THE HELLER & BRIGHTLY RECORDS

Robert C. Miller

The firm of Heller & Brightly, mathematical instrument makers, was founded by Charles S. Heller and Charles H. Brightly in Philadelphia in 1870. Brightly withdrew from the partnership in 1891. Heller continued the business until his death in 1912, and was succeeded by his son C. Warren Heller. In 1926 the firm was incorporated and purchased by three employees: Herman C. Berger, Albert C. Diffenbacker and George Kegelman. Howard W. Goodall acquired Heller & Brightly Inc. in 1929. The firm continued under the management of Richard B. Goodall until the death of Jimmy Shay, the last instrument maker in the shop, in 1946. In 1968, when the corporation was dissolved, the tools, unfinished instruments, an assortment of instruments by Heller & Brightly and other makers, parts, and some of the original factory records were moved to Maryland and placed in storage.

Heller & Brightly announced their wares in a catalog entitled *REMARKS on Engineers' Surveying Instruments*, the first edition of which was dated February 1, 1874. Subsequent editions differed only slightly: an occasional preface, different illustrations of the transit and the level to show changes in design, the addition of excerpts of published articles, and dated price lists with the current address. The preface to the undated 25th edition states that this is a complete revision of previous editions. In fact, however, although the text is arranged in a more orderly fashion, and the pages are numbered consecutively, it contains much old material. One notable addition was a reprint of an 1888 article on the Sunflower, and the inclusion of this instrument in the price list; while Leslie's Micrometer was dropped from the text and the price list. A section entitled "Books on Civil Engineering, Surveying etc." was also dropped. This edition remained in print for many years. The earliest of appended price lists yet found is dated January 1, 1905. Some time after 1914 the title of the catalog was changed to *SURVEYING INSTRUMENTS*. This version, which contains much old material, introduces the Intermediate Transit. Heller & Brightly prices remained stable during the period 1878 to 1909. The 1920 prices were the same or slightly lower than those of earlier years.

The preface to the 1st edition of *REMARKS* states:

> "As we have in the last three years made two improvements in Telescopes a word of explanation may be necessary to distinguish them apart. In 1870 we improved the formula in general use for Tele-

scopes in such a manner as to practically annihilate the chromatic and spherical aberration. This Telescope is the one referred to in the Philosophical Society paper, and in the report of the Franklin Institute Committee of Civil Engineers; and this Telescope is on all of our instruments from No. 4100 to No. 4592 inclusive. (All of our instruments are numbered on the face.)

Early in 1873 we commenced experimenting in order to increase the power of our Telescopes, and we only brought our experiments to a perfectly satisfactory conclusion in the latter part of December of the same year. We have made but comparatively few instruments with this new Telescope attached (from No.4593 to No.4645 inclusive)."

This excerpt implies that Heller & Brightly started numbering their instruments with No. 4100. In fact, however, the first instrument marked "Heller & Brightly" was No. 4400. While the confusion may result from a typographical error (which was repeated for 50 years), it seems more likely that Heller considered instruments No. 4100 to approximately No. 4399--which were marked "Wm. J. Young and Co", and made while he was a partner in that firm--as his own.

Heller & Brightly brought out at least three special publications. Their *Circular of Lyman's Trigonometer and Universal Draughting Instrument* appeared in 1878, *Heller & Brightly's Sunflower* appeared sometime after 1901, and a four page pamphlet entitled *Introducing HELLER & BRIGHTLY, INC. Latest Model Engineer's Transit* was issued in 1938. In 1895 they issued a 10-page excerpt from *REMARKS*, intended to entice the reader to send 19 cents in postage stamps for the entire publication. Throughout this whole period they advertised widely in engineering journals.

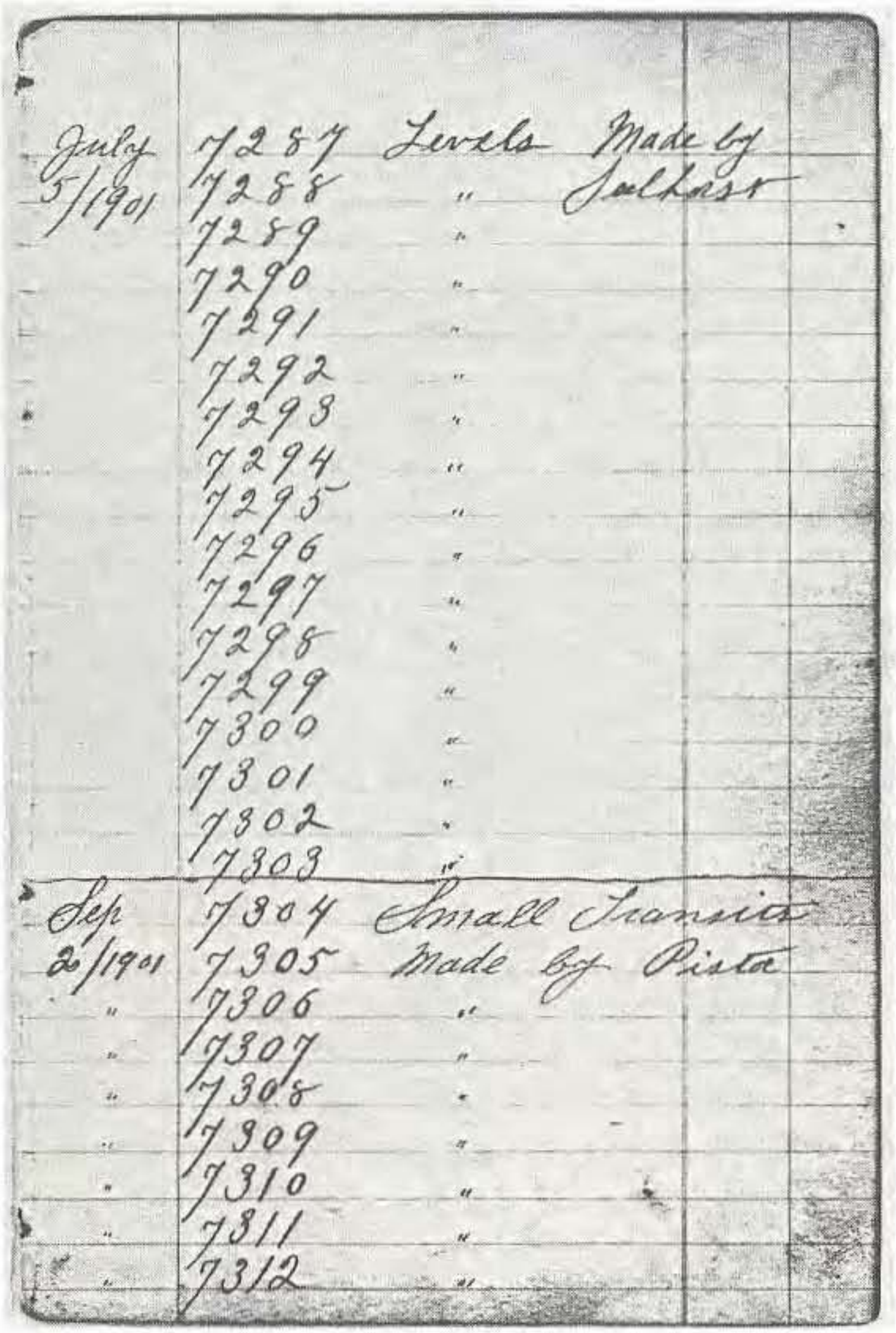
Two important factory records found among the Heller & Brightly material stored in Maryland are now housed with the author's collection. The first is labeled on the top of the first page:

Numbers of Instruments
Transferred from Old Book
From 4400 to 6142 Inclusive
from Aug. 1st 1870 to June 1st 1888
and continued in this book

This is a leather covered book which measures 6 by 8.5 inches and contains about 68 ruled pages with hand written entries. The second book, labeled "Numbers - H&B", has a plane cardboard cover, measures 8.5 by 5.62 inches, and contains about 80 plain

pages with hand written entries. Since these books were in use over a period of many years, it is not surprising that the entries were made by several hands. However, only one person made the entries in one book during a given period of time, and a different person made the entries in the other.

The Instrument Book contains blocks of consecutive numbers covering the period from July 31, 1888 to some time in 1943. The instrument numbers range from 6143 to 8287 (marked Heller & Brightly), and from 10,000 to 10,287 (marked Heller & Brightly Inc.). A typical entry identifies the a number, type (transit, level etc.), and maker of each instrument, the date the number was assigned. Occasionally there is a note about special features of the instrument. This information has been entered into a computerized data base dBASE III ™.



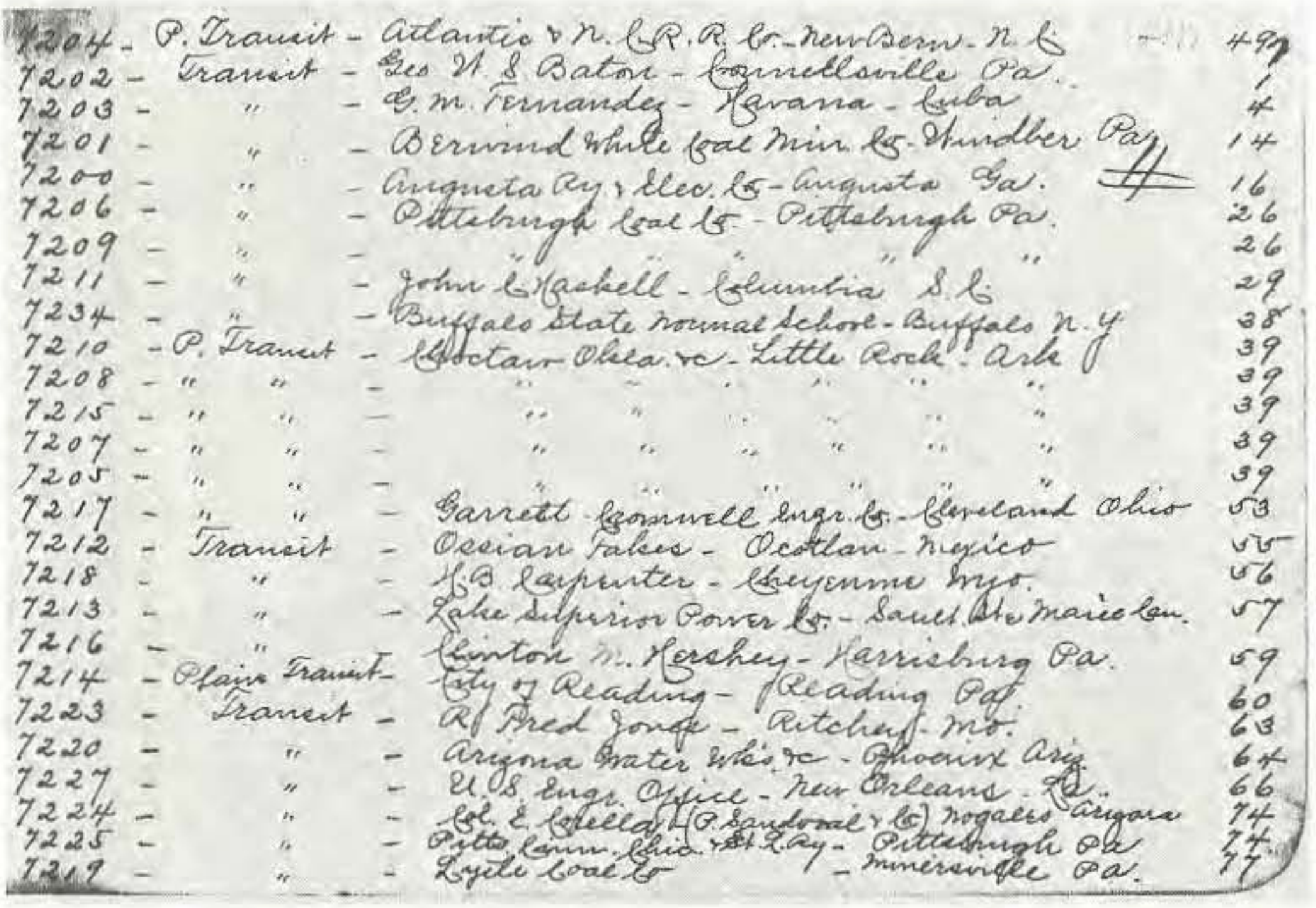
July 5/1901	7287	Levels	Made by
	7288	"	Jackson
	7289	"	
	7290	"	
	7291	"	
	7292	"	
	7293	"	
	7294	"	
	7295	"	
	7296	"	
	7297	"	
	7298	"	
	7299	"	
	7300	"	
	7301	"	
	7302	"	
	7303	"	
Sept	7304	Small Transits	
2/1901	7305	Made by Pistor	
"	7306	"	
"	7307	"	
"	7308	"	
"	7309	"	
"	7310	"	
"	7311	"	
"	7312	"	

A Typical Page of the Instrument Book

The last page of the Instrument Book contains general information about the instruments, such as their weights, and a table of "Deaths":

Mr.	Brightly	Nov. 1907
	Heim	July 91
	Opdyke	94
	Reuss	June 92
	Thaite	April 97
	Lettinger	July 1912

The information on Brightly is in error, since he died in 1897. The other names represent employees of Heller & Brightly, and the dates seem to be correct.



7204 - P. Transit - Atlantic & N. C. R. R. Co. - New Bern - N. C. - 49
7202 - Transit - Geo. W. & Baton - Connellsville Pa. - 1
7203 - " - G. M. Fernandez - Havana - Cuba - 4
7201 - " - Bernard White Coal Min. Co. - Dundber Pa. - 14
7200 - " - Augusta Ry. & Elec. Co. - Augusta Ga. - 16
7206 - " - Pittsburgh Coal Co. - Pittsburgh Pa. - 26
7209 - " - " " " " " - 26
7211 - " - John C. Haskell - Columbia S. C. - 29
7234 - " - Buffalo State Normal School - Buffalo N. Y. - 38
7210 - P. Transit - Choctaw Okla. & G. - Little Rock - Ark. - 39
7208 - " " - " " " " " - 39
7215 - " " - " " " " " - 39
7207 - " " - " " " " " - 39
7205 - " " - " " " " " - 39
7217 - " " - Garrett-Cromwell Engr. Co. - Cleveland Ohio - 53
7212 - Transit - Ossian Fales - Ocotlan - Mexico - 55
7218 - " - H. B. Carpenter - Cheyenne Wyo. - 56
7213 - " - Lake Superior Power Co. - Sault Ste. Marie Can. - 57
7216 - " - Clinton M. Hershey - Harrisburg Pa. - 59
7214 - Plain Transit - City of Reading - Reading Pa. - 60
7223 - Transit - A. Fred Jonge - Ritchey - Mo. - 63
7220 - " - Arizona Water Wks. &c. - Phoenix Ariz. - 64
7227 - " - U. S. Engr. Office - New Orleans - La. - 66
7224 - " - Col. E. Clelland (P. Sandoval & Co.) Nogales Sonora - 74
7225 - " - Pitts. Conn. Chic. & St. Ry. - Pittsburgh Pa. - 74
7219 - " - Lytle Coal Co. - Connersville Pa. - 77

A Typical Page from the Numbers Book

A typical entry in the Numbers Book identifies the serial number and type of instrument, the name and usually the address of the customer, and a one to three digit number (which I have termed A, and discuss below). Some 8 to 12 consecutive pages of this book were allotted to each group of 100 serial numbers. When the first instrument in this group was sold, the information was recorded on the top of the first allotted page. On the page shown above, this was instrument No. 7204. The serial numbers of successive instruments follow in an erratic fashion, and by the time some 50 instruments had been recorded, a few instruments had been entered in pages allotted to the range 7300-7399.

Since the serial numbers were assigned in the book before the instruments were started, and were engraved on the instruments while they were being made, and since the instruments were sold when they were finished and orders were received, it is not surprising that entries in this book are not in numerical order.

The serial numbers in the Numbers Book range from 6071 to 7834. There are, in addition, five pages of entries for which no serial number is given (apparently these instruments were sold and shipped before the serial numbers were recorded), and one page listing 16 instruments with serial numbers ranging between 5159 and 5955. No. 5259 is a tunnel transit which was probably made around 1878, and which remained in inventory until it was purchased by the Southern Railroad Co.in 1898. This instrument was probably returned unused, as it was found in new condition with the material stored in Maryland. The other instruments on this page were probably taken in trade, repaired and resold. The data from this book has been entered into a second dBASE III TM file and merged with the file from the Instrument Book. This combined file can provide information on a single instrument, and determine correlations, production data, etc.

Another source of information about Heller & Brightly instruments is a list compiled by George Kegelman, and typed on loose sheets of 8.5 by 11 notebook paper. This was based on the data in the Numbers Book and a (missing) book with similar information for instruments having serial numbers above 7800. (George Kegelman withdrew from the firm around 1943 and he and his brother William established their own shop.) This data has also been incorporated into the dBASE files. This document also identifies the suppliers of tools, materials, hardware, lenses, etc. used during the 1930's, and provides recipes for silvering, browning and lacquering instruments.

Instrument Makers Listed in the Instrument Book, 1888 to 1943

Maker	Number	Dates	Specialty
Fred Quednow	166	88-92	Transits
Kaiser	163	88-91	Transits
Alfons Pistor	773	88-17	Transits
Julius Seelhorst Sr.	259	89-03	Levels
Julius Seelhorst Jr.	84	90-05	Levels
Will Thaite	2	93-96	
Gus Brauer	3	93-98	
R. Schubert	4	96-98	
E. Nerger	349	00-10	Transits
August Hunold	146	00-20	
Wm. Busch	3	03	

Geo. Dailinger	1	03	
A. Diffenbacker	16	04-08	Transits
C. Warren. Heller	5	05	
Warrie	3	13	
George Kegleman	55	21-27	Transits
H. Berger	9	22	Levels
George Kegleman		28-43	
A. Diffenbacker		30-37	
Walter Friedrichs		30-32	
Max Herman		37	
James Shay		37-43	

Since most of the instruments made up until Heller's death in 1912 were produced by just a few makers, it is likely that Heller used some form of internal contracting. George Kegelman said that the lead instrument makers were well paid, and added that they came to work in top hat and tails. (I don't know if this was to be taken literally or figuratively). He also said that Heller gave these makers extra money for the training of apprentices.

Number of Heller & Brightly Instruments
Authorized Yearly from 1870 to 1930

1870-73	73*	1901	109	1916	16
1874-87	103*	1902	126	1917	16
1888	132*	1903	125	1918	10
1889	138	1904	72	1919	7
1890	185	1905	97	1920	9
1891	216	1906	46	1921	29
1892	1	1907	73	1922	9
1893	35	1908	67	1923	8
1894	32	1909	55	1924	2
1895	36	1910	51	1925	0
1896	39	1911	13	1926	1
1897	38	1912	34	1927	18
1898	36	1913	24	1928	2
1899	73	1914	19	1929	0
1900	118	1915	23	1930	1

* estimated

The numbers for 1870 to 1888 were estimated from the preface to the first edition of *REMARKS* and the note on the first page of the Instrument Book. They assume that all numbers between 4400 and 6142 were authorized, and that each number was only used once.

The number of authorized instruments increased from 1888 to 1891. It then dropped precipitously in 1892, the year that Charles H. Brightly left the firm. Fifty four instruments (numbers 6735 to 6787) were authorized from 1892 to 1897. The Instrument Book indicates that all but two of these were marked "Charles S. Heller trading as Heller & Brightly". The 145 or so other instruments authorized during this period were given numbers which duplicated those of instruments made up to five years earlier. These duplicate numbers were carefully chosen so that if the instrument to which the number was first assigned was a transit, the duplicate assignment would be to a level, or vice versa. This must have been done to hide from Brightly the number of instruments actually produced. The Instrument Book identifies the first lot of these duplicate-numbered as "numbered in error". The first 20 of these instruments were marked "Charles S. Heller trading as Heller & Brightly" and a star was added to the serial number. An additional 31 instruments were marked with the star alone. There is no indication of the markings of the remaining 94 instruments in this group.

Serial numbers 6788 to 6999 were never assigned, and thus the subsequent numbers exaggerate the production rate of the company. The first instrument authorized in 1898 was number 7000; it is marked simply "Heller & Brightly." It appears that after Brightly died (on October 25, 1897), Heller decided that it was again safe to use the original name.

From 1900 to 1905 the annual output was roughly the same as in the 1870's and 1880's. The drop in 1906 was probably related to the economy of the country; Young & Sons also had problems at this time. After a modest recovery from 1907 to 1910, the output declined again, and the rate of decline accelerated after Heller's death in 1912. Although few instruments were produced in the 1910's and 1920's, the shop may have been kept busy with repair work.

The records for the instruments marked "Heller & Brightly, Inc." are unfortunately not complete. The last entry in George Kegleman's list is for instrument 10167, the highest known serial number of any finished instrument is 10227, the Instrument Book lists numbers up to 10287, and unfinished instruments with numbers ranging from 10219 to 10321 were found in Maryland. It is thus probable that no more than 250 and probably less than 200 instruments marked "Heller & Brightly, Inc." were finished and sold. Assuming that production stopped in 1946, the average number of instruments authorized yearly was only 20.

Heller & Brightly Complete Large Transit #7000.
Collection of Alex T. LaBrecque of Elmira, New York.
This was authorized on 22 March 1898, made by Alphons Pistor, and sold (A number d165) to the Central Manual Training School in Philadelphia. As it now stands, this is a compound instrument. The box and leveling base are marked #6902, and thus originally belonged to one of five transits authorized on 29 October 1888, and made by Herman Kaiser. Instrument #6902 was sent (A number b83) to Williams, Brown & Earle, returned to Heller & Brightly, and then sold (A number b160) to the Central Manual Training School. Instruments #6902 and #7000 were the only ones bought by the Central Manual Training School directly from Heller & Brightly during the period from 1886 to 1943.

There were 292 assignments of serial numbers listed through 1930 on 238 different days. As shown in the table below, the persons who authorized numbers obviously worked six days a week, and occasionally on Sunday.

Number of Mondays, Tuesdays, etc. on Which
Serial Numbers Were Assigned During the Period 1880-1930

Monday	46
Tuesday	40
Wednesday	41
Thursday	30
Friday	41
Saturday	30
Sunday	10

The 1878 catalog lists nine major instruments: Complete Transit, Plane Transit, Small Transit, Tunnel Transit, Solar Transit, Plane Table, Small Level, and Plane and Vernier Surveyors Compasses. Prior to 1884 the Solar Transits were listed as of Lyman's pattern, and after 1889 as Saegmuller's pattern.

The table below lists the number of instruments of each kind authorized from 1888 to 1930, and the years during which these authorizations occurred. Although only five Complete Transits are listed, the Numbers Book indicates that over a thousand of these instruments were sold. Thus, except in a few cases, it is probable that Heller & Brightly made (and recorded) Plane Transits only, and when an order for a Complete Transit was received they added a level, vertical arc, clamp and tangent screw. Likewise with Solar Transits. However, the variation plate which was listed as a Extra in the catalogue required a specially manufactured Transit. Although the first Sunflower was made in 1888, no numbers were assigned to Sunflowers until 1905. There is thus nothing to indicate how many of these instruments might have been made in this period. The fact that no Tunnel Transits are listed is not surprising, since a Tunnel Transit made in 1878 remained unsold in 1946. The most surprising thing about the list is that it contains no Surveyors Compasses, either Plane or Vernier, even though four different Compasses--a $5\frac{1}{2}$ inch needle Plane, a $5\frac{1}{2}$ inch needle Vernier, a 6 inch needle Plane and a 6 inch needle Vernier--are listed in every catalog from 1878 through 1920. Among the material stored in Maryland there were parts of $2\frac{1}{2}$ inch needle Pocket Surveyors Compasses, which are listed in the catalogs, and of Miners Dip Compasses, which are not, but not a single item which could be identified as a part of a Surveyors Compass. If Heller & Brightly produced any Surveyors Compasses, it was before 1888 or else they were unnumbered. In either case the number must have been small.

Instruments Authorized in Instrument Book from 1888 to 1930

Complete Transits	5	1893-1897
Transits	1321	1888-1927
Variation Transits	66	1889-1926
Intermediate Transits	46	1908-1921
Small Transits	150	1890-1915
Levels	425	1888-1922
Small Levels	11	1903-1913
Sunflowers	27	1905-1930
Plane Tables	3	1891

Very few special instruments were ever authorized. There was an aluminum transit in 1890, a 10 second transit in 1901, a

transit with a right angle telescope in 1904, a lot of five transits made without compass box in 1909, and several transits with the verniers locate at SE-NW positions or E-W positions rather than the usual N-S location, made at various times. There are no high order triangulation or astronomical instruments listed, even though all catalogs through 1920 note that "Extra large size Transits, such as used by the U. S. Coast Survey, with horizontal limbs of from one to three feet diameter and reading by microscopes to seconds of arc, and furnished with powerful telescopes, or for Astronomical Transits--price lists will be furnished on application."

Even though Heller & Brightly's dividing engine was capable of dividing circles up to approximately 24 inches in diameter, there were no parts or patterns among the material stored in Maryland to suggest that a transit with a circle larger than $6\frac{1}{2}$ inches was ever made. An astronomical instrument was listed in the inventory of Heller's estate in 1912, and the base of a meridian transit (very probably the same instrument) was found in Maryland, but there is nothing to indicate that this instrument was made by Heller & Brightly

Of the 2081 instruments authorized in the Instrument Book, 1789 are listed in the Numbers Book. This indicates that at least 86% of the authorized instruments were finished and shipped to customers. Of the missing 292 instruments, some are included in the 77 instruments listed in the Numbers Book and for which the serial numbers were not recorded, some were finished and never shipped (a plane table in 1890 and a small level in 1913, neither of which are listed in the Numbers Book, were found in the material stored in Maryland), some were never finished, some possibly never started and some were shipped and not recorded (many of the Sunflowers which were authorized are not listed in the Numbers Book).

Numbers of Instruments Listed in Numbers Book, 1888-1930

Transit	1162	Intermediate Transit	42
Large Transit	83	Tunnel Transit	1
Level Transit	4	Level	352
Plane Transit	148	Wye Level	25
Variation Transit	2	Small Level	8
Small Transit	157	Sunflower	15

The Numbers Book contains a different sample of instruments than does the Instrument Book. The largest difference concerns the Variation Transits. Of the 66 authorized in the Instrument Book, only 2 are listed as such in the Numbers Book, 50 are listed as Transits, 3 as Large Transits, 1 as a Transit Level, 4 as

Plane Transits, and 8 are not listed at all. (This adds up to more than 66 because some instruments are listed more than once.) Apparently it was not important to the persons entering data into the Numbers Book to note if a Regular or a Variation Transit was shipped.

If we assume that all the instruments listed as Transits, Transit Levels and Large Transits (this designation was first used after the introduction of the Intermediate Transit) were Complete Transits, we can conclude that only 11% of Heller & Brightly's Large Transits were sold as Plane Transits. This is consistent with the observed rarity of these instruments. The Small and Intermediate Transits were only made as Complete Transits. The designation Wye Level appears to be an idiosyncrasy of the persons entering the data into the book during the period 1916 to 1918, since it appears nowhere else, and there is nothing to indicate that these instruments differ from the usual Levels.

The instruments produced by Heller & Brightly were shipped to 49 of the present 50 states. As expected, most were sold to customers in Pennsylvania and New York. Four instruments were shipped to the Indian Territories.

Numbers of Instruments Shipped to Each of the States, 1888-1930

AL	49	IL	28	MT	11	RI	1
AK	0	IN	30	NB	7	SC	10
AZ	7	IA	11	NV	5	SD	4
AR	17	KS	5	NH	3	TN	36
CA	23	KY	20	NJ	41	TX	48
CO	15	LA	23	NM	4	UT	5
CT	7	ME	7	NY	166	VT	2
DE	36	MD	11	NC	30	VA	74
DC	11	MA	12	ND	1	WA	27
FL	10	MI	21	OH	97	WV	48
GA	22	MN	32	OK	2	WI	15
HI	1	MS	7	OR	19	WY	9
ID	8	MO	34	PA	573		

Heller & Brightly sent 86 instruments to foreign countries, most of them to North America. There is no indication of shipments to Europe, even though in 1875 Heller & Brightly reported sending instruments to Austria, England, China, Japan, Chile, Peru, Venezuela, and Cuba (one each?). They implied that their European orders were the first for any American instrument maker. William J. Young, however, had sent instruments to England in the 1840's.

Numbers of Instruments Shipped to Foreign Countries, 1888-1930

Canada	39	Mexico	31
Cuba	7	Ecuador	3
Honduras	2	Brazil	1
India	1	China	1
New Zealand	1		

Most of Heller & Brightly's instruments were sold directly to the customers (individuals, companies, schools and federal, state and local government agencies). Only about 6% to 7% were sold through distributors. Williams, Brown & Earle in Philadelphia took 81 instruments, and Wm. E. Stieren in Pittsburgh took 32.

About 50 instruments are listed two or three times in the Numbers Book, indicating that they were shipped to more than one customer. This is probably a result of the policy stated in 1874, and reiterated in all subsequent catalogs, of sending instruments on trial. Those that were returned were sent to a second or third customer, with an new entry in the Numbers Book for each transaction. In a few cases it is noted that the instrument was returned, but in most cases there in no such notation.

The A numbers mentioned above range from 1 to 600. Since many numbers are repeated, they probably refer to a page of an account book in which daily transactions were recorded. (Although there is no information to indicate the nature of this transaction, I suspect that it was the shipping of the instrument to the customer.) As shown in the page reproduced above, the number 39 is listed after 5 plane transits shipped to the Choctaw, Oklahoma & Gulf Railroad, and number 74 is listed after three transits shipped to three different customers. The numbers are generally monotonically increasing down the page and they are usually not consecutive. An exception is noted at the top of the page, where the first number is 497 and the second 1. This suggests that the first instrument was entered on page 497 (nearly the last page) of one account book and the second instrument on page 1 of a different account book. Similar breaks in sequences occur elsewhere in the Numbers Book.

By a rather tedious analysis (made easier by the use of a computer) it is possible to establish that five account books (which I have arbitrarily labeled b to f) were used. It is also possible to establish the dates of these account books, and thus to estimate the shipping date of each instrument.

In this analysis the numbers are divided into monotonically increasing segments, and these segments are placed in order using such information as the page of the Numbers Book on which the segment occurs, the location of the segment on the page, the hand

writing of the entries, and the date on which the instrument was authorized.

Account Books, Dates in Use, Number of Pages, and Number of Instruments Listed

b	1888-1893	440	528
c	1893-1897	491	221
d	1897-1900	500	285
e	1900-1904	602	354
f	1904-1907	503	222

Approximately 2500 pages were used over a period of 20 years, which corresponds to two to three pages per week. Since only about 50% of the pages recorded information on new instruments, these books must have been used for such other transactions as instrument repairs and sales of accessories and other small items.

Also found in Maryland was a note book 4.5 by 7.3 inches in which Frank L. Watson recorded his time charges from 4-10-41 to 2-10-44. The only significant information which was obtained from this book is that a lot of small transits was in production in early 1944.

The Heller & Brightly shop in the late 1930's (from left to right: William Lettinger, A. Diffenbacker, George Kegelman, John Moss, and Tregumbo)

Acknowledgement: I would like to thank Mr. Richard B. Goodall for preserving these materials and making them available to me.