

A. Frederick Collins

*The Book of Stars: Being
a Simple Explanation
of the Stars and Their
Uses to Boy Life*

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CHAPTER I

HOW TO FIND THE NORTH STAR

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If you want to know something about the stars which will be helpful as well as entertaining, the first thing you should do is to be able to find the *North Star*.

The North Star is taken as a starting point in the sky for two very good reasons: first, of all the thousands of stars which the eye can see, it moves the least; and second, it is *north* from any place on the Earth's surface from which it can be seen.

It must be plain then that this star is the most important one of all to us, for by its friendly light we can easily tell the points of the compass, though we may be lost in an unknown land or shipwrecked on a strange sea. That is, of course, we can easily find the points of the compass if we have first learned how to find the North Star.

How to Make a Star Finder.—To find the North Star for the first time is a very easy matter if the simple directions given below for making and using a star chart, or star finder, are followed.

Get a smooth pine board, about 16 inches wide, 20 inches long and $\frac{7}{8}$ inch thick; make two cleats of wood, each of which is 1 inch wide, 12 inches long and $\frac{1}{2}$ inch thick, and screw these to the board near the ends and on the same side, to prevent the board from warping, as shown in [Fig. 1](#). If a drawing board of any size is at hand, it will serve the purpose just as well as a homemade board.

The next thing to do is to obtain a sheet of cardboard about 12 by 16 inches and cover one side of it with a dull black paint; when the paint is thoroughly dry lay it, black side up, on the smooth side of the board.

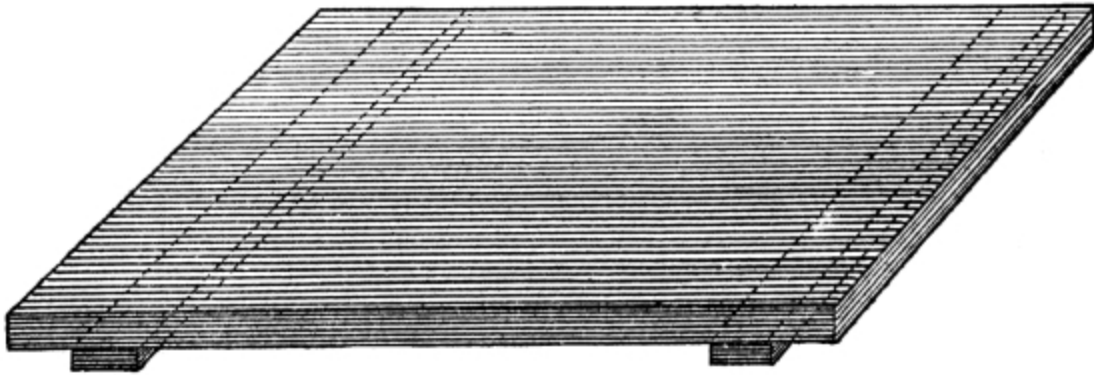


FIG. 1.—STARBOARD SHOWING CLEATS.

From another sheet of white cardboard cut out seven stars, about the size and shape shown in [Fig. 2](#), and cut out another star nearly twice as large, to represent the North Star.

Now place the white stars on the black surface of the cardboard in the positions shown in [Fig. 3](#), using the smaller stars to form the outline of the *Big Dipper* and the large star for the North Star.



FIG. 2.—CARDBOARD STAR.

When all of the stars have been properly arranged, fasten them to the black cardboard with a bit of glue or mucilage. Push a thumb tack, or a pin, through the center of the large star, which is the North Star, and well into the board, so that the chart, or star map, can be turned round on the board with the North Star as its *axis*. When this is done your star finder is complete.

Finding the North Star.—All being in readiness, take this chart, or star finder, out-of-doors some evening when the *seeing* is good and all the stars in the northern sky are shining brightly, and face about north, holding the starboard in front of you, as shown in [Fig. 4](#).

Usually the direction of north is well known, and yet there are some places where the streets and roads do not run due north and south, and for this reason it is sometimes hard to tell exactly which way is north. In such a place either use a compass to get your bearing, or, if you haven't a compass, face about as nearly north as you know how.

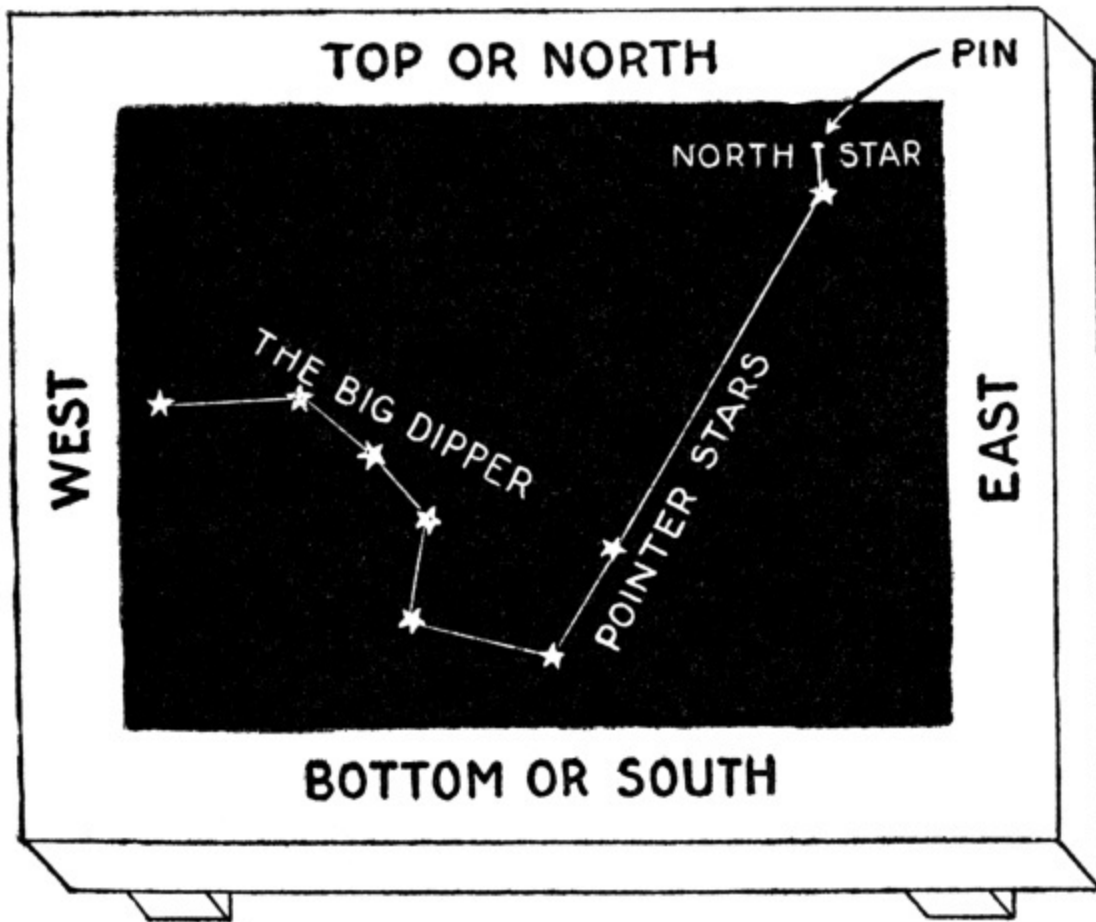


FIG. 3.—THE NORTH STAR AND BIG DIPPER ON STARBOARD.

(Position of Big Dipper in Autumn.)

Having looked at your star chart carefully raise your eyes from the board until they are in a line with the northern *horizon*, that is, the line where the earth and the sky seem to meet. Keep on raising your eyes in a straight line until they reach a group of stars, which is about 40 degrees above the horizon. (See Fig. 98.) The line for sighting the North Star is shown in Fig. 5.

All the stars of this group are very faint except one and this particular star will stand out bright, distinct and alone,

for the other two stars of the same group which can be plainly seen are not very close to it. The star you have found is the *North Star*, or *Pole Star*, or to give it its proper name *Polaris* (pronounced Po-la´-ris).



FIG. 4.—FINDING THE NORTH STAR AND THE BIG DIPPER.

To make sure you have not mistaken some other star for the North Star it will be a good idea to prove your find. Search around in the northern sky a little and you will see a group of seven bright stars fixed in the sky just as the cardboard stars are fixed on the black surface of your chart, and which are shown in [Figs. 4 and 5](#).

The Big Dipper.—This group of seven stars is called the Big Dipper because if a broken line joined all the stars together a very good figure of a big dipper would be formed. A group of stars is called a *constellation*, and this constellation is shown as we see it in [Fig. 6](#), and as the ancient shepherds and sailors pictured it in [Fig. 7](#).

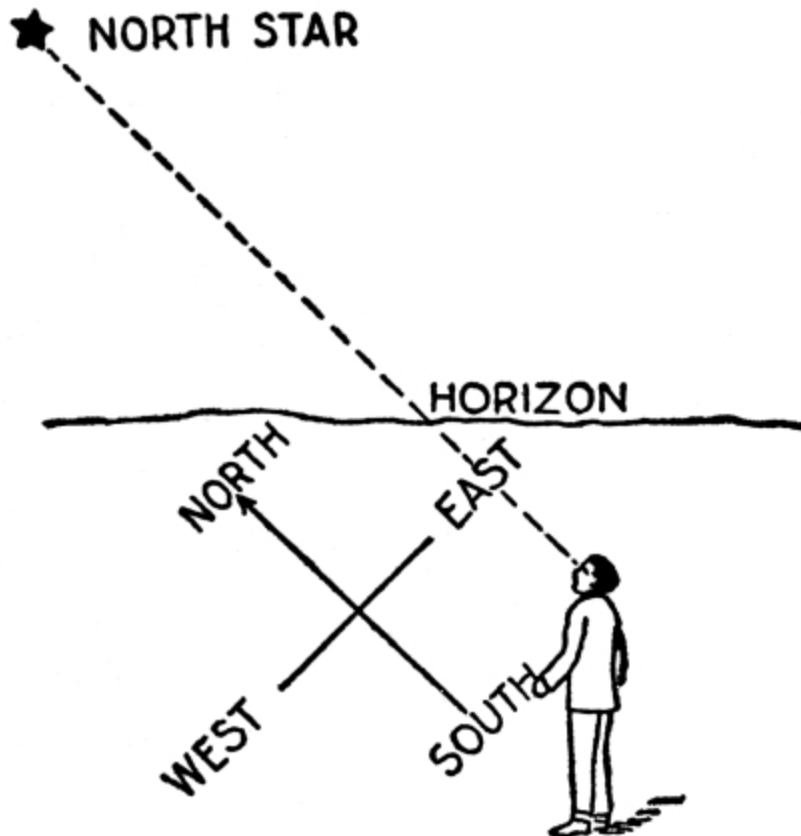


FIG. 5.—LINE FOR SIGHTING THE NORTH STAR.

In England this group of stars, or constellation, is sometimes called the *Plough*, for our friends across the pond see in it the likeness of a plough as well as of a dipper. It is also called the *Great Bear* the world over after the ancient name given it, but it requires some stretch of the imagination to liken it to that nubby short-tailed animal.

All these fancy names were given this great group of stars long before the birth of Christ and by these names the constellation is still familiarly called. Astronomers of the present time also call this constellation the Great Bear, but they say it in Latin and so it becomes *Ursa Major*, which is a very high toned and scholastic sounding word. But the Big Dipper is a name that is good enough for all ordinary purposes and so we'll use it.

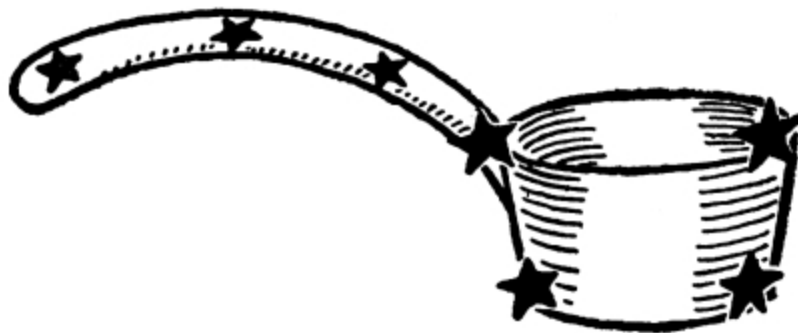


FIG. 6.—THE BIG DIPPER AS WE SEE IT.

The stars forming the Big Dipper stand out so bright and clear in the northern sky that you won't have the slightest trouble in finding it, especially if you have the star finder at hand to help you.

In using the star finder there is one thing you should keep well in mind and that is that the Big Dipper as we see it turns round the North Star, like the hands of a clock, but in the opposite direction. That is, the Big Dipper, when below the North Star, *seems* to turn round the North Star from left to right.

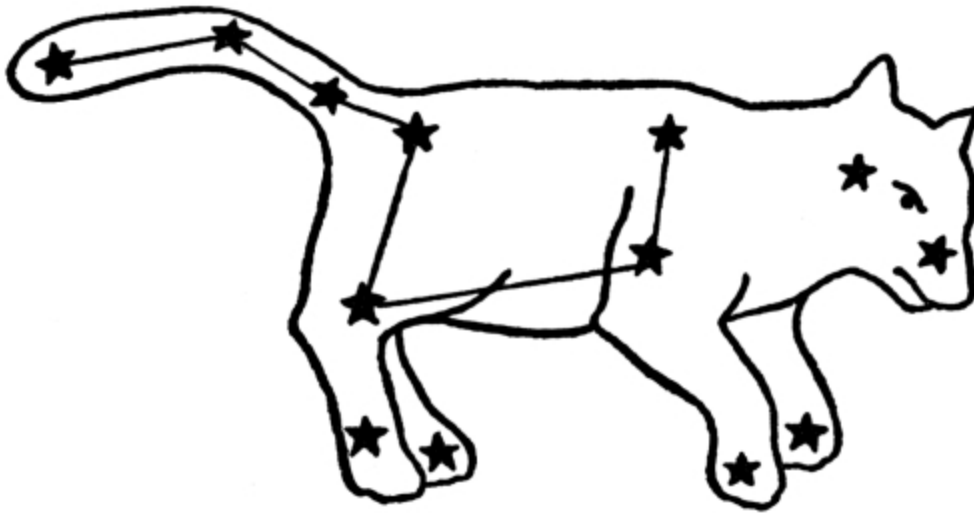


FIG. 7.—THE GREAT BEAR AS THE ANCIENTS SAW IT.

In a word the North Star forms one end of the axis round which not only the Big Dipper but the whole starry heavens seem to revolve as though they were fastened to the spokes of a great wheel. This is the way it seems to us. As a matter of fact, though, all the stars are *fixed* in their positions in the sky, and the reason they seem to revolve round the North Star is because the Earth from which we see the stars turns round instead.

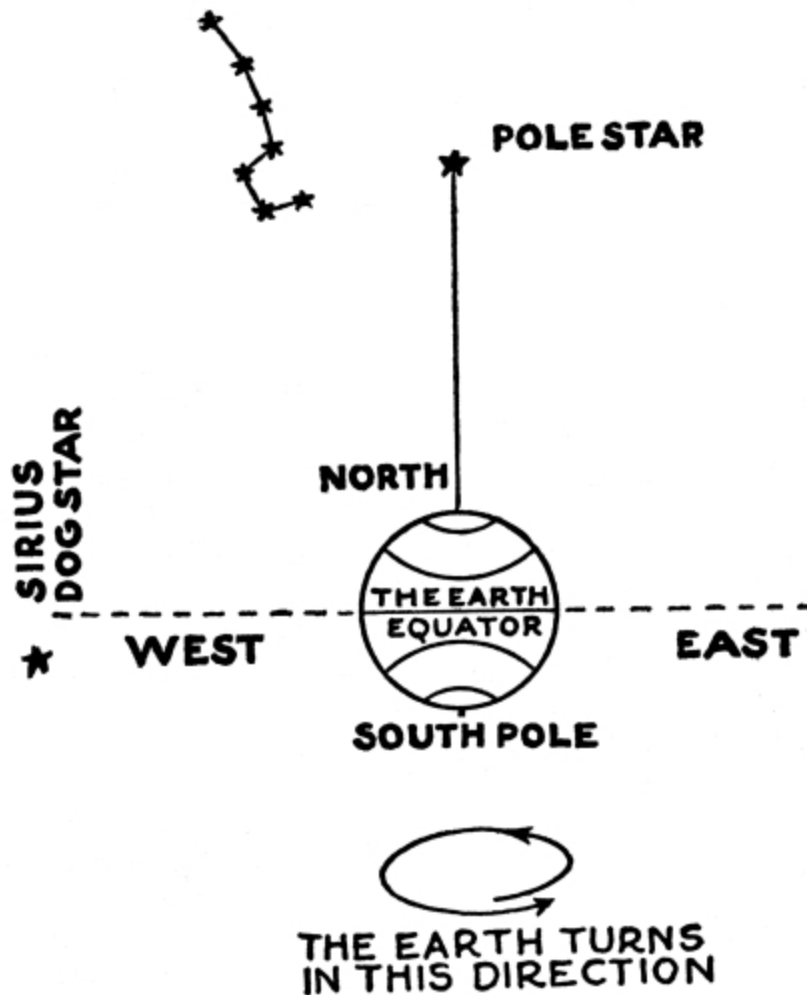


FIG. 8.—THE EARTH, POLE STAR AND DOG STAR.

By looking at the drawing shown in [Fig. 8](#), it will be seen that the *north pole* of our Earth is directly under the North Star,—hence the name Pole Star—and that if we could draw a line through the center of the Earth from the *south pole* to the *north pole* and extend the line far enough, or *produce* it as it is called, it would finally meet the North Star.

Let us take, now, another star, called the *Dog Star*—its real name is *Sirius* (pronounced Sir'-i-us)—which is not far from a line with and overhead of the Earth's equator; suppose we are some place on the earth where we can see

both the North Star and the Dog Star at the same time, and keeping in mind that the Earth is turning round on its axis; it must be plain, then, that though both of these stars are fixed in the sky and never change their positions we on the Earth will turn away from the Dog Star until the Earth has turned half way round, but we will not turn away from the North Star.

The eye, however, is easily deceived; for example, if we are on a moving train nearby objects, such as houses, trees, etc., will seem to be moving in the opposite direction to which we are going while we seem to be standing perfectly still. The illusion is much more complete when we are seeing the stars, for the motion of the Earth as it spins on its axis and shoots round the Sun in its orbit is so steady that we cannot notice it; for this reason it seems as if it is the stars which are moving and that we are standing still.

It is easy to understand now why the Big Dipper, and all the other stars, seem to move in great circles round the North Star as well as why the Big Dipper marked with cardboard stars on your chart may not have the same relative position to the horizon as the Big Dipper of real stars in the northern sky, when you view them together as in [Fig. 4](#).

Not only does the revolution of the Earth on its own axis once in every 24 hours cause the Big Dipper to seem to turn round the North Star, but the yearly journey of the Earth round the Sun makes a change in the position of the Big Dipper as we see it at different seasons of the year. And what has been said about the Big Dipper is just as true of all the other constellations.

For these reasons we would need an almanac to help us keep track of the exact hour when the Big Dipper would be in a given position for every night in the year. But you can always find the Big Dipper any evening in autumn about nine o'clock, by remembering that it is turned right side up as shown in Figs. 3 and 4. Again, if you look for the Big Dipper in winter at about nine o'clock in the evening you will find it standing on its handle a little to the east as in Fig. 9. In spring about 9 o'clock, it will have moved on round the North Star until it is upside down, as in Fig. 10, while in summer, at 9, it is hung up by its handle high in the sky, as shown in Fig. 11. The four positions of the Big Dipper during the same hours of the different seasons are shown in Fig. 12, which also shows the four positions of the Big Dipper during each 24 hours.

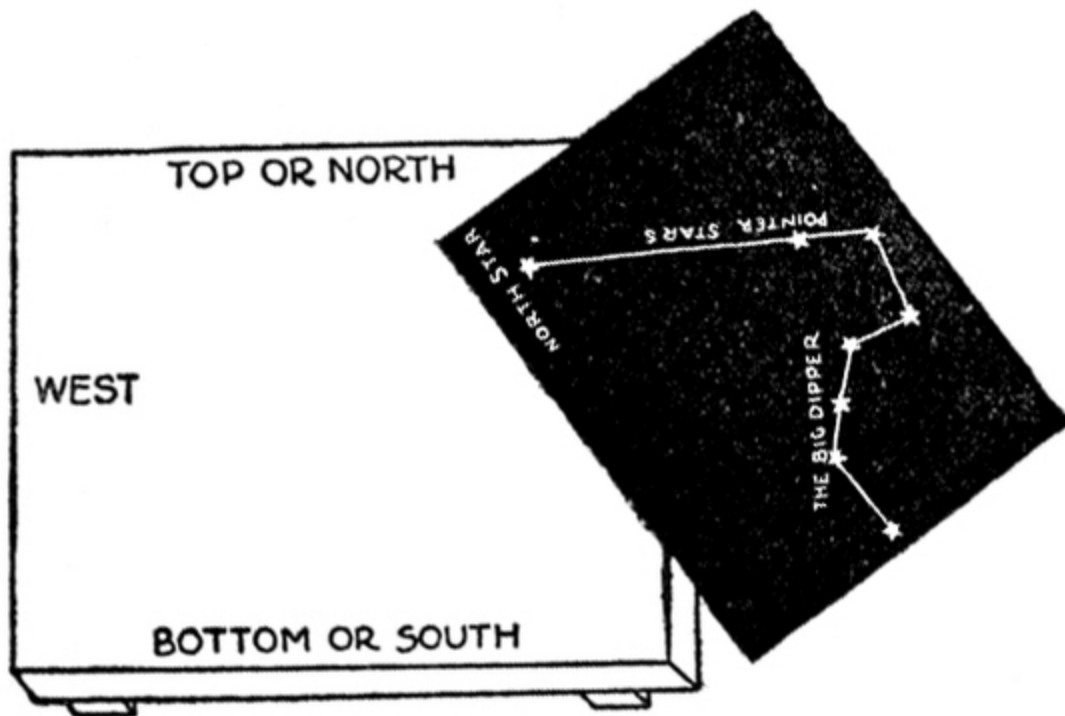


FIG. 9.—THE NORTH STAR AND BIG DIPPER IN WINTER.

By turning the chart round on the board *counter-clockwise* you will soon come to a point where the Big Dipper of paper stars and the Big Dipper of real stars are in exactly the same position.

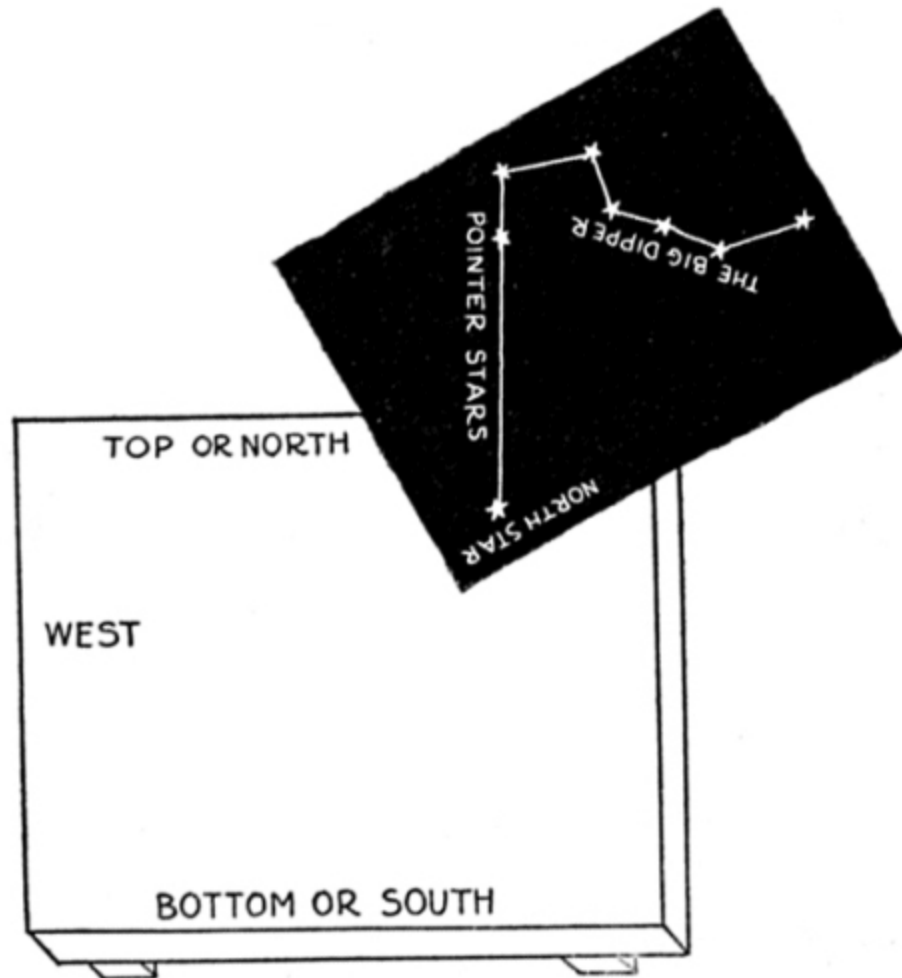


FIG. 10.—THE NORTH STAR AND BIG DIPPER IN SPRING.

You have, no doubt, noticed that a line joins the two end stars of the Big Dipper and the North Star in Figs. 3, 4, 10, and 11. These two end stars of the Big Dipper are called *pointer stars*, for they point directly to the North Star; that is if we draw a line with the eye through the pointer stars and

produce, or continue the line, it will run into the North Star, nearly.

By using these pointer stars it is easy for any one who knows the Big Dipper to be able to find the North Star on any clear night in the year, for the Big Dipper can be seen the year round.

The seven stars which form the Big Dipper are not the brightest stars in the sky by any means, yet each one is a great white sun as large or larger than our own Sun.

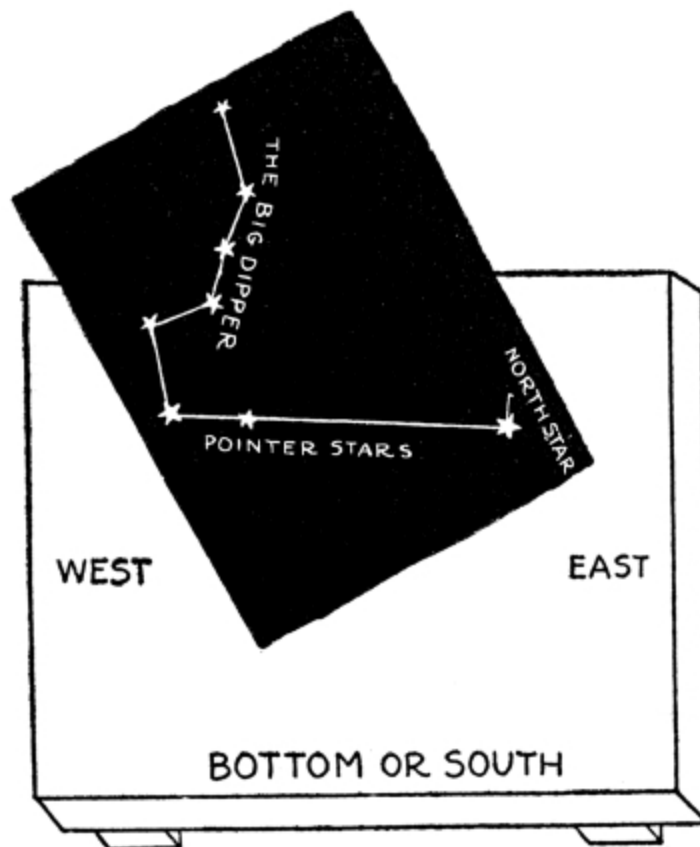


FIG. 11.—THE NORTH STAR AND BIG DIPPER IN SUMMER.

Now look sharply at the middle star in the handle of the Big Dipper, whose name is *Mizar* (pronounced Me'-zar), and see if you can make out another little star whose name is

Alcor (pronounced Al'-cor) hugging up close to it. The Arabs who named them called these two stars the *Horse* and its *Rider*. If you can see this little star *Alcor* you will have cause to shake hands with yourself, for if your eyes are good you can see it and if they are only fair to middling you cannot see it. This is one of the famous Arab tests for eyesight.

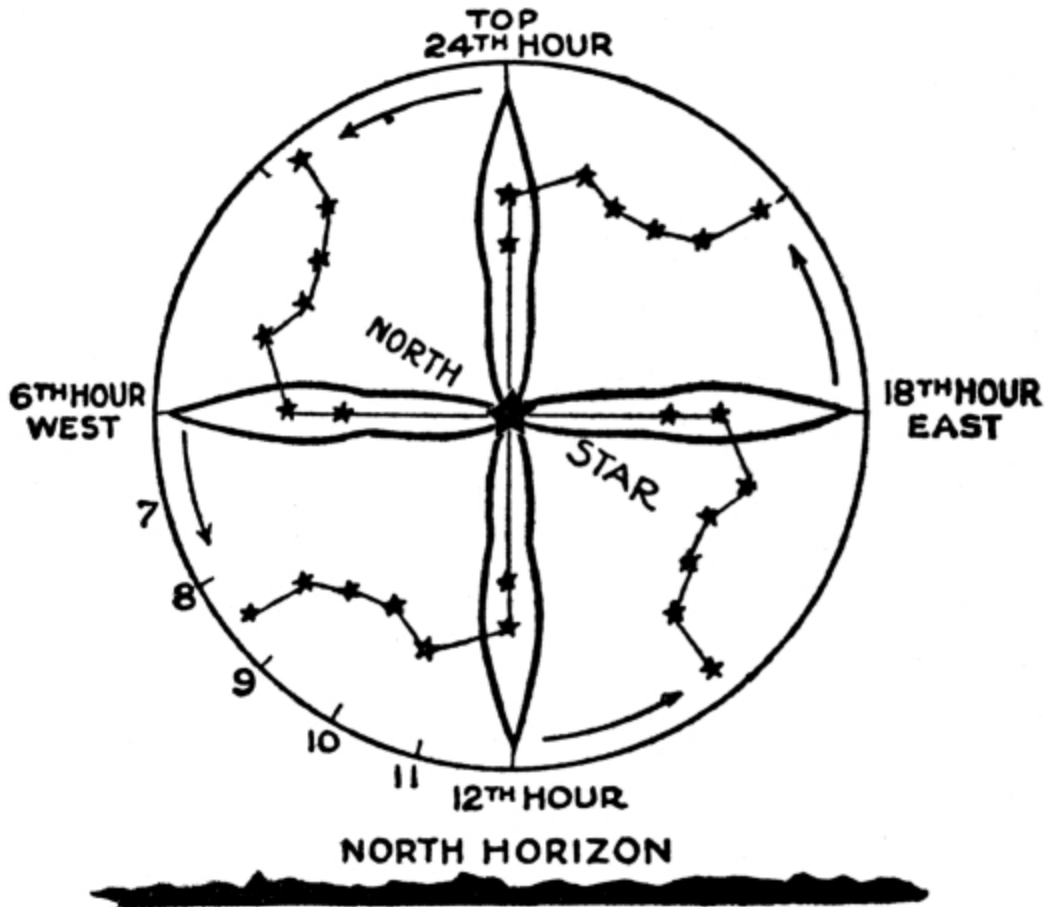


FIG. 12.—TELLING TIME BY THE BIG DIPPER.

How to Tell Time by the Big Dipper.—We have seen how the Big Dipper seems to turn round the North Star and this being the case we can use the pointer stars for the hour hand of a big star clock.

You must always bear in mind, though, that while the hands of a clock turn from right to left, the Big Dipper swings round from left to right; and there is another thing to be kept in mind and that is while the hour hand of a clock goes *twice* round in 24 hours, the Big Dipper revolves only once in 24 hours, and for this reason the hand formed by the pointer stars of the Big Dipper moves only half as fast as the hour hand of a watch or clock.

Each quarter of the circle, then, is equal to 6 hours and by dividing the quarter circles into 6 equal parts you can mark off the hours. The best way to do this at first is to make a large drawing of [Fig. 12](#) on your starboard and compare it with the Big Dipper; then draw an imaginary circle round the North Star in the sky so that it will just clear the last star in the handle of the Big Dipper. With some practice you will be able to tell the time within half an hour or less.

In telling the time by the Big Dipper you must remember that the stars in turning round the north pole run fast an hour every 15 days, and this makes them gain 6 hours in 3 months and so they gain a complete revolution in a year. But every time the Big Dipper makes one complete turn round the North Star, one complete day, as measured by star time, will have passed.

The Pointers of the Big Dipper are in the four positions, shown in the figure, on the following dates at 8 P.M.: May 1, 24th hour; Aug. 1, 6th hour; Nov. 1, 12th hour; Feb. 1, 18th hour. In the same way, on Sept. 1 at 8 P.M. the pointers will be at 8 and they will also be there at 7 P.M. on Sept. 16.

CHAPTER II

HOW TO KNOW THE STARS

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One of the tests a Boy Scout must pass in order to obtain his badge of merit for starcraft is to be able to name and point out twelve principal constellations, and every boy, whether he is a scout or not, should be able to do the same thing for his own good.

The word *constellation* is formed from two Latin words, the first being *con* which means *together*, and the last being *stella* which means *star*, or in plain English, constellation means *stars together*.

In your efforts to find the North Star you have already learned one of the principal constellations—that of the Big Dipper—and to learn more of them will be even easier and much more fun, for now you have learned the game.

The Constellation of Cassiopeia.—To find the constellation of *Cassiopeia* (pronounced Cas'-i-o-pe'-ah) again make use of your star finder. Remove all the stars from the blackened cardboard and rearrange them so that the North Star is in the center of the board and the Big Dipper is on the left hand side with the two pointer stars in a line with the North Star. On this chart the Big Dipper must be made much smaller than the one described in the first chapter.

Cut out five more stars from white cardboard and place them on the opposite side of the board from the Big Dipper in such a manner that they will form the letter W being

careful to fasten the stars to the cardboard so that the letter W stands in the exact position shown in Fig. 13.

A line drawn through the pointers of the Big Dipper and produced will, as before, pass through the North Star, and if it is extended an equal distance beyond it, will pass very closely to the constellation of Cassiopeia; this line will aid you in placing the stars on your chart in the right positions.

Having thus prepared the star finder, take it out into the open when night comes on and begin by locating the North Star and the Big Dipper. Now set the Big Dipper and the North Star of your star chart in a position which to your eye corresponds to the Big Dipper and the North Star in the sky. Follow the line from the pointer stars to the North Star and beyond when the great letter **W** which is the constellation of Cassiopeia, will stand out so clear and bright that you will wonder why you have never seen it before.

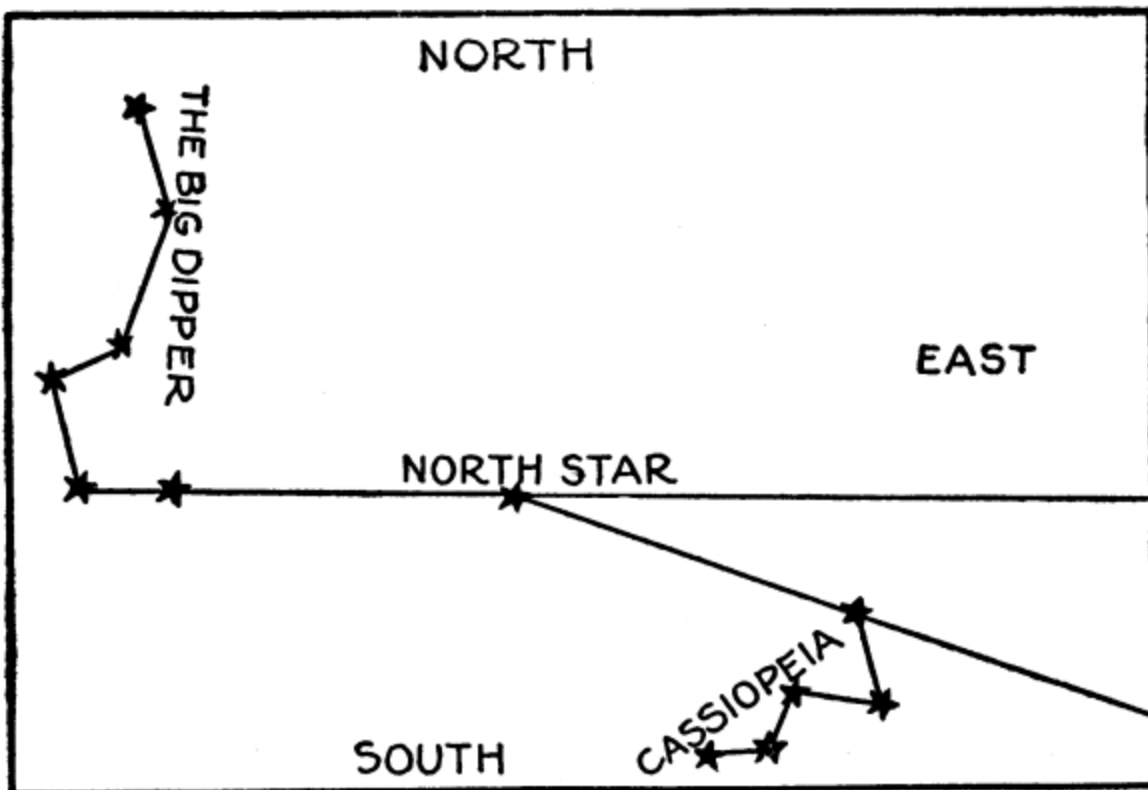


FIG. 13.—CONSTELLATION OF CASSIOPEIA.

Fig. 14 shows this group of stars and the outline of the unhappy Cassiopeia who is as often standing on her head as on her feet, but it requires the imagination of an Arabian star-gazer to see the likeness.

The Little Dipper.—Although some of the stars which form the *Little Dipper* are very faint it is included in our list of 12 principal constellations for two reasons: first, because it contains the very important North Star, and second, because it is easy to find.

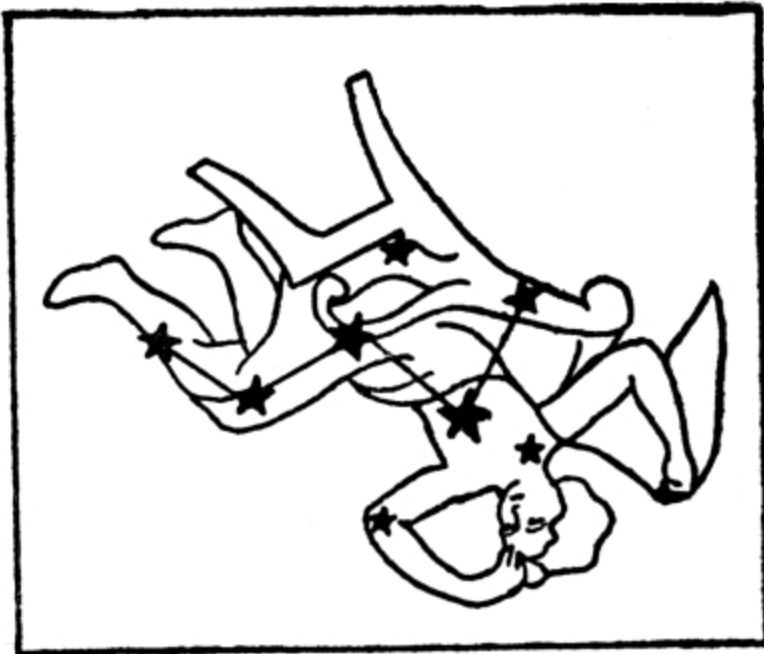


FIG. 14.—CASSIOPEIA AS THE ARABS SAW HER.

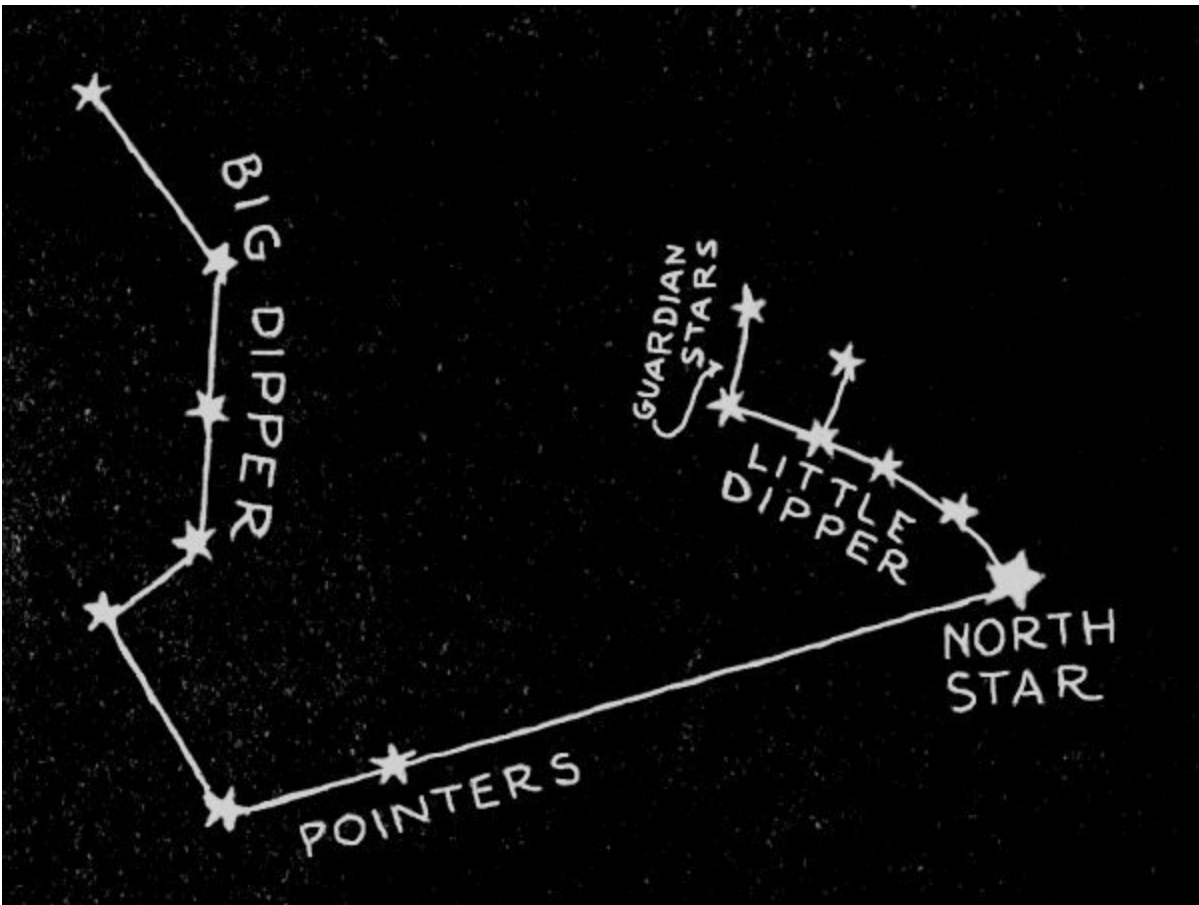


FIG. 15.—THE LITTLE DIPPER OR LITTLE BEAR.

The North Star is the last star in the handle of the Little Dipper. The two outer stars which form the bowl of the Little Dipper, and which are called the *Guardians of the Pole*, are quite bright, and after a few trials you can easily put in the other stars that are much fainter, and so complete in your mind's eye the outline of the Little Dipper as you have it on your chart. [Fig. 15](#) shows the arrangement of the stars in the Little Dipper and the relative position of the Little Dipper to the Big Dipper.

The Little Dipper is also called the *Little Bear* and this latter name when done into Latin becomes *Ursa Minor*,

which is its scientific name. How the Little Dipper was made into a Little Bear by the ancients is shown in [Fig. 16](#).

The Great Square of Pegasus.—Unlike the Big Dipper, the Little Dipper and Cassiopeia, which are so close to the North Star that they never set and hence can be seen at any hour of the night and at any season of the year, we now come to some constellations which are quite distant from the North Star and are for this reason to be seen only at certain times of the year. The *Great Square of Pegasus* can always be seen on clear, crisp nights during the autumn months.

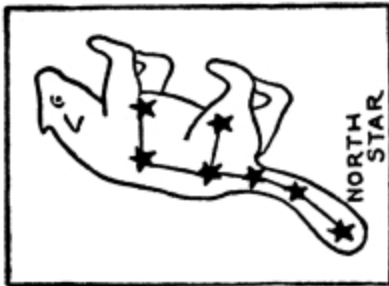


FIG. 16.—THE LITTLE DIPPER
MADE INTO A LITTLE BEAR.

To find a constellation that is as far away from the North Star as Pegasus (pronounced Peg'-a-sus) is not an easy thing to do, at least the first time you try it, for while our chart is marked with a straight line the sky is like a great bowl and a line produced from the North Star to Pegasus will, in consequence, not be a straight line, but a curved line. However, with your star finder charted like the diagram shown in [Fig. 17](#) you will be able to locate Pegasus with very little effort.

After taking off all the stars from the cardboard surface, pin or paste the North Star to the lower left hand corner of

the black surface of the cardboard and place the five stars of Cassiopeia in their proper positions. Now draw a line from the North Star through Cassiopeia just below the star marked β which is the Greek letter *beta* (see Appendix C) and produce, or extend that line until the edge of the cardboard is reached. On the extreme right hand end of this line set two stars, which we will also call pointer stars, and place two more stars above them so that a nearly perfect square will be formed as shown in Fig. 17.

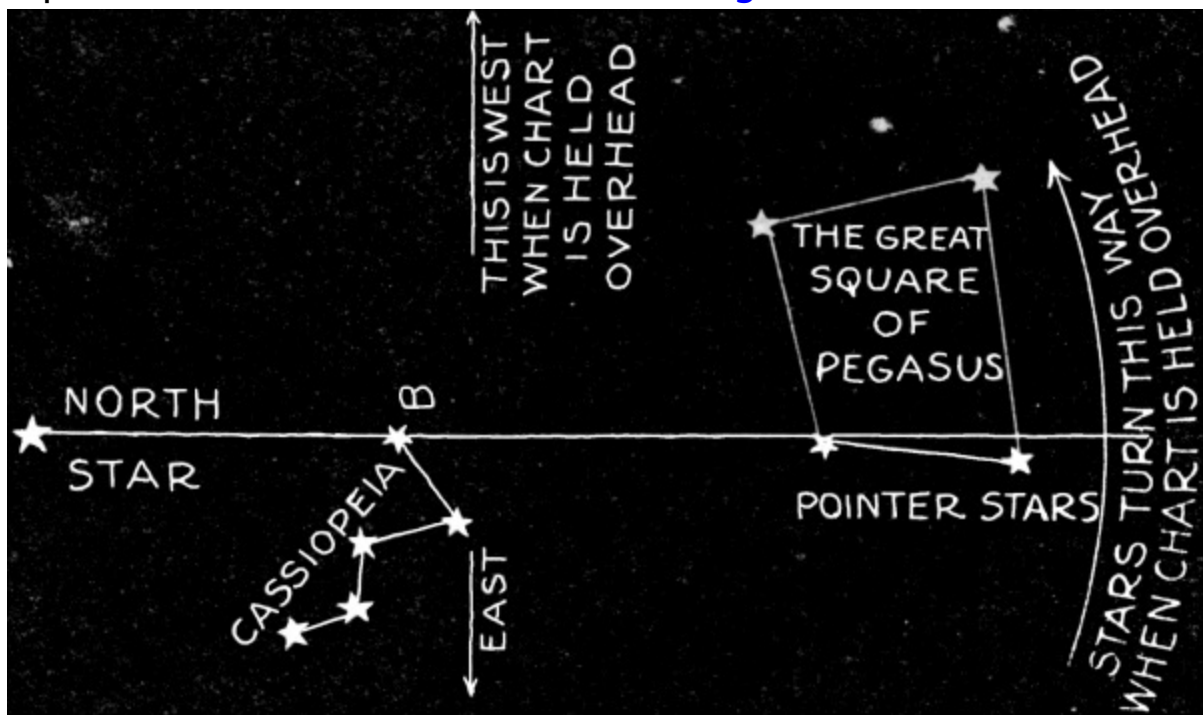


FIG. 17.—THE GREAT SQUARE OF PEGASUS.

To find Pegasus take the star chart out-of-doors, say some evening in November about 9 o'clock, for the Great Square will then be on the *meridian*, that is, on a line passing over your head and which runs north and south across the sky. This time, instead of looking down on the chart, as you did in finding the Big Dipper and Cassiopeia,

turn the board bottom side up, as shown in [Fig. 18](#), but still keeping the cardboard North Star pointing north and the four stars of Pegasus pointing toward the south.

By looking over your chart into the sky and following an imaginary line with your eye from the North Star through Cassiopeia past the star β (beta) and lengthening this line toward the equator in the southern sky you will come upon four bright, white stars which form the Great Square of Pegasus and you have added another and fourth constellation to your list.

The practical value of knowing the mighty constellation of Pegasus is that you can always find the north, by means of its friendly stars, though the North Star, the Big and Little Dippers and Cassiopeia are hidden by clouds. To find the north you only have to wait until Pegasus gets very high in the sky and run an imaginary line through the pointer stars of Pegasus and produce it until it reaches the northern horizon.

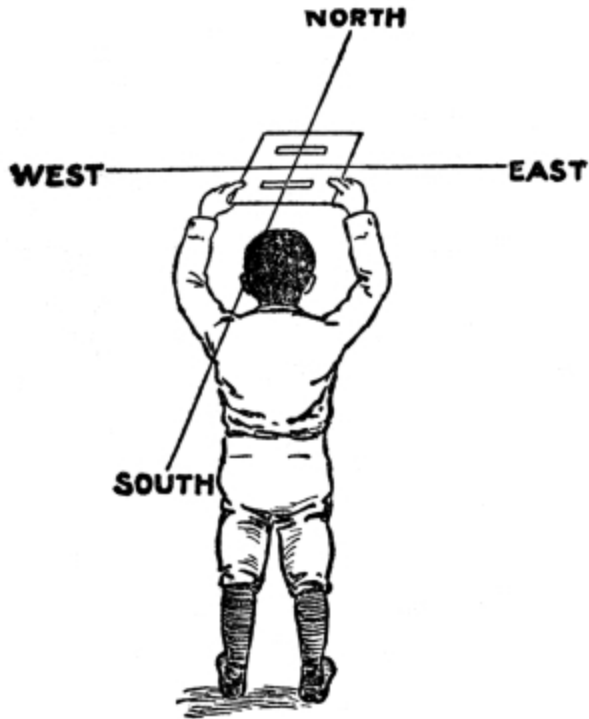


FIG. 18.—HOLDING THE CHART OF PEGASUS OVERHEAD.

The Great Square of Pegasus was fancifully pictured by the ancients as a *Flying Horse* and, curiously enough, with only half a body at that, as shown in Fig. 19. To those who do not know the lore of the stars it is not so easy to see in the Great Square the fabled winged steed who still continues his flight through the sky just as he did when he was invented over four thousand years ago.

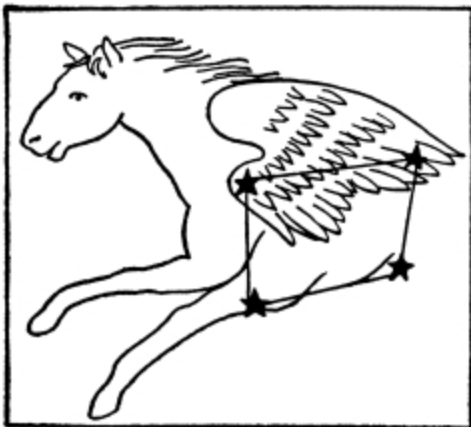


FIG. 19.—THE FLYING HORSE
OF PEGASUS.

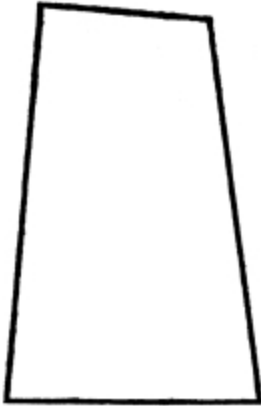


FIG. 20.—FIGURE OF A
TRAPEZIUM.

The Mighty Orion.—The brightest constellation in the whole sky is *Orion* (pronounced O-ri'-on), the Great Hunter, as the ancients liked to imagine this group of stars.

With the exception of the Big Dipper, Orion is the easiest of all the constellations to find provided you look for it at the right time of the year, which is during the winter months.

To locate Orion cut out of cardboard seven large stars and three small stars. Near the lower edge of the blackened cardboard pin two large and two small stars to form what is called a *trapezium*, that is, four straight lines forming a figure, none of which are parallel, as shown in [Fig. 20](#). About halfway across the figure pin three large stars in a row, at equal distances apart and tilted a little, as shown in [Fig. 21](#).



FIG. 21.—CONSTELLATION OF ORION.