Field

Center for Astrophysics

Harvard College Observatory
Smithsonian Astrophysical Observatory

MEMORANDUM

To: George Field

September 15, 1980

From: Owen Gingerich

Subject: 15" Restoration

Several weeks ago Nat Carleton and I took a close look at the 15" refractor and dome, and we came away with the comparatively optimistic feeling that things were not in as bad a shape as we had remembered and that certain relatively simple steps would make an enormous step forward toward converting the instrument into a showpiece that we could be proud of exhibiting.

Some simple things, such as the installation of stair treads on the steps up to the dome or the painting of the walls of the dome could probably be handled within the maintenance budget for the buildings. Perhaps even a hardwood floor could be installed from the same budget. The refurbishing of the observing chair could well be carried out by the local amateurs under Nat Carleton's close supervision. I believe that Nat is interested in taking the lead on this, and will be in touch with you on this matter.

Meanwhile, I have shown the telescope to Dr. Paul Hanle, Curator from the National Air and Space Museum, and he was most enthusiastic about Smithsonian co-operation in making the telescope a first-class exhibition area. He has subsequently called me to say, that funding for exhibits is available through the National Endowment for the Humanities and the National Endowment for the Arts, and he has given me the contact names listed below.

Constance Clement - NEH; 202-724-0327
John Spence - NEA; 202-634-6164

OG/jj
Xc: Nat Carleton

Center for Astrophysics

Harvard College Observatory
Smithsonian Astrophysical Observatory

MEMORANDUM September 19, 1980

To: Distribution

From: George B. Field GBF

Subject: Fifteen-inch refractor

Over the years a number of us have wished that the 15-inch refractor could be restored to its former splendor. Clearly HCO is not in a position to spend the $50-150 K needed to do this, but foundations and/or individuals might be interested in helping financially, and, moreover, the Amateur Telescope Makers of Boston have from time to time stated their interest in helping out.

Recent notes from Bill Waller and from Owen Gingerich have stimulated me to call a meeting of interested persons to discuss the possibilities. I hope you can attend. Judy will contact you concerning an appropriate time.

W. Barad
N. Carleton
J. Cornell
Jim Crawford
O. Gingerich ✓

THE 15-INCH
GREAT REFRACTOR
of the
HARVARD COLLEGE OBSERVATORY

A Budget of Costs
To Restore And Maintain The Instrument
And Building And To Continue Further
Historical Studies

Nathan Hazen
Harvard College Observatory

March, 1970

INTRODUCTION

This supplement to the study report on the history, current condition, and future utilization of the 15-inch telescope at the Harvard College Observatory presents the estimated cost of carrying out the program recommended in the main document. After reviewing the significance of the 123-year-old great refractor to the stature of the University and American astronomy during the 19th Century and evaluating the present state of the instrument, ancillary equipment, and original building -- Sears Tower --, the report concludes that with modest effort and expenditure, the historic telescope could continue to play an important educational role within the Observatory, University, and community at large.

In support of this general recommendation, the various costs of initiating and maintaining a program to preserve and enhance the cultural value of the instrument and building have been organized into two separate though related budgets. One allocates the capital funds required to restore the great refractor and Sears Tower for permanent exhibition and student use; the other provides for yearly basic maintenance and display activities.

The items in the Capital Funding budget follow closely the sequence of topics discussed on pages 19-32 of the main report. The Annual Support budget outlines the cost of a continuing program of reasonable proportions for preservation and historical exposition as formulated on pages 35-38 of that document.

ALLOCATION OF FUNDS

The major difficulty in establishing a cost basis for the various tasks and activities lies in defining the scope or magnitude of the optimum program. For this program one alternative was to gradually assign funds for certain basic repairs, thus gradually reversing the present trend of deterioration; at the other extreme was the immediate appropriation of large sums of money for all major renovations, thus achieving in the shortest possible time a permanent educational facility for academic as well as public use.

The approach actually adopted in preparing the budgets follows an intermediate course based on underwriting a substantial portion of the recommended work through initial capitalization, with provision for continued improvements through annual support. The costs in the budgets were derived from a variety of sources, but mainly from direct vendor quotations (for example, the telescope tube restoration) or working experience within the Observatory engineering service group, since most of the required work would be accomplished either by our engineering and model shop staff or outside contractors.

The allocations should be viewed with a certain degree of flexibility, especially in accomplishing individual tasks. For example, recovery of the presently missing Clark clock drive would probably eliminate the need for rebuilding the electrical drives but, on the other hand, could entail restorative work of another kind, incurring more or less comparable costs. However, while unforeseen changes in the nature of the work may alter some items, the overall cost of the program should not be materially affected.

The cost of some budgeted items could be reduced or defrayed appreciably by other means. Although no solicita-

tions have yet been made, some vendors might welcome the chance to exchange their materials or services for appropriate publicity or "good will". Such arrangements are quite common in modern museums. Recognition for support in the restoration of the 15-inch telescope could be acknowledged as part of the proposed displays or in one of the special publications. Moreover, the cost of producing these publications would in time also be reduced or even returned through public sales and subscriptions, eventually making this annual support item self sustaining.

PROGRAM SCHEDULE

Since fine weather is required for exterior work and it is inappropriate to heat the observing floor of Sears Tower, it will be necessary to make most of the repairs on the telescope, dome, and roof during the summer months. However, some work on telescope equipment (such as refurbishing the observer's chair and testing optical components) which will be done elsewhere in the Observatory could be initiated without regard to season. Designing the display area and planning the scope and nature of the exhibits could also be independently started. If funds were available in mid-1970, these latter activities could be conducted during the fall and winter months of 1970-1971, with major renovations scheduled for the following spring and summer. In this case, the entire program would be completed and the area opened to visitors by the beginning of the academic year in September, 1971.

This staggered schedule provides ample opportunity for planning and orderly procedures. An earlier target date might be met but would not allow the fullest time for organization, and the rush to completion would unquestionably prove detrimental to the ultimate value of the program.

CAPITAL FUNDING

Objective		
Additional dispersion, homogeneity and strain tests		$ 500
Tube and Mount		
Rebuild wooden tube	$1,200	
Strip, refurbish, reassemble mount	1,500	
Fix counterweight shaft, refit bands, etc.	800	3,500
Drives		
Rebuild or restore present R.A. drive and clutch	2,000	
Rebuild or restore present declination drive	700	
Refurbish and document drive and control electronics	900	3,600
Observer's Chair		
Refasten and paint frame	400	
Refit and adjust drives	300	
Rebuild and reupholster chair	600	1,300
Finder Telescope		
Replace eyepiece and refit hardware		200
Dome		
Sill: repair bolts and apply preservative (includes removing some ceiling, jacking up dome)	1,000 *	
Restore ball tracks and install balls	1,200	
Make and install handwheel	250	
Repair and refit lower sash frames and doors	400 *	
Replace upper door fittings	100	
Refasten door drive frame	200	
Refit door drive winch, including new gears	300	
Make and install external position ball	200	
Prepare roof and install silicone membrane roofing	2,500 *	
Repair ceiling, as required	400 *	6,550

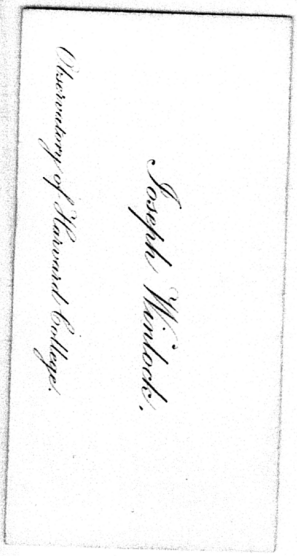
---

* Areas normally covered by building maintenance reserves and therefore probably not requiring independent funding

Tower		
Strip and rebuild observing level flooring (includes refastening chair rails and installation of water proofing)	$1,500 *	
Repair west wooden door and east iron door	150 *	
Repaint interior, including dome, at observing floor level	500 *	
Install improved lighting at observing floor level	400	
Install equipment storage cabinets - northeast alcove	500	
Install double door entry to observing floor (to permit winter entry with minimum heat loss)	300	$3,350
Displays and Exhibits Material		
Observing Floor (furnishings largely from available material)		
Install protective rails	200	
Pictorial and explanatory material	1,000	1,200
Rotunda Level		
Display and explanatory materials		2,000
South Vestibule		
Display cases and explanatory material		1,000
Publications		
Reprint (offset) initial quantities of certain significant documents for resale to public - proceeds to cover additional printings (i.e. Vol. I - Annals, 2000 copies, and others)		3,000
Subtotal (without asterisks)		$19,750
Subtotal (asterisks)		6,450
Total		$26,200

ANNUAL SUPPORT

Continuing Studies and Projects		
Senior Research Assistant (1/2 time)	$6,000	
Publications: material and services	2,000	$ 8,000
Routine Operations, Maintenance and Improvement		
Research Assistant (1/4 time) for daily activity	2,000	
Instrument technician (1/4 time)	2,500	
Direct materials	500	5,000
Total Appropriation/yr.		$13,000



George Field November 26, 1980

Owen Gingerich

15-inch Committee

I am enthusiastic to see that Jim Crawford's work is pushing us ahead on this project and I hope that we can have an early meeting. However, I shall be in Europe for the next two weeks and hope that the meeting can be held off until the week of December 8.

I remind you of our discussion that Barbara Welther should be included on the Committee. She has, in fact, started doing some legwork on the historical background.

Last Friday I filmed six transition segments for a forthcoming Nova program "Beyond the Milky Way," and one of the historical segments was filmed in the 15-inch dome. I only wish that the surroundings had been restored to their 1850 splendor! Presumably Jim Cornell will give some publicity as to the precise date in February when you can see it on Channel 2.

OG/jj
(Transcribed/signed in his absence)

Center for Astrophysics

Harvard College Observatory
Smithsonian Astrophysical Observatory

MEMORANDUM

To: George Field

September 15, 1980

From: Owen Gingerich

Subject: 15" Restoration

Several weeks ago Nat Carleton and I took a close look at the 15" refractor and dome, and we came away with the comparatively optimistic feeling that things were not in as bad a shape as we had remembered and that certain relatively simple steps would make an enormous step forward toward converting the instrument into a show-piece that we could be proud of exhibiting.

Some simple things, such as the installation of stair treads on the steps up to the dome or the painting of the walls of the dome could probably be handled within the maintenance budget for the buildings. Perhaps even a hardwood floor could be installed from the same budget. The refurbishing of the observing chair could well be carried out by the local amateurs under Nat Carleton's close supervision. I believe that Nat is interested in taking the lead on this, and will be in touch with you on this matter.

Meanwhile, I have shown the telescope to Dr. Paul Hanle, Curator from the National Air and Space Museum, and he was most enthusiastic about Smithsonian co-operation in making the telescope a first-class exhibition area. He has subsequently called me to say, that funding for exhibits is available through the National Endowment for the Humanities and the National Endowment for the Arts, and he has given me the contact names listed below.

Constance Clement - NEH; 202-724-0327
John Spence - NEA; 202-634-6164

OG/jj
Xc: Nat Carleton

Owen

Nat - please return folder after you copy anything you need.

HCO 15 incl. Ltr

Society
for the Preservation
of New England
Antiquities

Harrison Gray Otis House
141 Cambridge Street
Boston, Massachusetts 02114
617 227-3956

January 7, 1980

Mr. James Crawford, Chief Aerospace Engineer
Harvard College Observatory
Garden Street
Cambridge, MA. 02138

Dear Jim:

Restoration of Sears Tower, a landmark of first importance in the history of science in America, would provide Harvard University with visible evidence of a portion of its history which richly deserves preservation and presentation. In a sensible restoration undertaking the first step is usually to determine both the needs and the history of the building so as to know what portions of the building are original and what condition they are in, and to present this information in an historic structure report. While the telescope itself and its machinery require certain special non-architectural conservation services (furniture re-upholstery and wood re-finishing, repair of brass clock works), the building which houses the telescope and its accoutrements needs architectural attention. An historic structure report stands as a basic architectural and historical reference work on the building under consideration, and is divided into three sections: the first details as fully as possible the history of the building; the second analyses and evaluates the present physical condition of the historic building; the third section specifies preferred methods and appropriate materials for building conservation, along with a restoration program and some commentary on peripheral but related matters such as landscape design and possible lines of interpretation.

Lines of action subsequent to the historic structure report involve the actual repair and, where needed, reconstruction, exhibit design, and so on. SPNEA/Consulting Services would be pleased to continue its participation in the restoration of Sears Tower in a review or advisory capacity as work proceeds.

We look forward to your comments, questions, or suggestions.

Sincerely,

Sara

Sara B. Chase
Preservation Consultant and
Project Coordinator
Consulting Services

SBC/mr

Enc.

Harvard College Observatory: Sears Tower

An Historic Structure Report Proposal

I. Architectural and Historical Survey

A. Short History of the Observatory, its telescopes, and its work

B. Notable women who worked in the Sears Tower

C. Architectural history of the building including alterations and identification of remaining original and historic fabric, interior and exterior

D. Compilation of illustrations and documentation of the above

E. Outline of themes for interpretive and educational programs

Cost Estimate:	3-5 weeks @ $1,225/week . . .	$3,675 - 6,125
	Reproduction & photographic costs	1,000 -- 1,500
		$4,675 -- 7,625

II. Existing Conditions

A. Roof and drainage

1. copper dome - flat seam pans, structural framework, view-opening details

2. straight gable roof over entry

3. metal-clad eaves, gutters, downspouts

B. Exterior and Interior Masonry

1. cleaning and repair of exterior of brick, granite, brown-stone trim

2. cleaning, pointing (?) of interior granite

C. Paint, Interior and Exterior

1. color research

2. appropriate materials

3. removal of stains

4. paint problems on small iron balcony and metal-sheathed cornice overhangs

D. Interior of Dome

1. treatment of matched board sheathing
2. original colors of all trim and surfaces
3. doors and floors

E. Interior

1. partitions
2. stairs and floors
3. lighting

Cost Estimate: 1-2 weeks @ $1,225/week . . . $1,225 - 2,450

III. Recommendations

A. Conservation of Historic Fabric

B. Restoration to original appearance

C. Landscaping

D. Interpretive themes

Cost esimate: 1-1½ weeks @ $1,225/week . . . $1,225 - 1,640

ARCHITECTURAL AND HISTORICAL SURVEY

HARVARD COLLEGE OBSERVATORY

Part I. History of the Observatory and its Work.

The "Great Refractor", the 15 inch telescope for which the Sears Tower was constructed, was installed in 1847. The Harvard College Observatory had waited for four years for the components of this instrument to arrive. It almost immediately began making "splendid revelations" and its long participation in the important work of the Observatory has continued until recently.[1] The instrument, the building, and the men and women who used them form the three interwoven parts of this history.

Interest by Harvard College in making astronomical observations can be traced back to 1671 when the College received its first "tube", a gift of John Winthrop. Thomas Brattle's observations of 1678 were used by Isaac Newton in his calculations and it was Isaac Greenwood, Hollis Professor of Astronomy in 1738 who turned students' eyes from their books to the skys. In 1761 Professor Winthrop was outfitted and sent to Newfoundland to record the transit of Venus over the sun. Despite the stresses of the Revolutionary War a second Harvard party was launched in 1780, this time to Penobscot to observe a total eclipse of the sun.

After the War attention could be directed to pursuit of this science with greater vigor and in 1815 the College passed an act ordering a committee to look into the establishment of an astronomical observatory. William Cranch Bond was asked to visit Greenwich's Observatory to study it for construction, equipment and price.

Bond was an instrument maker and self-taught astronomer who had made the first American chronometer. He lived in Dorchester where he freely indulged his passion for making and buying astronomical instruments and using them for inventive and accurate observations.

1. Bessie Zaban Jones and Lyle Gifford Boyd, The Harvard College Observatory, Cambridge, Mass. 1971, p. 67.

The idea of an observatory failed this time on discovery of the cost. Although the project was revived in 1823 and 1825 by John Quincy Adams' needling insistence, it was not until 1839 that Harvard College Corporation voted to establish an observatory. In that year Bond, now Director, was established in Dana House, a renovated house which served as the first Observatory where magnetic and meterological readings were made. Work proceeded from Dana House but in March of 1843 a large comet appeared and the equipment's failure to give accurate information to an aroused and vitally interested public led to the decision to build an observatory which would be better equipped and more soundly established. The American Adacemy of Arts and Sciences called a meeting on "the want of a telescope", and the Boston public responded with generosity. David Sears promised $5,000 for the new tower if $20,000 were found by subscription. Eighty two individuals and seven firms met Sears' goal within six weeks. Their names are engraved on a plaque mounted in the dome room. With this boost ten acres were bought on the Craigie estate in Cambridge which included the hill known as Summer House Hill, a favorite summer resort with a spectacular view of the Great Blue Hill in Milton.

Next, William Bond ordered from Merz and Mahler two 15" refracting object glasses to be made in Munich; the better one would be chosen for the Observatory. Meanwhile, Bond worked with the Boston architect Isaiah Rogers planning and designing the tower and its dependencies. By late 1847 the main structures were completed and the East Equatorial as the telescope was called for its mounting, was installed and in constant use.

Two of the most directly practical functions the Observatory was to perform were for time and position: a standard of time was provided for the city of Boston and determinations of longitude for many years were also performed. Telegraph lines were set up from Observatory

Hill to selected offices in Boston and the time related by the interruption of electrical impulses. From 1871 businesses could subscribe to this service from the Observatory and had lines directly connected to their offices.

The first few decades of work were directed toward researching Saturn whose eighth satellite was discovered in 1848 by William Bond and his son George, and whose rings were first described as fluid by William Bond. They published observations on the zones of the stars, the nebula in Orion and a complete series of observations of Donati's Comet.

Mathematical and astronomical calculations were periodically published from the Observatory which served as a catalyst for the developing field of astronomy in the U.S. One such visiting scholar, N. S. Shaler, described the surface of the moon and first determined its craters were not the result of water erosion.

One of the more interesting accomplishments of the Observatory to the public was the series of drawings made by M. L. Trouvelot using the Eastern Equatorial. The finely detailed drawings were engraved and published for subscription in a series which is partially reproduced in the Volume VIII of the Observatory's Annals.

But what probably had the greatest significance for the future use of the Observatory was an adventurous experiment in 1848. William Bond and J. A. Whipple, a daguerrotypist, began collaboration which for the first time in the U.S. used the telescope for astronomical photography. By 1860 an entire series of the Sun, Moon, Jupiter, Saturn, Venus and Mars had been completed. This important discovery of the use of photography was to continue into the mid-twentieth century providing a continuous history of the observed universe from Harvard College Observatory which is kept today in its photographic collection. From 1877 to the 1940's the Eastern Equatorial was used almost exclusively for photometry. From 1928 to 1942 variable stars were studied on about 60,000 photographic plates.

As scientific use of the telescope became increasingly limited to student use and infrequent astronomical projects the Observatory was opened to the public on a regular basis for Open Nights, fascinating both for the views into space they afford and for the remarkable example of 19th century engineering the building itself offers.

Unlike many other disciplines in the early 19th century such as architecture or medicine, astronomy involved a large number of women and their work forms a distinct chapter in the history of the Harvard College Observatory. Its reliance on the contributions of women, both financial and scientific was a result of the enlightened approach of several of its Directors who encouraged women's involvement in their study and work. Two women were responsible for major financial donations: the Henry Draper Memorial of 1886 which provided funding for an heroic photographic study of stellar spectra, and the Bruce Photographic telescope purchased in 1893 which recorded the southern sky and was still in use in 1954, providing data on the distribution of faint galaxies.

As Jones and Boyd state it, "Less spectacular or familiar, yet of enormous significance were the scientific contributions of a large corps of women on whose infinite patience, unflagging industry depended the ultimate results of their sisters' munificence".[2] In 1875 the Observatory began its policy of hiring women for its staff. Women were excluded from the physical observation of the skys to protect them from the rigors of the cold dome and long night vigils, and were similarly excluded from official academic study. They were available, however, for low-paying, time-consuming work computing, cataloguing, identifying and organizing the observations of others. By 1886 when funds became available for the great stellar project in photography, between 15 and 40 women were employed-among whom at least 4 made important contributions to the field.

2. Jones and Boyd, op,cit., p.383.

Williamina Peters Stevens who began as a second maid in the residence of the fourth Director Edward Pickering was introduced into the Observatory at the time of the Director's first experiments in stellar photography. She rose to a position of responsibility and creativity, publishing much original work, and studied and encouraged the contributions of other women to the field.

Antonia Maury joined the staff in 1888. Her work on bright stars for the Henry Draper Memorial fund made important advances to sidereal astronomy. Henrietta Swan Leavitt made discoveries of variable stars and elucidated the relationships between their magnitude and their periods.

Annie Jump Cannon who began at the Observatory in 1896 also participated in the Draper project, becoming the Curator of Astronomical Photography for the Observatory. She was a leading authority on the classification of stellar spectra, but received no official appointment from Harvard until 1938.

Women have continued to donate money and scientific achievements to the Observatory. Henrietta Swope, who died in 1980, gave a 40" telescope to the station in Chile and worked at the Observatory between 1928 and 1942 studying variable stars. She helped to change astronomers' notion of the relative position of our universe in the Milky Way. While this is a partial listing of the women who have been involved with work at the Observatory, it is a subject which would bear further research.

Part II. The Building and Those Involved in its Construction.

When it became clear in 1843 that a new building would have to be erected to house the planned equipment, Isaiah Rogers was hired to design the Observatory. Rogers was the most nationally famous of a trio of Greek Revival architects practicing in Boston. He was undoubtedly chosen for the project for the combination of engineering and design skills he had evinced in his Tremont House Hotel in Boston of 1827

where he devised elaborate mechanical equipment and the first indoor hotel plumbing facilities within an elegant classical architectural setting. Rogers' only formal training was in the office of Solomon Willard, the second of the trio of Greek Revival architects, but his stay with Willard was short as he began practicing on his own in 1826. After the Tremont House Hotel and the Tremont Theater he went to New York where he designed the Astor House. While his achievements were largely in commercial structures, he was also Supervising Architect for portions of Robert Mills' Treasury Building in Washington and was named U.S. Government Architect during the Civil War.

Alexander Parris was the third architect of the trio and together with Rogers and Willard practiced an aesthetic which is clearly at work both in his Quincy Market and in Rogers' Harvard College Observatory. Commonly referred to as Greek Revival, this newly rational approach to architecture called for simple geometric shapes in stark arrangement. At the Observatory the hemispherical dome is placed on the severely regular base to which is attached the rectangular portico. The building's utilitarian considerations coincided completely with Rogers' stylistic vocabulary, it would seem. Yet documents depict a different story.

While Isaiah Rogers was was practicing architecture, William Bond was developing his own notions of engineering the Observatory for the ultimate convenience of the astronomer based on his own experience and from his 1815 trip to the famous Greenwich Observatory. Bond and Rogers quickly came into conflict over the engineering of the dome. After a good deal of dissension, Bond finally prevailed upon President Eliot to approve his scheme over Rogers', but the Director believed that Eliot had been "in great error in listening to Rogers who has all along shown himself utterly ignorant of the wants of the observatory", a "wretched mechanic" whose architectural

tastes were "discordant with the true principles of the art."[3] By April 1846 he writes, "We have now, I hope, done with him."[4] Neither the appearance of the Observatory nor Rogers' later career seem to have suffered from Bond's opinions, however.

The plan of the Observatory as finally agreed upon, was composed of the central Sears Tower in which the main telescope was located, flanked by two rectangular buildings which were connected to the tower by one-story wings. The easternmost building served as the Director's residence and the western one, which was completed in 1851, housed a second 5" refractor known as the Western Equatorial. In the wings were located the transit circles and minor instruments used for magnetic experiments.

In elevation the three symmetrical blocks presented pedimented gables to the south, their only decorative embellishment being large modillion blocks at the eave and cornice lines. While the wings were of frame construction the central tower is brick with brownstone sills and lintels and has an entrance door surround of Quincy granite in a bold pedimented enframement.

As absolute solidity of the telescope was required for accuracy, cement foundations of the central pier were sunk 26 feet below the surface of the ground. Above this foundation were laid rounded granite blocks for a height of 11' topped by a circular capstone which is 22" thick and 10' in diameter. Upon the capstone Bond had carved a graceful granite tripod to support the mahogany and brass telescope.

To assure complete, convenient use of the telescope the hemispherical dome rotates 360°, originally on 8 iron balls. In the dome is an opening for the telescope which is closed by means of a series of adjustable shutters. The observer's chair is a perfect example of Yankee ingenuity. Its beautyresults from the combination of sleek efficiency and graceful line. The seat, reached by narrow curved stairs with brass handrails, can be

3. Jones and Boyd, op. cit. p. 57.
4. ibid, p. 57.

moved by the occupant on both horizontal and vertical curves by means of pulleys and counterweights. The entire structure can be circulated around the dome on rails. It is served by a " convenient stand for the observer's notebook", an arrangement for adjusting the back part for supporting the head, and a compartment for holding the eyepieces.[5] Bond, who designed the observer's chair proudly reported that it is "found on trial to fulfil perfectly the objects for which it was designed, giving the observer entire command over his position...".[6] Four balconies with cast iron railing opened from the main room and were used for additional instruments. The pure description, however, of these mechanisms cannot convey the awe and pleasure their action inspires in anyone who experiences them: their mechanical principles are direct and comprehensible, the materials of construction are generous and fine.

In the course of making this preliminary investigation into the history of the Harvard College Observatory and the people involved in it, it has become apparent that there is an extraordinary wealth of original material in the libraries and archives of the University which illuminates the Observatory's leading role in the growth of astronomy and the Observatory's scientific accomplishments. Documents also reveal the vision of the founders. In 1847 John Quincy Adams wrote to Edward Everett, President of the University what was to be his final report on the work of the Observatory, "An Observatory is a standing testimonial to the progress in the career of civilization of the people on whose soil it is located."[7] Adams proposed that a plan for the occupation and employment of the Observatory be composed and that such a plan should "admonish our children of after ages, that the blessings heaped upon them during successive centuries since the first settlement of the country, by the unceasing and provident care and affection of their forefathers, impose upon them the corresponding duty of making like provision for their own posterity."[8]

5. William Cranch Bond, History and Description of the Astronomical Observatory of Harvard College, Cambridge, 1856; reprint 1980, p.xli.
6. ibid, p.xlii.
7. ibid, p.cxiv.
8. ibid, p.cxv.

Bibliography

Bailey, Solon I. The History and Work of Harvard Observatory, 1839-1927. An Outline of the Origin, Development and Research of the Astronomical Observatory of Harvard College Together with Brief Biographies of its Leading Members, Harvard Observatory Monograph #4, New York, 1931.

Bond, William Cranch. History and Description of the Astronomical Observatory of Harvard College and Results of Astronomical Observations Made at the Observatory of Harvard College, New York, 1980.

Boston Public Library, Fine Arts Department, Architects' Index, see "Isaiah Rogers".

Burchard, John and Albert Bush-Brown. The Architecture of America, Boston, 1961.

Hamlin, Talbot. Architecture through the Ages, New York, 1940, 1953.

Harvard College Observatory. Annals of the Astronomical Observatory of Harvard College, Vols. I, VIII, Boston, 1877.

----------. The First Century, A Review of the Past and a Preview of the Future, Cambridge, Mass., 1946.

Harvard University Gazette, Bol. LXXVI, No. 14, December 5, 1980.

Jones, Bessie Zaban and Lyle Gifford Boyd. The Harvard College Observatory. The First Four Directorships, 1839-1919, Cambridge, Mass., 1971.

Kilham, Walter H. Boston After Bulfinch, Cambridge, Mass. 1946.

Morrison, Samuel Eliot, Three Centuries of Harvard, 1636-1936, Cambridge, Mass., 1936.

Pierson, William H. American Buildings and their Architects, New York, 1970.

DOCUMENTATION

HARVARD COLLEGE OBSERVATORY

[Written for the Pictorial Drawing Room Companion.]

IF THE HEART IS ALL RIGHT.

BY W. N. M'CALLA.

Should the darts of misfortune
Around you be hurled,
Should the dark flag of fate.
O'er life's bark be unfurled;
Your brightest hopes vanish,
Your day turn to night;
You yet may feel happy,
If the heart all right.

Should friends all desert you,
And those proffered most,
Like the rainbow's hues vanish,
Their love 's but a boast.
Should they leave you forever,
Like the meteor's light;
You 'll be happy without them,
If the heart is all right.

Let the foul tongue of slander
Seize you for its aim,
Let envy and malice
Assail your fair name;
Persecutions surround you,
Oppress you with might,
Your soul rises o'er them,
If the heart is all right.

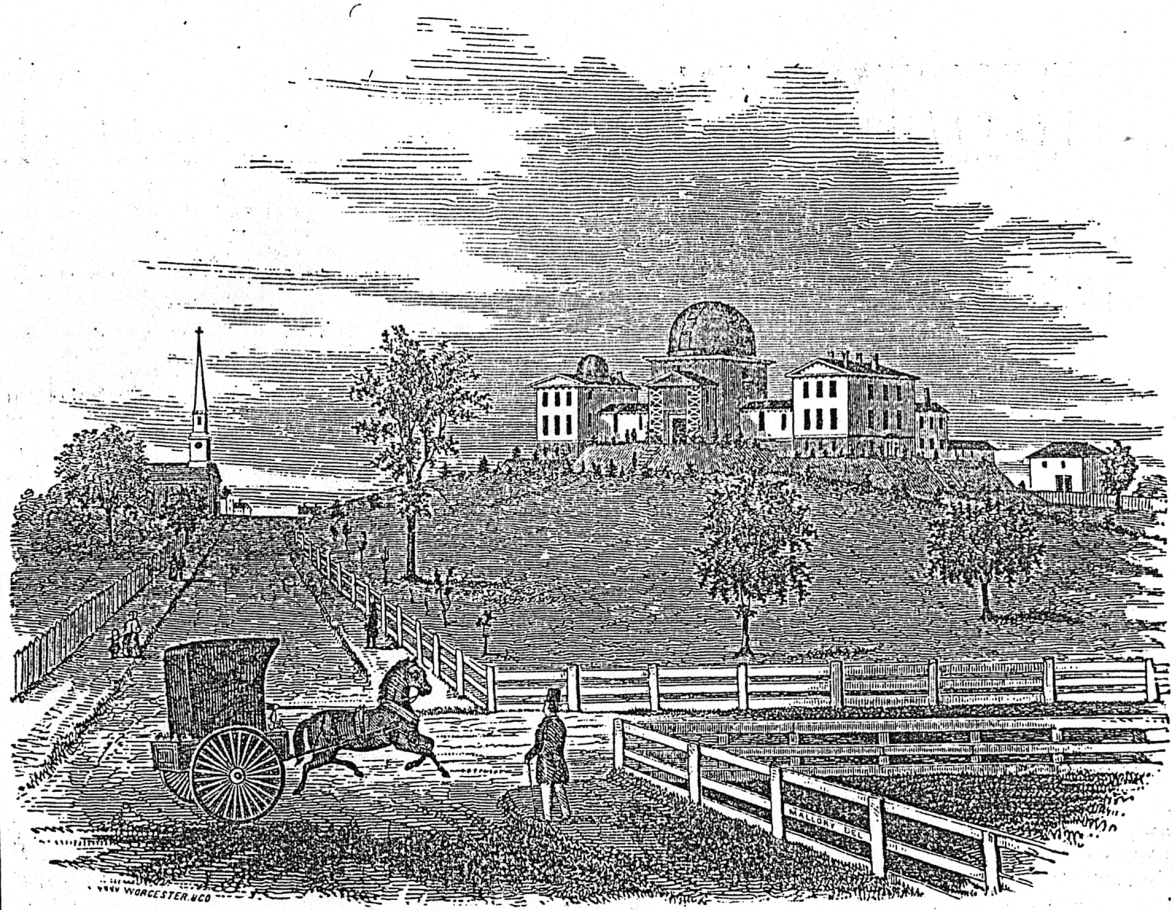
Let death, with its horrors,
Come to claim you his own,
Away to that dream-land
Whose realms are unknown;
His decree has no terror,
You welcome his sight,
Dying peaceful and happy,
If the heart is all right.

Be you poor—be you wealthy,
Be you lowly or grand,
Be you on the wide ocean,
Or safe on the land;
In health or in sickness,
Mid darkness or light,
You still can feel joyous,
If the heart is all right.

Philadelphia, May, 1851.

CURIOSITY OF CHILDREN.

The curiosity of the child is the philosophy of the man,—or, at least, to abate somewhat of so sweeping a generality, the one spirit very frequently grows into the other. The former is a sort of pilot-balloon, a little thing, to be sure, but a critical one nevertheless, and pretty surely indicative of the height, as well as the direction, to be taken by the more fully expanded mind. Point out to me a boy of original, or what would



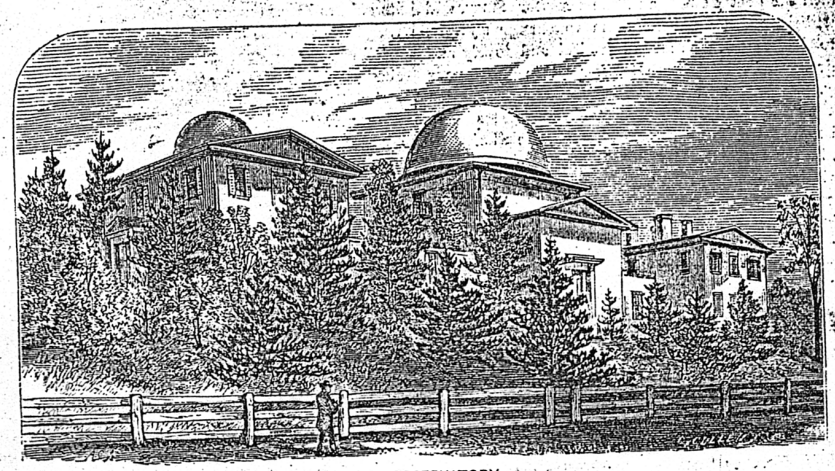
ASTRONOMICAL OBSERVATORY, CAMBRIDGE, MASS.

This interesting building, given with such accuracy by our artist, is a monument of the growth of science and civilization in this country. It is situated on an eminence about 50 feet above the plain on which are the other buildings of the University, and is 75 feet above the tide-waters of Charles River. This height is found sufficient to give from the dome an horizon almost uninterrupted, to within two or three degrees of altitude, in every direction. The grounds appropriated to it comprise 6½ acres. It is ¾ of a mile from University Hall, and 3½ miles from Boston.

This observatory has the honor of possessing the most celebrated refractor in this country, and one of the largest in the world. It was made at the establishment of Messrs. Merz & Mahler, Munich, Bavaria. The diameter of its object glass is 15½ English inches. At this observatory some of the noblest discoveries in astronomy have been made, very gratifying to American science, and reflecting great credit upon the professors, Messrs. Bond and Pierce. Among others may be noticed the brilliant discovery, in October last, of the eighth satellite of Saturn, a discovery which was verified two days later by the observation of Mr. Lassell, at Starfield, near Liverpool, England.

wretched animals can refresh themselves on "their way to dusty death."

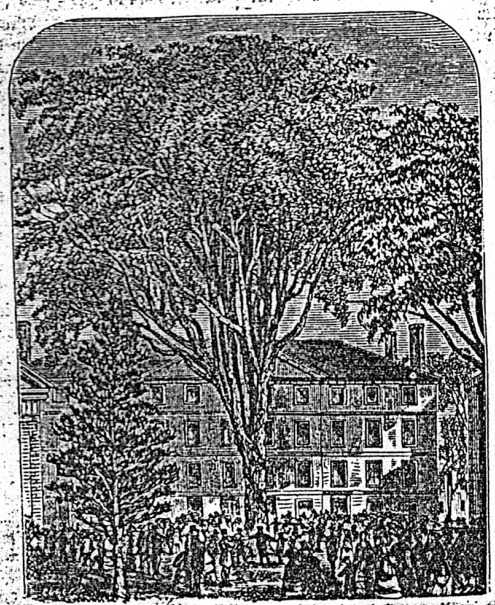
Through the trees we get a little glimpse of University Hall, built in 1814, of white Chelmsford granite, devoted to lecture and recitation rooms. Before the building of the Appleton Chapel, here was the College Chapel, which has been now cut up into smaller rooms for other purposes.



THE OBSERVATORY

Over the head of the gentle shepherd in our sketch, we see old "Massachusetts," the oldest of our buildings, of three stories of ancient brick, built in 1720, quaint and venerable, and very dear to the memories of thousands who have lived and studied in her pleasant, elm-shadowed rooms. On the gable toward the street is an immense sundial, weather-beaten and faded, so that no figures can now be deciphered upon its face, from which the gnomon has long ago disappeared, its functions superseded by the town-clock, whose ponderous bell strikes the hours in the church opposite.

Beyond, and parallel with Massachusetts, we see Harvard Hall, built in 1766, for a library and chapel, upon the site of the former building destroyed by fire in 1764, while occupied by the "General Court" (as the Legislature of Massachusetts was then designated) during the prevalence of the small-pox in Boston. In the upper stories of this building the library was kept, until removed to Gore Hall. These old library-rooms are very precious in the memory of older graduates, quaint and old-fashioned in their architecture, the deep alcoves adorned by a heavy Grecian cornice and Ionic pilasters, and crowded with books. *Books* were everywhere, save where some choice full-length old portraits, by Copley or Stuart, of old benefactors of the college, in wigs and court-suits or flowered dressing-gowns, filled some spaces on the walls. No library in the country was ever, in all its appearance, so completely adapted to its uses. So far as one can judge from engravings, it resembled some of the old English libraries—the Bodleian, at Oxford, for example. Its whole atmosphere was redolent of *books*, which were accessible to all. No forbidding bars warned off trespassers; but all, at will, could linger in the fascinating alcoves, and browse on the outsides of the volumes, or at pleasure take down what struck the fancy, and delve as deeply or as long as inclination prompted, the only limit being the warning proclamation of the old janitor that the hour of closing had come. Who of the graduates of Quincy's time can



"CLASS-TREE," HARVARD.

These rooms have since been converted into lecture-rooms, while those below, originally occupied, one as the chapel, and the other as the philosophical lecture-room, now thrown into one, and supported by a wilderness of slender iron pillars, make the hall used for the dinners of Commencement-Day and of other high feasts. In this hall are collected the various portraits of personages more or less intimately connected with the history of the college, its presidents, professors, benefactors, and distinguished sons, done by the hands of the best artists of their times—Copley, Gilbert Stuart, and Peale—constituting probably as fine a collection of American portraits as can be found in the country. Very precious is this hall in the hearts of the "girls of the period;" for here, on Class-Day, to the strains of bewitching waltz, polka, or redowa, do they dance themselves around the hearts of the young devotees of learning, and here have sprung the first tender shoots that many a time have grown and ripened into life-long love.

The dinners referred to above are "feasts of reason" rather than banquets of literal good things. Once, indeed, the provisions, falling short of the standard of excellence required by the enlightened minds of the revellers, were unceremoniously thrown out of the windows, and they were fain to be content with "the flow of soul." Hither, after the exercises in the church, winds in tortuous folds the long procession of hungry graduates, of which Lowell has said, "Since in the academic processions the classes are ranked in the order of their graduation, and he has the best chance at the dinner who has the fewest teeth to eat it with, so, by degrees, there springs up a competition in longevity, the prize contended for being the oldest surviving graduateship."

Of late years, things are better managed, and, under the inspiring presidency of a gallant youth, who was of the staff of Meade, the younger classes, among whom are the boys who fought with Grant and Burnside and Farragut and Sheridan and Meade, in a smaller hall, sing their camp-songs and fight their battles over again around the table.

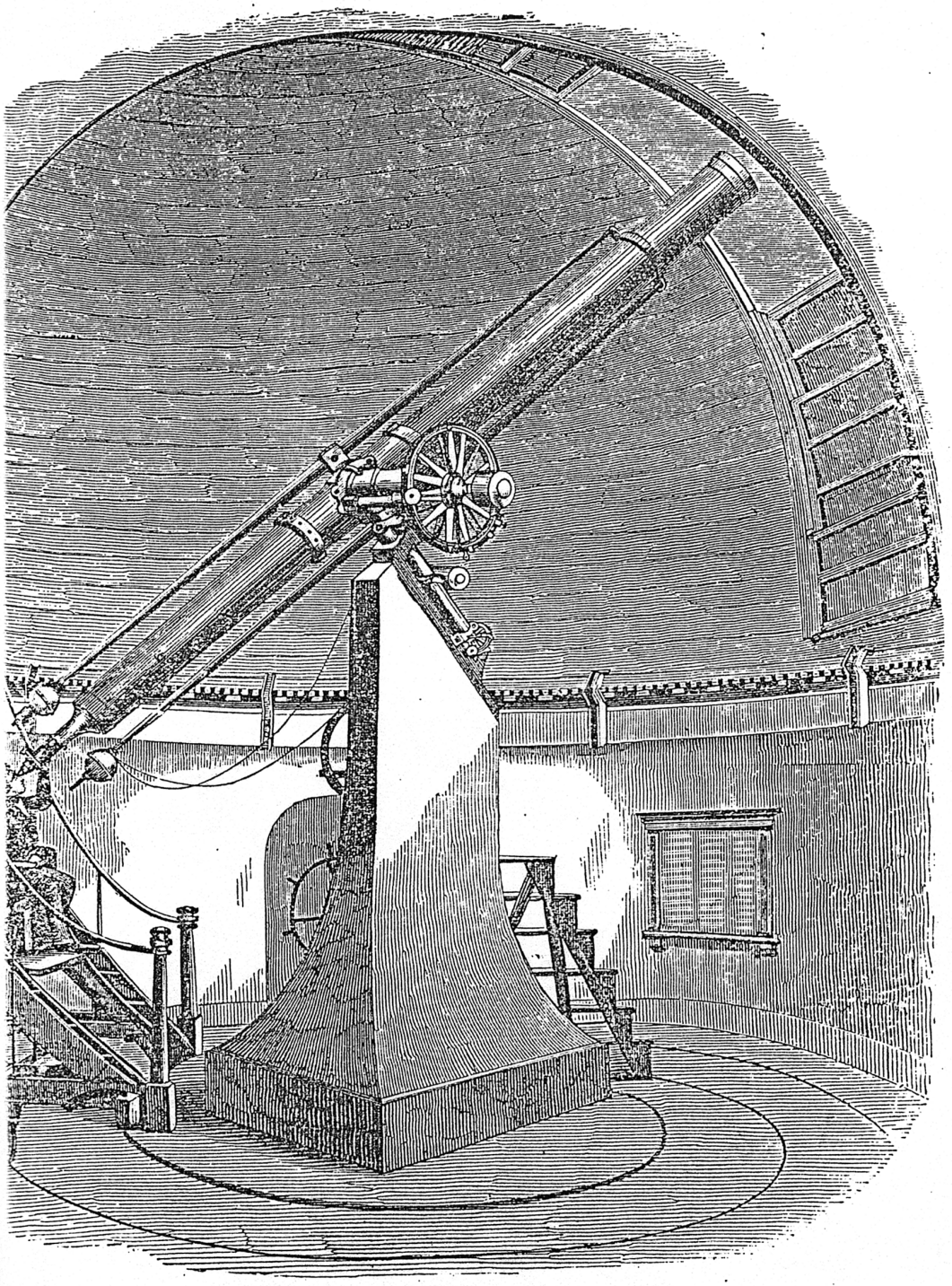
Beyond, standing farther back, is "Hollis," erected in 1763, in front of which stands the "Liberty-Tree," around which on Class-Day—now the great day of the year here, for the old-time glory of Commencement has departed—the graduating class whirl in frantic rings at the close of the long day of pleasure and flirtation, sing the class-ode, hand-in-hand, and climb madly, raised on each other's shoulders, to clutch at the [illegible]

SPNEA Archives

Mezzotint

c. 1890 ?

Jan 1852 GLEASON'S PICTORIAL DRAWING-ROOM COMPANION.



THE CELEBRATED REFRACTOR, AT THE OBSERVATORY, CAMBRIDGE, MASS.

THE GREAT REFRACTOR

This splendid scientific instrument at the establishment of Messrs. Merz & Munich, Bavaria. The extreme diam object-glass is fifteen and a half Engli The effective aperture is fourteen and hundredths inches, the solar focus bei two feet six inches. From the outer the object-glass to the intersection of t tion axis is thirteen feet seven inches. intersection of the declination-axis t focus is eight feet eleven inches. T the telescope is of wood, veneered with ny, and polished on the outside; within with paper, and is strengthened by phragms. The flexure of the tube is c ed and its balance preserved by two seventeen feet in length, having at thei ties nearest the eye end, brass spheres lead, eight inches in diameter. It w that the observer, without leaving his move himself upon a sort of circula while by means of other machinery just his position as to altitude. The ship of the machinery is very beautiful, strength with simplicity; and so perfe power, that the whole, though weighi three tons, is moved easily by a single

EXISTING CONDITIONS

HARVARD COLLEGE OBSERVATORY

Illustrations of Some Existing Conditions

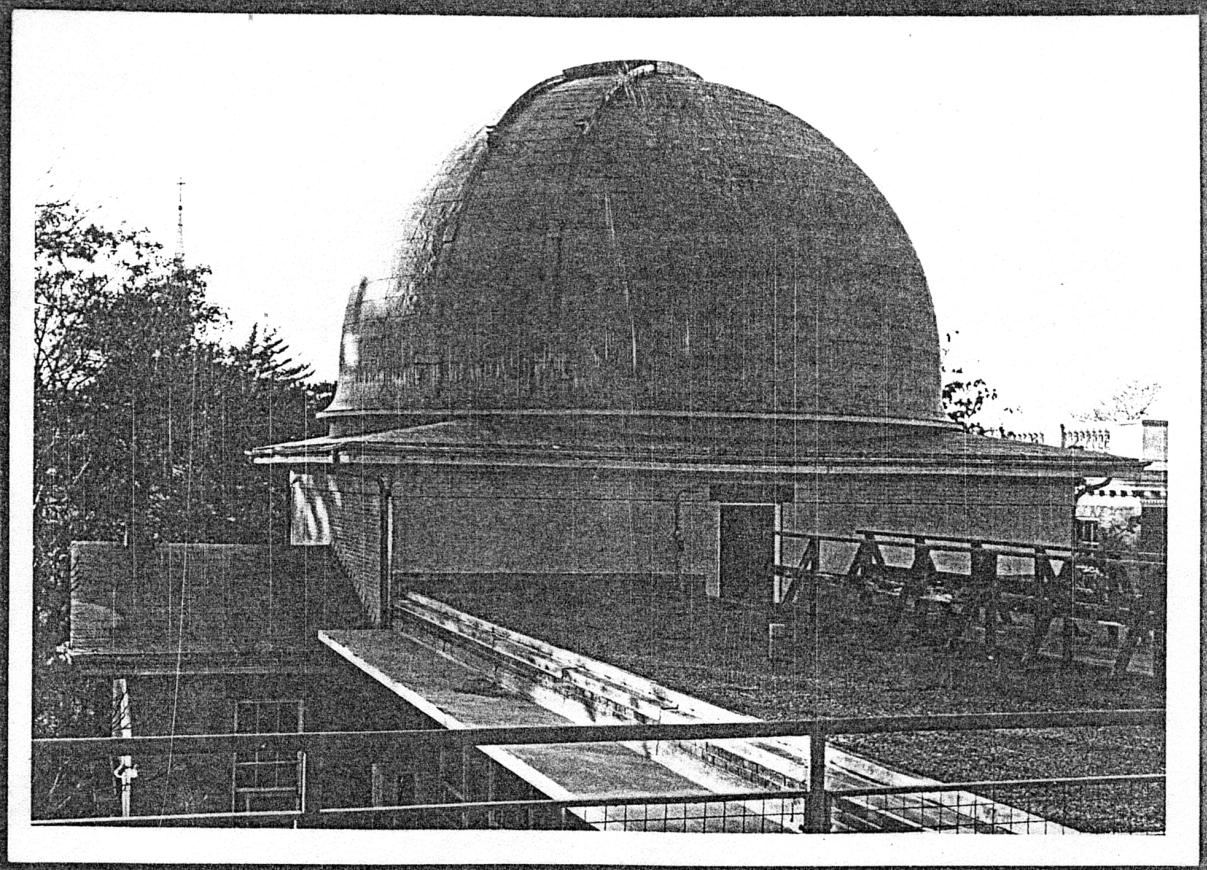


Figure 1. Dome roof of second story and cornice overhang under dome, and pedimented roof over projecting entry pavillion.

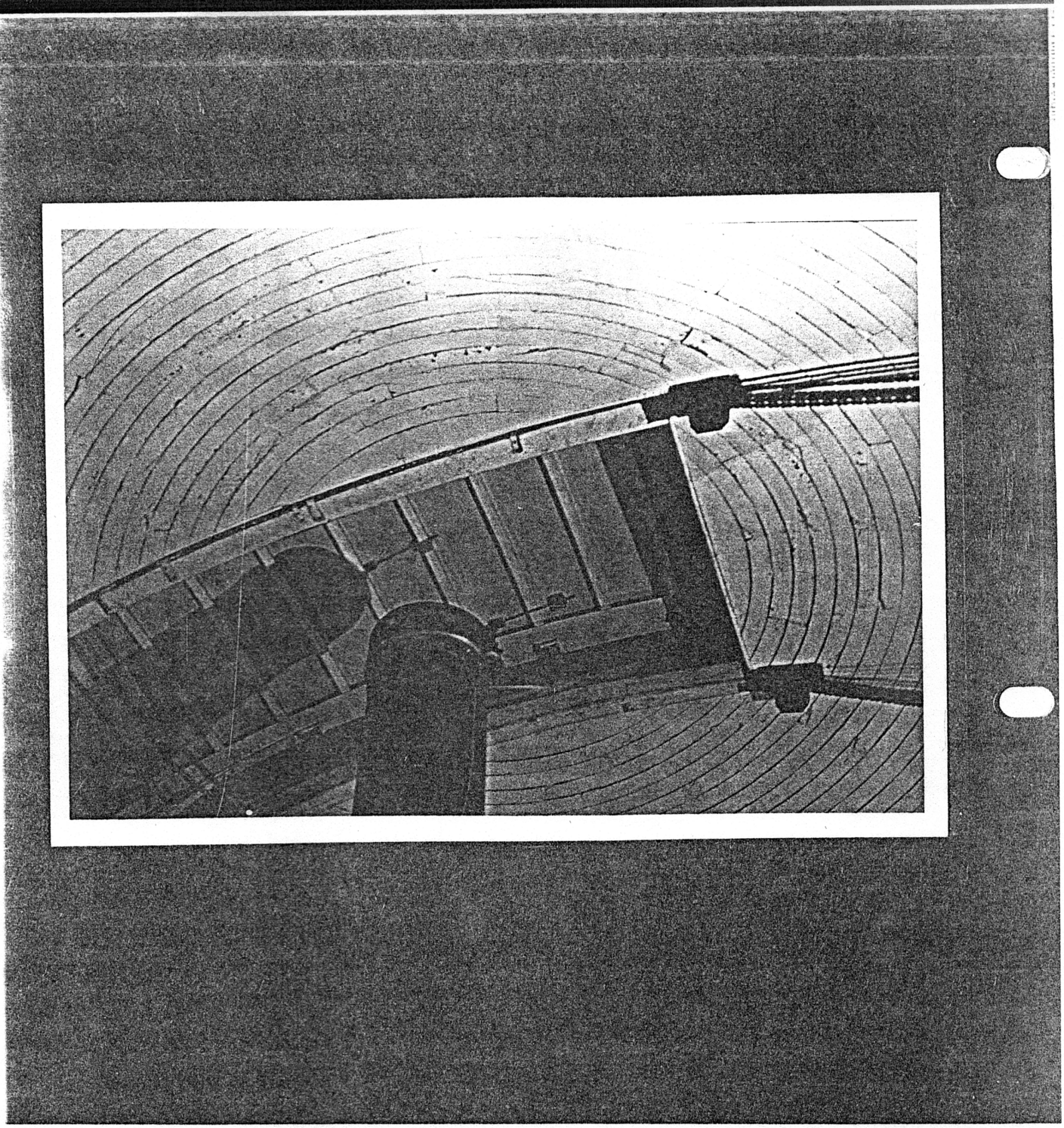


Figure 2. Interior of dome, showing matched boarding laid in concentric rings.

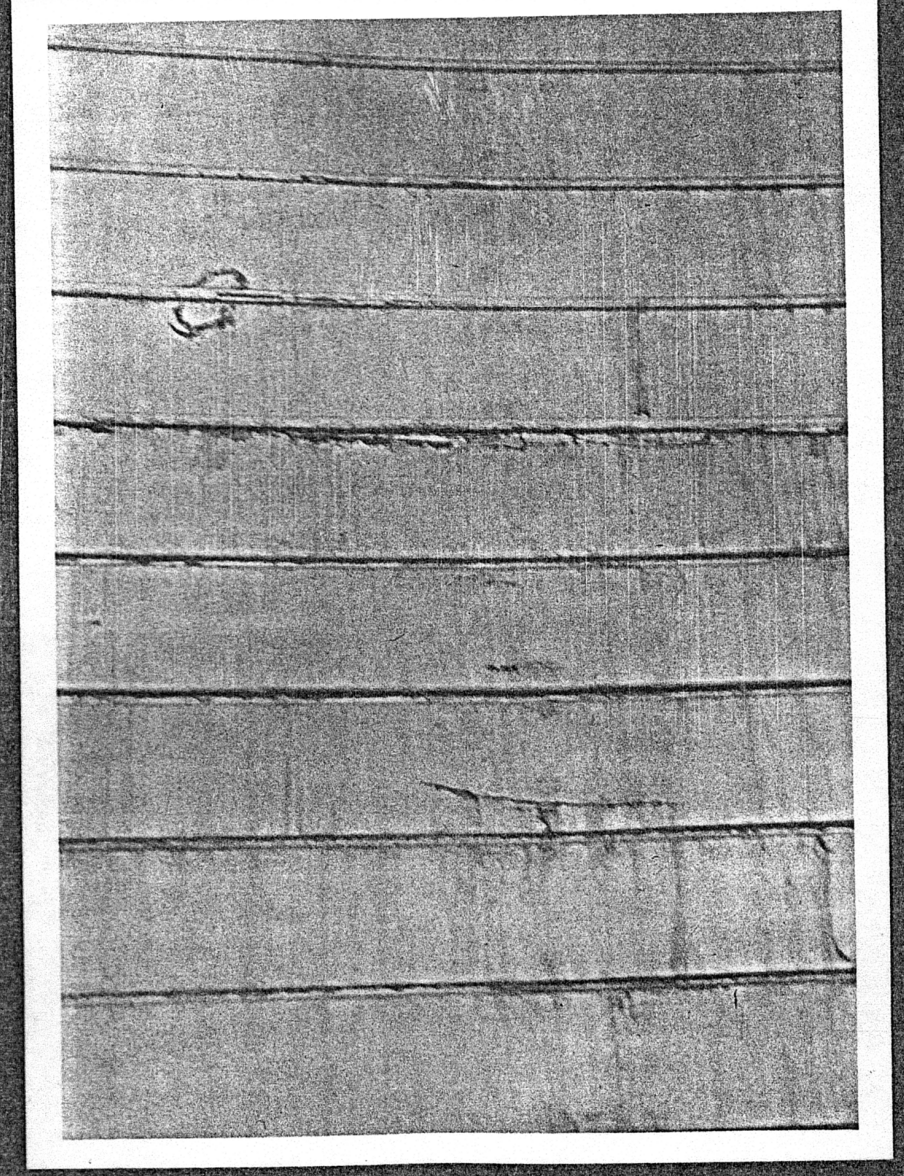


Figure 3. Close-up of water damage on matched board ceiling.

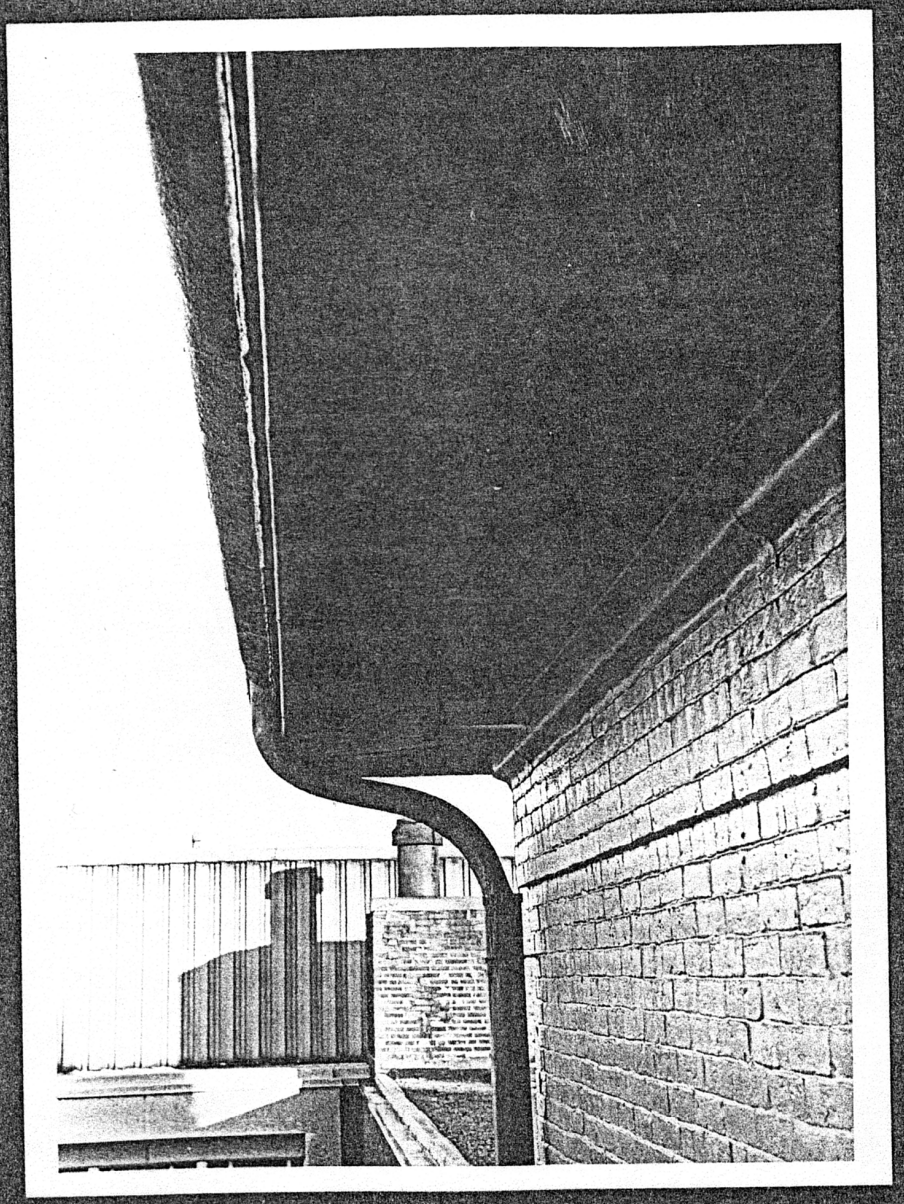


Figure 4. Typical metal clad eave.

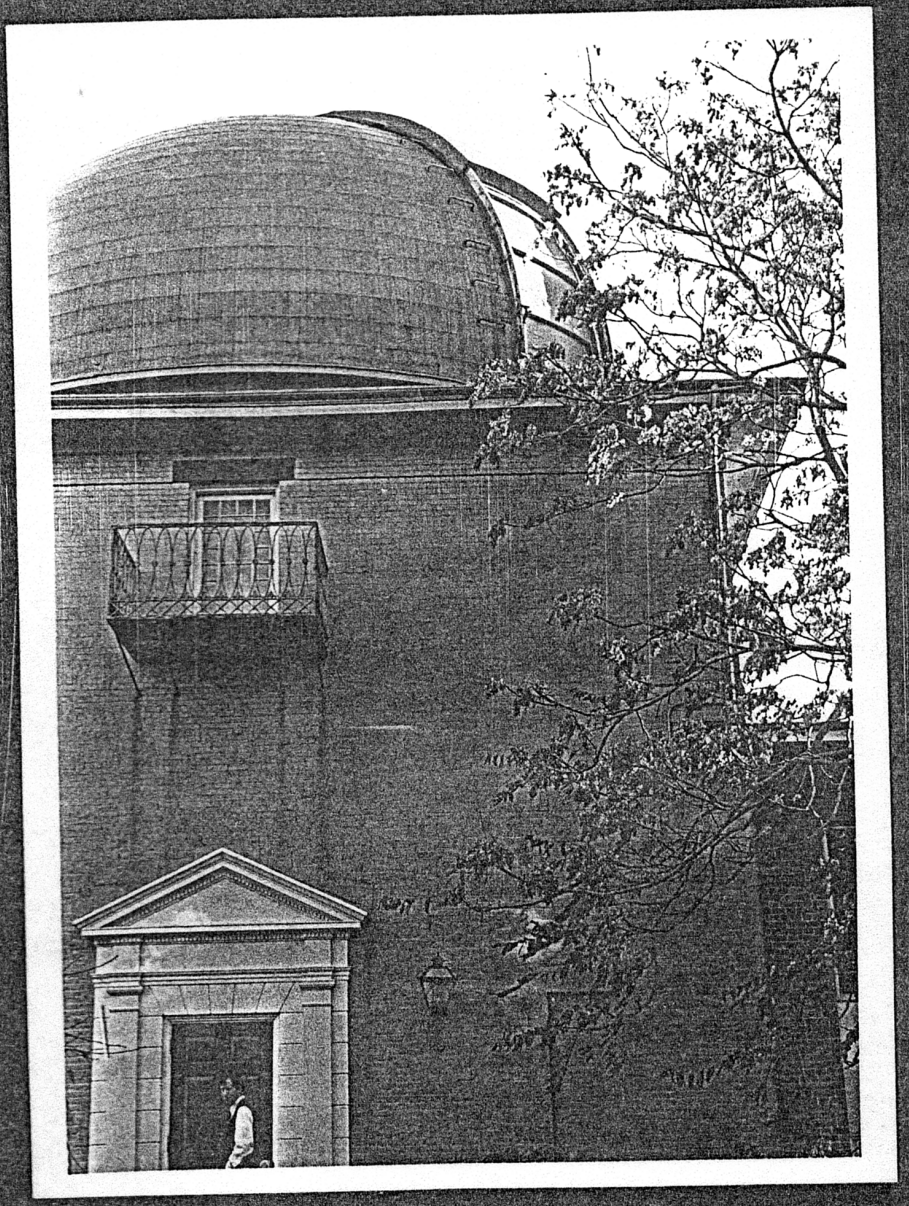


Figure 5. North side of building, showing staining from iron balcony supports and incongruous Colonial Revival doorway.

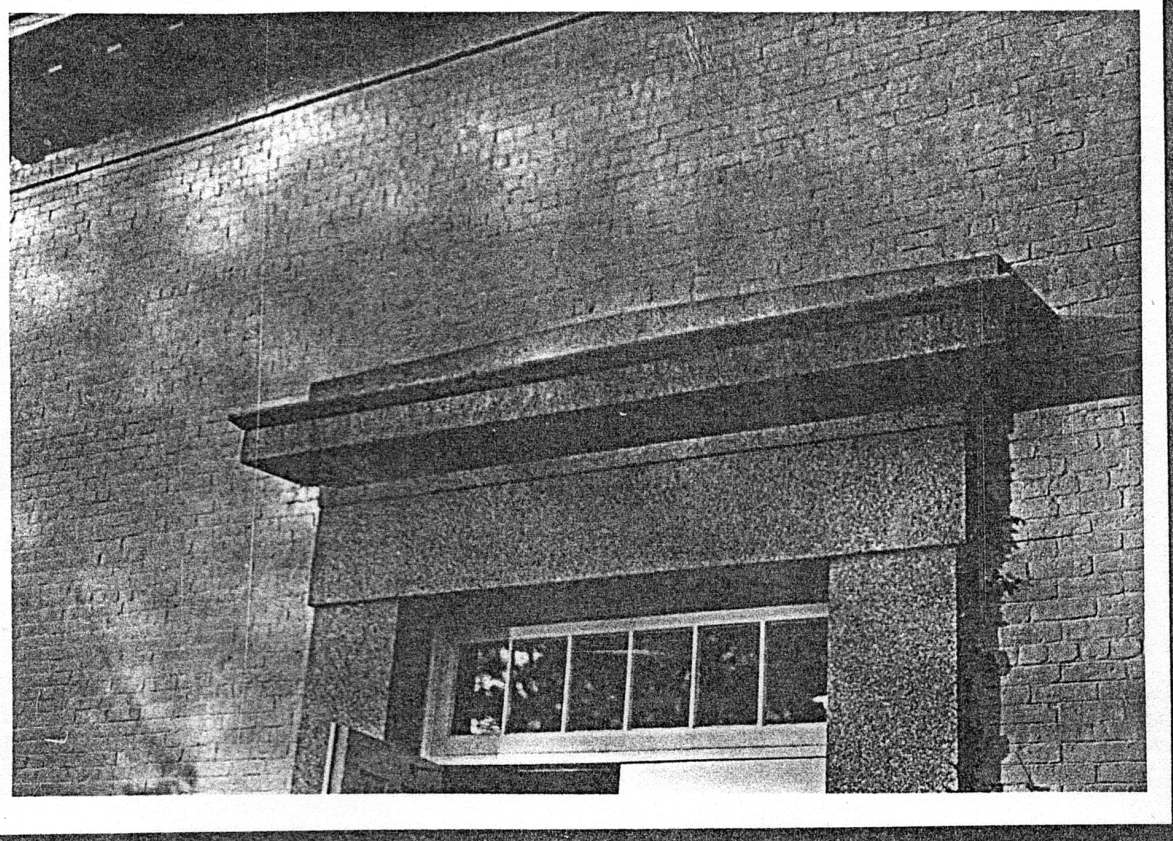


Figure 6. Granite doorway on south side of Sears Tower (Parris design?).

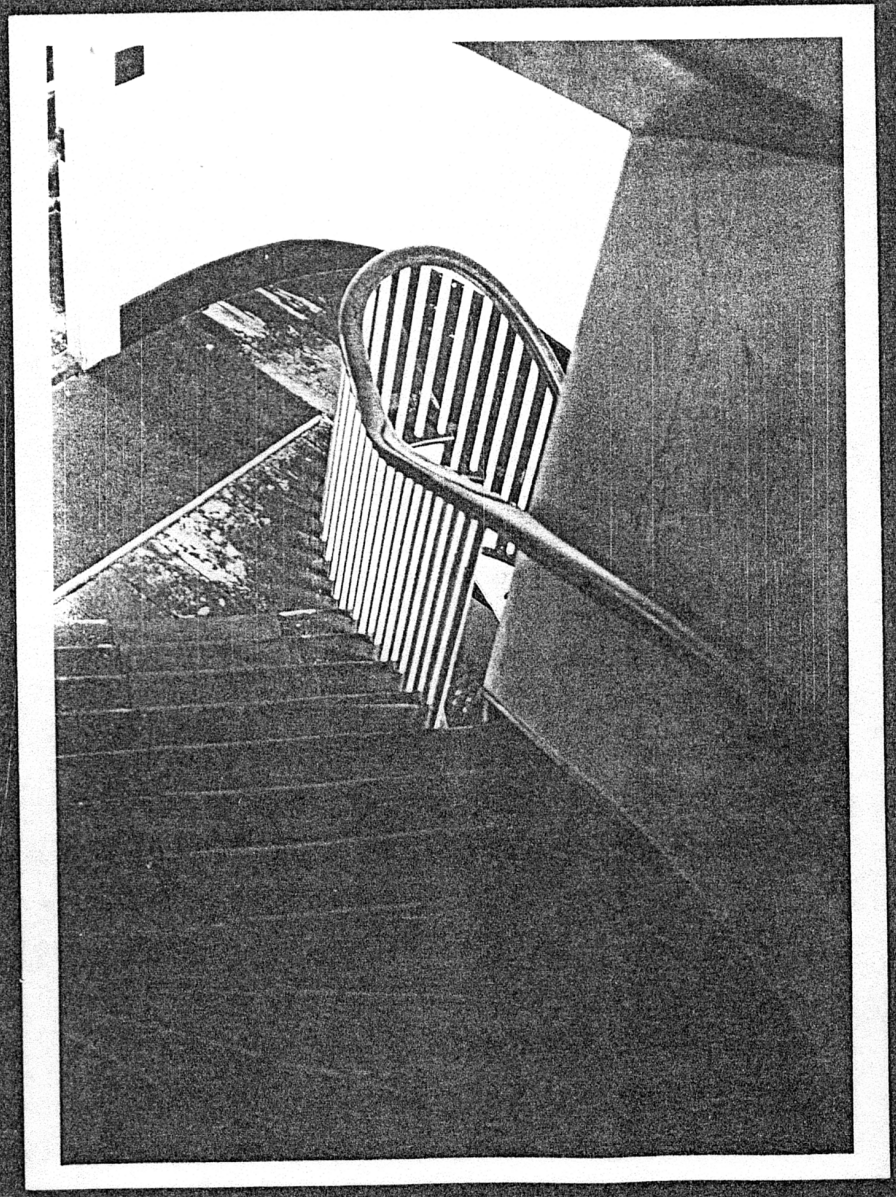


Figure 7a. Stairway to telescope chamber; part of original design.

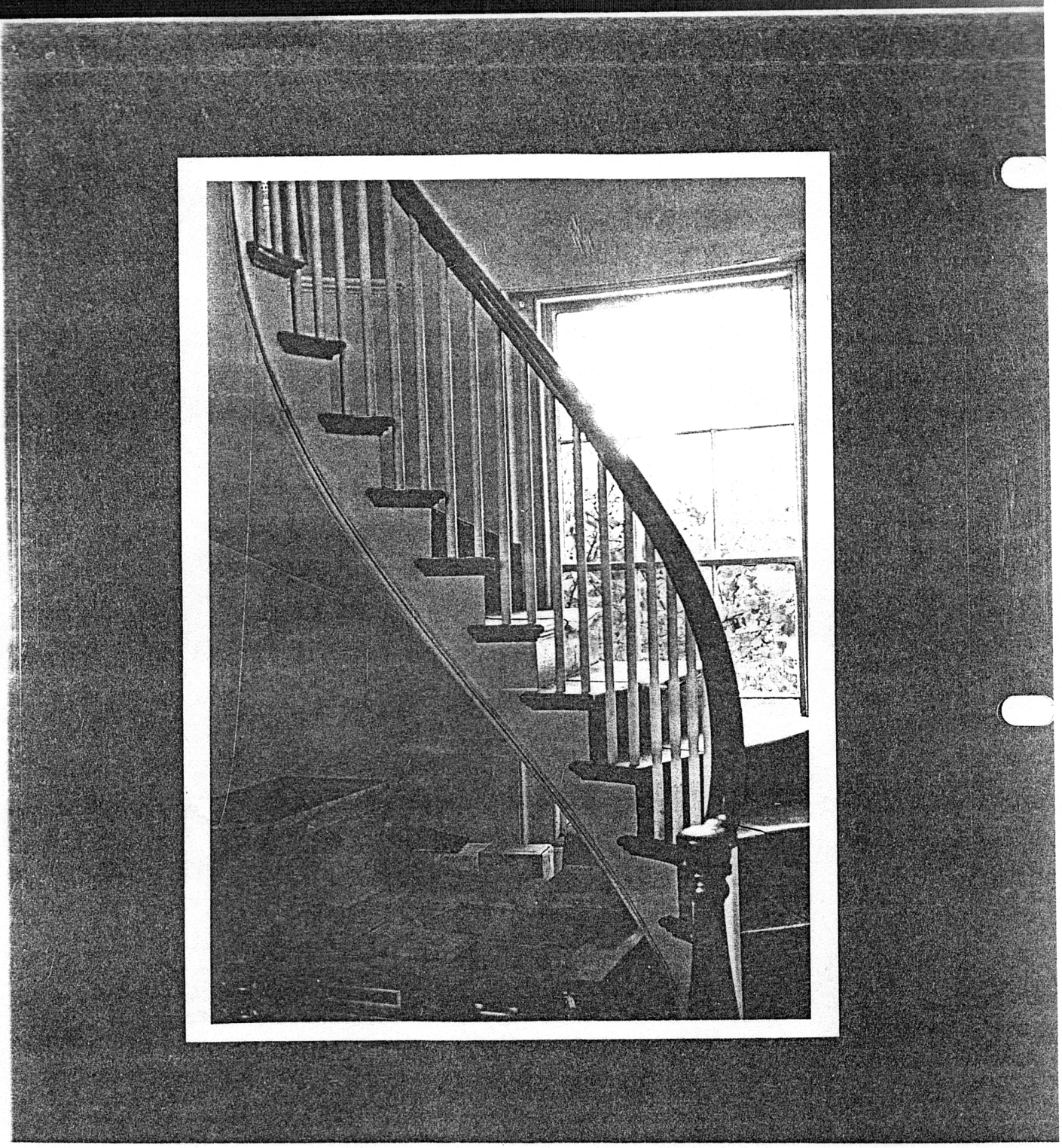


Figure 7b. Stairway to telescope chamber; part of original design.