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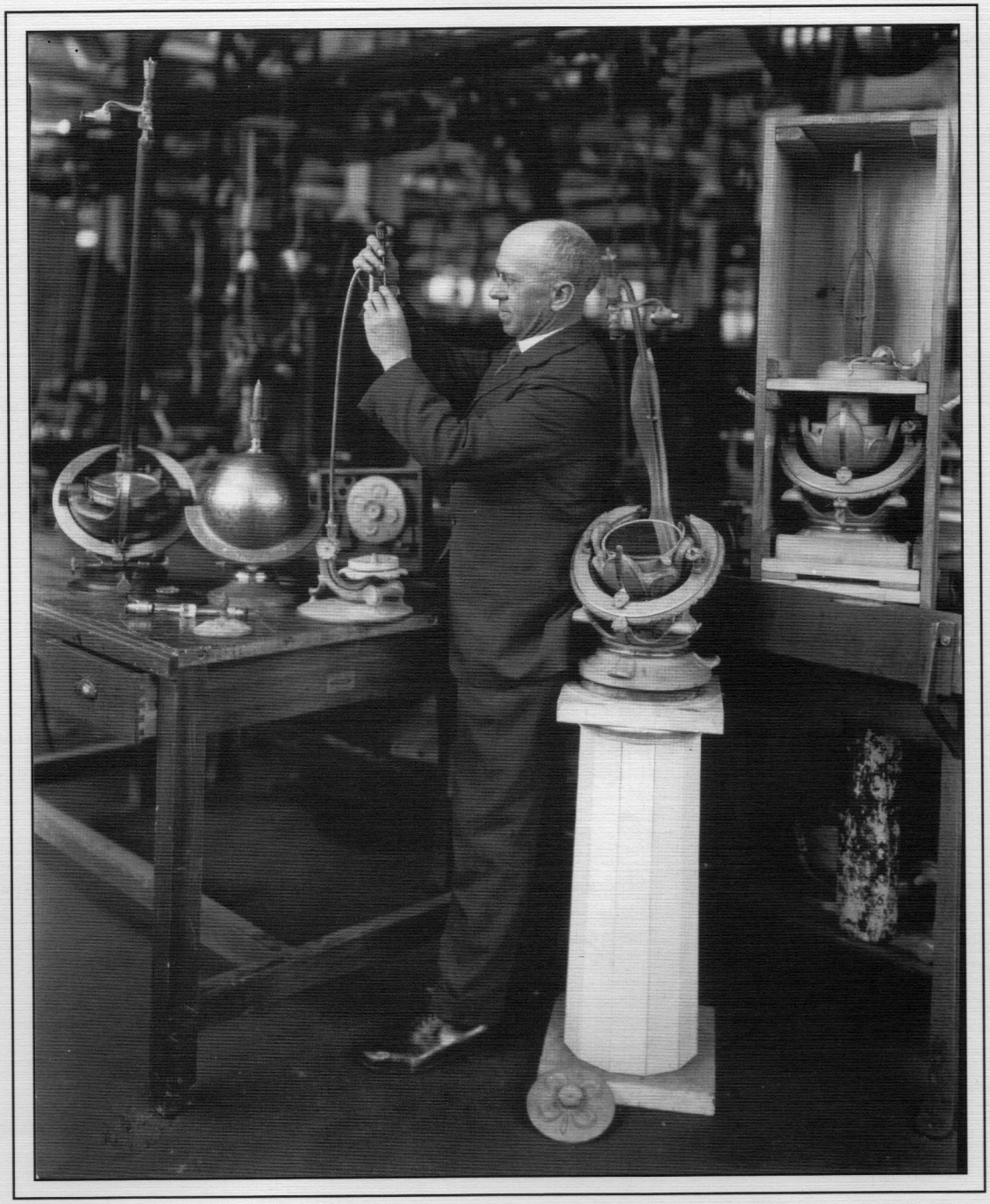

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The Porter Garden Telescope

Bert Willard
Carlisle, MA

Russell W. Porter invented his Garden Telescope at the beginning of the 1920s. It was as much a formal garden sculpture as it was a Newtonian telescope, intended for casual use by its owners. It was manufactured at the Jones and Lamson Machine Company in Springfield, Vermont, but was a short-lived success for a company whose business was building machine tools. The innovative split-ring feature of the mounting eventually found its way into the Hale 200-inch telescope. Although the actual number of instruments produced is unknown, several are known to exist today.

In 1919, at the age of 47, Russell W. Porter moved from Port Clyde, Maine to his hometown of Springfield, Vermont to start work for his long-time patron, James Hartness, president of the Jones and Lamson Machine Company. Porter's assignment was to engineer Hartness' invention of an optical comparator into a commercial product and establish an optical shop to fabricate the necessary lenses and mirrors.

Figure 1: *Russell W. Porter demonstrating how his Garden Telescope may be used as a sundial by directing the sun's image onto a card and reading the sun's hour angle from the hour circle. Date unknown, early 1920s.*

Porter possessed the perfect balance between the artistic and the technical to create The Garden Telescope, Figure 1. His love of astronomy and a desire to share this with others provided the inspiration. James Hartness was the means by which he could commercialize the concept in the 1920s.

It was not long after starting to work for Hartness that Porter finished working out the details for a telescope he hoped would introduce astronomy to more people. The fact that he was able to convince Hartness to manufacture the telescope at the Jones and Lamson Machine Company, whose products were machine tools, is remarkable. In part it may have been due to Hartness' own interest in astronomy and his invention of his refracting turret telescope, which still exists at the Hartness House Inn.

Porter described his inspiration thus:

"It was the old man with his 'five cents a look' telescope, standing at Brimstone Corner on the edge of Boston Common some twenty odd years ago, that first created in me the desire to possess for myself a telescope big enough to spread the marvels of the heavens before my eyes.

"Since then I have been constantly at it – to invent a telescope that would come within the means of you and me and thousands of others. I believe I have found this in the garden telescope.

"Why a garden telescope? Well, nearly all of us would like to explore the heavens and see for ourselves what astronomers have so laboriously gathered through the centuries. But few of us ever venture beyond what the unaided eye may reveal, because a powerful telescope has been beyond the means of most people. Moreover, the nuisance of having to transport the cumbersome affair out of doors each night, set it up and dismantle it again, has tended to discourage the few who could afford one. And so to fill this need the garden telescope was invented.

"We now have a new instrument at our command, so entirely new that one hesitates when he first sees it to tell what it is. It opens a new field of usefulness, where the amateur may acquire a telescope of large aperture so mounted as to follow the stars in their courses across the sky; where the garden lover finds an ornament as distinctive and beautiful as the sun dial, wherewith he may sweep the country side far and near – so built in durable bronze that it may be left on its pedestal as a permanent garden fixture. It will be interesting to see for which purpose this new instrument will mostly be used, for it is equally well adapted for day or night observation." [1]

Made of cast bronze, The Garden Telescope is a blend of outdoor sculpture, mechanics, optics, and sundial; wrapped in a motif of leaves. The names of three of the greatest astronomers are cast around the base, Figure 2. The design is reminiscent of the Art Nouveau style of decorative art popular between 1890 and 1914. The 6-inch F/4 parabolic mirror is held in a bronze bowl of lotus leaves, and rising up from this is a slender curving leaf and stock that supports the prism and eyepiece holder. The bowl pivots about the declination axis, which is close to the mirror surface. The bearings are attached to the hour circle, and Roman numerals mark out the hour angles. The hour circle is split at its upper end to allow the leaf stock to pass through when viewing to the north. This is the key feature that found its way into the Hale 200-inch telescope. The bowl, which holds the mirror, rides inside an upside-down bell, and the tip of this bell forms the lower thrust bearing of the polar axis. Two rollers support the machined circular track, both hidden behind the hour circle, Figure 3. The polar axis may be adjusted between 30° and 50° north or south latitude.

Figure 2: *A close-up showing details of the base, split-ring hour circle, and bowl holding the mirror. Date unknown, early 1920s.*

For terrestrial viewing, a ball bearing track in the base allows the entire telescope to be swung in azimuth about the fixed base.

The prism and eyepiece can be rotated about the mirror axis for comfortable viewing of any object. When not in use, the prism and eyepiece are removed as a single stem unit, as is the mirror and its cell, with all the optics stored in a custom wooden box. Removing the mirror reveals the builder's plate, Figure 4.

Figure 3: *A close up showing details of the base, bell, and one of the knobs for turning the telescope in right ascension (seen on the right). Date unknown, early 1920s.*

The eyepieces offered with the telescope gave magnifications of 25, 50, and 100X, "being the Hastings positive astronomical oculars by Brashear."[2] The mirror was silver coated and "covered with a laquer (sic) of gun cotton and amyl acetate to preserve its luster without detriment to its optical properties."[2]

Porter kept a notebook that he called his "Germ Book,"[3] dated 1921-1926. In it he sketched his ideas for numerous optical instruments; some were clearly related to his work at the "J&L", designing optical comparators and lens grinding and polishing machines. However, others reveal his penchant for daydreaming; like reflecting binoculars worn as a pair of glasses, a folding pocket

Figure 4: *The builder's plate.*

reflector, and a windowsill-mounted telescope. Also to be found are details on a boom and stellar interferometer for a turret telescope, and a transit instrument – all for Stellafane. Stellafane is the name of the clubhouse of the Springfield Telescope Makers, Inc. and is a contraction of Stellar Fane, shrine to the stars. However, dispersed within the pages are notes on the progress of the Garden Telescope, the only such records known to exist. The first entry reads; "Started six Garden Telescopes last week by altering design of base to give range of 30° in latitude," dated April 3, 1922. On June 5, 1922 he began the first draft of "The Garden Telescope, an account of a new garden accessory by its inventor." Some time after that, no date given, he enters preliminary sketches for a brochure on the Garden Telescope. On September 1, 1922 he writes, "Six garden telescopes nearly completed. First cast iron telescope well along — will carry five foot focal system." The final entry is on October 23, 1922, "Garden telescopes boxed ready for delivery. Advertising deferred. Cast iron tel finished — O.K. Resolves Epison (sic) Lyrae." Figure 5 shows Russell Porter and members of his first mirror-making class.

Figure 6 shows Porter demonstrating how to use eyepiece projection to image the sun. Note the partial eclipse. The telescope is set up on the north side of the Jones & Lamson Machine Co. property as shown by the "Office" sign over the door. The offices were on the north side of the building. This is also evidenced assuming Porter has the polar axis properly aligned. The long shadows indicate the photo was taken late in the afternoon. The fact that it is a partial eclipse determines the exact date to be September, 10, 1923, at close to maximum eclipse, about 5:40 p.m.

Figure 5: *Russell Porter, far left, and his cast iron model of the Garden Telescope on Hawks Mountain just north of Springfield, Vermont, on an outing of his first mirror making class. The author believes the person fourth from the left is Wilbur Perry, who figured all the mirrors for the Porter Garden Telescope. Date unknown, early 1920s.*

The mirrors were made in the optical shop set up by Porter to produce the optical parts for the Hartness comparators. On the question of who made the parabolic mirrors, Porter wrote the following:

> *" ... a machine has been designed to bring to a complete polish a number of glass discs holding their surfaces very close to that of a concave sphere, the knife edge test being carried out at the center of curvature of the glass. The parabolizing is then carried on with a specially designed machine, the knife edge test now being at the focus, parallel light as from a distant star having been produced in the laboratory. The parabolizing is perfected until all parallel rays reflected from the mirror cross the axis of the glass within one hundredth of an inch of each other.*
>
> *" ... The writer must admit, however, his inability to completely parabolize by machinery. To bring the figure within the specifications he has laid down for these mirrors a certain amount of hand work seems unavoidable."*[2]

To fulfill the need for this "hand work," Porter hired Wilbur Perry (1905-1978), a young machinist who quickly learned how to figure the mirrors.[4,8] Figure 7. Porter wrote about the limited success of the venture, "It was short lived. About a hundred were sold which evidently saturated the market. Although half a dozen were sold here in southern California, I have been unable to locate them. Yes, Wilbur Perry was broken in and he made all the mirrors. The prisms and oculars came from John Brashear."[5] In 1930 Perry was hired by physicist R.W. Wood, director of the Ruling Engine Laboratory at Johns Hopkins University, Baltimore, MD to make diffraction gratings and maintain the ruling engine.[4,6,7,8]

The price of the telescope is documented in two letters from the Jones and Lamson Machine Company to prospective buyers:

June 16, 1923

"The price of the telescope, exclusive of pedestal, f.o.b. Springfield, Vermont, is $250.00. Our present supply is exhausted, but others are going through the factory and we expect to be able to make delivery in from six to eight weeks."

July 23, 1923

"The price of the Garden Telescope, exclusive of pedestal, f.o.b. Springfield, Vermont, is $250.00. Some owners prefer to furnish their own pedestal, but we can furnish one especially designed for the Porter Garden Telescope with means of

Figure 6: *Porter projecting an image of the partial solar eclipse on September 10, 1923, at the Jones and Lamson Machine Co.*

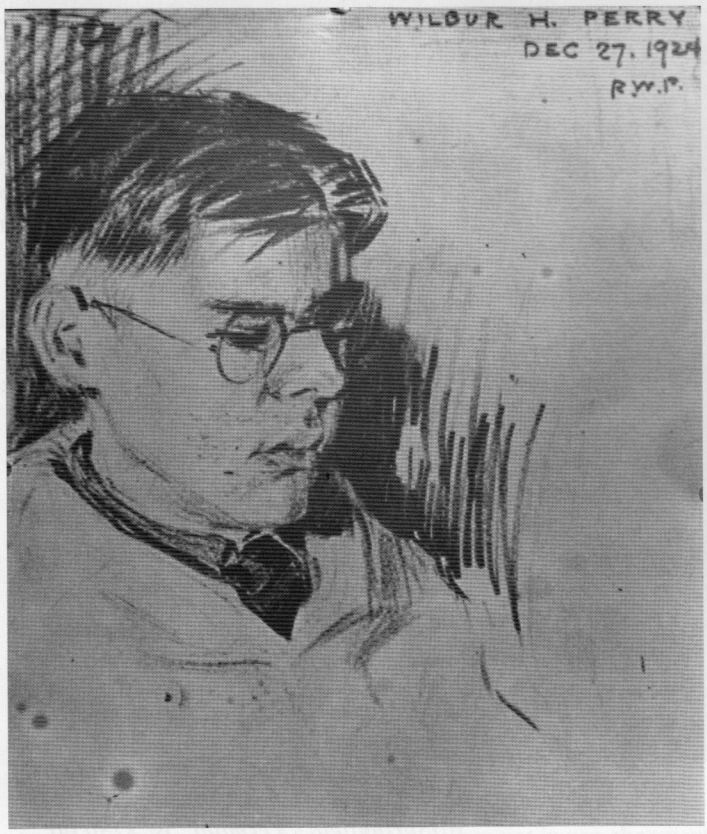

Figure 7: *Porter drawing of Wilbur Perry who figured all the mirrors for the Porter Garden Telescope.*

locking securely the mounting to the pedestal at $25.00 f.o.b. Chicago."[9]

However, evidence suggests it was soon realized that the price of $250 would not cover the costs and so the price was increased to $400.[7,10] For comparison, the price of 1923 touring cars ranged from $750 to $2550.[11] The Ford Model-T was selling for about $300 in 1925.[12]

By this time, the local newspaper, the *Springfield Reporter*, printed a story full of optimism for the industrial success of this new enterprise:

"Still another healthy industrial enterprise, one which, it is stated, will eventually mean the manufacture in considerable quantities of telescopes of the distinctly 'garden variety', is rapidly assuming definite form here.

"Just now the new industry is more or less in the embryonic stage. As has been the case for several other prosperous industries in Springfield, the telescope business is developing as an off- shoot of the Jones & Lamson Machine Company of which ex-gov. James Hartness has been a leading figure for many years.

"From present indications it seems to be pretty well settled that the manufacture of the 'garden telescope', as far as Springfield inventors are concerned, is far past the toddling stage, and it bids fair to become one of the leading industries of Springfield, a village frequently referred to as 'the cradle of invention' because of the large number of patents taken out on improvements, mainly mechanical which have been evolved in this Vermont town.

"It is pointed out that a telescope of the 'garden variety', while familiar to Springfield people, is something of a novelty generally elsewhere. In fact it bears little or no resemblance to the common idea of a telescope having an elongated tube with lenses, but is, from the optical standpoint a modified Newtonian reflector. That is, the image which one sees on looking into the eye-piece is formed by converging light from a silvered mirror instead of through a lens.

"Considerable assistance and moral support in the perfection of the new telescope has been given by ex-gov. Hartness who himself is deeply interested in astronomy ...

"Mr. Porter states confidently, 'It is not improbable that this beginning is the forerunner of a new industry for Springfield.'"[13]

The market for these telescopes can be traced through the advertisements placed in various home and garden oriented magazines. These ran through 1923-1924 in *House Beautiful*, *Country Life*, and *House & Garden*. Most of the ads ran as fractional columns but one in *Country Life* for March, 1924, ran full page (page 109). Figure 8.

The reasons why the telescope remained a J&L product for only two years is not clear, but it may have been the cost and lack of understanding on the part of the owners. The latter is clearly indicated by two references that have the same tone but are from different J&L employees, both of whom were sent on fact-finding trips.

In the first reference[14], Henry Loudon, in charge of advertising for J&L, was asked to work with Porter on the promotion of the Garden Telescope. The company realized that once the telescopes were sold, their owners were never heard from again. It was decided that Loudon would take a cross-country trip, through New Orleans and on to the west coast. He would visit the people who bought the telescopes to be sure they knew how to operate them, with the anticipation that this would lead to more sales. He found that many of the owners did not understand the operation, in particular the equatorial mount. Some of the telescopes were being used as garden ornaments only, and some were not being used, but were packed away. Loudon took the time to explain the operation to the owners. This led to the sale of enough telescopes to pay for his trip.

THE PORTER GARDEN TELESCOPE

Designed for Use in Homes, Summer Resorts, Golf Clubs, in the Mountains, or on the Shore

AN ornamental telescope made in solid statuary bronze—a permanent garden fixture—needs no shelter, but is always there for instant use, whether to follow an airplane, the flight of a bird, or a ship far out at sea.

The wonders of an evening sky or the enchantment of a distant landscape may now be brought to our feet for mutual enjoyment.

The equatorial mounting, rotating prism and eyepiece make it possible to observe in comfort any object whether directly overhead or on the horizon, without going through any neck and back-breaking motions.

The six-inch reflecting mirror gives a light grasp hundreds of times that of the human eye.

Eyepieces are furnished to give 25, 50 and 100 magnifications. The Porter Garden Telescope may be provided with double eyepieces so that distant objects may be observed by two persons simultaneously.

The telescope is equally well adapted for night or day use. Sun spots, mountain chains, craters, dried-up sea floors on the moon, rings of Saturn, belts and moons of Jupiter, Venus in crescent form and the ice caps on Mars, are easily discernible and identified.

FOR FURTHER DETAILS WRITE DESK A

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont

The second reference comes from Oscar Marshall:

"This Garden Telescope was a departure from the normal product made by Jones and Lamson's, but Mr. Hartness and Mr. Flanders were in favor of the enterprise. They felt confident that the ornamental instrument would appeal to wealthy owners of fine estates. Hartness and Flanders were right with respect to the appeal of this decorative telescope, but they misjudged the ability of the owners to use it competently for its designed purpose.

"With the rare skill for which be became known, Russell Porter designed the instrument that was patented September 25, 1923. I was put in charge of building the mechanical structure, an assignment that gave welcome relief from the boredom of my usual shop days. Russell superintended the optical works. Plans were laid to market this new member of the telescope family. The outlook was promising. Orders arrived so promptly that we had to step up the tempo of production.

"Gradually the need for a field agent became apparent. I was delegated to visit each party who had purchased a Garden Telescope. My assignment was to help him achieve 100 percent satisfaction with his new instrument. In every instance I discovered that the owner faced identical difficulties and for the same two reasons. First, he had failed to heed the printed instructions concerning the care of the mirror. These had been carefully enclosed with the instrument. Second, the operation of the reflecting telescope was complicated at best, in spite of detailed information which Russell had provided. The instrument, designed for astronomical use, failed to be effective in the hands of those who were unskilled in basic astronomy. When the Porter Garden Telescope was discontinued after two years, one of my shop friends remarked, 'Oscar has had to go back to work.'"[15]

Porter obtained two patents for his telescope:
- Patent No. 1468973, dated September 25, 1923 for a Newtonian model.

What is less known is a second patent:
- Patent No. 1651412, dated December 6, 1927. This is for a refracting model which was never produced.

Figure 9.

In 1929, Porter was hired by George E. Hale to go to the California Institute of Technology and help with the design for a 200-inch telescope and observatory. It can be argued that the horseshoe mount that was finally selected for the Hale telescope can be traced back to Porter's split ring mount on the Garden Telescope. The following exchange of letters between Porter and Flanders supports this claim.[16]

27 January 1936
Ralph E. Flanders, President
Jones & Lamson Mach. Co.
Springfield, Vermont

My Dear Ralph:

You will remember that the Governor took out a patent on the Porter Garden telescope in my name and had it transferred to the company.

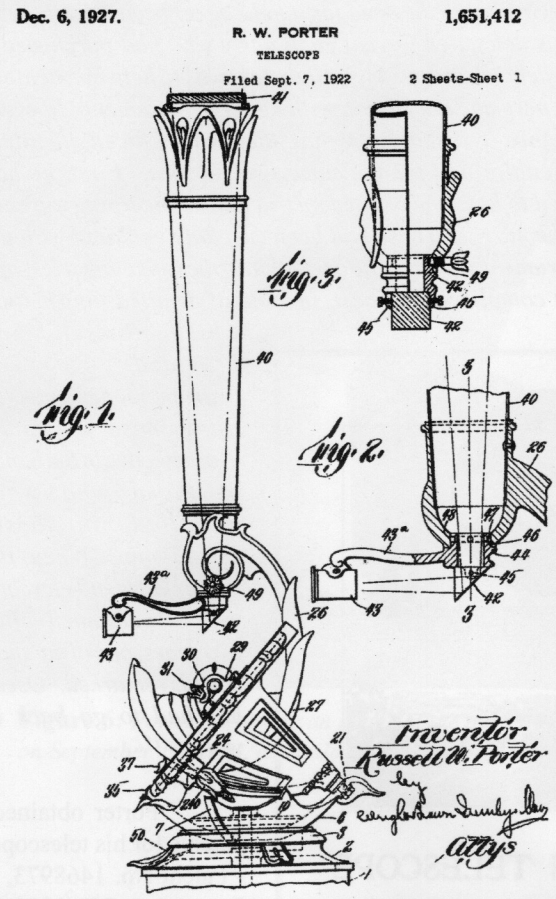

Figure 9: *Drawing from the patent for the refracting Garden Telescope issued December 6, 1927.*

As the Specifications contained a reference to the "split ring" feature of the mounting, and as this feature is being considered in the mounting of the 200-inch telescope, we would appreciate a statement from you to the effect that, as far as your patent is concerned, the California Institute of Technology has full permission to incorporate any of the claims mentioned in your patent.
Russell W. Porter

February 3, 1936
Mr. Russell W. Porter
California Institute of Technology
Pasadena, California

Dear Russell:

In response to your request of January 27th, you are hereby officially informed that the California Institute of Technology has full permission to incorporate any of the claims mentioned in your patent No. 1,468,973 dated September 25, 1923 without remuneration to us.

We are proud of your connection with this great undertaking and are very glad to assist it in any way possible. If there is anything else we can do for you, or for the Institute, let us know.
R. E. Flanders

Today, there are a number of Porter Garden Telescopes known to exist; the known serial numbers are:

No. 10	Callusa Nature Center, Ft. Myers, FL
No. 13	Cincinnati Observatory, Ohio
No. 31	Springfield Telescope Makers, Inc.
No. 42	Santa Barbara Astronomical Unit
No. 47	Mt. Cuba Observatory, Greenville, Delaware
No. 49	Smithsonian National Museum of American History
No. 52	Buffalo Museum, New York

Figure 10: *Engraved top of the Porter Garden Telescope optics box, in the Museum of Amateur Telescope Making, The Springfield Telescope Makers, Inc.*

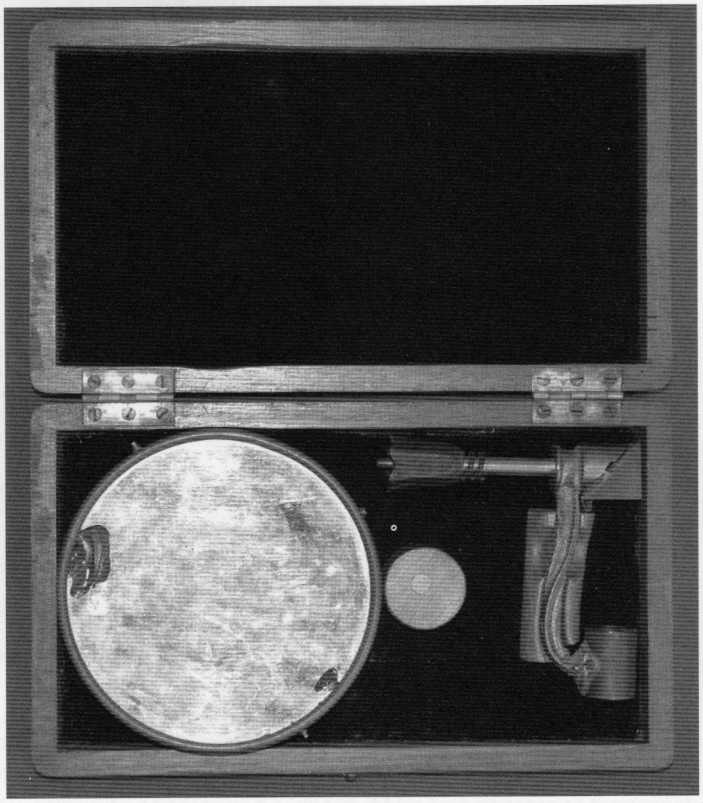

Figure 11: *Inside of the felt-lined box shown in Figure 10. Note the wooden cam that secures the mirror. The prism and eyepiece stem is held by a hand-carved wooden cradle.*

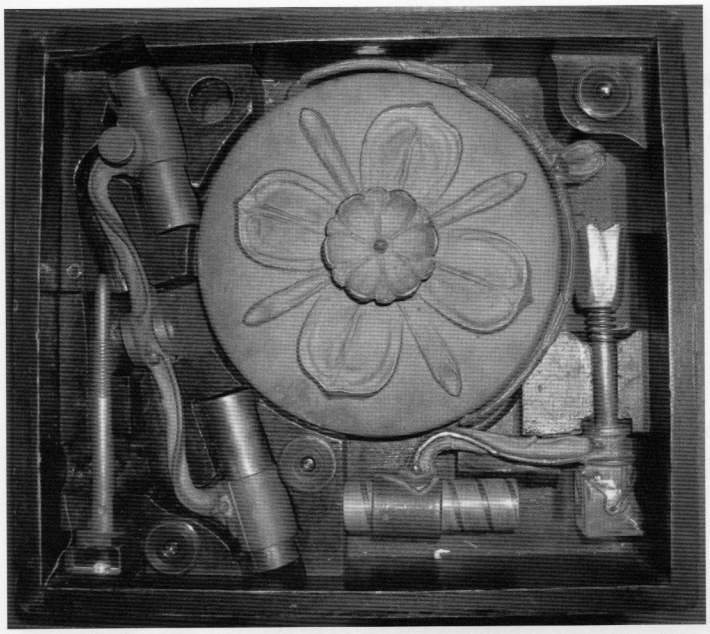

Figure 12: *A complete set of optics in the original storage box showing the single prism and helical focuser on the lower right, and the special order dual prisms and dual rack and pinion focusers on the left. The large cast bronze floral cover protects the primary in its cell. Note the cast lifting bail that also serves to lock the primary cell in the telescope's bronze bowl. All Figures are from the archives of the Springfield Telescope Makers, Inc., except Figure 12.*

The numbers 3, 21, 28, 36, 44, 46, and 53 are presently held by private collectors. Not all Garden Telescopes were identical; some had rack and pinion focusers but most did not. Some were purchased with a dual prism and eyepieces which allowed two observers simultaneously. Each prism captured light from separate segments of the primary mirror.

Even the optics storage boxes changed with time. Figure 10 shows the engraved top of one box, which was cut and routed from a single piece of mahogany, while Figure 11 shows the inside of this box. Figure 12 shows a complete set of optics in a different storage box. On the lower right is the single prism and helical focuser. On the left is a second pin holding the dual prisms and the dual eyepiece tubes with rack and pinions. The entire enterprise was short lived, lasting about two years, but the Porter Garden Telescope is now being reproduced by a commercial venture. Perhaps this will be a longer lasting tribute to the three great astronomers whose names are cast into the base of this Garden Telescope: Kepler, Galileo, and Newton.

Addendum

After submitting this paper to JATS the author had the opportunity to search through the archives at the Miller Art Center, Springfield Art and Historical Society, Springfield, Vermont. They have a collection of documents from the defunct Jones and Lamson Machine Company and among the documents are six photographic prints of a pre-production model of the Porter Garden Telescope. A comparison of Figure 13 and Figure 2 reveals numerous changes that were made: a small declination circle on the east side of the declination axis was replaced by the declination ring on the underside of the bowl, the pointer for the hour circle was changed, the broad base was replaced with a more pleasing form, and the leveling screws were removed. These last two changes allowed the entire base to be moved in azimuth for terrestrial viewing. A second photograph reveals that the stem was screwed onto the bowl, yet the production model made the stem and bowl in one casting, a challenge to casting technology even today. The prism and eyepiece stock appear to be unchanged.

The date on these prints is April 6, 1922, just three days after Porter's first entry in his "Germ Book" mentioning the first six Garden Telescopes having entered production.

This is also the model used by Porter to paint his only known watercolor of the Garden Telescope, dated 1921, a photographic print of which is on display in the Porter Hartness Museum of Amateur Telescope Making, operated by the Springfield Telescope Makers, Inc.

I am indebted to Matt Considine, who arranged with the director of the Miller Art Center to allow me to look through their archives of the Jones & Lamson material.

Figure 13: *Photograph from the Miller Art Center, Springfield, Vermont, dated April 6, 1922. This was a pre-production model. Compare it to the production model in Figure 2.*

End Notes:

[1] Porter, Russell W., "The Garden Telescope, An Account by Its Inventor of a New Garden Accessory", *House Beautiful*, March, 1923.
[2] Porter, Russell W., unpublished manuscript, "A Garden Telescope", undated. Archives of the Springfield Telescope Makers, Inc.
[3] Porter, Russell W., "Germ Book", archives of the Springfield Telescope Makers, Inc.
[4] Ingalls, Albert G., *Scientific American*, April, 1949, p. 60.
[5] Letter from Russell W. Porter to Leo J. Scanlon, November 3, 1946. Archives of the Springfield Telescope Makers, Inc.
[6] Ingalls, Albert G., *Scientific American*, November, 1932, p. 304.
[7] Ingalls, Albert G., *Scientific American*, December, 1937, p. 363.
[8] Ingalls, Albert G., *Scientific American*, June, 1952, p. 90.
[9] Archives of the Springfield Telescope Makers Inc.
[10] One of the few remaining brochures that sold with the telescope contains a hand written note on page 15: "Price $400.00 without pedestal, Oct. 30, 1923", from Matt Considine, Doylestown, PA.
[11] Advertisements in the *Boston Globe*, June 2, 10, and 17, 1923.
[12] website: www.answers.com.
[13] *Springfield Reporter*, July 19, 1923.
[14] Letter from Henry A. Loudon to the author, April 26, 1968.
[15] Marshall, Oscar Seth, *Journeyman Machinist*, Wm. S. Sullwold Publishing, Inc., Taunton, MA, 1979, p. 76.
[16] Ralph E. Flanders papers, *Special Collections Research Center*, Syracuse University Library.

Publications:

1. Porter, Russell W. "The Garden Telescope, An Account by Its Inventor of a New Garden Accessory", *House Beautiful*, March, 1923.
2. "A Garden Telescope for the Amateur Astronomer", *Scientific American*, January, 1923, p. 35.
3. "Lens On Sundial Shows Wonders Of Nature", *Popular Mechanics*, August, 1923, p. 262.
4. Porter, Russell W., "A Garden Telescope", *Popular Astronomy*, May, 1924, p. 273.
5. "Ornamental Telescope for Lawn or Garden", *Popular Science Monthly*, September, 1924, p. 53.
6. "Telescope and Sundial Are Combined In One", *Popular Mechanics*, January, 1931, p. 35.
7. Scanlon, Leo J., "The Porter Garden Telescope", *Popular Astronomy*, Jan.-Feb., 1962.
8. Photo and description of model #10, *Sky and Telescope*, October, 1964, p. 204.
9. Scanlon, Leo J., "The Porter Garden Telescope", *Modern Astronomy*, July-August, 1974, p. 62.
10. Spaight, John Tracy, "The Porter Garden Telescope", *Rittenhouse Journal of the American Scientific Instrument Enterprise*, August, 1992, p. 97.
11. Warner, Deborah Jean, "Astronomical Highlights of the Collections in the National Museum of American History", *Journal of the Antique Telescope Society*, Volume 3, Winter, 1993, p. 5.