with lunar calculator with brass indicator,

89 - HORIZONTAL U.S.A. 1878. Paper. 45mm diameter. Made by J.L.D. Sullivan (Boston, Mass.). Dial plate printed on paper pasted on wood base. Fitted with separable wood cover, compass, and fixed triangular brass gnomon. Monogram of superimposed D, L, and S, on dial plate west of gnomon; the date 1878 east of gnomon. Instructions for use printed on paper pasted on top of cover. Called "Pocket Solargraph". Signed: J. L. D. Sullivan and Son, 26 School ~~Street~~ St. Boston, Mass.

90 - HORIZONTAL Germany Early 19th Century. Paper. 53mm diameter. Made by E. C. Stockert (Bavaria). Hand-colored, floating, paper dial plate mounted on magnetic needle. Small

brass gnomon. Ornamental hand-colored paper rhumb ring. Compass and dial mounted in wood case, fitted with convex-concave glass window. All notations in English. Signed: "Stockert", on south edge of dial plate.

91 - HORIZONTAL France. Paper. 52mm diameter. Hand-colored, floating, paper dial plate, mounted on magnetic needle. Small brass gnomon. In wood case fitted with convex-concave glass window and separable cover. Ornamental hand-colored paper rhumb ring.

92 - HORIZONTAL Japan. Pap~~a~~er. 55mm diameter. Dial plate printed on paper pasted on wood base. Lacquered brass folding gnomon, held in position by notched segmental ring. Compass in base marked in English, compass points marked with Japanese characters on the dial plate, hours marked in Roman numerals. In the northeast part of the plate the letter M is inscribed within a circle. Wood base fits nickel case fitted with separable nickel cover. Colored landscape pasted inside cover.

93 - HORIZONTAL Holland(?) Brass. 40mm diameter. Cut-out brass dial plate with folding gnomon fits friction tight in compass box, and rests on green glass window. Hand-colored interior scene on paper pasted inside of separable brass cover, inscribed: "Bij Ian Tra...." Letters IT incised on south edge of dial plate. Hand-colored floating rhumb card.

94 - HORIZONTAL Ivory. 45mm x 27mm. Tablet form. Thread gnomon. Incised hour lines and Arabic numerals, filled red. Incised, colored, floral design on both sides of vertical tablet.

95 - CONCAVE Japan. Brass. 43mm diameter. Watch case form. Unequal hours. Compass in top of case adjacent to small square ink well, both protected by hinged cover. Case engraved.

96 - CONCAVE Japan. Brass. 30mm diameter x 70mm high. Wood cylinder composed of four separable sections, carved. Lower section contains ivory calendar; second section contains brass compass with glass window; third section contains a brass dial with unequal hours; the fourth or top section serves as a cover, painted gold inside. Sections held together by a chord.

97 - ~~HORIZONTAL~~ Analemmatic France ca. 1675. Ivory. 70mm x 75mm. Made by Charles Bloud (Dieppe) Tablet form. Equatorial and polar dials on outside of ~~upper~~ vertical tablet. Well in edge of tablet to receive removable gnomon, fitted with silver hook cover. A scale of ~~Xa~~ degrees on the underside of vertical tablet allows adjustment to latitude. Three pewter disks are also attached to the inside of the vertical tablet, by means of which lunar calculations can be made, thus enabling the dial to be used at night by the light of the moon. The base or lower tablet contains a horizontal dial and a large compass in the center. Beneath the magnetic needle is a silver elliptical hour band that may be adjusted for the time of year by turning a silver plate on the under side of the base. In use, the time is shown by the position of the compass needle among the hours on the elliptical band. All parts beautifully ornamented. All incisions filled black. Adjustment plate on underside of base inscribed: "Fait Par Charles Bloud, Dieppe".

98 - ASTROLOGICAL INSTRUMENT Japan ca. 1500. Clay. 118mm diameter. Also known as a geomancer's compass. Characters written in black on painted surface. Compass in center. Cover missing. Similar to ~~No.~~ No. 210

99 - CONCAVE Japan. Copper, silver-plated. 70mm x 80mm. In form of clam shell on rock. One half of inside of shell contains a compass, the other half a dial with unequal hours. When closed the clam shell is surmaounted by a small crab.

100 - HORIZONTAL U.S.A. 1921. Brass. 50mm x 75mm. Made by Ansonia Clock Co. ( ). Aluminum plate attached to inside of cover gives latitude, longitude, and variation of the magnetic needle for 30 of the principle cities in the U.S., together with the equation of time. Dial plate has three hour bands for use in latitudes 35°, 40°, and 45°N. Compass let into dial plate. Adjustable gnomon. Scale of degrees at north end of compass extends 40° either side of the meridian. Called "Sunwatch". Complete with cardboard case and pamphlet of instructions for use. Standard time may be obtained.

101 - 200 incl. - Not Assigned.

201 - CONCAVE Japan. Olivewood. 205mm diameter. Marine compass with dial 35mm. diam. Dial painted black with gold hour lines. Unequal hours. Periphery scalloped.

202 - HORIZONTAL Germany. Paper. 90mm diameter. Floating paper dial plate with brass gnomon, mounted on magnetic needle. Wood case fitted with separable hemispherical cover. Convex-concave glass ~~compass~~ window missing. Paper rhumb ring,

203 - HORIZONTAL, Noon Mark Japan. Brass. 56mm x 30mm. Base fitted with two levelling screws. Hinged perpendicular style heldin position by hinged prop. Thread gnomon. Compass let into base. Perpendicular style fitted with plumb bar.

204 - HORIZONTAL France Early 17th Century. Paper. 50mm diameter. Floating, hand-colored, paper dial plate mounted on magnetic needle. Hand-colored rhumb ring. Wood case fitted with separable cover. Convex-concave glass window missing.

205 - HORIZONTAL France 17th Century. Brass. 44mm diameter. In wood case with cover. Folding brass gnomon, and compass with mariners markings. Scale marked 20° either side of meridian for adjustment to magnetic declination. Initials ITH scratched on cover. Dial plate fits case friction tight and rests on compass window.

206 - HORIZONTAL France Early 17th century. Pap~~a~~er. 50mm diameter. Floating, hand-colored, paper dial plate~~s~~ mounted on magnetic needle. Fitted with separable cover and convex-concave glass window. Hand-colored rhumb ring.

207 - HORIZONTAL Japan. Paper. 55mm diameter. Dial plate pasted on wood base. Fitted with compass and separable wood cover. Folding brass gnomon held in place by notched semicircular brass ring. Plumb line, attached to perpendicular style, passes ~~thor~~ through hole in base. Equation of time, in Japanese, pasted on inside of cover.

208 - CONCAVE Japan. Copper. 38mm diameter. Brass case fitted with separable cover. Brass compass rim encroaches on copper dial rim. Unequal hours. Attractive metal combination.

209 - HORIZONTAL, Noon Mark Japan. Wood. 82mm diameter. Wire gnomon mounted over compass in wood box fitted with separable cover. Compass rim reversible, with 12 divisions on one side, and 24 on the other. Top of cover has inlaid mother-of-pearl

210.- ASTROLOGICAL INSTRUMENT Japan. ca. 1500. Wood. 86mm diameter. Also known as a Geomancer's Compass. Compass in center. Fitted with separable cover. Characters around compass, gold; those inside cover, black. Mica compass window.

211 - CONCAVE Japan. Brass. 115mm diameter. Dial plate set in wood base fitted with separable cover. Unequal hours. Rim carved with signs of the zodiac, filled red. Metal and wood ornament on cover. Small compass in base.

212 - Missing. A small clock made in Japan. Movable hours.

213 - CONCAVE Japan. Copper, silver-plated. 90mm diameter. Dial and compass in wood case, fitted with separable cover, Pearl inlay floral design on lacquered cover. Unequal hours. Complete with gold brocade bag. From Kyoto. Once the property of the temple of Higashi-Hogwangi.

214 - EQUATORIAL Japan. Ivory. 33mm x 73mm. Dial plate inscribed on upper side and adjustable to seasons. Compass in base. All

lines incised -- hours and compass characters filled black, all others filled red. From the region of Lake Biwa. Signature undeciphered.

215 - CONCAVE Japan. Lead. 200mm long. An old pistol with dial mounted in back of hammer. Unequal hours. Trigger missing. Hammer and dial protected by a cover.

216 - EQUATORIAL Japan. Steel. 22mm x 63mm. Dial plate is a quarter circle, adjustable to declination of the sun. Dial plate held in position by hinged prop.

217 - CONCAVE Japan. ~~Japan~~ Wood. 48mm x 24mm. Dial painted gold with black hour lines. Unequal hours. Gold characters around compass. Separable wood cover.

218 - CONCAVE Japan. Brass. 105mm x 38mm. Dial, compass, and ivory calendar in wood base. Carved ivory and wood ornament on separable cover. Unequal hours.

219 - CONCAVE Japan. Brass. 74mm x 35mm. Dial and compass in wood base. Unequal hours. Ivory rhumb ring with incised cardinal characters filled red, other characters filled black. Carved silver and jade ornament on top of separable cover. From country house near Nagoya.

220 - HORIZONTAL France 19th Century. Silver. 48mm diameter. Dial plate cut-out, mounted on compass window. There are four hour bands for use in latitudes 52°, 49°, 46°, and 43°N. Folding gnomon adjustable to latitude and supported by figure of a bird. Brass case fitted with separable chased cover.

221 - CONCAVE Japan. Ivory. 42mm x 19mm. Dial and compass in ivory block with surface painted gold. Unequal hours. All lines incised -- hours filled red, letters filled black. Fitted with separable ivory cover.

222 - CONCAVE Japan. Ivory. 23mm x 48mm. Dial painted gold with red hour lines. Unequal hours. Brass compass. Fitted with separable ivory cover.

223 - CONCAVE Japan. Ivory. 36mm x 17 mm. Dial and compass in ivory block with surface painted red and gold. Unequal hours. Hour lines gold, character black.

224 - HORIZONTAL, (Azimuth) Japan. Wood. 39mm x 78mm. Wood block fitted with separable cover. Base plate contains two dials and a compass. Inside of cover contains four dials.. Each dial has two holes to receive perpendicular brass pin gnomons at different seasons. Groove in base for storage of gnomons when instrument is in transit.

225 - EQUATORIAL Japan. Silver. 25mm diameter. Dial mounted on compass cell. Dial is hinged and folds down on compass, the whole protected by a hinged lid or cover. Top of lid bears the crest of the Tokugawa family.

226 - HORIZONTAL, Noon Mark. Japan. Ivory. 44mm diameter. Ivory box with compass. Wire gnomon mounted on the edge. Incisions filled green, red, and black. Separable ivory cover has removable disk.

227 - CONCAVE Japan. Wood. 34mm x 50mm. Dial and compass in wood base. Unequal hours. Dial painted black qith gold lines. Carved separable cover embellished with copper and enamel inlay.

228 - Missing. Identical with No. 216.

229 - HORIZONTAL England. Paper. 38mm diameter. Floating paper dial plate mounted on compass needle. Small brass gnomon. Brass case with convex-concave glass window, and separable hemispherical cover. Equation of time printed on card pasted inside of cover.

230 - CONCAVE Japan. Wood. 40mm diameter. Dial, compass, and calendar in wood base. Dial painted gold with black lines and characters. Unequal hours. Separable cover. Magnifying lens compass window.

231 - CONCAVE Japan. Copper, silver-plated. 34mm square. Dial and compass in form of watch case. Unequal hours. Brass case.

232 - HORIZONTAL France ca. 1860. Paper. 100mm diameter. Computed for 41°15'. Brass gnomon may be folded into base. Labelled : "Cadran Solaire C. de'pose' R." The words "SOIR MATIN" on dial plate. Instructions for use printed inside cover, in both English and French.

233 - CONCAVE Japan. Brass. 35mm x 21mm. Dial, compass, and calendar in wood case. Unequal hours. Ivory calendar set in separable cover.

234 - EQUATORIAL Japan. Bamboo. 145mm x 45mm. Compass in base, fitted with protective sliding cover. Dial adjustable to declination of sun at different seasons. All lines incised and filled black. White characters on black rhumb ring.

235 - COMPASS Japan. Wood. 35mm diameter. Fitted with separable cover. Directions and characters on rim of compass marked in white; north point, red.

236 - Missing. A silver dial from Kyoto. Also formerly the property of the temple of Higashi-Hogwangi.

237 - HORIZONTAL China 1916. Wood. 58mm x 42mm. Tablet dial with compass. Thread gnomon. Black lines, black and red characters.

238 - HORIZONTAL-VERTICAL China 1916. Wood. 82mm x 57mm. Tablet dial with compass and lunar calculator. Thread gnomon.

239 - HORIZONTAL-VERTICAL China 1916. Wood. 81mm x 56mm. Tablet dial with compass and thread gnomon.

240 - HORIZONTAL-VERTICAL China 1916. Wood. 104mm x 70mm. Tablet dial with compass. Thread gnomon. Outside of vertical tablet decorated with two black swastikas and hand-colored floral design. Complete with paper box.

241 - HORIZONTAL France. ca. 1650. Silver. 70mm x 60mm. Made by Pierre LeMaire (Paris). Eight-sided dial plate with compass. Four hour bands for use in latitudes 52°, 49°, 46°, and 43°N. Bottom of dial plate and compass box inscribed with the latitude of various cities. Inscribed: "P. LeMaire Paris".

242 - CONCAVE Japan. Olivewood. 192mm x 58mm x 24 mm. This instrument contains an~~d~~ inkwell, writing brushes, dial, compass, and counting apparatus (abacus). Brass dial set into base. Unequal hours. Wood cover protects dial and compass. Steel knife with wood handle fits slot in side. Steel scissors, ivory handled awl and stylus, and a brush are stored in well beneath abacus.

243 - HORIZONTAL - France, Paper. 53mm diameter. Floating paper dial plate mounted on magnetic needle. Small brass gnomon. Brass case fitted with convex-concave glass window. Equation of time given. Letter C.R. in hour band at center of dial.

244 - HORIZONTAL U.S.A. Late 19th Century. Paper. 45mm diameter. Dial plate pasted on wood base. Compass in base. Cardboard gnomon. Fitted with separable cover.

245 - CONCAVE Japan. Brass. 65mm x 125mm x 80mm. Dial and compass set in wood knot or knurl, fitted with separable cover. The whole tapers to a peak. Unequal hours. From the temple of Higashi-Hogwangi.

# V I

# C O L L E C T I O N S   I N THE U. S. A.

We have received many requests for information concernin the location of other sundial collections in the United States. Therefore we take this opportunity to present a list of those collections that have come to our attention as of June 1940. Since the publication of our previous list (as of June 1938) several private collections have come to hand. They are included here as a matter of record, for they show a widespread interest in sundials as a hobby -- an interest that is increasing steadily. We are indebted to the curators and owners of the various collections, for the information contained in the following list.

## COLLECTIONS OPEN TO THE PUBLIC

### CONNECTICUT

F. RICHARD BOLSTER COLLECTION - An excellent collection of copies of historic and interesting sundials, together with a few nocturnals and astrolabes. All instruments (about 60) were made by the owner. They may be seen in the museum on the top floor of the Bristol Connecticut Public Library. The museum is open on request only. An inquiry at the delivery desk will admit visitors to the collection , without fee, at any time during library hours.

### DISTRICT OF COLUMBIA

UNITED STATES NATIONAL MUSEUM, Washington, D. C. -- A collection of sundials (~~26~~ 22 portable, 30 stationary), covering the period from the 17th century to 1917, is housed in the Arts and Industries Building, which is open to the public, without fee, from 9 a.m. to 4:30 p.m. daily; and from 1:30 p.m. to 4:30 p.m. on Sundays.

ILLINOIS

MENSING COLLECTION - One of the finest collections of astronomical instruments in the world. Located in the Adler Planetarium, Chicago, Illinois. More than 400 instruments are on display, of which about 175 are sundials of all sorts. Many of them are intricate devices containing gears, lenses, and so forth. It is representative of the finest work done in the period from 1479 to 1800. Open to the public. Entrance fee charged.

JOHN C. TOMLINSON COLLECTION - Located in the ~~Museum of Science and Industry,~~ adler Planetarium Chicago, Illinois. A small collection of 17th to 19th century instruments. The outstanding instruments are those by Schissler Christopher Wren and Thomas Jefferson Open to the public. We regret that it is impossible to give more specific information at the time of writing.

MASSACHUSETTS

NATHANIEL BOWDITCH COLLECTION - This collection is divided into two parts. PART I is located in the Peabody Museum, Salem, Mass. Nathaniel Bowditch is particularly well known for his "American Practical Navigator" which is, even today, a standard reference work on navigation. Many of the Bowditch manuscripts and marine instruments together with a few sundials are on display. Open to the public, without fee, each weekday from 9 a.m. to 5 p.m. PART II is located in the ~~transparency Room~~ Wolbach Library at the Harvard College Astronomical Observatory, in Cambridge, Mass. Several instruments made by Bowditch are on display together with a Gunter's quadrant (sundial), astrolabe, nocturnal, and other instruments used by

cont. p. 72

HAROLD C. ERNST COLLECTION - Located in the ~~transparency room~~ Wolbach Library at the Harvard College Astronomical Observatory in Cambridge, Mass. A fine collection of about 150 portable sundials covering the period from the 16th century to 1921. This collection is particularly notable for its oriental dials, the largest group of such dials , in the world.

INSERT @ 'A'

ESSEX INSTITUTE, Salem, Mass. - Here is preserved what is considered to be the first sundial in America. This small hexagonal dial, about 5" across, was made by William Bowyer in London in 1630, for John Endicott, who lived in Salem at that time.

INSERT @ "B"

Bowditch. There is also a horizontal dial made by his son Ingersoll at the age of 16.

"A" Insert Ernst Collection

"B" Essex Inst.

HARVARD COLLEGE ASTRONOMICAL OBSERVATORY, Cambridge, Mass. - Several collections are exhibited in the transparency room. Permanent exhibitions include the Harold C. Ernst collection of portable sundials (about 150 pieces), a specially selected group of astronomical photographs, various types of astronomical instruments of historic interest, and the Wheeler Willson collection of instruments. Loan collections include the Yalden collection, a portion of the Mayall collection, and a portion of the Bowditch collection. A small case is devoted to temporary exhibits. In this case have been displayed the Walker collection, a portion of the Bolster collection, ~~and~~/a portion of the Lester T. Forbes collection, and other instruments of an astronomical character.

PEABODY MUSEUM , Salem, Mass . - A small but interesting collection of 8 sundials, 8 sand glasses (including a 24 second and a 28 second log glass), 1 astrolabe, 4 nocturnals, and 1 lunar calculator, representing the period from about 1650 to 1800. The instruments are displayed in the Cabinet Hall Corridor. A portion of the Nathaniel Bowditch collection is also located in this building. Open to the public, without fee, each weekday from 9 a.m. to 5 p.m.

J. ERNEST G. YALDEN COLLECTION - Located in the transparency room at the Harvard College Astronomical Observatory in Cambridge, Mass. The collection contains about a dozen replicas of larger dials designed by the late J. Ernest G. Yalden of East Orange, New Jersey.

NEW YORK

JAMES ARTHUR COLLECTION of CLOCKS and WATCHES, and the JAMES ABBOT COLLECTION of WATCHES -- These famous collections became the property of New York University in 1926, where they are now exhibited in the Library situated on the Campus at University Heights, New York City. Here will be found 180 clocks, 1400 watches (including 200 from the Abbot collection), and two sundials. This is the largest collection of its kind in this country and one of the finest in the world. It includes clocks and watches of every description gathered from all parts of the world. Due to the present temporary cramped condition of the exhibition room, the Curator suggests that visitors seek an appointment. The collection is open to the public, without fee, afternoons only, each day except Sundays and holidays.

HAYDEN PLANETARIUM, 81st Street at Central Park West, New York City. A loan collection of about 50 sundials, mostly portable, may be seen in the wall cases in the corridor around the theater. Open to the public. Admission fee 25 cents. Hours - from to .

METROPOLITAN MUSEUM OF ART, 5th Avenue, New York City - Only about 14 of the 65 dials owned by the museum are on exhibition in Gallery K 26. The character of the collection is similar to that of the Mensing and Ernst. There are in all 59 portable dials, 6 stationary dials, 83 clocks, 451 watches, 1 astrolabe, 5 calendar dials, a graphometer, and a few nautical instruments, covering the period from about 1560 to about 1890. There is also a sundial represented in the Boscoreale Fresco in Room VIII. The museum is open to the public, without fee, daily from to p.m., except on and when a fee of cents is in effect.

DAVID EUGENE SMITH COLLECTION - Located in Room 210, Low Memorial Library, Columbia University, 116th Street, New York City. A diversified group of instruments including astronomical, surveying, drawing, numbers games, and many odd pieces such as lucky charms and "knotted cords". There are 278 pieces of which 54 are sundials of various kinds, covering the period from 1450 to 1900. Open to the public, without fee, from Monday through Friday from 9 a.m. to 5 p.m., and on Saturdays from 9 a.m. to 12m.

Insert FRANKLIN Inst.

PENNSYLVANIA

HAMILTON WATCH COMPANY, Lancaster, Pennsylvania - A selected group of replicas of old timepieces including time lamp, signal gun, time candle, water clock, and several sundials. This is a travelling exhibit designed for educational purposes and to show the various methods used to tell time before the advent of the watch and clock.

PRIVATE COLLECTIONS

IOWA

CHARLES F. NOE COLLECTION - A small but fine collection of a few selected signed instruments (portable) of exceptional workmanship representative of the period 1600 to 1800.

MASSACHUSETTS

LESTER T. FORBES COLLECTIONS - A small collection of portable and stationary dials representing the fine workmanship of the period from 1631 to 1800.

MAYALL COLLECTION - A small collection of portable dials including replicas of historic dials, and other instruments used for timekeeping. A portion of the collection was made by the owner, who has loaned some instruments to the Harvard College Observatory in Cambridge, Mass., where they are on display.

FREDERICK A. STEBBINS COLLECTION - The main portion of this collection comprises stationary and portable dials made by the owher, who displays ingenuity in the application of various methods of telling time.

RICHARD D. WALKER COLLECTION - A few selected signed portable sundials representing the ~~the~~ work of the period 1592 to 1700.

NEW JERSEY

LAURITS CHRISTIAN EICHNER COLLECTION - The owner, a craftsman, has made many fine replicas of famous instruments, including water clocks, sinking bowls, sand glasses, time lamps, time candles, and many sundials.

ALBERT E. McVITTY COLLECTION - A fine collection of 46 potable sundials, mostly of the 18th century. Representative of the finest craftsmanship of the period.

NEW YORK

L. PRESCOTT BROWN COLLECTION - Contains many interesting portable and stationary dials made by the owner.

LESTER F. HOYT COLLECTION - A group of stationary dials of various types made by the owner. All the dials are etched with acids.

HENRY RUSSELL WRAY COLLECTION - An excellent collection of about 200 portable sundials, covering the period from 1460 to 1926. Also includes astrolabes, perpetual calendars, and sand glasses.

PENNSYLVANIA

HARROLD E. GILLINGHAM COLLECTION - One of the finest collections of portable sundials comprising about 250 pieces. Also sand glasses, astrolabes, orrery, time lamps, and mathematical instruments. Representative of the period, 1548 to 1930

J. R. LAMBERT COLLECTION - Many interesting portable and stationary dials made by the owner, who shows ingenuity in the application of various methods of telling time.

# VII

# I L L U S T R A T I O N S

SUFFICIENT FOR 1 signature

List of HCO collection in case

ASTRONOMY

July 23, 1964.

| Box | No | |
|---|---|---|
| 3 | 214 | EQUATORIAL DIAL - JAPAN |
| 4 | 33 | CONCAVE DIAL - JAPAN |
| 5 | 78 | CONCAVE DIAL - JAPAN |
| 5 | 209 | NOON MARK - JAPAN |
| 6 | 12 | EQUATORIAL DIAL - FRANCE |
| 6 | 59 | METAL FOLDING DIAL - CHINA |
| 6 | 88 | TABLET DYPTICH DIAL - FRANCE |
| 7 | 21 | NOON SIGNAL CANNON GUN - U.S.A. |
| 8 | 50 | FINGER RING DIAL - JAPAN |
| 8 | 93 | COMPASS DIAL - ENGLAND? FRANCE? |
| 8 | 229 | FLOATING DIAL - ENGLAND |
| 9 | 24 | EQUATORIAL - GERMANY ? 1740 |

These are in a case in the Lecture Room of Library of the Observatory.

6/11/79 - Copied from original from Wheatland. Illegible on xerox

[illegible]

The collection is kept in 6 [illegible] in the ~~[illegible]~~ transit case in back store-room

11/25, [illegible]

[illegible] to Safe in Office [illegible] 11/25/64

78 CONCAVE. JAPAN. CA.1600

88 HORIZONTAL-
VERTICAL. FRANCE.
CA.1650.

93 HORIZONTAL

209 NOON MARK.
JAPAN

214 EQUATORIAL
JAPAN

229 HORIZONTAL
ENGLAND

12 EQUATORIAL
FRANCE. E.20TH CENT.

21 SIGNAL GUN
U.S.A. L.19TH CENT.

24 EQUATORIAL
GERMANY 1730-1740

33 CONCAVE. JAPAN

59 HORIZONTAL. CHINA

50 EQUATORIAL
JAPAN

Complete list.

HARVARD COLLECTION OF

POCKET SUNDIALS (ERNST)

Material that of dial plate.

Proportions approximate.

No. 11, 212, 228, 236 given

by Dr. Ernst to a friend 1937.

No. 17, 26, 27, 35, 47, 85, 86,

203, 205, 222, 231, 235, 244,

missing January 4, 1954.

HARVARD COLLECTION OF

POCKET SUNDIALS (ERNST)

1. EQUATORIAL Japan, c.1700
   Brass disc & supports 1", wood base 7" x 4"

2. MULTIFACE France, c.1900
   Wood cube 5" x 5", pedestal, base 5" x 4" - 8" hi

3. MULTIFACE Germany, 18th century "D. Beringer"
   Wood cube 3", pedestal & base 4" x 3" - 6 hi

4. CONCAVE Japan
   Brass, silver plated oblate pendant 2" dia - 1" hi

5. WATCH England 1730 "E. James, London"
   Brass oblate pendant, silver watch, Japanese hrs.2"dia -1" hi

6. NOON MARK Japan
   Brass rectangle 2" x 3" - 2" hi

7. CONCAVE Japan
   Brass oblate 2" dia 1" hi, handle 6"

8. CONCAVE Japan, Kyoto
   Wood pendant 2" x 2" - 1" hi

9. CONCAVE Japan
   Brass oblate pendant 2" dia - 1" hi

10. CONCAVE Japan
    Bronze & silver oblate 2" dia - 1"hi

11. NOON MARK
    Given by Dr. Ernst to a friend 1937

12. EQUATORIAL France, c.1910
    German silver ring in wood case 4" sq.

13. EQUATORIAL France, c 1900
    German silver ring in wood case 5" sq. - 1" hi

14. PILLAR France, c.1890
    Box wood 1" dia, 3" hi.

15. PILLAR France, c.1890 "Henry Robert, Paris"
    Wood paper covered 1" dia - 5" hi

16. PILLAR France, c.1920
    Box wood 1" dia - 4" hi

17. HORIZONTAL China, late 19th cen.
    Missing Jan. 4, 1954

18. CONCAVE Japan
Copper silver plated oblate pendant 2" dia. - 1" hi

19. NOON MARK Japan
Brass folding rectangle 1" x 3" - 2" hi

20. EQUATORIAL Germany, 1740-1750 ("J. Schretteger")
Brass octagonal base 2" - 2" hi

21. NOON SIGNAL CANNON, U.S.A., c.1800
Brass dial, compass, levels, 4" dia

22. EQUATORIAL Germany, 1705 "J. Martin, Augsburg"
Silver octagonal 2" x 2" - 2" hi

23. CONCAVE Japan, c1900 "Kyoto"
Copper silver plated oblate pendant 2" dia. - 1" hi

24. EQUATORIAL Germany, c.1730 "L. Gresiel"
Brass octagonal 2"

25. EQUATORIAL Japan, c.1800 "Kokusai"
Ivory rectangle 3" x 2" - 1" thick

26. CONCAVE Japan "Mijanoshita"
Missing Jan. 4, 1954

27. BOX Japan
Missing Jan. 4, 1954

28. CONCAVE Japan
Brass spherical pendant 1" dia - 1" hi

29. CONCAVE Japan
Brass oblate pendant 2" dia - 1" hi

30. DIPTICH Germany, c.1605 "Hans Troschel"
Ivory oval 3" x 2" - 1" hi

31. CONCAVE Japan
Brass silver plated oblate 1" dia - 1" hi

32. CONCAVE Japan
Brass oblate pendant 2" dia - 1" hi

33. CONCAVE Japan, 18[illegible] "Nara"
Brass silver plated oblate 2" dia - 1" hi

34. COMPASS England, c.1750
Brass cylindrical box 1" dia - 1" hi

35. CONCAVE Japan
Ivory, Missing Jan. 1954 - Stolen 1938

36. HORIZONTAL Japan
Brass tablet 3" sq

37. TABLET Bavaria, c. 1890 "Stockert"
Wood, paper scale 3" x 2"

38. TABLET Germany, c.1870 "P.B" (Beringer ?)
Wood, paper covered 4" x 3" - 1" hi

39. DIPTICH France, c.1810
Wooden rectangle 4" x 2" - 1" hi

40. DIPTICH France, 1629
Wood & paper 4" x 5" Compass 4" dia

41. DIPTICH Italy, 1624
Ivory octagonal 3" x 3" - 1" hi

42. NOON MARK Japan (Navigation)
Brass 5" sq, 2 brass uprights 5" x 1", base 6" x 5"

43. CONCAVE Japan
Brass oblate pendant 2" dia 1" hi

44. NOON MARK Japan, c.1890 "From P.O. Kyoto"
Wood 5" x 2"

45. METAL FOLDING France, c.1745 "Le Maire, Paris"
Brass rectangle 4" x 3"

46. WATCH England, c.1850 "Paul Chotard"
Silver 2" dia. - 1" thick

47. NOON MARK Japan
Wood missing Jan.4,1954

48. EQUANOCTIAL, Germany c.1730 "A. Vogel"
Brass octagonial 3" x 3" hi

49. NOON MARK Japan
Brass folding 1" x 2" - 2"hi

50. EQUATORIAL Japan, c.1820
Brass finger ring 1" - 1" o.a.

51. CONCAVE Japan
Brass, copper "dumbell" shape 2" x 2" - 1" hi

52. METAL FOLDING Japan
Brass rectangle 3" x 1"

53. INKWELL Japan
Brass 7" long

54. CONCAVE Japan
Ivory cylinder 1" dia - 2" hi

55. HORIZONTAL France, 18 cen. (Debombourg) compass
Brass 3" x 3"

56. UNIVERSAL RING Germany, c.1748 (Willebrand)
Brass 4" dia

57. UNIVERSAL RING Portugal, c.1750
Brass 3" dia

58. BIRD France, c.1750 (Baradèllè) horizontal, compass
Brass 3" x 3"

59. METAL FOLDING China, c.1890
Brass gilded enamel 8" x 5" - 4" hi o.a.

60. UNIVERSAL RING Germany, 17th cen.
Silver 3" dia.

61. CONCAVE Japan
Brass oblate pendant 2" dia x 1" hi

62. CONCAVE Japan, c.1790
Silver 1" dia - 1" hi

63. CONCAVE Japan
Copper silver plated 2" sq. - 1" hi

64. CONCAVE Japan
Brass pendant 2" x 1" - 1" hi

65. CONCAVE Japan
Lacquered oblate 2" dia - 1" hi

66. CONCAVE Japan (from Lake BIWA)
Brass pendant 2" x 1" - 1" hi

67. CONCAVE Japan, c.1840
Silver oblate pendant 1" x 1" hi

68. CONCAVE Japan
Two silver discs 2" x 3" - 1" hi

69. VERTICAL England, 1751
Brass 3" x 3"

70. RING England, 16th cen.
Brass 2" dia.

71. UNIVERSAL RING England, c.1850 (T. Harris & Son)
Brass 6" dia.

72. HORIZONTAL England, c.1500
Lead 5" dia

73. HORIZONTAL England, c.1500 (initialed N.M.)
Pewter 3" dia 3"' high

74. CONCAVE Japan, 19th cen.
Silver oblate pendant 1" dia - 1" hi

75. CONCAVE Japan
Copper oblate pendant 2" dia 1" hi

76. CONCAVE Japan, c.1840
Brass oblate pendant 2" dia - 1" hi

77. CONCAVE Japan
Brass, silver plated oblate pendant 2" dia 1" hi

78. CONCAVE Japan, c.1800
Wooden fish 7" long

79. NOON MARK Japan
Silver rectangle 5/8" x 7/8" - 3/8" hi

80. EQUATORIAL Germany, c.1735 (A. Vogler)
Brass octagonal 3" - 3" hi

81. CONCAVE Japan
Ivory pendant (violin shape) 1" x 2" long

82. BIRD France, c.1700 (N. Bion)
Silver octagonal 3" x 2"

83. CONCAVE Japan, c.1800
Silver oblate pendant 1" dia 1" hi

84. COMPASS Japan
Ivory octagonal 2" x 2" - 1" hi

85. MULTIFACE Germany, c.1775 (D. Beringer)
Missing Jan. 4.54

86. HORIZONTAL Japan, late 19th cen
Missing Jan.4.54

87. DIPTICH France, c.1811
Ivory rectangle 1" x 2" - 1" hi

88. TABLET DIPTICH France, c.1650
Ivory 3" x 2" - 1" hi

89. HORIZONTAL U.S.A., 1878 (Sullivan & Son. Boston)
Wood & paper cylinder 2" dia

POCKET SUNDIALS (ERNST)

90. FLOATING Germany, c.1850 (Stockert)
Wood & paper 2" dia 1" hi

91. FLOATING France, c.1850
Wood & paper 2" dia

92. HORIZONTAL Japan, c.1910
Metal box paper circle 2" dia 1" hi

93. COMPASS Holland (?)
Brass 2" dia 1" hi

94. DIPTICH Italy, c.1810
Ivory rectangle 2" x 1"

95. CONCAVE Japan
Brass oblate pendant 2" - 1" hi

96. CONCAVE Japan
Wooden cylindrical pendant 1" dia - 3" hi

97. DIEPPE France, c.1670 (Chas Bloud)
Ivory 3" x 3" - 1" hi

98. ASTROLOGICAL INSTRUMENT Japan, c.1500
Wooden oblate 5" x 1" hi

99. CONCAVE Japan
Silver plated shell 3" x 3" - 2" hi

100. BOY SCOUT SUNWATCH U.S.A.,1921 (made by Ansonia Clock Co.)
Brass rectangular 2" x 3"

101 - 200 inclusive - not assigned

201. CONCAVE Japan
Olive wood disc 12" dia - 3" hi

202. FLOATING Germany, c.1820
Paper covered wood circle 3" dia - 3" hi

203. NOON MARK, Japan
Brass. Missing Jan. 1954

204. FLOATING France, c.1850
Cylindrical wood box, paper dial 2" dia - 2" hi

205. HORIZONTAL, France, 17 cen.
Brass. Missing Jan. 1954

206. FLOATING France, c.1850
Cylindrical wood box, paper dial 2" dia -2" hi

207. HORIZONTAL Japan, c.1900
Wooden cylindrical disc. Paper circle 2" dia - 1" hi

208. CONCAVE Japan
Copper cylindrical box 2" dia X 1" hi

209. NOON MARK Japan, 1870
Wood case 4" dia - 1" hi

210. ASTROLOGICAL INSTRUMENT Japan, c.1500
Wood oblate 3" x 1" thick

211. CONCAVE Japan, c.1900
Cylindrical wood box 5" dia - 1" hi

212. SMALL CLOCK, Japan
Given to a friend by Dr. Ernst 1937

213. CONCAVE Japan
Lacquered box, silver plated dial 4" dia - 1" hi

214. EQUATORIAL Japan (From Lake Biwa).
Ivory 3" x 1"

215. CONCAVE Japan, c.1840
Brass pistol lead dial mounted on back of hammer 8" long

216. MOCK EQUATORIAL Japan
Silvered brass 2" x 1" - 2" hi

217. CONCAVE Japan, c.1910
Horizontal wood box 2" x 1" x - 1" hi

218. CONCAVE Japan
Brass dial, wood box 4" x 2" - 1" hi

219. CONCAVE Japan
Wooden rectangular box 3"x 2" - 1" hi brass dial

220. COMPASS France, 19th cen
Silver dial 2" dia 1" hi

221. CONCAVE Japan
Ivory rectangle 2"x 1" - 1" hi

222. CONCAVE Japan
Missing Jan. 1954

223. CONCAVE Japan, c.1900
Ivory rectangle 2" x 1" - 1" hi

224. PIN Japan, c.1900
Wood rectangle 4" x 2" - 1" hi

225. EQUATORIAL Japan (Bears crest of Tokugawa family)
Silver 1" dia - 1" hi

226. NOON MARK Japan
Cylindircal ivory box and cover 2" dia - 1" hi

227. CONCAVE Japan
Wooden rectangular 2" x 1" - 1" hi

228. EQUATORIAL Japan
Given to a friend by Dr. Ernst 1937

229. FLOATING England, c.1890
Cylindrical brass box 2" dia - 1" hi

230. CONCAVE Japan, c.1900
Wooden oblate 2" dia - 1" hi

231. CONCAVE Japan
Copper silver plated 34 m.m. sq. Missing Jan. 1954

232. HORIZONTAL France, c.1860
Folding cardboard circle with paper case 4" dia

233. CONCAVE Japan
Wooden oval box 1" x 1" - 1" hi brass compass, dial & calendar

234. EQUATORIAL Japan, c.1700
Bamboo rectangle 6" x 2"

235. COMPASS Japan
Wood 35 m.m. dia. Missing Jan.1954

236. CONCAVE Japan
Given to a friend by Dr. Ernst

237. TABLET China, 1916
Wooden rectangle 2" x 2" x 1" hi

238. TABLET China, 1916
Wooden rectangle 3" x 2" - 1" hi

239. TABLET China, 1916
Wooden rectangle 3" x 2" - 1" hi

240. TABLET China, 1916
Wooden rectangle 3" x 4" - 1" hi

241. BIRD France, c.1745 (made by P. Lemaire)
Silver octagonal 3" x 3"

242. CONCAVE Japan
Olive wood rectangle 8" x 2" - 2" hi

243. FLOATING
Card board dial in brass container 2" dia - 1" hi

244. HORIZONTAL U.S.A., late 19th cen
Paper Missing Jan. 1954

245. CONCAVE Japan (From Temple of Higashi Hogwangi)
Brass compass and dial 3" x 5" - 3" hi