

CIVIL ENGINEERS'  
AND  
SURVEYORS'  
INSTRUMENTS



W. & L. E. GURLEY'S Instrument Manufactory, Established 1845.

1885.

W. & L. E. GURLEY,  
TROY, N. Y.



In ordering, please give NUMBER AND EDITION of Manual or Circular describing the Articles wanted.

NOTE.—The Numbers and Figures mentioned in this Circular are the same as those given in the 25th Edition of Manual.

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• UPPER STRASBURG, FRANKLIN CO., PA., }  
December 17th, 1883. }

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs:*

Allow me to return my sincere thanks for the copies of the twenty-fourth edition of your Manual, and the Ephemeris for 1884, you kindly sent me. Having been a customer of yours for more than twenty-six years, and used your instruments during that time, it may be that I am over partial to everything that comes from your establishment, still I do not think that I am chargeable with flattery when I say that your Manual by far surpasses anything of the kind I have ever seen, and I have the manuals and descriptive lists of many manufacturers of instruments.

With sentiments of the highest esteem,

I remain, as ever,

Your friend,

JOHN B. KAUFMAN.

# ILLUSTRATED CATALOGUE

AND

## PRICE LIST

OF

CIVIL ENGINEERS' AND SURVEYORS'

## INSTRUMENTS,

With Descriptions and Illustrations of Latest Improvements,

MADE AND SOLD BY

W. & L. E. GURLEY,

TROY, N. Y.



1885.



# TRANSITS.



No. 3. FIG. 1.

## ENGINEERS' TRANSITS.

The Engineers' Transit is like the Surveyors' Transit, except that in the former the axis or centre runs from the lower parallel plate to the centre plate of the instrument, thus giving a long socket and spindle, and there is no vernier for adding or subtracting the magnetic variations of the needle as in the Surveyors' Transit, unless it is specially ordered. The upper part of the instrument does not separate from the leveling plates, as in the Surveyors' Transit, but is permanently attached to them, and when put into its box is unscrewed from the tripod at the lower parallel plate.

This is the standard Railroad Transit, and is generally preferred for exclusive railroad practice.

No.								PRICE.					
1.—	Engineers',	two	verniers	to	limb,	4-inch	needle,	plain	telescope,	leveling	tripod...	\$145 00	
2.—	do	do	do	do	4½	do	do	do	do	do	do	150 00	
3.—	do	do	do	do	5	do	do	do	do	do	do	150 00	
4.—	do	do	do	do	5	do	do	do	do	with	theodolite	axis..	185 00

LAMAR, MO., July 16th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—The Engineers' Transit ordered of you was received in good order and perfect adjustment all around, and on trial has given good satisfaction. In the future I shall use none other save the "Gurley."

Yours respectfully,

FRANK M. BARRETT, *City Engineer*.

WELLINGTON, KAS., Dec. 3d, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—Engineers' Transit duly received, and appears to be all right. It is the best instrument for the price I ever used. Yours truly,

ORVILLE SMITH, *Civil Engineer*.

OLIVET, PA., October 9th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

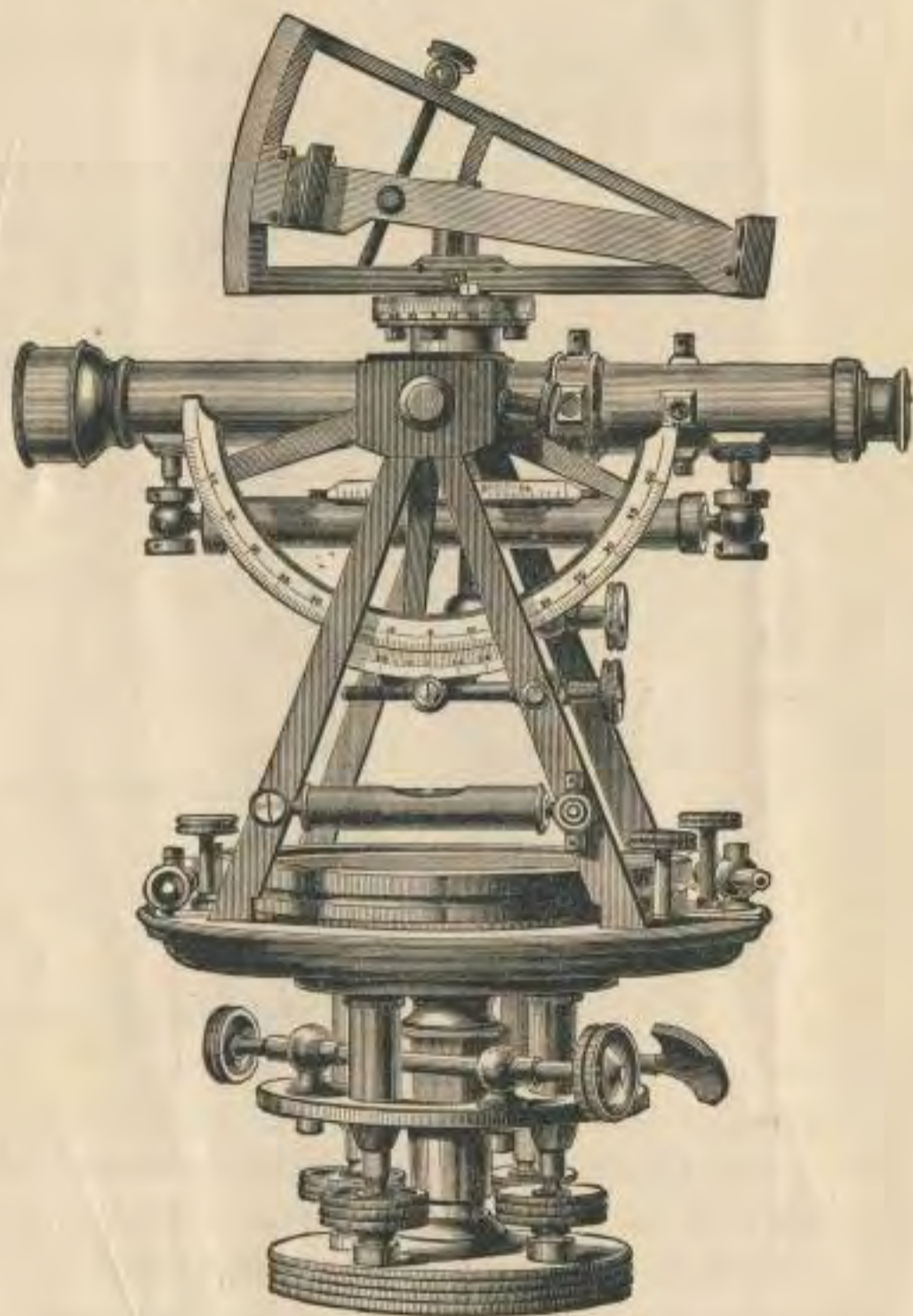
*Gentlemen* :—I want to say for your Engineers' Transit, that there may be as good but none better. I think a graduation could not be more accurate. Why, it would be perfectly safe to adjust the line of collimation by the limb alone; *i. e.*, to set the vertical wire on a point, turn 180 degrees, reverse the telescope and adjust to the point.

The telescope is good and adjustments in general steady and easily managed. The weight is the only objection when on long runs and when the work does not require the highest degree of accuracy. Yours very truly,

ROBERT H. WILSON, *Civil Engineer*.



## ENGINEERS' TRANSIT WITH SOLAR ATTACHMENT.



No. 5. FIG. 8.

Five-inch Engineers' Transit with Solar Attachment. Price as shown,  
including tripod, \$250.00.

The engraving represents our Engineers' Transit with five-inch needle and attachments of vertical arc, six inches in diameter, divided on silver, reading to thirty seconds—level on telescope—clamp and tangent to axis and solar apparatus—with declination arc reading to thirty seconds.

The compass circle is also made movable, with pinion and clamp, for setting off the variation of the needle.

ENGINEERS' CAMP, CAMARGO, MEXICO, October 12th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—Please send me a copy of your Solar Ephemeris for the year 1884. The Engineers' Solar Transit you sent me last March has since that time been in constant use, and its adjustment to-day is as perfect as when it left your establishment. I have in person run more than 1,500 miles of standard parallels and meridians for the Mexican Government, and never had to adjust the instrument. In all the country where I have been operating the needle is rendered practically useless by local attraction. Your Solar Attachment is a perfect success. When used by a person fully understanding its functions it will detect any error in the true meridian greater than fifteen seconds.

Respectfully, A. Q. WINGO,

*Civil Engineer, Topographical Engineer in charge of Public Surveys.*

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LIVINGSTON, MONTANA, January 5th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs* :—Your Engineers' Solar Transit with various attachments came as ordered. I have made thorough tests, and although I expected big things of it, I can honestly say it works far better than I expected. When I tested the line of collimation, I took sights estimated to be five miles distant on opposite mountains, and in reversing it cut the sights exactly. That is not bad after a trip of 3,000 miles by express.

Respectfully, C. W. MEAD,

*U. S. Dep. Min. Sur.*



## LIGHT MINING OR MOUNTAIN TRANSITS.



No. 7. FIG. 9.

This is an extra light Engineers' Transit for mine or mountain use, introduced by us in 1876 to meet a demand for a light transit of the best quality. It has met with a very large sale and been universally approved. We confidently recommend it to all our friends as a transit of the first class, capable of any work, and specially adapted for mining or rough country use where great portability is required.

*PRICES:*

- No. 6. Light Mountain Transit, with four-inch needle, vernier for setting off the magnetic variation, two opposite verniers to the limb reading to single minutes, eight-inch achromatic telescope of the finest quality, power twenty diameters, furnished with our patent extension tripod shortening to half length for portability and low tunnel service. The instrument is packed in a light mahogany case, and this covered with a light sole-leather case, amply furnished with straps for "packing." With plain telescope.....\$150 00
- No. 7. Light Mountain Transit, same in all respects as the above, but with the addition of our patent solar attachment, vertical arc on silver, level on telescope, with ground bubble and scale, and clamp and tangent to axis of telescope, complete, as shown in Fig. 9.....\$245 00



BOSTON, MASS., May 9, 1884.

MESSRS. W. & L. E. GURLEY,

*Dear Sirs:*—About a year ago I got one of your Mountain Transits and am very much pleased with it. I would not exchange it for any other I ever used. One day this week I used it for running a line of levels 9,300 feet long; I connected at each end and about the middle with another line run sometime before, very carefully, with a Temple Level and reading the rod to thousandths. I read only to hundredths and made a difference of less than two hundredths in the first 5,200 feet and the nearest hundredth for the last 4,100 feet. I have done other work just as good, but have not attempted so long a line of levels with it before, where I could check my work. As a Transit it is as good as any I ever used. It stands more steady in the wind than a large one.

Yours, &c.,

HEBERT C. KEITH, *Civil Engineer.*

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PALMER'S FALLS, SARATOGA CO., N. Y., June 6th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen:*—The Mountain Transit works very satisfactory, and is all that you claimed or we expected of it in every respect.

Yours truly,

WARREN CURTIS, *Sup't.*

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CATSKILL, N. Y., September 3d, 1884.

MESSRS. W. & L. E. GURLEY,

*Gentlemen:*—I must say that the Light Mountain Transit goes way ahead of any I ever used. The graduations on the plate are absolutely perfect. I am very much pleased to think I bought your instrument.

Yours respectfully,

W. S. PARKER, *Civil Engineer.*

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SOCORRO, NEW MEXICO, December 5th, 1884.

MESSRS. GURLEY BROS.,

*Gents:*—Please send me an Ephemeris for 1885. I am using your Mountain Transit on the line between Arizona and New Mexico, sectionizing. I find that there is no Solar equal to yours in accuracy and quickness. I am using two of your make and one other.

Yours truly,

ERNEST G. MILLER, *U. S. Dept. Surveyor.*



## LIGHT MOUNTAIN TRANSIT.



FIG. 11.

Light Mountain Solar Transit, with Jones' Patent Latitude Arc, and reversible Level Bubble.

Price as shown, including extension tripod, - - - \$200.00.

#### R. M. Jones' Patent Latitude Arc.

In this new attachment, which has now been secured exclusively to us, the usual vertical arc is omitted, and replaced by a double latitude arc attached to the under-side of the telescope, as shown in Fig. 11. The smaller arc having its centre directly under the cross-bar of the telescope, has an arm with vernier reading the arc to single minutes, and carries also a level tube open both top and bottom, with a divided scale over each opening, in order to read the level accurately.

#### PRICES:

Jones' Patent Latitude Arc, with reversible level bubble.....	\$73 00
When furnished with a new transit of our make in place of the ordinary vertical arc, the Jones' Patent Latitude Arc, with reversible level bubble, increases the cost of the instrument.....	54 00
Thus: The Light Mountain Transit, with Patent Solar Attachment and Jones' Patent Latitude Arc, costs.....	200 00



LAGUNA, VALENCIA CO., NEW MEXICO, September 29th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—Having tested Jones' Patent Latitude Arc by actual use in the field, I am prepared to say that it is a very great improvement over any other form of the Latitude Arc, both on account of increased accuracy and quickness of manipulation.

The adjustments of this form of Latitude Arc (and Patent Solar Attachment) can be made in a much shorter time, and much more accurately, than those of any other; and in any work where it is necessary to take angles of elevation and depression the advantages of the double arc and the swinging level will be readily appreciated.

I have lately had occasion to use two transits of exactly the same make, one fitted with the usual form of solar attachment and the other with Jones' improvement, and I found a decided difference in point of accuracy and rapidity of manipulation in favor of the latter. This improvement was fully tested in establishing the base line for public Surveys in New Mexico, over a distance of one hundred and twenty miles (120), and the results were highly satisfactory. In short, this improvement is just what is wanted to make the Solar Instrument accurate, reliable, and of rapid adjustment.

Very truly yours,

GEO. H. PRADT, *U. S. Dep. Sur.*

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LAS CRUCES, NEW MEXICO, April 12th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—The Transit (Light Mountain Transit with Patent Solar Attachment and Jones' Latitude Arc) is, with its attachments, the most perfect instrument we have ever seen. So far as we have used it, it pleases us exactly.

Hastily and very truly yours,

LAMPTON & BIGGS, *U. S. Dep. Surveyors and Civil Engineers.*

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SUNBURY, PA., June 25th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—Oftentimes it is important between makers and buyers, that the buyers should know the approbation or disapprobation of the article purchased. Not in my opinion alone, but that of some five or six civil engineers of the Reading R. R. Co., and one of the S. and W. R. R., the Light Mountain Transit sent me is the noblest, most perfect, and handiest instrument they ever handled. So perfect an instrument, I think, is a feather in your cap. Hoping you feel proud, while I am pleased at so perfect a job.

Truly yours,

H. S. BOYER, *Civil Engineer.*



## Solar Transit, showing Patent Latitude Level.

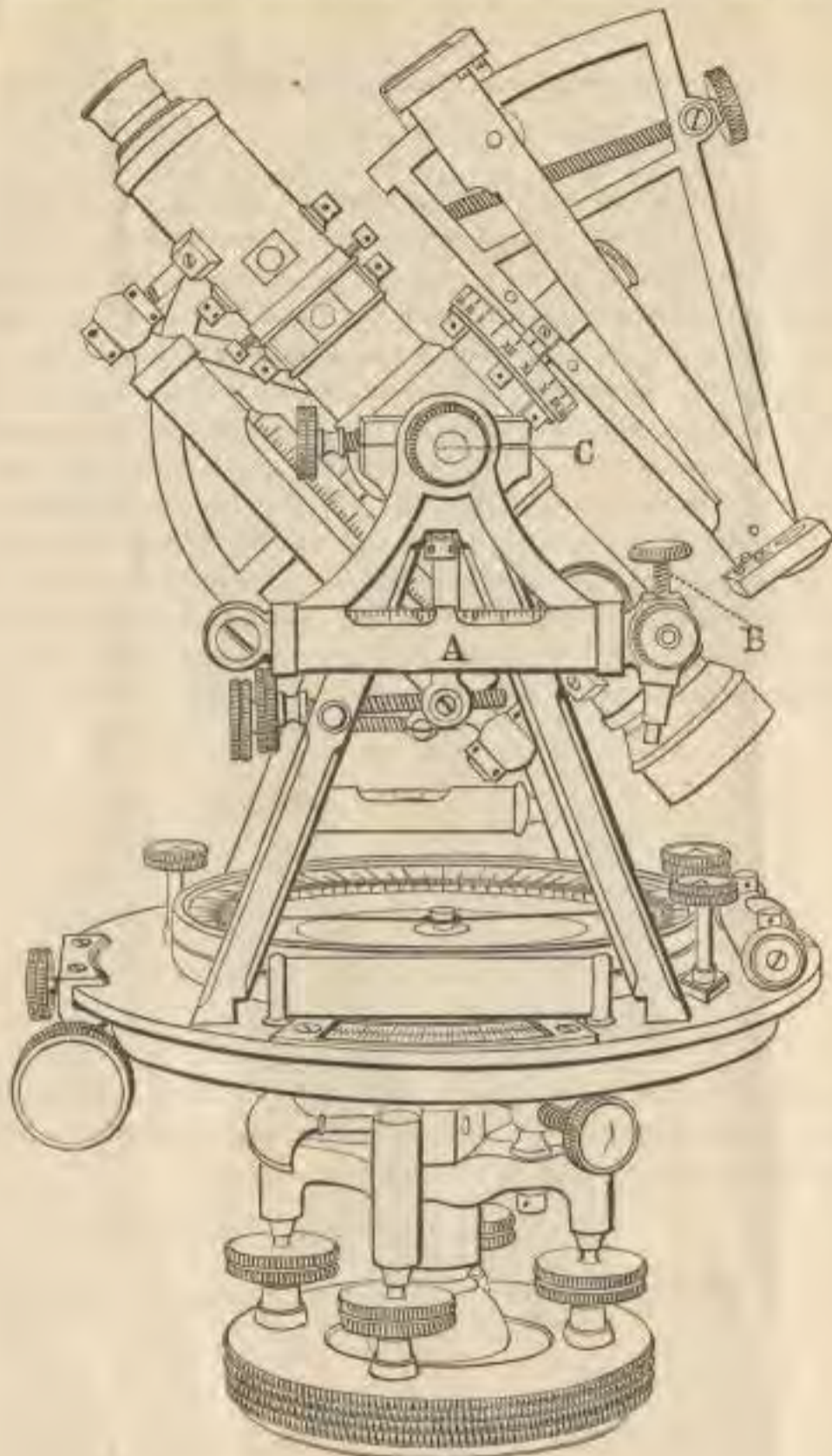


FIG. 10½

## PATENT LATITUDE LEVEL. (No. 56).

The outline engraving, Fig. 10½, represents an arrangement (*A, B, C*) recently patented by us, for recovering the Latitude of a Solar Transit, without referring to the Vertical Arc; and generally for setting the telescope at any desired angle in running grades, etc.

It consists of a level, *A*, connected by a short conical socket with the end of the telescope axis, to which it is clamped by a milled head screw at *C*, and made adjustable at *B* by a screw and spring on opposite sides of the enlarged end of the level tube. When the screw at *C* is released the level turns vertically upon the axis, and can thus be set at any angle with the telescope, the final adjustment being made by the screw at *B*.

The latitude being set off upon the vertical arc, as usual, the level is clamped and brought into the centre as above described.

The telescope may then be released and used in running lines, etc., until it is desired to recover the latitude again; this is easily and accurately done by the level alone without referring to the Vertical Arc.

Its use in running any desired grade is readily understood.

When desired, this latitude level can be attached inside the standards, on the inner surface of the vertical arc, and used in the same manner.

## PRICE.

We make no additional charge for this attachment on Transits with Solar attachment hereafter furnished by us; and when put on our Solar Transits heretofore sold, the cost will be six dollars.



SYRACUSE, N. Y., March 10th, 1883.

MESSRS. W. & L. E. GURLEY,

*Dear Sirs:*—The Transit (Mountain Transit) came safely to hand yesterday, and I must say that it is the most perfect instrument I have seen during a practice of twenty-five years. I mean all of that, for the construction of mathematical instruments requires the most exact and perfect of all mechanical workmanship. During all those years of practice in the field I have used instruments of your make mainly, with occasional but thorough trials of other makers, but I have never found those that have given me the entire satisfaction that I have experienced in the use of yours. You have my best wishes for continued prosperity.

Truly yours,

MARSHALL WHEELER.

BRYAN, OHIO, April 24th, 1883.

MESSRS. W. & L. E. GURLEY, Troy N. Y.

*Gentlemen:*—I have thoroughly tested the Light Mountain Transit I purchased of you at the Michigan Surveyors' Association, last January, and I must write to you to let you know how well I am pleased with it. I can find no fault with it. It is just what I want for my work of land and city surveying. I would not exchange it for any other instrument I have seen. In fact, take it all in all, it is a gem of an instrument, and is a great time-saver. Give me the Light Mountain Transit.

Very truly yours,

FRANCIS M. PRIEST, *County Surveyor.*

SANTA FE, NEW MEXICO, August 10th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs:*—I wish you would send me, as soon as convenient, C. O. D., a stop for the latitude arc of my Solar Light Mountain Transit. The instrument is perfect, and has not required adjusting since I have had it.

Yours respectfully,

R. A. VARDEN, *M. E.*

EVERETT, LAKE CO., COLORADO, January 19th, 1884.

MESSRS. W. & L. E. GURLEY,

*Dear Sirs:*—Please send me your Solar Ephemeris for the year 1884. I am using one of your Light Mountain Transits with Solar Attachment, and could not be better satisfied with an instrument. It does its work well.

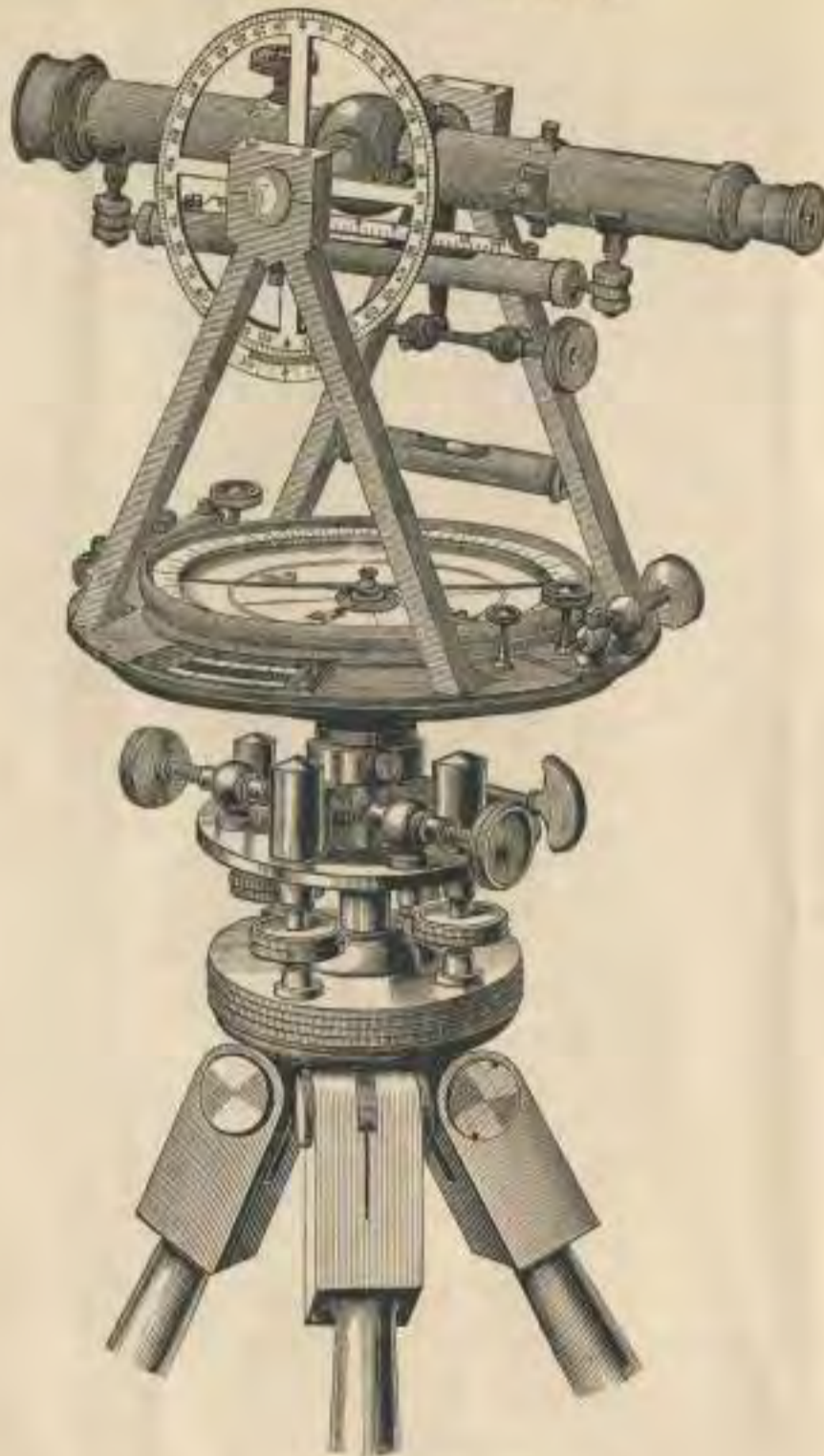
Very respectfully yours,

JOHN A. STORM, *U. S. Dep. Surveyor.*



## SURVEYORS' TRANSITS.

TWO VERNIERS TO LIMB.



No. 15. FIG. 19.

The Surveyors' Transit has a telescope from ten to twelve inches long. The compass circle is divided to half degrees, and is provided with a vernier for adding or subtracting the magnetic variation of the needle. The tripod head is arranged with shifting centre, for setting the instrument quickly over a given point, without altering the position of the legs. The tripod legs are mahogany. The limb or divided circle outside the compass box and under the main plate, is provided with two opposite verniers covered with glass at right angles to the telescope, and is read to single minutes.

## PRICES:

No. 12. $\frac{7}{8}$ Surveyors' Transit, 4 inch needle, two verniers to limb, plain telescope. ....	\$125 00
No. 12a. Surveyors' Transit, same as above, but with vertical circle, level on telescope, and clamp and tangent to axis of telescope, as in engraving.....	155 00
No. 13. Surveyors' Transit, 5-inch needle, two verniers to limb, plain telescope, or without extras.....	130 00
No. 14. Surveyors' Transit, 5 $\frac{1}{2}$ -inch needle, two verniers to limb, plain telescope, or without extras.....	130 00
No. 15. Surveyors' Transit, 5 or 5 $\frac{1}{2}$ -inch needle, but with 4 $\frac{1}{2}$ -inch vertical circle on silver, reading with vernier to single minutes, level on telescope with ground bubble and scale, and clamp and tangent movement to axis of telescope, as in engraving.....	160 00



BLACKSVILLE, WEST VA., February 29th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—I received your five-inch Surveyors' Transit last fall in good condition. It has proved a merit and honor to you. I have given it a good test and done some nice work. Mr. Van Orden and others of the U. S. Coast Survey, with whom I was while surveying the Pennsylvania line through here last fall, were pleased with its working. If I were going to purchase another, I would select your Mountain Transit because it is not so heavy. My Transit is heavier than I thought it would be, but it is business when set up for work.

Very respectfully,

D. N. GASS, *Civil Engineer.*

OXMOOR, ALABAMA, March 15th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

I received your Transit (Surveyors') in good order; the glasses are beautiful. Please accept my thanks for promptness. Since my first order from you in Omaha in 1868, I have always preferred your instruments, and I think my recommendation on the frontier has yielded good results. Please send me one of your latest catalogues, and oblige,

Yours truly,

WM. KIP, *Civil Engineer.*

MARQUETTE, MICHIGAN, September 2d, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents* :—I have a Surveyors' Transit, which you made to order some sixteen years ago, which I have always used with the greatest satisfaction, having tested it on particular work requiring great accuracy, and always with good success. I have, as you know, from time to time, adopted the improvements, the extension tripod, the quick leveler, detachable telescope for vertical sighting, greatly increasing the facility of using the instrument and thereby the capacity, so to speak, of the instrument, to accomplish results. I have more recently owned and used one of your Pocket Solar Compasses and have been much pleased with its working. I had it fitted with a side telescope last winter and have had occasion to use it in particular work, with very correct results.

Very truly yours,

GEO. P. CUMMINGS, *Civil Engineer.*

HONDURAS, CENTRAL AMERICA, November 17th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—This Transit is for my own use, and I wish to have it of as good quality as the one (Double Vernier Surveyors' Transit) you sold me in 1878; it has been in constant service in all parts of the American continent, and is still in A 1 condition.

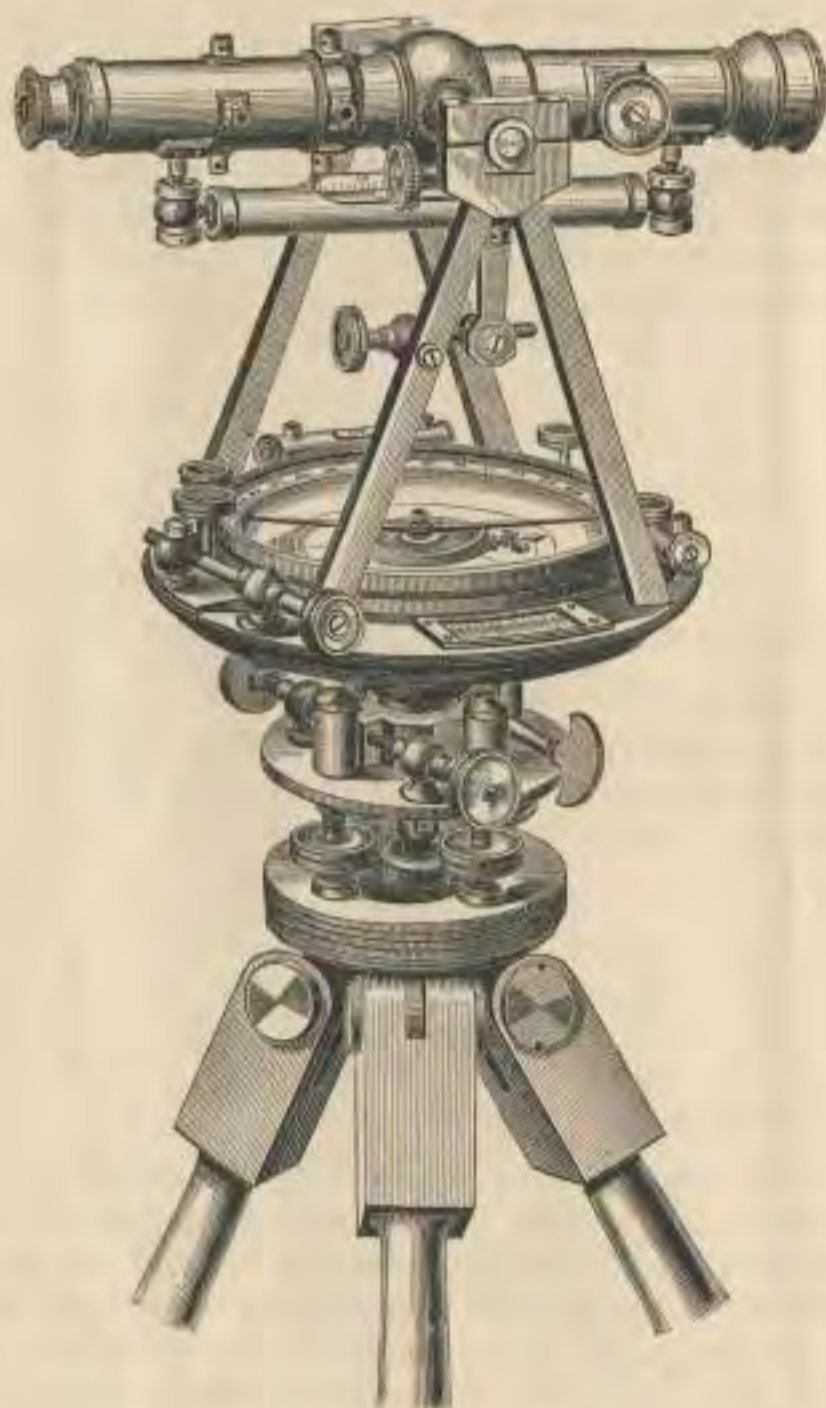
Yours very truly,

A. T. BYRNE, *Civil Engineer.*



## SURVEYORS' TRANSITS.

ONE VERNIER TO LIMB.



No. 23. FIG. 21.

The Surveyors' Transit has a telescope from ten to twelve inches long. The compass circle is divided to half degrees, and is provided with a vernier for adding or subtracting the magnetic variation of the needle. The tripod head is arranged with shifting centre, for setting the instrument quickly over a given point, without altering the position of the legs. The tripod legs are mahogany. The limb or divided circle outside the compass box and under the main plate, is provided with a vernier covered with glass at right angles to the telescope, and reads to minutes.

## PRICES:

No. 20. Surveyors' Transit, 4-inch needle, one vernier to limb, plain telescope.....	\$110 00
No. 20a. Surveyors' Transit, same as above, but with level on telescope, and clamp and tangent to axis of telescope, as in engraving.....	128 00
No. 21. Surveyors' Transit, 5-inch needle, one vernier to limb, plain telescope, or without extras.....	115 00
No. 22. Surveyors' Transit, 5½-inch needle, one vernier to limb, plain telescope, or without extras.....	115 00
No. 23. Surveyors' Transit, same as above, 5 or 5½-inch needle, but with level on telescope, and clamp and tangent movement to axis of telescope, as in engraving.....	133 00



PARISHVILLE, NEW YORK, May 8th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs* :—I received Surveyors' Transit and chain in good condition ; have tested Transit to-day and find it in perfect adjustment throughout ; am very much pleased with it.

Very respectfully,

H. S. MEEKHAM, *Civil Engineer.*

COLUMBUS, NEBRASKA, May 9th, 1884.

MESSRS. W. & L. E. GURLEY,

*Gentlemen* :—I have this day put in the new cross wires and return you the old ring by mail. Again, many thanks and will further say I think you make the very best instruments in the world.

Respectfully,

J. G. ROUTSON, *Civil Engineer.*

CATSKILL, NEW YORK, May 19, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—This day I had the misfortune to injure my old Transit, one of your make and of the single vernier type. I have had it in constant use for over sixteen years and have never laid out one cent for repairs, and have found it always perfectly accurate.

Yours respectfully,

W. S. PARKER, *Civil Engineer.*

DODGE CITY, KANSAS, December 6th, 1884.

W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—I received the Surveyors' Transit in good shape, last August ; have used it every day since, and had no occasion to adjust any of its parts except the levels. It is superior in every respect.

A. W. SMALL, *Civil Engineer.*



## THE SOLAR ATTACHMENT.

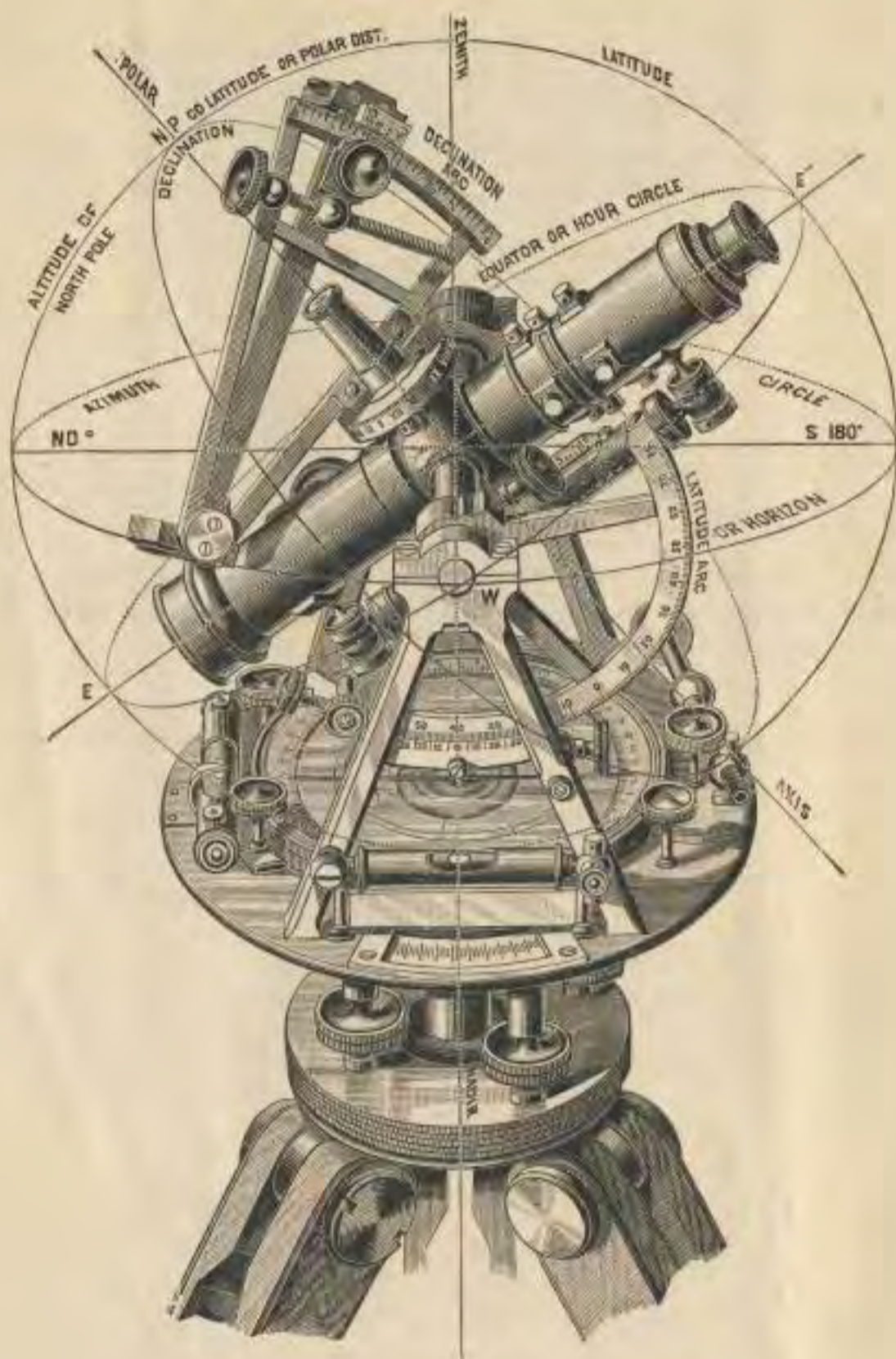


FIG. 10.

In Fig. 10 we have a graphical illustration of the Solar Apparatus, the circles shown being intended to represent in miniature those supposed to be drawn upon the concave surface of the heavens.

LAWTON, MICHIGAN, November 3d, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents*:—I have to thank you for the Solar Almanac for 1884, also for repairs on my instrument. As far as I have examined it, it works nicely; I think it is all O. K. By the way, I think very highly of your Solar Attachment. It is the most important improvement that has been made in surveying instruments for many years.

Yours, etc.,

C. D. LAWTON, *Civil and Mining Engineer.*



## Advantages of the Solar Attachment.

It will be readily understood that the more perfect horizon obtained by the use of the telescope level, and the use of a telescope in place of sights, render the new attachment more accurate than the ordinary solar compass.

It can also be put on the telescope of any good transit at comparatively small cost, and thus enable the surveyor to establish the true meridian, to determine the correct latitude, and to obtain true time very nearly.

Its adaptation to the purposes of illustration and instruction in practical astronomy in colleges and schools, will occur to every teacher; and we believe that for the Government surveyor it furnishes a long-sought and much-needed instrument, superior in many respects to the solar compass now so commonly used.

In experiments made by us, an error of one-quarter of a minute in the direction of the true meridian, or in latitude, could be easily detected by observing the sun's image by a magnifier, and we feel confident that any one who uses the new solar will be surprised and delighted with its work. When desired it can be removed from the telescope and packed in the instrument case.

A thin sheath is put on the polar axis, and kept in its place by the screw and washer of the socket.

The weight of the new Solar Attachment is but little over ten ounces, and is so distributed as not to disturb the counterpoise of the instrument, thus obviating the objection which has hitherto prevented the successful application of the telescope to the solar apparatus.

It is evident that all transits to which the Solar Attachment is to be applied should have a horizontal limb and verniers, and be leveled by leveling screws and parallel plates.

Of course it will be understood, in all cases, that where transits of any kind are to be supplied with the new Solar Attachment, they must be in perfect order, especially in respect to the sockets, before correct work can be done.

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ROSIITA, COLORADO, December 6th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—The Solar Attachment that you put on my Transit works splendid; in fact, it would be hard to get along without it.

Yours truly,

AUGUST KOPPE,

*U. S. Dep. Min. Surveyor.*

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HUNTINGTON, OREGON, March 28th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—The Mountain Transit I got from you, several months ago, gives great satisfaction, and I do not hesitate to recommend your "Light Mountain Transit" above all other productions of a similar kind that I have ever used. I am sorry that I did not get the Solar Attachment with this Transit when it came from your manufactory, but I will send it back to you for the attachment to be added the first favorable opportunity.

I am, respectfully,

J. MAC FARLANE, *C. E.*,

*Assistant Engineer, O. S. L. Ry.*



## SURVEYORS' TRANSIT WITH SOLAR ATTACHMENT.



FIG. 22.

The cut represents our Surveyors' Transit with one vernier to limb and 5-inch needle ; to which is adapted the Solar Attachment with vertical arc, level, etc. ; both the vertical arc and that of the declination arm being divided on silver and reading to thirty seconds.

The Surveyors' Transit with two verniers to limb is also arranged in precisely the same manner, when desired ; but the level, which is shown above on the plate, is then raised and fitted to the standards, so as to allow of the vernier opening beneath.

Both styles have been for years in successful use in different parts of the country ; both have shifting centres to tripods.

*PRICES :*

No. 24.—Price as shown, with one vernier to limb, 5-inch needle, including tripod,	\$211 00
No. 16.—If two verniers to limb.....	236 00



OHIO STATE UNIVERSITY,  
COLUMBUS, OHIO, April 29th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen*:—I acknowledge the receipt of your new Manual, for which I thank you. The work seems to me to be complete on all sides, leaving nothing to be desired.

A pupil in this College, whose home is in Nebraska, wrote to me stating that he intended purchasing a Transit of you, and asking that I would examine and see whether it was in order, etc. I replied, saying that it would be better to have it forwarded directly to him, that I had examined nearly a dozen when fresh from your hands, and had found all of them right.

Very respectfully,

R. W. McFARLAND,

*Professor of Mathematics and Civil Engineering.*

HARPER, KANSAS, December 26th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen*:—Please send me by return mail a copy of your Solar Ephemeris for 1884, for use with Solar Attachment with Transit. The Solar Transit of your make that I bought of James W. Queen & Co., of Philadelphia, in March last, is a "daisy"; have tried it at all kinds of work, and don't think it has a superior for general use.

For instance, I have just run a half-mile line with twenty-one angles, and close within six inches on the first trial.

Respectfully yours,

E. W. KLINE, C. E., *County Surveyor.*

AGRICULTURAL AND MECHANICAL COLLEGE,  
BLACKSBURGH, VIRGINIA, August 18th, 1884. }

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen*:—Your Surveyors' Solar Transit with all attachments, has been received and examined by me very carefully.

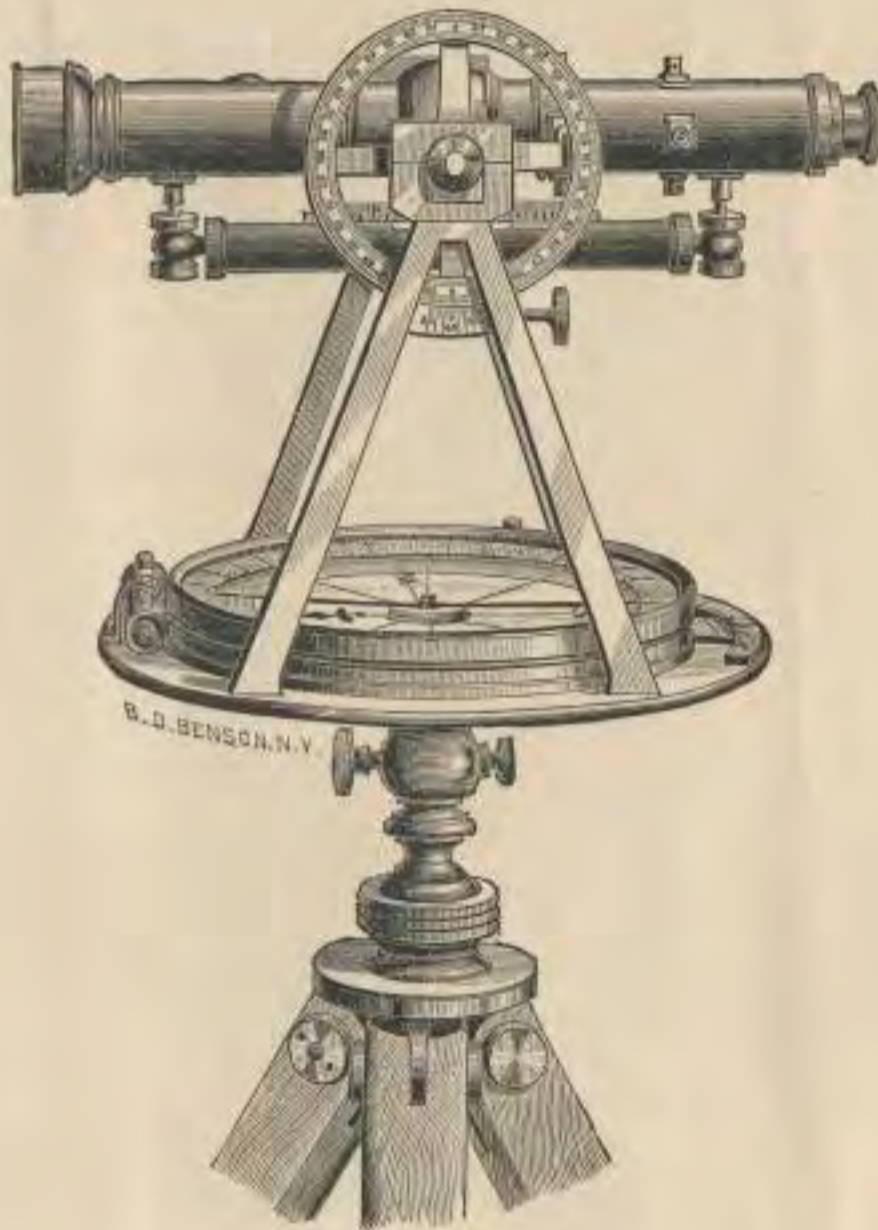
It is in perfect working order. I am unable to detect a flaw in its construction. The verniers are exact, the needle is quick, the telescope is powerful, and the Solar Attachment works so admirably that I can determine the latitude of our place with great precision. In fine, it is one of the best instruments that I have ever seen.

Very truly, &c.,

FLOYD DAVIS, *Civil & Mechanical Engineer.*



## VERNIER TRANSIT COMPASS.



No. 31. FIG. 23.

Price as shown, with 6-inch needle and tripod, \$101.00.

The Vernier Transit or Transit Compass has the same general properties as the Vernier Compass, but is furnished with a telescope in place of the ordinary sights. The telescope is from ten to twelve inches long, and sufficiently powerful to see and set a flag at a distance of two miles on a clear day.

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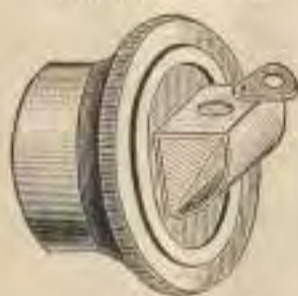
**PRICES.**

No. 28.—Vernier Transit, 4-inch needle, compass tripod, plain telescope.....	\$70 00
No. 28a.—Vernier Transit, same as above, but with $3\frac{1}{2}$ inch vertical circle, level on telescope, and clamp and tangent movement to axis of telescope, as in engraving.....	96 00
No. 29.—Vernier Transit, 5-inch needle, compass tripod, plain telescope.....	70 00
No. 29a.—Vernier Transit, same as above, but with vertical circle, level on telescope, and clamp and tangent movement to axis of telescope, as in engraving.....	96 00
No. 30.—Vernier transit, 6-inch needle, compass tripod, plain telescope... ..	75 00
No. 31.—Vernier Transit, same as above, but with vertical circle, level on telescope, and clamp and tangent movement to axis of telescope, as in engraving....	101 00





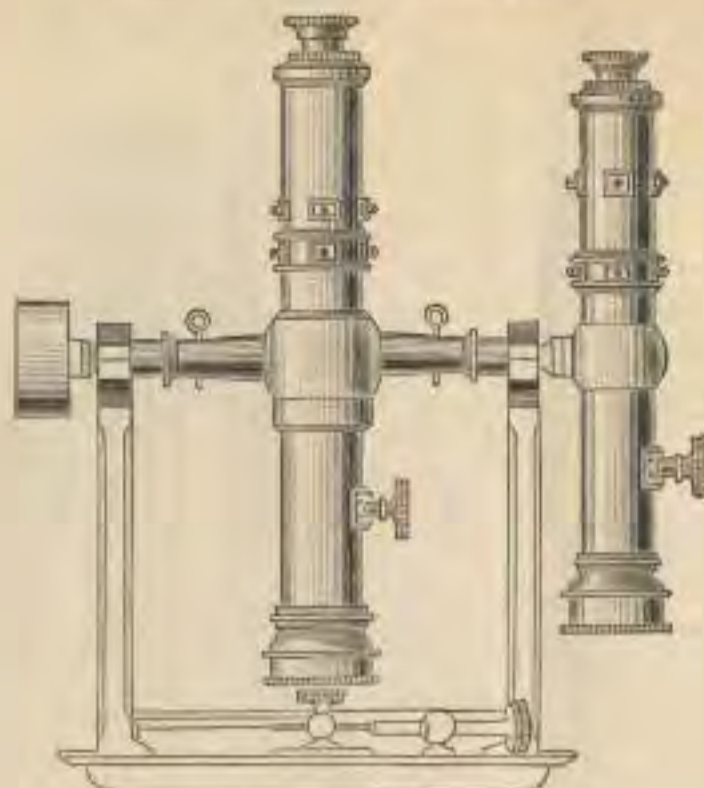
No. 38. FIG. 16.  
PLUMMET LAMP.



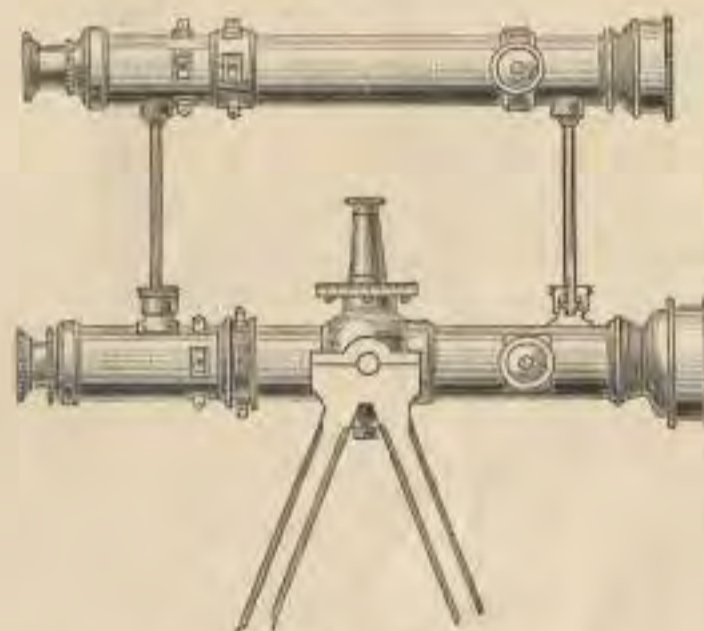
No. 39. FIG. 13.  
DIAGONAL PRISM.



No. 40. FIG. 12.  
REFLECTOR.



No. 50. FIG. 14.



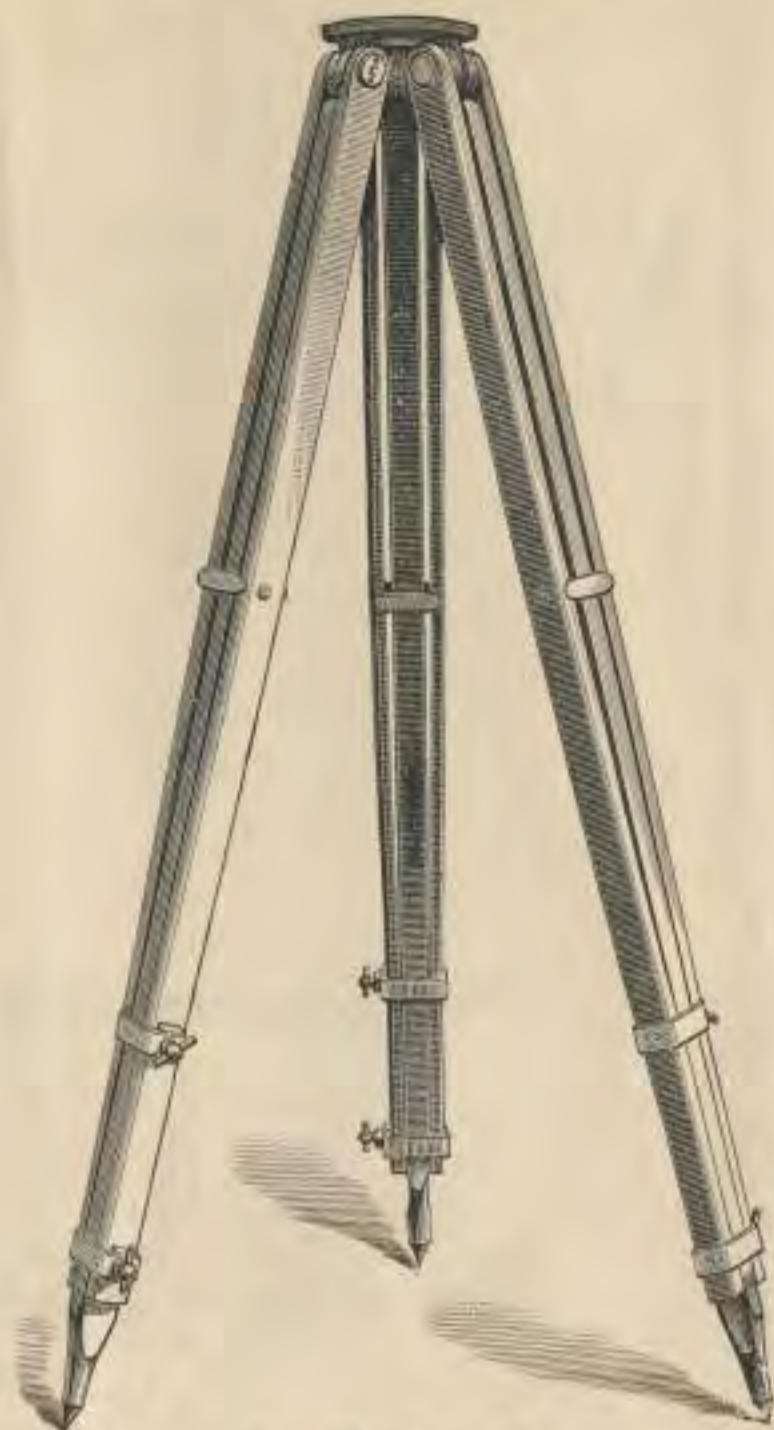
No. 50. FIG. 15.

EXTRAS TO TRANSITS.

No.	DESCRIPTION	PRICE.
35.	Patent Solar Attachment	\$60 00
36.	Variation Plate furnished with new Engineers' Transit when ordered	4 00
37.	Variation Plate added to any Engineers' Transit sent for repairs	15 00
38.	Plummet Lamp for Mining Engineering, hung in gimbals, Fig. 16	10 00
39.	Diagonal Prism for eye-piece, Fig. 13	8 00
40.	Reflector for object-glass of Transit Telescope, Fig. 12	4 00
41.	Vertical Circle, 3 1/4 inches diameter, divided on silver, vernier reading to five minutes	8 00
42.	Vertical Circle, 4 1/2 inches diameter, divided on silver, reading to single minutes	12 00
43.	Vertical Arc, 6 inches diameter, divided on silver, with vernier, movable by tangent screw, reading to 30 seconds	18 00
44.	Clamp and tangent movement to axis of telescope	6 00
45.	Gradienter, combined with clamp and tangent, Fig. 18	18 00
46.	Level on telescope, with ground bubble and scale	12 00
47.	Rack and Pinion movement to eye-piece	5 00
48.	Sights on telescope, with folding joints	8 00
49.	Sights on standards at right angles to telescope	8 00
50.	Detachable telescope for vertical sighting, either Fig. 14 or 15	25 00
51.	Graduations of limb on solid silver	10 00
52.	do do to read to 20' or 30'	10 00
53.	do do to read to 10'	30 00
54.	do on 4 1/2-inch vertical circle, to 20' or 30'	5 00
55.	Jones' Patent Latitude Arc, with reversible level bubble, Fig. 11	72 00
56.	Patent Latitude Level, for use with Solar Transit, as shown in Fig. 10 1/2	6 00
60.	Leveling tripod head, with clamp and tangent movement, fitted to Vernier Transit Compasses, Nos. 28 to 31	13 00 extra
61.	Patent extension tripod, furnished instead of regular tripod, with any new instrument,	5 00



## EXTENSION TRIPOD.



No. 60. FIG. 17.

We make three sizes of extension tripods, of which the medium size is shown in Fig. 17.

The Light Mountain Transit is almost always used upon our patent extension tripod, Fig. 17, in which all its legs can be shortened or lengthened at will. It is thus adapted for use in mountain surveys, where one or more legs must be shortened; or for mines, where in many places a short tripod is indispensable.

If desired, the sliding pieces can be easily turned end for end, the points being thus put out of the way, and the tripod more safely transported. The tripod when closed is only three feet long, and is carried by an ordinary shawl strap.

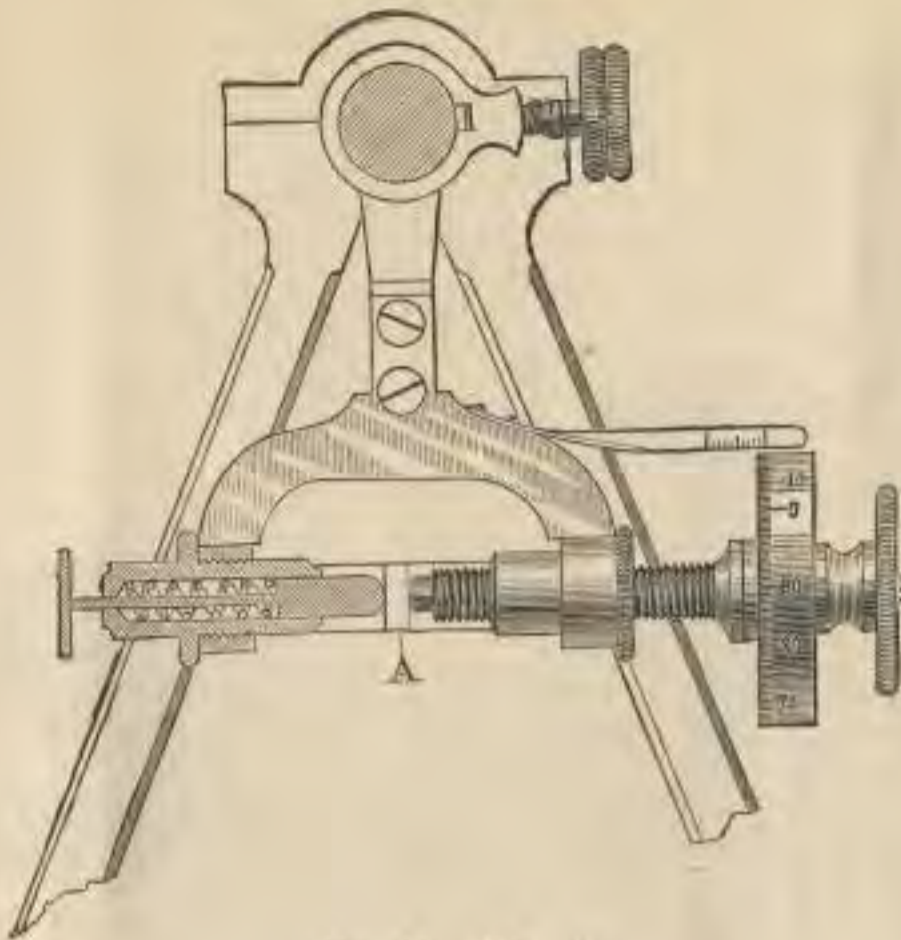
A larger size with bronze head and heavier legs is used with the larger transits and leveling instruments; and a smaller and lighter one with the various pocket compasses.

## PRICES.

No. 60.—Patent Extension Tripod for Transit or Level.....	\$15 00
No. 61.— do do do furnished instead of regular tripod, with any new instrument extra .....	5 00
No. 121.—Patent Extension Tripod furnished with any compass.....	10 00
No. 170.—Patent Extension Tripod for pocket compass.....	10 00



## GRADIENTER.



No. 45. FIG. 18.

Price as shown.....\$18.00

This attachment, as shown in Fig. 18, is often used with transits for fixing grades, determining distances, etc.

It consists mainly of a screw attached to the semicircular expanded arm of the ordinary clamp of the telescope axis; the screw is accurately cut to a given number of threads, and passing through a nut in one side of the arm, presses against a little stud, A, fixed to the inside surface of the right-hand standard.

In the other side of the semicircular arm is inserted a hollow cylinder containing a pin actuated by a strong spiral spring, the end of the pin pressing against the side of the stud opposite that in contact with the screw.

Near the other end of the screw, and turning with it, is a wheel, or micrometer, the rim of which is plated with silver, and divided into one hundred equal parts.

A small silver scale, attached to the arm and just above the micrometer wheel, is divided into spaces, each of which is just equal to one revolution of the screw; so that by comparing the edge of the wheel with the divisions of the scale, the number of complete revolutions of the screw can be easily counted.

It will be seen that when the clamp is made fast to the axis by the clamp-screw, and the gradienter screw turned, it will move the telescope vertically, precisely like the tangent-screw ordinarily used.

And as the value of a thread is such that a complete revolution of the screw will move the horizontal cross-wire of the telescope over a space of one foot on a rod at a distance of one hundred feet, it is clear that when the screw is turned through fifty spaces on the graduated head, the wire will pass over fifty one-hundredths, or one-half a foot on the rod, and so on in the same proportion.

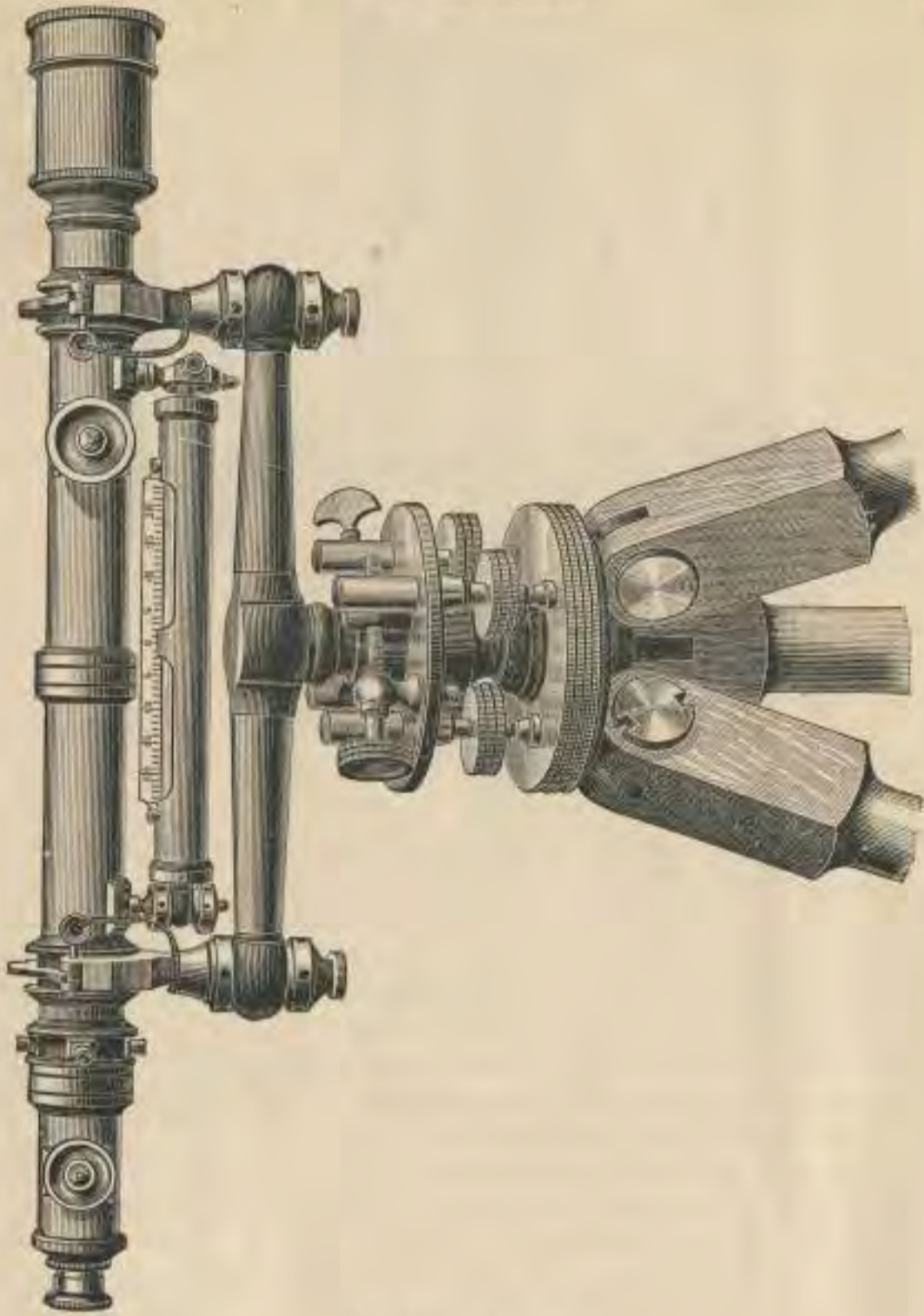
In this way the Gradienter can be used in the measurement of the distances, precisely like the stadia already described in the article on the Engineers' Transit.

Grades can also be established, with great facility, as follows: 1st, level the instrument; bring the telescope level to its centre by the clamp and gradienter-screw; move the graduated head until its zero is brought to the edge of the scale; and then turn off as many spaces on the head as there are hundredths of feet to the hundred in the grade to be established.



# LEVELING INSTRUMENTS.

## Y LEVELS.



No. 73. FIG. 42.  
20-INCH Y LEVEL.

Price as shown, including tripod, \$110.00.

Y Level, of the most improved form and construction, with telescope either 15, 18, 20 or 22 inches long. In this instrument the telescope is made to revolve readily and truly in the Y's by rings of bell metal, which when desired may be firmly clamped by the clips and held in any position. One Y clip is furnished with a horizontal stud fitting into a semi-cylindrical cut on the flange of the ring of the telescope, insuring the accurate position of the vertical wire. It has a rack and pinion movement to both object and eye glasses, an adjustment for centering the eye-piece, and another for insuring the accurate projection of the object-glass in a straight line. Both of these are completely concealed from observation and disturbance by a thin ring which slides over them. The Y's of this level are made large and strong of the best bell metal, and each has two nuts, both being adjustable with the ordinary steel pin. The level bar is made round of fine bronze, and shaped so as to possess the greatest strength in the parts most subject to sudden strains. The leveling plates are the same as those used with the Engineers' Transit.

No. 70.—Fifteen-inch telescope, with leveling tripod, Fig. 44.....					\$90 00
No. 72.—Eighteen-inch do do do do .....					110 00
No. 73.—Twenty-inch do do do Fig. 42.....					110 00
No. 74.—Twenty-two inch do do do .....					115 00



OTTAWA, OHIO, May 1st, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Sirs*:—I received my instrument (18-inch Y Level) in good condition. The Level gives me perfect satisfaction in all its parts in every respect, and I consider it a perfect instrument. One engineer who examined it said it is the best he ever handled.

Yours very truly,

H. T. SARBER, *Ass't County Surveyor*.

LONDON, MADISON CO., OHIO, March 13th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents*:—I am going to get me a new Transit and Y Level. I want you to send me one of your best 22-inch Y Levels at \$115. I do not want it any cheaper. From my humble standpoint I think you make the best levels that are made in the United States. I never heard of a poor one.

Yours, etc.,

J. ARNETT, *Civil Engineer*.

LEROY, OHIO, July 27th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs*:—The 20-inch Y Level that I purchased of you is a "darling." I could not wish for a more perfect instrument. It is the only level in this county, and I assure you that it has won laurels for itself and will continue so to do.

I am, very respectfully,

GEO. A. LATIMER, *Civil Engineer*.

RICHMOND, VA., September 11th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen*:—I have just telegraphed you "Send Level and Transit as before" which I now beg to confirm. Please send instruments\* such as you did in previous orders (which have given perfect satisfaction) and bill to me here.

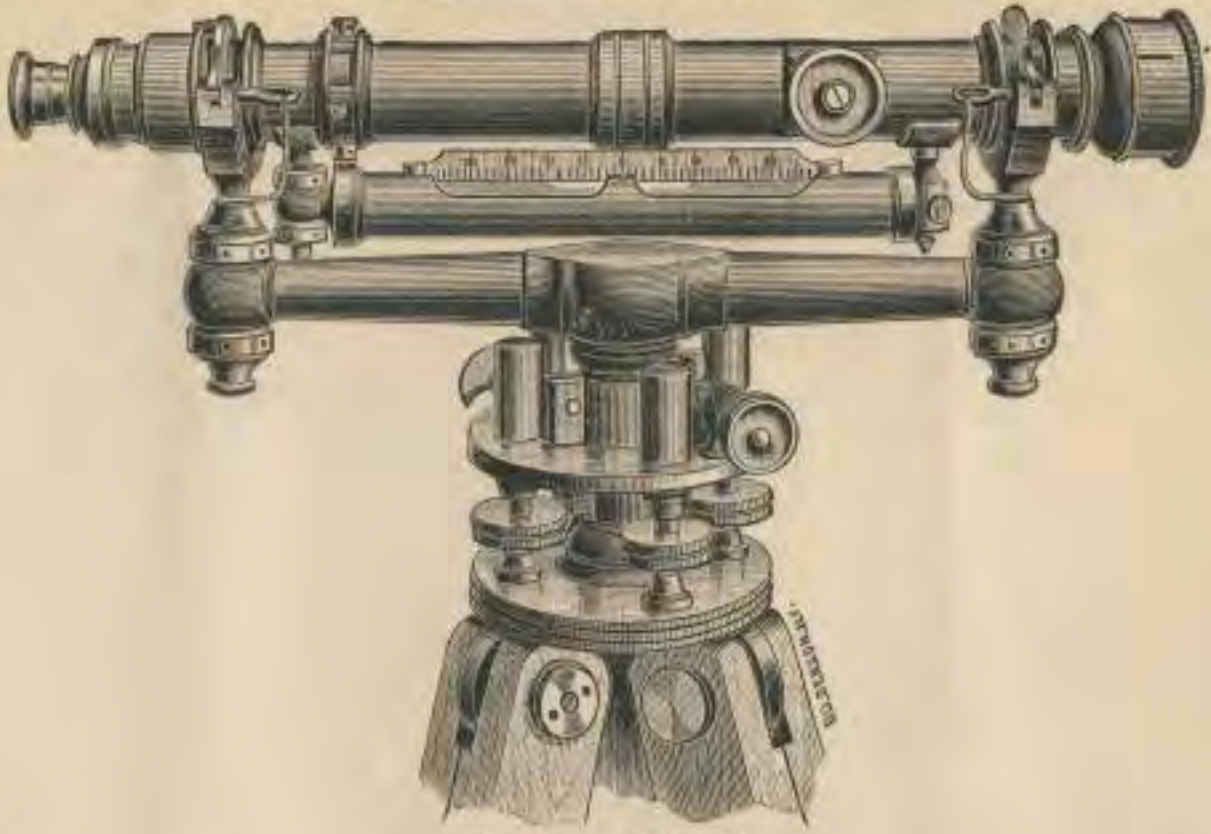
Very respectfully,

P. A. WELLFORD, *Vice-President, Virginia & Carolina R. R. Co.*

\* 5-inch Engineers' Transit, 20-inch Y Level.



## LEVELING INSTRUMENTS.

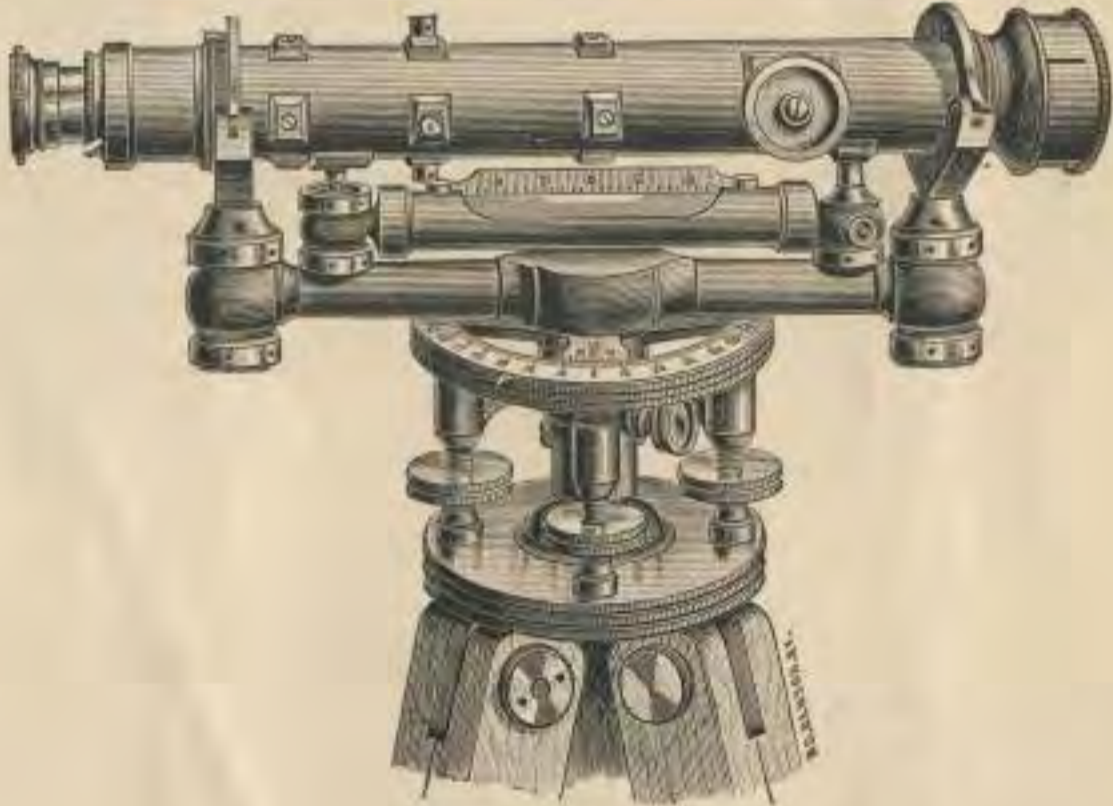


No. 70. FIG. 44.

Price as shown, with tripod, \$90.00.

Our fifteen-inch Level is shown in Fig. 44; it has the same arrangement of sockets, tripod, etc., as the larger instruments, but no pinion movement to the eye-piece. The leveling-head remains attached to the spindle, and is packed with it in the box; it is also somewhat smaller and lighter than those of the other sizes.

## THE ARCHITECT'S LEVEL.



No. 75. FIG. 45.

Price as shown, with tripod, \$45.00.

The figure represents the level introduced by us ten years ago, and which has since been very largely used by architects, builders, and millwrights in all sections of the country.

It has a telescope of 11 inches, mounted in wyes as usual; furnished with the accessories of the larger instruments, and adjusted in the same manner.

The leveling-head has the ordinary screws and a clamp to the spindle, but no tangent movement; it has also a horizontal circle of 3 inches diameter, fitted to the upper end of the socket and turning readily upon it; the circle is graduated to degrees, figured from 0 to 90 each way, and is read to five minutes by a vernier which is fixed to the spindle.



MARION, IND., October 2d, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents*:—Permit me to say that the Architects' Level has given eminent satisfaction; been no expense worth mentioning since I bought it, and has been in almost constant use, and for accuracy is the most reliable of any instrument I ever used in sixteen years' experience.

Respectfully,

L. M. OVERMAN, *Civil Engineer*.

STILLWATER, MINN., December 7th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents*:—If not rather late I wish to acknowledge the receipt of the Architects' Level you sent me. I have used the instrument and am pleased with it, finding it more of a Level than I expected.

Yours truly,

JAMES STEWART, *Civil Engineer*.

WHITE SULPHUR SPRINGS, GA.,

February 12th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs*:—I bought from you a year or two since one of your Architects' Levels. I think the money invested in it is the best of my life.

Respectfully, &c.,

JAS. F. OGLETREE, *C. E.*

BRIGHTON, MASS., December 8th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gents*:—I have tested the Architects' Level which you sent me and find it every way satisfactory. I have heretofore purchased all the cheap levels in the market, but found them defective. I have named yours "Eureka." I have instructed the express to forward the money at once.

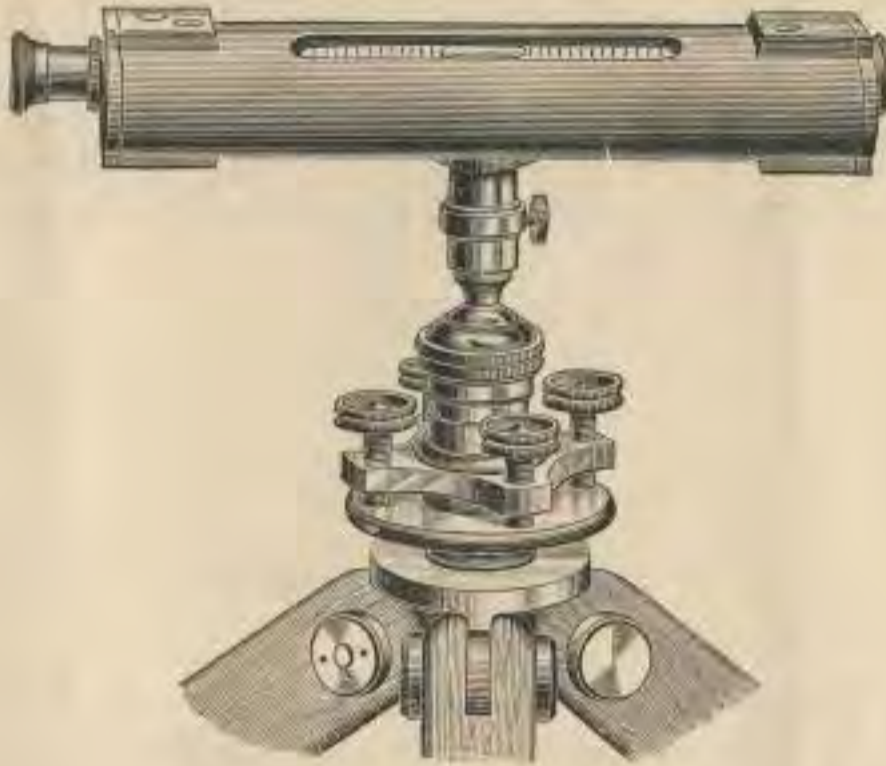
Respectfully yours,

SAMUEL N. DAVENPORT, *Architect and Builder*.



## FARMERS' OR DRAINAGE LEVEL.

PATENTED OCTOBER 16th, 1883.



No. 78. FIG. 47.

The figure represent a level devised by us combining the extremes of simplicity and compactness with real efficiency, and all at a very moderate cost. The telescope is about nine inches long and is made especially for this instrument, achromatic, of low but sufficient power, and good light and definition. The cross wires are fixed in the eye-piece so that they are not easily disturbed. The level and telescope are both inclosed and secured in a strong outside case of bronze from eight to nine inches long, two inches wide, and one and one-quarter inches high, oval in form.

A small socket screws into the under side of the case, and is fitted to a ball spindle, by which it is made approximately level, and then precisely so by the small leveling-screws, as shown. When desired the leveling-head can be dispensed with, and the instrument leveled on the ball alone.

The advantage of this level in the work of the farmer, manufacturer and builder, will be apparent on a simple inspection; for not only can drains be located and leveled, the height of springs ascertained, the accurate levels of lines of shafting, floor timbers, sills, etc., be determined, but when removed from its socket it can be applied, either by itself or on a straight edge, to the leveling of any surfaces of stone, wood, or metal.

In response to many inquiries and suggestions we now add to the Drainage Level, when desired, a three-inch needle magnetic compass. This is fitted securely to the upper surface of the case, is removable at pleasure, and while it does not interfere in any way with the reading of the level, it furnishes a ready means of determining the bearings of lines, or measuring angles by the needle.

The instrument with the staff-mountings, adjusting block and screw driver, is packed in a neat mahogany box with lock and key, and brass handle,

### PRICES.

No. 76.—Farmers' or Drainage Level, with jacob-staff mountings.....	\$15 00
No. 77.— do with plain tripod.....	20 00
No. 78.— do with tripod and leveling screws (Fig. 47).....	25 00
Compass with clamp screws to attach to Farmers' or Drainage Level.....	5 00



STATE AGRICULTURAL COLLEGE—DEPARTMENT OF ENGINEERING, }  
LANSING, MICHIGAN, December 5th, 1883. }

MESSRS. W. & L. E. GURLEY, TROY, N. Y.

*Gents* :—I have recommended your Drainage Level as the best one constructed at a price within the reach of all, and on examining and handling the instrument I felt that I could have praised it even much more. It is an excellent instrument, and in capable hands it can be made to do reliable and accurate work ; it seems to be as accurate as a standard sixteen-inch Y level ; it certainly is more convenient. The rod (Architects' Rod) is of especial merit, and for any surveyor who does leveling only occasionally, it is fully as good as the more costly and heavy New York rod. I consider it a marvel when we take into account its price.

Yours truly,

R. C. CARPENTER, *Professor of Engineering.*

GRINNELL, DAKOTA, February 7th, 1884.

MESSRS. W. & L. E. GURLEY, TROY, N. Y.

*Gents* :—I received one of your Drainage Levels, which I ordered through Mr. E. C. Town. I am very well pleased with it. I got it to lay irrigating ditches. It is just the thing.

Yours, etc.,

GEO. GRINNELL.

STATE AGRICULTURAL COLLEGE—RUTGER'S COLLEGE, }  
NEW BRUNSWICK, N. J., December 14th, 1883. }

MESSRS. W. & L. E. GURLEY, TROY, N. Y.

*Gentlemen* :—I tried the Drainage Level on the Farm the other day. It answers its purpose admirably. It is accurate enough for much of the work usually done by the Engineers' Level, so that it is sufficient for the most extended work of drainage or local improvement. Its mounting is such that work can be done very rapidly with it, and its price is such as to bring it easily within the reach of all who have any occasion for a level. I shall feel that I do the young men in our scientific school a service by showing them this instrument and recommending it as the best of its kind. The rod which accompanies it (Architects' Rod) is a good one, portable, accurate, and easily understood in its readings. You are welcome to use my name or any of the above in making known your Drainage Level.

Yours very truly,

GEO. H. COOK, *Professor of Agriculture.*

COLORADO AGRICULTURAL COLLEGE, }  
FORT COLLINS, COLORADO, February 28th, 1884. }

MESSRS. W. & L. E. GURLEY, TROY, N. Y.

*Dear Sirs* :—The Drainage Level you sent me has been received, and after a careful examination I am both astonished and delighted with its excellence. It is certainly an admirable instrument for our irrigating work here, and will prove an efficient aid to the agriculture of this region, and for this reason I shall use my influence to secure its extended trial.

I am, truly yours,

E. MEAD, *Prof. Mathematics.*

BOZEMAN, MONTANA, March 25th, 1884.

MESSRS. W. & L. E. GURLEY, TROY, N. Y.

*Gentlemen* :—I received the Drainage Level lately ordered and am highly pleased with it, as it fills a want long felt for an efficient, compact and cheap leveling instrument.

Respectfully,

J. M. ROBERTSON, *Civil Engineer.*



LEVELING RODS.



No. 190. FIG. 53.—Architects' Rod. Price, \$6.00.



No. 191. FIG. 51.—Troy Rod. Price, \$10.00.



No. 192. FIG. 49.—Boston Rod. Price, \$16.00.



No. 194. FIG. 48.—Philadelphia Rod. Price, \$16.00.

PRICES.

No. 190.—Architects' Rod, 5½ ft. closed, sliding, to 10 ft., Fig. 53. ....	\$6 00
No. 191.—Troy Rod, 6½ ft. closed, sliding to 12 ft., Fig. 51. ....	10 00
No. 192.—Boston Rod, 6 ft. closed, sliding to 11 ft., Fig. 49. ....	16 00
No. 193.—Philadelphia Rod, 7½ ft. closed, sliding to 13 ft., Fig. 48.....	16 00
No. 194.—Philadelphia Metric Rod, 2½ metres closed, sliding to 3½ metres.....	16 00



LEVELING RODS, (Continued.)



No. 195. FIG. 50.—New York Rod. Price, \$16.00.



No. 196. FIG. 53.—New York Rod, in 3 parts. Price, \$18.00.



No. 200. FIG. 53A.—English Rod. Price, \$24.00.



No. 215. FIG. 53 B.  
Rod Level. Price, \$3.00.



FIG. 53 C.  
Rod Level as applied to a Rod.

PRICES.

No. 195.—New York Rod, 6 $\frac{3}{8}$ ft. closed, sliding to 12 ft., Fig. 50.....	\$16 00
No. 196.—do in 3 parts, either 5 ft. closed, sliding to 13 ft., or 5 $\frac{1}{8}$ ft. closed, sliding to 14 $\frac{1}{4}$ ft. Fig. 53.....	18 00
No. 197.—do in 4 parts, 5 ft. closed, sliding to 16 ft.....	20 00
No. 198.—New York Metric Rod, 2 $\frac{1}{8}$ metres closed, sliding to 3 $\frac{1}{8}$ metres.....	16 00
No. 199.—Telemeter, or Stadia Rod, 6 ft. folded, unfolding to 12 ft.....	12 00
No. 200.—English Rod, telescope pattern, 5 ft. long, sliding to 14 ft., Fig. 53A.....	24 00

FLAG STAFFS, ETC.

No. 210.—6 feet long, with steel-pointed shoe, and divided off in feet, which are painted red and white alternately.....	\$2 50
No. 211.—8 feet long, do do do do.....	2 75
No. 212.—10 feet long, do do do do.....	3 00
No. 215.—Pocket Folding Rod level for plumbing a rod or flag staff, Figs. 53 B & C.....	2 00



### QUICK LEVELING TRIPOD-HEAD.

We have for several years past made a quick leveling arrangement, which was patented by us in November, 1878, and has given general satisfaction; it is specially adapted to tripod-heads of our own make, but can also be applied to those of other makers, as shown hereafter.

The arrangement of this attachment will be readily understood by inspection of the following cuts:

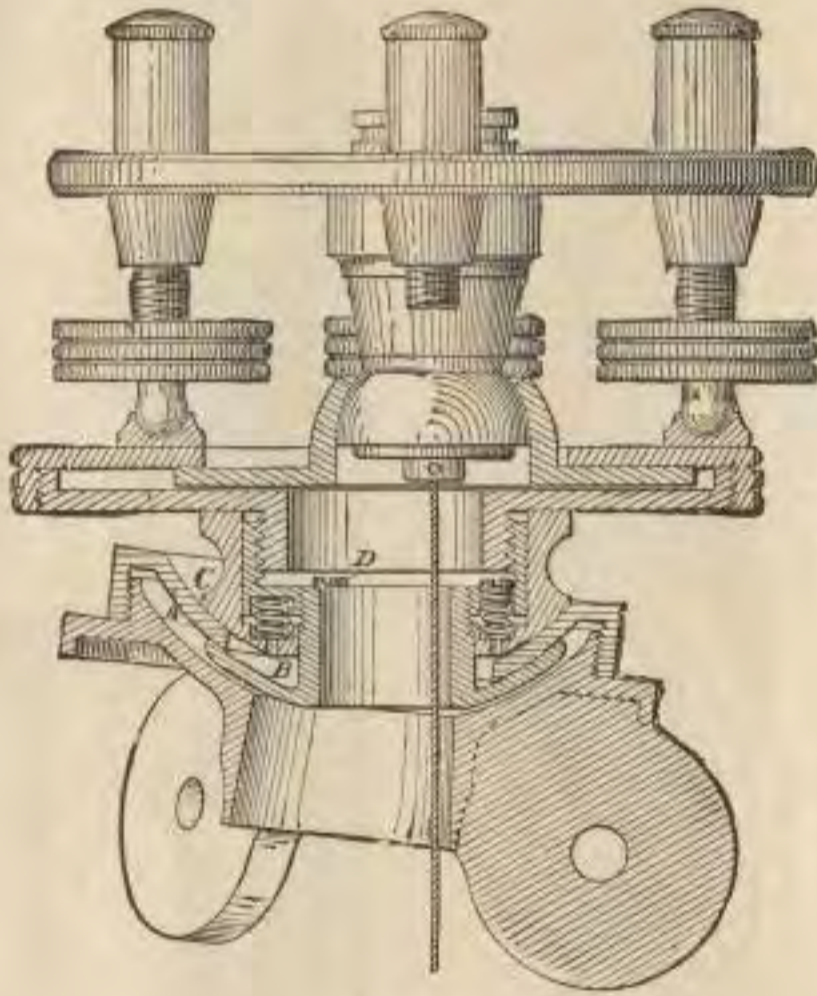


FIG. 65.

To use the quick leveling attachment, screw the instrument on the tripod as usual; if not nearly level, unscrew the leveling-head a very little—a bare loosening of the screw is sufficient. The instrument will then be free to move upon the spherical surfaces, A B C, in any direction required to bring the plates approximately level, and will be held in this position by the friction of the same surfaces.

Now, screw the head fast again, firmly clamping the whole instrument to the tripod. The final adjustment of the levels is then completed by the use of the leveling screws.

The friction of the spherical surfaces may be increased or diminished at will, by turning the screws (D) which compress the spiral-springs.

FIG. 65 shows the Quick Leveling Tripod, with shifting plate for use with Transit.



## QUICK LEVELING ATTACHMENT.

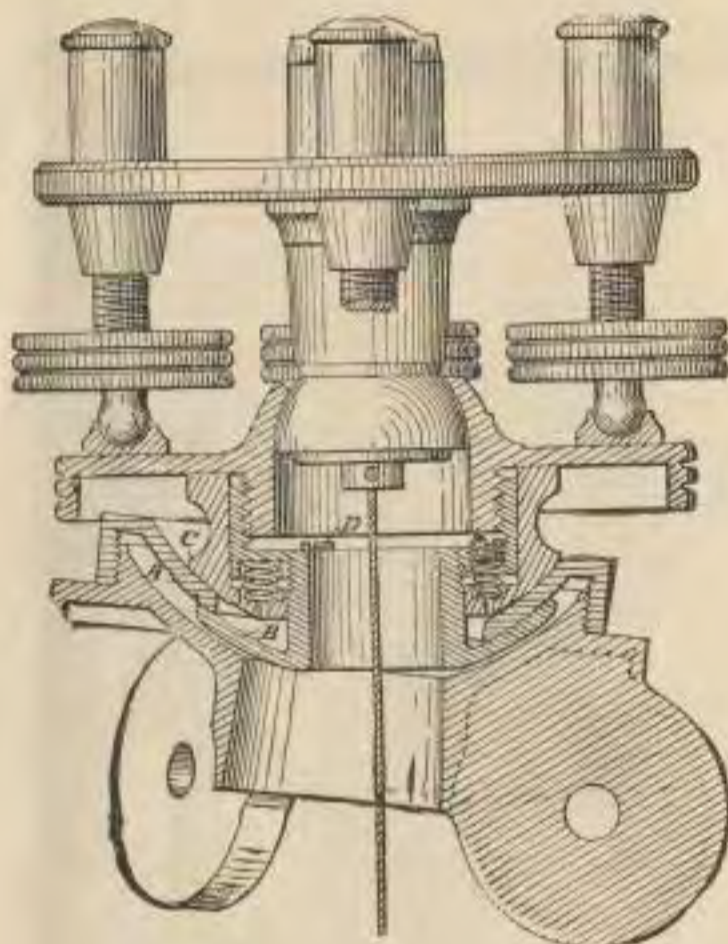


FIG. 66.

Fig. 66 shows the Quick Leveling Tripod-head designed for Level or Transit, and without shifting plate.

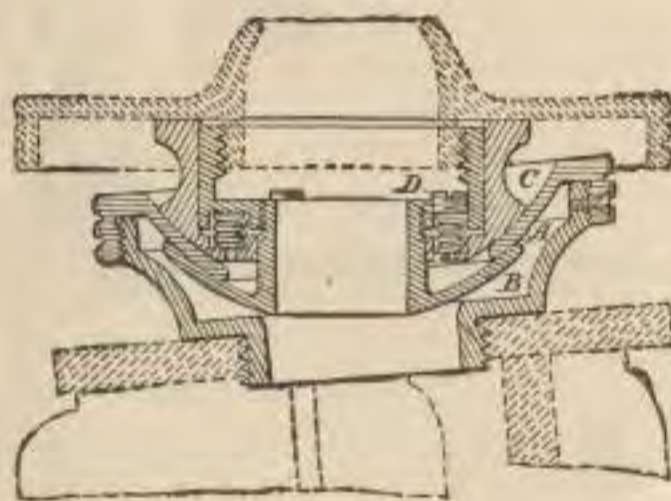


FIG. 67.

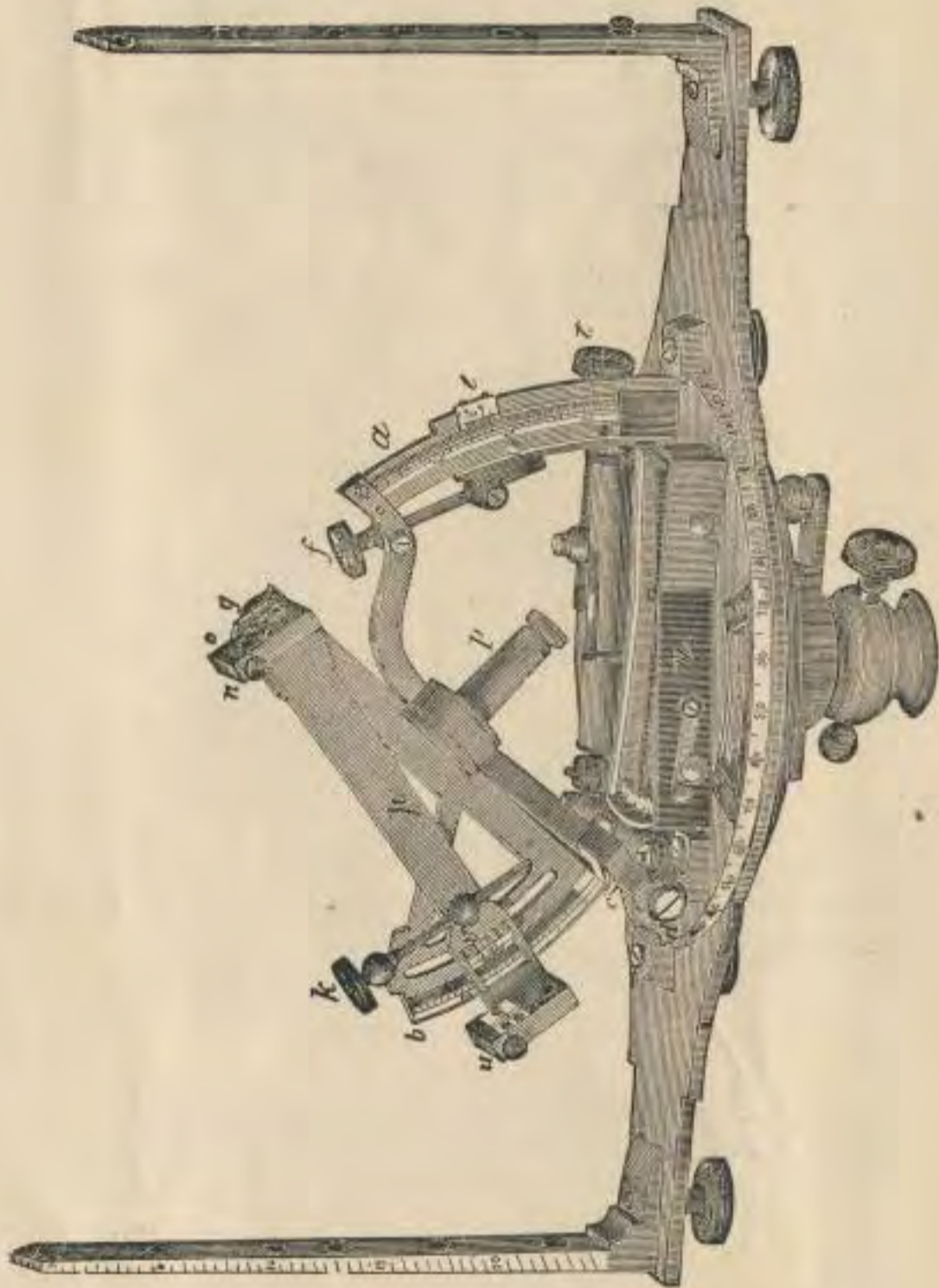
Fig. 67 shows the Quick Leveling Attachment as screwed fast to a Tripod of any pattern now in use.

**Prices.**—As shown in Figs. 65 and 66, when furnished with a new instrument, \$5.00. For same, adapted to any instrument already in use, as in Fig. 67, \$6.00.

**N. B.**—When Fig. 67 is ordered for any instrument, the lower plate of the leveling-head, as shown in outline of same figure, or the brass head of the tripod, the legs being removed, may be sent to us by mail or express, prepaid, with the remittance of—say \$7.00—to pay for attachment and return charges.



## THE SOLAR COMPASS.



No. 100. FIG. 25.

Price as shown, including leveling adopter, compound tangent ball, and leveling tripod, \$210.00.

COLUMBIA CITY, OREGON, October 28th, 1883.

MESSRS. GURLEY,

*Dear Sirs:*—The Solar Compass you sent me is a delightful instrument, always keeping its adjustments, and showing the true meridian. Would not be without it for five times its cost.

I am, your ob'd't serv't,

THOMAS S. WILKES, *Surveyor.*



## THE POCKET SOLAR COMPASS.



No. 140. FIG. 33.

Price as shown, \$105.00.

The Pocket Solar Compass, well shown in Fig. 33, has a needle 3 inches long, and a limb of  $4\frac{1}{2}$  inches diameter, divided to half degrees and reading by its one double vernier horizontal angles to single minutes.

The arrangement of the plates is similar to that of the large Solar Compass, the under plate carrying the sights revolving around the upper or compass plate, to which are attached the solar apparatus, levels, etc.; there is also a clamp with tangent-screw between the two plates, and another to the whole instrument about its spindle.

The solar apparatus is attached to the flange of the upper plate, and consists of the usual *hour*, *latitude* and *declination arcs*, marked respectively A, C, and B, in the cut, with an arm, F F, to the last named, carrying the solar lenses and lines as in the larger instruments. The latitude and declination arcs are each divided to half degrees, and read by verniers, the latitude arc to five minutes, and the declination arc to single minutes of a degree; the hour arc is divided on its inner edge into hours and twelfths, or spaces of five minutes each, the index of the declination arc above easily enabling one to read the time to single minutes.

## P R I C E S :

No. 140.—Price, with Staff Mountings.....	\$100 00
“ “ “ Light Tripod, as in Fig. 33.....	105 00
“ “ “ Light Extension Tripod.....	110 00
“ “ “ “ “ “ and Leveling Plates.....	150 00
No. 141.—Price, of Side Telescope and Counterpoise fitted to new Pocket Solar Compass.....	25 00
No. 142.—“ “ Leather Case with Shoulder Straps for new Pocket Solar Compass.....	5 00



## THE DIAL COMPASS.



No. 148. FIG. 41.

This little instrument has a needle three inches long, and with its compass circle is inclosed in a circular box set upon a brass base four inches square, three edges of which are chamfered and divided; one on the W-side of the compass into inches and tenths, the two others into degrees and half degrees, and figured from a centre on the south-west corner of the base.

The compass circle is movable in order to set off the variation of the needle, and has a vernier attached to it on the inside, reading a divided arc on the face of the compass to three minutes of a degree.

There is also on the south side of the face an arc of  $180^\circ$ , figured from 0 to 90 on each side of the south or zero line of the face.

A little pendulum with index point hung from the centrepin reads this arc, when the compass is set up, vertical, on the raised south edge, thus making it a clinometer or slope measurer.

The sight is hinged so as to fold in packing, but when erect makes taut a fine silk thread, attached at one end to the sight and at the other to a brass hour-circle above the compass glass, at an angle with the plane of the hour-circle equal to that of the latitude of the place where the compass is used. The hour circle is divided for any required latitude like that of a sun-dial, the hair serving as a gnomon to give apparent time with the sun.

## PRICE.

No. 148.—Simple Dial Compass, with removable hour arc, graduated for any latitude as ordered, two levels and clinometer, Fig. 41..... \$16 00



## THE PLANE TABLE.

This instrument, which has been so largely employed abroad in topography and map drawing, is now fast coming into use in our own country, especially in colleges and schools where the study of surveying is pursued.

To further popularize the Plane Table we have devised a number of different styles, varying mainly in the Alidades furnished with each, and supplying in all the grades an excellent instrument at a very moderate cost.



No. 92. FIG. 54.

Price as shown, \$120 00.

One style of Alidade is shown in the cut of the Plane Table, the brass rule being two inches wide, except where it is expanded one-third from the end to receive the base of the column.

The column supports the telescope with its attachments, the vertical circle being divided on silver and reading to single minutes.

The telescope is nine inches long, of a power of 20 diameters, provided with stadia, and adjusted and used like that of the Transit; it is also in line with the chamfered edge of the rule.

### PRICES:

No. 92.—Plane Table, with board, etc., like No. 90 .....	\$45 00
Combined compass and levels .....	15 00
Alidade with telescope 9 inches long, power 20 diameters, with stadia, vertical circle to 5 minutes, level on telescope, and clamp and tangent, mounted on column as in engraving, Fig. 54 .....	70 00
Total .....	<u>\$130 00</u>



### THE PLANE TABLE, (Continued.)

The construction of the socket and tripod head is shown in Fig. 55, in which *a* represents the hemispherical concave metal cup fastened by six screws to the wood top of the tripod, *b* the upper or convex part fitting nicely into the cup and clamped to it at will by the clamping piece *c* and nut *d*; a strong spiral-ring in the hollow cylinder between *c* and *d*, serves to hold the two spherical surfaces of the socket together, and allow of the easy movement of the one within the other in the leveling of the table.

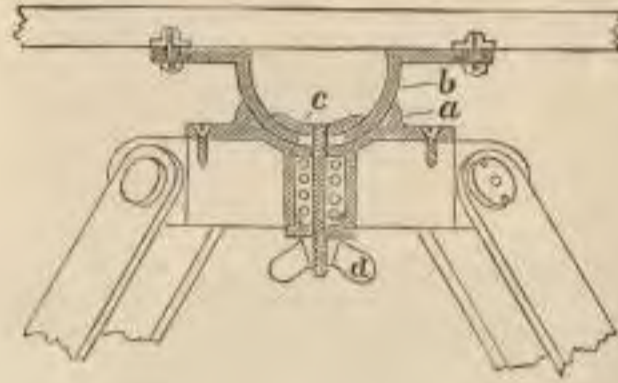


FIG. 55.

### THE ALIDADES.

The different styles of our Plane Tables vary only in their Alidades, of which we make four kinds.



No. 90. FIG. 56.

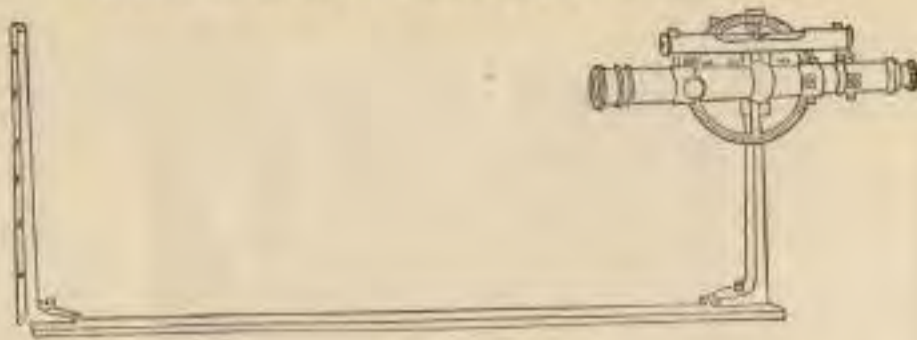
Price, \$15.00.

The most simple Alidade is shown in Fig. 56, and consists of a brass rule or straight edge, twenty inches long and two to three inches wide, at the ends of which are screwed sight-vanes, like those of the ordinary compass; the edge of the rule being chamfered and in line with the slots of the vanes.

No. 90.—Plane Table, board 24 x 30 inches, mounted on large tripod, with leveling socket and clamp, and with plumbing bar, plummet, and clamps for paper.....	\$45 00
Combined compass and levels, with square base.....	15 00
Alidade with compass sights, Fig. 56.....	15 00
Total.....	\$75 00



**THE PLANE TABLE, (Continued.)**



No. 91. FIG. 57.

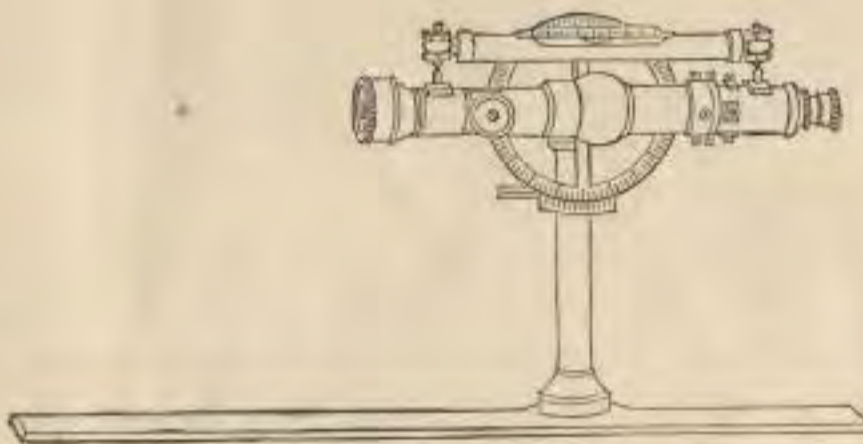
Price.....\$50.00

FIG. 57 shows the simple Alidade, to which is fitted the telescopic sight, having a level, clamp and tangent, and vertical circle reading to five minutes, attached to the telescope, which is also supplied with micrometer wires.

The telescope is placed in line with the straight-edge, as before.

**PRICES.**

No. 91.—Plane Table, with board, etc., as in No. 90.....	\$45 00
Combined compass and levels .....	15 00
Alidade like No. 90, supplied with telescopic sight, No. 182, with stadia, vertical circle to 5 minutes, level, and clamp and tangent, Fig. 57.....	50 00
Total.....	\$110 00



No. 93. FIG. 58.

Price.....\$90.00

In the Alidade shown in Fig. 58, the telescope is precisely the same as that used on our best Transits, being also supplied with the level, clamp and tangent, vertical circle on silver reading to single minutes, and micrometer wires for measuring distances.

It is placed on the brass rule precisely like that of the one last described, and is adjusted and used in the same manner.

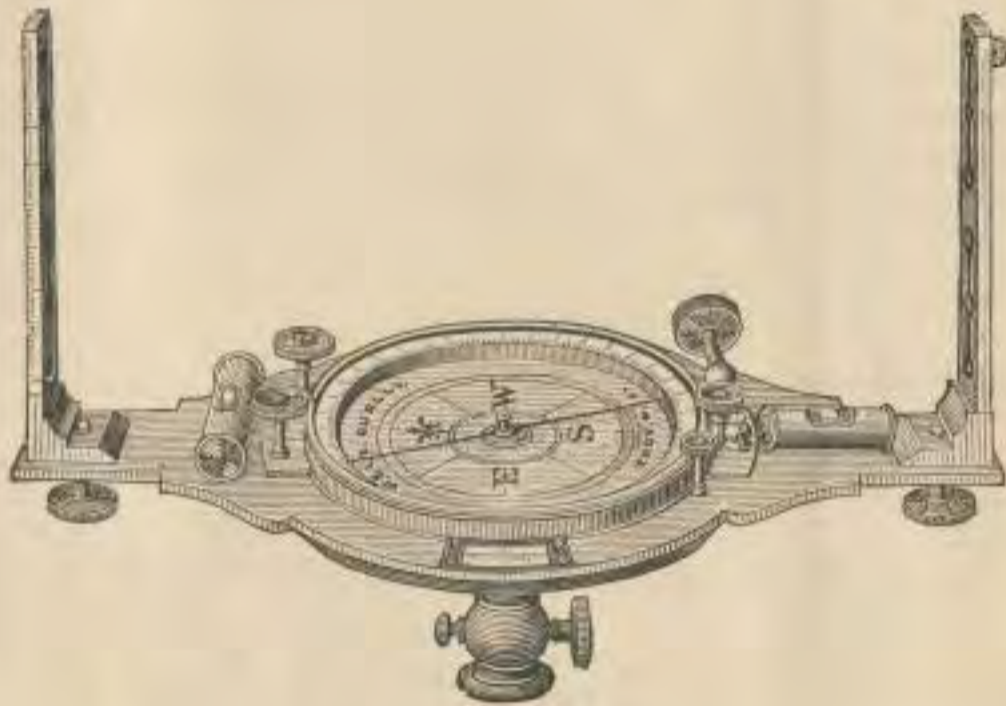
**PRICES.**

No. 93.—Plane Table, with board, etc., like No. 90.....	\$45 00
Combined compass and levels.....	15 00
Alidade with telescope 11 inches long, with stadia, $4\frac{1}{2}$ -inch vertical circle on silver to 1 minute, level on telescope, and clamp and tangent, on column, power of telescope 24 diameters, Fig. 58.....	90 00
Total.....	\$150 00
No. 96.—Set of three leveling screws for any of the above-named Plane Tables, extra.....	10 00
No. 97.—Clamp and tangent, for movement in azimuth, extra.....	10 00



# SURVEYORS' COMPASSES.

## RAILROAD COMPASSES.



No. 105. FIG. 29.

The Railroad Compass has the main plate, levels, sights and needle, jacob-staff mountings, brass cover, out-keeper, and vernier for setting off the variation of the needle of the ordinary Surveyors' Compass, but has also underneath the main plate a divided circle or limb, by which horizontal angles to single minutes can be read independently of the needle. In mahogany box, with lock and strap.

### PRICES.

No. 105.—Railroad Compass, $5\frac{1}{2}$ -inch needle, one vernier to limb .....	\$60 00
No. 106.—Railroad Compass, 5-inch needle, two verniers to limb.....	70 00
No. 107.—Railroad Compass, same as above, but with $5\frac{1}{2}$ -inch needle.....	75 00

Mt. Carmel, Md., April 24th, 1883.

Messrs. W. & L. E. Gurley, Mathematical Instrument Makers, Troy, N. Y.

*Gentlemen* :—The Railroad Compass which I received of you gives perfect satisfaction. With it I can do the most accurate work, and in retracing old lines, which forms the principal part of my work, it comes out right every time.

Yours with respect,

THOMAS KELBAUGH, *Surveyor.*



## VERNIER COMPASSES.



No. 112. FIG. 30.

## PRICES.

- No. 110.—Surveyors' Compass, 4-inch needle, two straight levels, jacob-staff mountings, brass cover, out-keeper, vernier under the glass for adding or subtracting the magnetic variation of the needle, sights graduated for taking angles of elevation and depression. In mahogany box with lock, and strap for carrying..... \$30 00
- No. 111.—Surveyors' Compass, same as above, but with 5-inch needle.... 35 00
- No. 112.—Surveyors' Compass, same as above, but with 6-inch needle and vernier outside, as shown in engraving..... 40 00





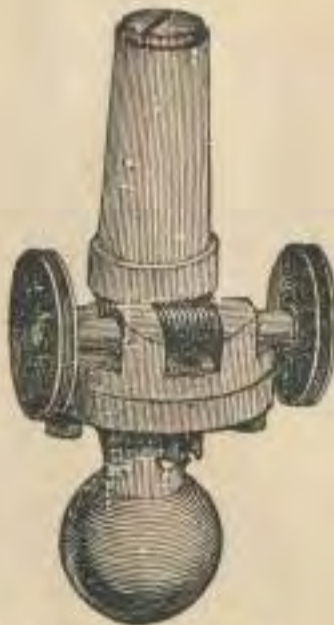
PLAIN COMPASSES.  
No. 115. FIG. 31.

PRICES:

No. 115.—Surveyors' Compass, 4-inch needle, two straight levels, jacob-staff mountings, brass cover, out-keeper, sights graduated for taking angles of elevation and depression. In mahogany box with lock, and strap for carrying.....	\$25 00
No. 116.—Surveyors' Compass, same as above, but with 5-inch needle.....	30 00
No. 117.—Surveyors' Compass, same as above, but with 6-inch needle.....	35 00

Extras to Compasses.

No. 120.—Compass Tripod, cherry legs.....	5 00
No. 121.—Patent Extension Tripod, furnished with any compass.....	10 00
No. 122.—Compass Tripod, with leveling screws, and clamp and tangent movement.....	18 00
No. 123.—Compass Tripod Mountings, without legs.....	4 00
No. 124.—Compound Tangent Ball, Fig. 24.....	6 00
No. 126.—Leveling adopter, large size, Fig. 27 a.....	7 00



No. 124. FIG. 24.



FIG. 27.

The price of the leveling adopter, without tripod or ball spindle, is \$7.00; with tripod and compound tangent ball, as shown in Fig. 27, \$18.00.



## TELESCOPIC SIGHT.

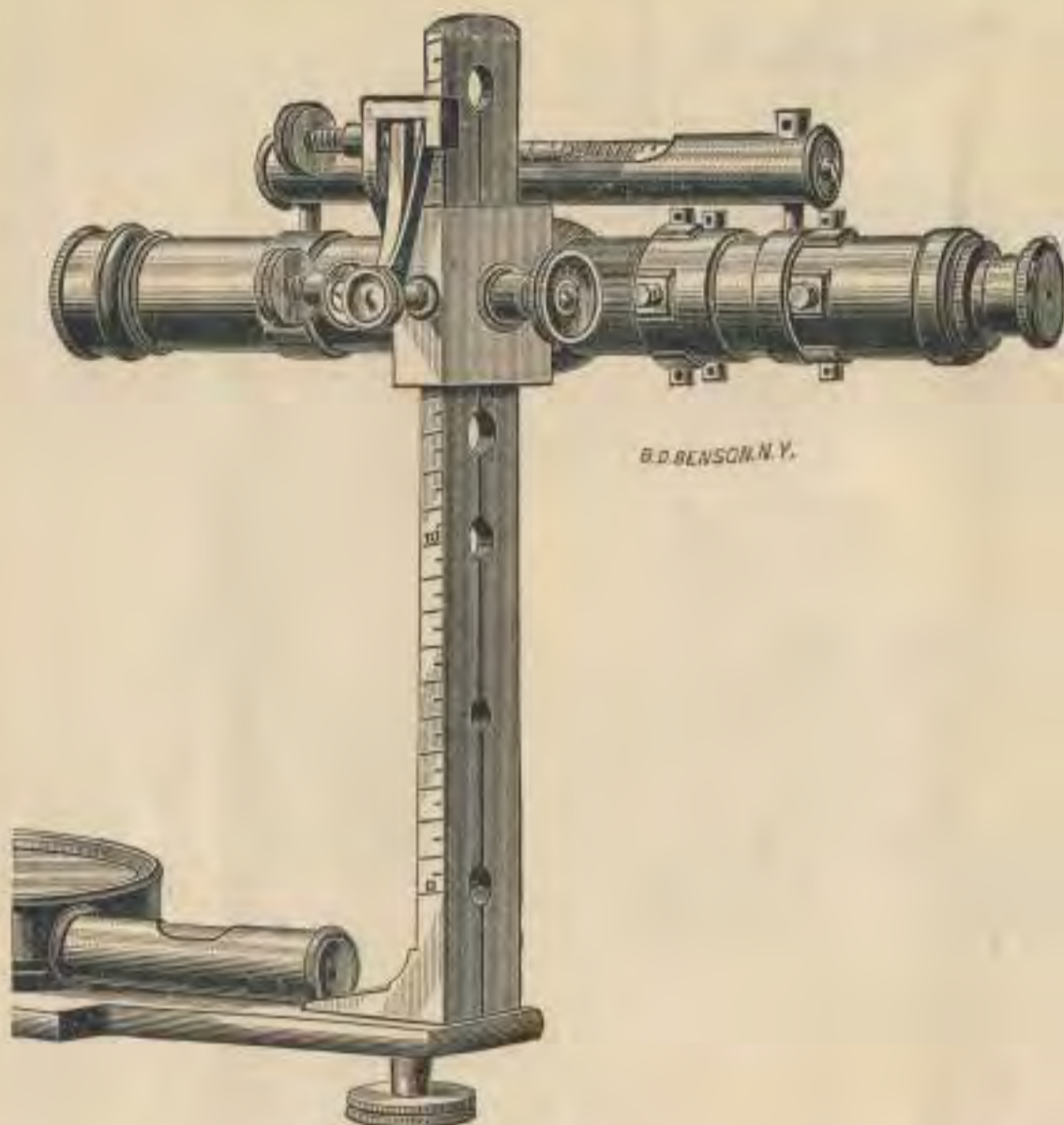


FIG. 28

Telescope No 132, with Level, and Clamp and Tangent (Nos. 134 and 135).

Price, as shown, \$30.00.

*Telescopic Sight Attachable to Compass Sight. Patented July 9, 1878.*

## PRICES:

No. 130.—Nine-Inch Achromatic Telescope, power about 10 diameters.....	\$12 00
No. 131.—Nine-Inch Achromatic Telescope, larger diameter of object glass and power about 20 diameters. ....	17 00
No. 132.—Same Telescope as No. 131, but furnished with micrometer or stadia wires for measuring distances.....	20 00
We add to any TELESCOPIC SIGHT the following extras, at prices annexed :	
No. 133.—Vertical Circle, Vernier to 5 minutes.....	5 00
No. 134.—Level on Telescope.....	5 00
No. 135.—Clamp and Tangent to Axis of Telescope.....	5 00

BELTON, TEXAS, May 28th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen* :—Have you a Pocket Solar Ephemeris for 1883? The Official (U. S.) almanac is entirely too cumbersome, and you spoiled me by sending your pocket Ephemeris for 1881. What will you charge to put a vertical circle and tangent screw on the micrometer telescope that you attached to my solar compass in 1881? I take pleasure in saying to you that the telescope you sent me, in the language of Pat Muloney, is a "jewell intirely."

Respectfully yours, etc.,

ED. T. RUCKER, *Civil Engineer.*



## Plain Pocket Compass.



Nos. 150 to 154. FIG. 38.



FIG. 64.

## Vernier Pocket Compass.



No. 155 and 156. FIG. 36.

Price as shown,  $3\frac{1}{2}$ -inch needle, with tripod, \$21.00.  
If  $4\frac{1}{2}$ -inch needle, and tripod, \$23.00.

## Pocket Compasses and Extras.

150.—With folding sights, $2\frac{1}{2}$ -inch needle, very serviceable for retracing lines once surveyed,	\$8 00
151.—Same as above, with jacob-staff mountings, Fig. 38	10 00
152.—With $3\frac{1}{4}$ -inch needle, and jacob-staff mountings, Fig. 38	12 00
153.—Same as above, and two levels	13 50
154.—Same as 152, but without jacob-staff mountings	10 00
155.—Vernier Pocket Compass, with folding sights, staff mountings, two levels, and $3\frac{1}{2}$ -inch needle, Fig. 36	16 00
156.—Same as above, $4\frac{1}{2}$ -inch needle, Fig. 36	18 00
167.—Leather case with shoulder strap, for pocket compasses	according to size, 2 00 to 5 00
168.—Tripod for pocket compass	5 00
169.—Tripod for pocket compass, with leveling plates and clamp and tangent	15 00
170.—Patent extension tripod for pocket compass	10 00
171.—Tangent movement for ball spindle of pocket compasses, Nos. 151 to 159	5 00
172.—Rack movement to vernier of Vernier Pocket Compass	4 00
173.—Leveling adopter, small size, Fig. 64 a	5 00

## Leveling Adopter.

We have just introduced the appliance shown in Fig. 64, at *a*, for use with the Pocket Compasses, &c., giving in connection with the ball, a rapid and accurate means of leveling any of the smaller instruments. Its weight is less than one pound; it can be attached to the lighter tripods by merely removing the brass cap, and its value and use are apparent on inspection.

Price, \$5.00. (See Price List, No. 173.)

We also make a larger size of the adopter for use with our larger compasses.

Price, \$7.00. (See Price List, No. 126.)



## VERNIER POCKET COMPASSES.

WITH TELESCOPIC ATTACHMENT, etc.



No. 161. FIG. 37.

Price, complete as shown, \$60.00.

This engraving shows the attachment of our new TELESCOPIC SIGHT, with the extras of Level, Vertical Circle to 5' and Clamp and Tangent to axis of telescope, to our 4½-inch needle Vernier Pocket Compass—which has also a clamp and tangent to the main spindle or socket.

Thus furnished, this light and popular instrument becomes a Transit Compass for ordinary land surveying or reconnoissance, with power to give levels and grades with accuracy sufficient for the common practice of the surveyor.

## PRICES:

No. 160.—Vernier Pocket Compass, 4½-inch needle with clamp and tangent to the main spindle or socket, and fitted with our new telescopic sight No. 130, with the extras of level, vertical circle to 5', and clamp and tangent to axis of telescope.....	Price, including tripod, \$55 00
No. 161.—Same as above, but with telescopic sight No. 131, Fig. 37.....	60 00
No. 162.—do do do No. 132 .....	63 00

NOTE.—The sights are placed at one side so that the telescope may be directly over the center.

CLINTON, ONEIDA Co., N. Y., Nov. 30th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen:*—It will be two weeks to-morrow since I received the Vernier Pocket Compass (No. 161). I have determined the meridian approximately, by observations on the Pole Star, tested the graduations of the compass circle in many different points; surveyed four farms with it; tested the vertical circle upon accessible vertical objects. I think it is a good instrument, and will retain it.

A. M. SCRIPTURE, *Surveyor.*



## POCKET RAILROAD COMPASS.



No. 159. FIG. 34.

Price as shown, with tripod.....\$45.00.

This instrument is a single vernier Railroad Compass in miniature.

The limb is five inches in diameter, and reads to single minutes by the vernier. The needle is  $3\frac{1}{2}$  inches long, and its variation can be set off to single minutes.

The price of this little instrument, with staff mountings only, is \$40; with light tripod, \$45; and if with extension tripod, \$50.



RAILROAD POCKET COMPASSES.



No. 159B. FIG. 35.

Price.....\$70.00.

In this style of the Railroad Pocket Compass the plates are circular, the sights being screwed to the lower one, the compass-circle above, and turning around the lower plate to set off the variation of the needle.

The limb is underneath the compass-face, but not shown in the cut, and read by one double vernier under the glass to single minutes.

When the telescope is applied, the sights are placed to one side of the line of zeros, and the telescope is then brought into that line, and over the centre of the instrument.

PRICES:

No. 157.—Railroad Pocket Compass, with folding sights, staff mountings, two levels, $3\frac{1}{2}$ -inch needle, with limb reading to five minutes.....	\$23 00
No. 158.—Railroad Pocket Compass, $4\frac{1}{2}$ -inch needle, clamp and tangent to limb, with limb reading to one minute.....	28 00
No. 159.—Railroad Pocket Compass, one vernier to limb, Fig. 34.....	40 00
No. 159A.—Railroad Pocket Compass, $4\frac{1}{2}$ -inch needle, clamp and tangent to limb, with limb reading to one minute, with clamp and tangent to the main spindle or socket, and fitted with our new telescopic sight, No. 130, with the extras of level, vertical circle to 5', and clamp and tangent to axis of telescope.....	Price, including tripod, 65 00
No. 159B.—Same as above, but with telescopic sight, No. 131, Fig. 35.....	70 00
No. 159C.— do do do No. 132.....	73 00



## MINERS' COMPASSES OR DIPPING NEEDLES.



FIG. 39. Nos. 178 and 179.  
Price, \$12.00.



FIG. 40. Nos. 181 and 182.  
Prices, \$12.00 and \$15.00.

## For Tracing Veins of Magnetic Iron Ore.

The Dip Compasses, two forms of which are shown in Figures 39 and 40, consist essentially of a magnetic-needle so suspended as to move readily in a vertical direction, the angle of inclination or "dip" being measured upon the divided rim of a small compass-box.

When in use, the ring or bail is held in the hand—the compass-box by its own weight takes a vertical position—and must also be in the plane of the magnetic meridian.

In this position the needle, when unaffected by the attraction of iron, assumes a horizontal line, as shown by the zeros of the circle. When brought over any mass of iron it dips, and thus detects the presence of iron ores with certainty.

If the Miners' Compass is held horizontally it serves as an ordinary Pocket Compass, and indicates the magnetic meridian, in the plane of which it should be held when used to ascertain the dip of the place where the observation is made.

## PRICES.

No. 178.—3-inch needle, glass on both sides, wood box, stop to needle, Fig. 39.....	\$12 00
No. 179.—do do do do brass covers, stop to needle.....	12 00
No. 180.—do do one side, brass cover, stop to needle.....	12 00
No. 181.—"Norwegian Needle," glass on both sides, brass covers, 3-inch needle, superior article, Fig. 40.....	12 00
No. 182.—Same as above, 4-inch needle.....	15 00
The first three of the Miners' Compasses furnished without stop (each).....	10 00

NOTE.—No instrument made that will indicate the presence of gold or silver.



## LOCKE'S HAND LEVEL,



FIG. 59,

Consists of a brass tube about six inches long, having, as shown in the figure, a small level on top and near the object end, there being also an opening in the tube beneath through which the bubble can be seen, as reflected by a glass prism, immediately under the level. The level of any object in line with the eye of the observer is determined by sighting upon it through the tube and bringing the bubble of the level into a position where it is bisected by a cross wire.

## PRICES:

No. 185.—Bronze, in box, Fig. 59. ....	\$9 00
No. 186.—Nickel Plated, in box, Fig. 59 .....	10 00

## THE ABNEY LEVEL AND CLINOMETER.

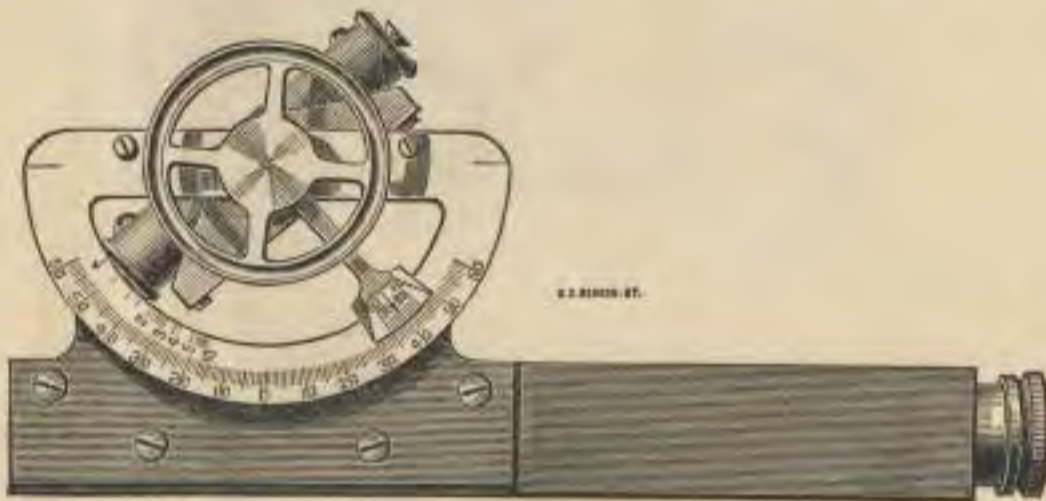


FIG. 60. Price, \$15.00.

The Abney Level, Fig. 60, is an English modification of that shown in Fig. 59, combining with it an excellent clinometer, as represented in the cut.

Here, when the level is brought to the centre by setting the vernier arm to zero, on the divided arc, the bubble is seen through the eye end and the level ascertained precisely as with the Locke's Level. And the main tube being square it can be applied to any surface, the inclination of which may be ascertained by bringing the level bubble into its centre, and reading off the angle to five minutes, by the vernier and arc.

The inner and shorter arc indicates the lines of different degrees of slope, the left-hand edge of the vernier being applied to the lines, and the bubble brought into the centre, as usual.



## ODOMETERS.

*For measuring distances by the revolution of a Carriage Wheel.*

No. 365.



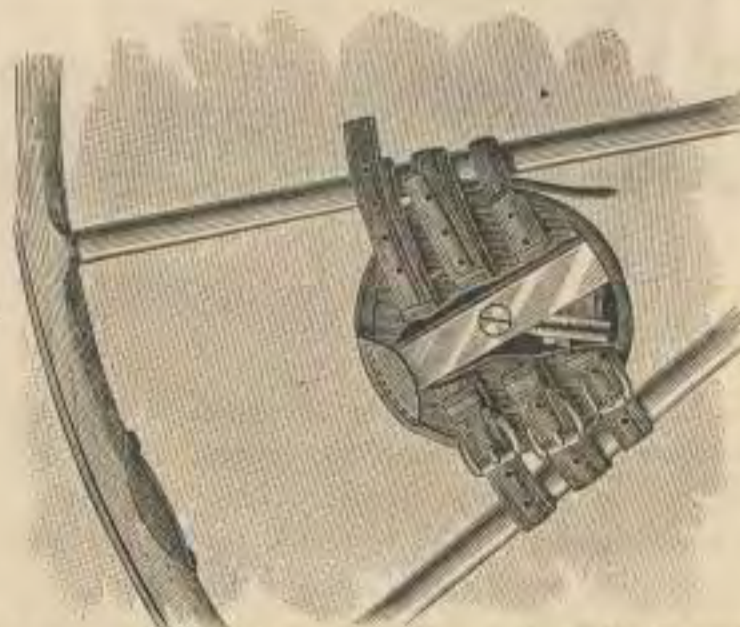
FIG. 63.

No. 366.



FIG. 61.

FIG.



62.

Can be attached to any carriage without injury to the wheel, and removed at pleasure. The circumference of the wheel being given, the distance is obtained by multiplying it by the number of revolutions recorded on the dials.

**PRICES:**

No. 365.—Odometer, Fig. 63, outside dial, with bolts for attaching, complete.....	\$10 00
No. 366.—Odometer, Fig. 61, inside dial, with leather case and straps.....	15 00



## CHAINS.

No.						Price.
220.	66 feet,	100 links,	with oval rings,	No. 8 refined iron wire,		\$4 00
221.	66 do	100 do	do do	10 do		3 50
222.	33 do	50 do	do do	8 do		2 50
223.	33 do	50 do	do do	10 do		2 25
224.	100 do	100 do	do do	8 best steel wire		10 00
225.	100 do	100 do	do do	10 do		8 50
226.	50 do	50 do	do do	8 do		5 50
227.	50 do	50 do	do do	10 do		4 75
228.	66 do	100 do	do do	8 do		9 00
229.	66 do	100 do	do do	10 do		7 00
230.	33 do	50 do	do do	8 do		5 00
231.	33 do	50 do	do do	10 do		4 00

## STEEL BRAZED CHAINS.

235.	100 feet,	100 links,	No. 12 steel, spring temper, brazed links and rings		\$11 50
236.	66 do	100 do	do do do do		10 00
237.	50 do	50 do	do do do do		6 00
238.	33 do	50 do	do do do do		5 50

The sale of our steel brazed chains is constantly increasing, and they displace the ordinary chains wherever they are tried, on account of superior lightness and strength. They are practically the only chains now used in railroad construction.

Pennsylvania chains of 2 and 4 poles, with 40 and 80 links, same price as chains of 50 and 100 links.

## SPANISH VARA AND FRENCH METRE CHAINS.

FOR USE IN TEXAS, MEXICO, SOUTH AMERICA, AND CUBA.

240.	10 varas or 10 metres,	50 links,	No. 10 refined iron wire		\$2 25
241.	20 do	20 do	100 do	10 do	3 50
242.	10 do	10 do	50 do	8 do	2 50
243.	20 do	20 do	100 do	8 do	4 00
244.	10 do	10 do	50 do	10 best steel wire	4 00
245.	20 do	20 do	100 do	10 do	7 00
246.	10 do	10 do	50 do	8 do	5 00
247.	20 do	20 do	100 do	8 do	9 00
248.	10 do	10 do	50 links, brazed links and rings	No. 12 steel wire, tempered	5 50
249.	20 do	20 do	100 do do do do	do do do do	10 00

NOTE.—Parties ordering chains, Nos. 240 to 249, must state whether vara or metre chains are wanted.

Steel snaps to make full chains, into "half chains," no extra charge, if ordered with the chain.

## GRUMMAN PATENT STEEL CHAINS.

260.	66 feet,	No. 15 tempered steel wire,	100 links,	weight 1 $\frac{1}{4}$ lbs.,	with 10 extra links	\$9 00
261.	33	do do	50 do	$\frac{3}{4}$ lbs.,	with 5 extra links	5 00
262.	100	do do	200 do	2 lbs.,	with 15 extra links	11 50
263.	50	do do	100 do	1 lb.,	with 10 extra links	6 00
264.	33 feet,	No. 12 wire,	5 tallies,	with 5 extra links,	1 $\frac{1}{2}$ lbs.	5 50
265.	66	do 10 do	10 do	3 lbs.		10 00
266.	50	do 5 do	5 do	2 $\frac{3}{8}$ lbs		6 00
267.	100	do 10 do	10 do	4 $\frac{1}{8}$ lbs.		11 50
268.	50 feet	No. 18 tempered steel wire,	100 links,	with attachments of spring-balance, level, and thermometer, for very accurate measurements; weight $\frac{3}{4}$ lb.		15 00
270.	Brass Plummets,	to use with light chain				2 00
271.	Spring-balance	to use with chains Nos. 260 to 263				2 00



## MARKING PINS.

No.		PRICE.
275.—	Set of 11 Pins, iron wire, No. 4.....	\$1 50
276.—	do steel wire, No. 6.....	2 00
277.—	do brass wire, No. 4.....	2 00
278.—	do steel wire loaded.....	3 00
279.—	do steel wire, very light, with leather case.....	2 00
280.—	Timber scribes or Marking Irons, each.....	1 25

## CHESTERMAN'S METALLIC TAPE MEASURES.

These tapes are made of linen thread, interwoven with fine brass wire, not so liable to stretch as the usual linen tape, and better calculated to withstand the effects of moisture. They are in substantial leather case.

285.—	Metallic tape measures, 33 feet long, in 10ths or 12ths, each.....	\$2 35
287.—	do do 50 do do.....	3 00
288.—	do do 66 do do.....	3 30
292.—	do do 100 do do.....	4 75

## CHESTERMAN'S METALLIC TAPES, WITHOUT BOXES.

295.—	Chesterman's metallic tapes, without box, 50 foot, 10ths or 12ths.....	1 75
296.—	do do 66 do.....	2 25
297.—	do do 100 do.....	3 25

NOTE—We can furnish Nos. 285 to 297 of any intermediate lengths required.

## CHESTERMAN'S STANDARD STEEL TAPE MEASURES.

Steel tape measures; all steel, to wind up in a box, same as linen measures, the most accurate, durable and portable measures.

300.—	Steel tape measures, 10 feet long, in 10ths or 12ths in German silver case, each.....	\$3 50
301.—	Steel tape measures, 10 feet long, tape divided on one side to 12ths, and on the other to centimetres and millimetres.....	3 75
302.—	Steel tape measure, 25 feet long, in 10ths or 12ths each.....	5 75
303.—	do do 33 do do.....	6 25
305.—	do do 50 do do.....	8 50
306.—	do do 66 do do.....	11 00
307.—	do do 75 do do.....	12 50
308.—	do do 100 do do.....	16 00
309.—	do do 50 do do extra wide and heavy.....	13 00

## POCKET STEEL TAPE MEASURES.

315.—	Pocket Steel tapes, in German silver cases, with spring and stop, divided into 10ths or 12ths of feet, 3 feet long.....	\$1 35
316.—	do do 4 do.....	1 50
317.—	do do 5 do.....	1 75
318.—	do do 6 do.....	2 00
319.—	do do 8 do.....	2 25
320.—	do do 12 do.....	3 00

These pocket tapes, with divisions to centimetres and millimetres on the other side, 25 to 50 cents per tape higher, according to length.

## EXCELSIOR STEEL TAPE MEASURES.

Excelsior Steel Tape,  $\frac{1}{2}$  inch wide, on Patent Brass frame with handle,—handy in rolling up or unrolling the tape, very good to be used in mines.

The Excelsior Steel Tapes are made of the best tempered Steel Ribbon, thicker and more substantial than other tapes of this kind and not subject to the annoyance of constant repairs.

The Patent Brass Frames have many advantages; they are stronger than Leather Cases and have a convenient handle. In the open frame the tape can be wound up much safer and also protected against moisture and dirt which destroys the tape enclosed in a case.

310.—	Steel tape measures, 50 feet long, in 10ths or 12ths.....	\$9 00
311.—	do do 100 do do.....	16 00



**PAINE'S PATENT STANDARD STEEL TAPES.**

*In Leather Cases, Flush Handles.*

325.—	Steel tape measures, 33 feet long, 10ths or 12ths.....				\$5 50
326.—	do 50 do do .....				8 00
327.—	do 66 do do .....				10 00
328.—	do 75 do do .....				12 00
329.—	do 100 do do .....				15 00
330.—	do in Japanned case, 25 feet long, 10ths or 12ths.....				3 50
331.—	do do 33 do do .....				4 50
332.—	do do 50 do do .....				6 00
333.—	do do 66 do do .....				8 00
334.—	do do 75 do do .....				10 00
335.—	do do 100 do do .....				12 00

Tapes No. 325 to 335, without cases, 10 cts. per foot.

Tapes No. 415 to 335, with metric measure on reverse side, at an extra cost of 5 cts. per ft.

**EXTRAS TO PAINE'S PATENT STAND. STEEL TAPES.**

340.—	Handles with graduated scale, per pair.....	\$4 00
341.—	Pocket thermometers .....	1 50
342.—	Spring balance and level.....	4 00

**STANDARD STEEL RIBBONS.**

Our own manufacture, without joint, for testing chains or tapes, or for bridge work,  
Ribbon  $\frac{3}{8}$  to  $\frac{1}{2}$  inch wide, graduated.

345.—	Steel Ribbon, 33 feet long, with clamping handles and reel.....	\$3 50
346.—	do 50 do do .....	4 00
347.—	do 66 do do .....	4 50
348.—	do 100 do do .....	5 50

No. 345 and 347 are graduated each foot up to ten feet, and also at each sixteen and one-half feet.

Nos. 346 and 348 are graduated each foot up to ten feet, and at each ten ft. thereafter.

Longer tapes to order. For each additional 100 feet, with an extra graduation at each 50 feet, add \$2.25. Thus, a steel ribbon 500 feet long will cost \$5.50+9.00=\$14.50

**NEW ADJUSTABLE PLUMB BOBS.**

This plummet has a concealed reel, around which the string is wound by turning the milled head on top. The friction upon the reel within will hold the bob at any desired point of the line.



No.	PRICE
350.—10 oz.....	\$2 50
354.—30 oz.....	5 00

**BRASS PLUMB BOBS.**

355.—Steel point, screw head, 3 oz.....	\$1 00
356.— do do 6 oz.....	1 25
357.— do do 10 oz.....	1 50
358.— do do 14 oz.....	2 00
359.— do do 20 oz.....	2 50
360.— do do 24 oz.....	3 00
361.— do do 32 oz.....	3 50



ANEROID BAROMETERS.

*For ascertaining Heights, Differences of Level and Meteorological Changes, Approach of Storms, etc.*

370.—Mountain Aneroid Barometers, compensated for temperature, with silvered dials, in morocco cases, accompanied by a hand-book of instructions.

These instruments as now made are nearly as portable as an ordinary watch, and yet are fully as accurate as the larger sizes. They are of very great service to the engineer and tourist, as well as to the scientific observer, and are rapidly coming into general use.

A.—	Pocket Aneroid,	1¾-inch dial,	altitude scale to 8,000 feet.....	\$18 00
B.—	do	do	do 10,000 feet.....	20 00
C.—	do	do	do 15,000 feet.....	25 00
D.—	do	do	do 20,000 feet.....	27 00
E.—	do	do	do 15,000 feet and thermometer.....	27 00



H.—	Pocket Aneroid,	1¾-inch dial,	altitude scale to 10,000 feet, and opposite side with pocket compass and thermometer.....	\$28 00
K.—	Pocket Aneroid,	2¾-inch dial,	altitude scale to 3,000 feet.....	19 00
L.—	do	do	do 5,000 feet.....	19 00
M.—	do	do	do 8,000 feet.....	20 00
N.—	do	do	do 10,000 feet.....	22 00
O.—	do	do	do 15,000 feet.....	25 00
P.—	do	do	do 20,000 feet.....	27 00
Q.—	do	do	do 10,000 feet, and thermometer.....	24 00
R.—	do	do	do 15,000 feet, do.....	27 00
S.—	Government Pattern Aneroid,	4½-inch dial,	altitude scale to 4,000 feet, and thermometer, with leather case and strap.....	33 00
T.—	do	do	do but with altitude scale to 8,000 feet.....	35 00
U.—	do	do	do do 10,000 feet.....	36 00
V.—	do	do	do do 15,000 feet.....	38 00
W.—	do	do	do do 20,000 feet.....	40 00
X.—	Plain Aneroid,	no altitude scale,	5-inch dial, with thermometer and open face to show mechanism, for parlor use.....	20 00
Y.—	do	do	but with 6½-inch dial.....	25 00

NOTE.—The barometers described above are the most desirable styles. We can, however, furnish any of the styles mentioned in the catalogue of other dealers, at their list prices.

A Treatise on the Aneroid Barometer; its construction and use. Illustrated..... 50



## PRICES FOR PARTS OF INSTRUMENTS LIABLE TO LOSS OR INJURY.

## FOR TRANSITS.

Needle and centre pin .....	\$2 50
Ground glass level vial for plate or standard, each .....	50
do do brass mounted complete, for plate or standard, each .....	2 50
do do for telescope, each .....	1 50
Cap for eye-piece or object glass, each .....	75
Shade for object glass .....	75
Clamp screws for horizontal limb, each .....	75
Tangent screw for leveling head .....	1 50
Clamp do do .....	75
Leveling do do each .....	1 50
Eye-piece complete .....	6 00
Object-glass complete .....	6 00
Platina cross-wires and diaphragm .....	3 00
do stadia do do .....	5 00

## FOR Y LEVELS.

Ground glass level vial .....	2 00
Cap for eye-piece or object glass, each .....	75
Clamp screw for leveling head .....	75
Tangent do do .....	1 50
Leveling do do each .....	1 50
Eye-piece complete .....	6 00
Object-glass complete .....	7 00
Platina cross-wires and diaphragm .....	3 00
do stadia do do .....	5 00

## FOR SURVEYORS' COMPASSES.

Needle and centre-pin .....	2 50
Plain glass level vials, each .....	25
do do brass mounted complete .....	2 00
Brass cover for compass of our make .....	1 00
Out-keeper .....	1 00
Staff mountings, brass head (without spindle) .....	2 50
do steel point .....	60
Ball-spindle .....	1 50
Compass sight vanes, each .....	2 50
Clamp screw for spindle or sight vane .....	75
Tangent screw for moving vernier .....	1 50
Staff mountings complete for $3\frac{1}{2}$ inch pocket compass .....	3 50
do do $4\frac{1}{2}$ do .....	3 50

## MISCELLANEOUS.

Patent Extension Tripod, Fig. 17, for Transit or Level .....	15 00
Extension legs only, with clamps, do do per set .....	10 00
Plain Mahogany Tripod, do do .....	10 00
Mahogany tripod legs only, do do per set .....	5 00
Wooden Cap, with brass screw plate, for tripod head .....	1 00
Ring for tripod legs .....	25
Brass bolts do each .....	50
Metal points do do .....	50
Screw drivers, each .....	25
Steel adjusting pins, each .....	10
Brass wrench for centre pin .....	10
Glass circle for compass face .....	25
Mahogany case with lock and key and leather strap, fitted complete for Transit or Level .....	6 00
do do do do for Compass .....	5 00
Regraduating compass circle .....	5 00
do horizontal limb and verniers of Transit .....	10 00
do vertical do do .....	5 00
Reading microscope .....	75
Plumb-bob for Transit or Level .....	1 50
Target for New York or Philadelphia Rod .....	5 50
Clamp for New York Rod .....	2 50
Rubber hood for Transit or Level .....	1 00
Chamois skin, best quality .....	65
Chain handles, each .....	75
Chain tallies, per set of nine .....	50



## INFORMATION TO PURCHASERS.

**SELECTION OF INSTRUMENTS.**—Where only original surveys or the bearing of lines in the preparation of County Maps are required the Plain Compasses will answer.

The Vernier Compass, or Vernier Transit Compass, will be required where the variation of the needle is to be allowed, as in retracing the lines of an old survey, etc.

When in addition to the variation of the needle local attraction must be taken into account, and the angles taken independently of the needle, an instrument with a divided limb must be employed, and for this purpose the Railroad Compass will be sufficient.

For a mixed practice of general surveying, including farm and city work, the establishment of grades of roads, the running of levels, etc., such an instrument as the Surveyors' Transit, with its various attachments, is amply sufficient.

The various forms of the Engineers' Transit, the Mountain Transit, and the Y Leveling Instruments, are designed for engineering of the highest class.

In the U. S. public land surveys, an instrument with Solar Apparatus is required, and the Solar Transit is usually selected.

In surveys of Mining claims, especially in the high elevations of Colorado, and for the surveys of mines in general, the Mountain Transit, either with the Solar Attachment or with other extras, has proved an almost universal favorite.

The new Drainage Level is, we believe, the most simple and efficient instrument designed for the drainage of farms, etc.

The Architects' Level is employed in laying out buildings, determining the level of their floors, sills, windows, and the general work of the builder.

The various forms of the Pocket Compass and Pocket Solar Compass, with or without Telescopic Attachments, are very desirable for a large class of work where extreme lightness and portability are demanded.

Where iron ores are also to be traced, the Miners' or Dip Compass, and the Dial Compass are often required.

We do not pretend to make any instrument by which veins of gold and silver can be traced, or the presence of those metals detected.

Our instruments are *not* for sale by dealers in books and apparatus; we do not deem it advisable to add to our prices to enable us to give such dealers a large *discount*, which of course would be paid by the purchaser.

**WARRANTY.**—All our instruments are examined and tested by us in person, and are sent to the purchaser adjusted and ready for immediate use.

They are warranted correct in all their parts—we agreeing in the event of any defect appearing after reasonable use, to repair or replace with a new and perfect instrument, promptly and at our own cost, express charges included, or we will refund the money and the express charges paid by the customer.

Instances may sometimes occur, in a business as large and widely extended as ours, where, owing to careless transportation, or to defects escaping the closest scrutiny of the maker, instruments may reach our customers in bad condition. We consider the retention of such instruments in all cases an injury very much greater to us than to the customer himself.

**TRIAL OF INSTRUMENTS.**—It may often happen that this statement of the prices and quality of our instruments may come into the hands of those who are entirely unacquainted with us or the quality of our work, and who therefore feel unwilling to make a final purchase of an article, of the excellence of which they are not perfectly assured.



To such we make the following proposition: We will send the instrument to the express station nearest the person giving the order, and direct the express agent, on delivery of the same to collect our bill, together with charges of transportation, and hold the money on deposit until the purchaser shall have had, say two weeks' actual trial of its quality.

If not found as represented, he may return the instrument before the expiration of that time, and receive the money paid in full, including express charges, and direct the instrument to be returned to us.

**EXTENT OF OUR BUSINESS.**—The manufacture of surveying instruments has been conducted by us over forty years, and thousands of our instruments have been distributed to customers in all parts of the United States and Canadas; in Mexico, Central America, Cuba, South America, Sandwich Islands, and Japan.

Our facilities for manufacturing, which for many years have been far superior to those of any other similar establishment, we have now (1885) greatly increased by the introduction of new machinery and tools of the most improved construction. Our manufactory has been rebuilt of nearly three times its former size, and we are better prepared than ever before to fill orders for any of our instruments with promptness and satisfaction.

**LOW PRICES OF OUR INSTRUMENTS.**—It is often urged by other makers, and persons prejudiced in their favor, that it is impossible to make first-rate instruments at the prices charged by us, and which are so very far below those of other skillful manufacturers.

We have only to reply, in addition to what we have stated in our warranty, that a visit to our works, and a comparison of our facilities with those of our competitors, would dispel all questions as to our ability to surpass them, not only in the cheapness, but also in the superior quality of our work.

**PACKING, ETC.**—Each of our Transits, Levels, and Surveyors' Compasses is packed in a well-finished mahogany case, furnished with lock and key and brass hooks, and leather straps for convenience in carrying. Each case is provided with screw-drivers, adjusting pin and wrench for centre pin, and if accompanied by a tripod, with a brass plumb bob; with all instruments for taking angles without the needle, a reading microscope is also furnished.

Unless the purchaser is already supplied, each instrument is accompanied by our "Manual" giving full instructions for such adjustments and repairs as are possible to one not provided with the facilities of an instrument maker.

When sent to the purchaser the mahogany cases are carefully enclosed in outside packing boxes of pine, made a little larger on all sides to allow the introduction of elastic material, and so effectually are our instruments protected by these precautions, that of many thousands sent out by us during the last forty years, in all seasons, by every mode of transportation, and to all parts of the Union, and the Canadas, and to foreign countries, not more than three or four have sustained any serious injury.

Instruments packed for foreign shipment are hermetically sealed in tin cases.

**MEANS OF TRANSPORTATION.**—Instruments can be sent by express to almost every town in the United States, Canadas and Mexico, regular agents being located at all the more important points, by whom they are forwarded to smaller places by stage. The charges of transportation from Troy to the purchaser are in all cases to be borne by him, we guaranteeing the safe arrival of our instruments to the extent of express transportation, and holding the express companies responsible to us for all losses and damages on the way.

**FINISH OF INSTRUMENTS.**—Customers ordering instruments will do us a favor by mentioning whether they prefer them of bright or bronze finish, the cost being the same in either case.

If no direction is given, we usually send Transit and Leveling instruments of bronze finish, and Compasses of bright finish.



TERMS OF PAYMENT are uniformly cash, and we have but one price, whether ordered in person or by mail. Our terms are as low as we think instruments of equal quality can be made, and will not be varied from the list given on the previous pages.

Remittances may be made by a draft, payable to our order at Troy, Albany, New York, Boston or Philadelphia, which can be procured from banks or bankers in almost all of the larger villages, or by Post Office money order, or by registered mail.

These may be sent by mail with the order for the instrument, and if lost or stolen on the route, can be replaced by a duplicate, obtained as before, and without additional cost.

The customer may also send the money in advance through the express agent, or, as is most common, may pay the agent on receipt of the instrument in funds current in New York or Boston.

The cost of returning the money on bills collected by express, of amounts under \$20, will be charged to the customer.

### REPAIR OF INSTRUMENTS.

Hundreds of instruments, of our own and others' make, come to us every year for refitting and repairs, and so much correspondence arises therefrom, that we are led to believe that a brief statement in this place of the cost of such repairs, etc., will be of service to our customers and ourselves.

Most instruments sent to us for repairs are injured by falls; many are worn and defective in parts after long use; and others are sent for repolishing and renovating.

We advise our customers having instruments in need of repairs, etc., to send them immediately to us, as our facilities enable us to do the work much more economically and promptly than any other maker, however accessible.

They should always, when practicable, be placed in their own boxes, and then enclosed in an outside packing case, an inch larger in all its dimensions, that the interval between the two may be filled with paper wadding, hay or fine shavings.

A note specifying the repairs needed should accompany the instrument, and a letter should also be sent by mail to us, giving not only directions as to the repairs, but also stating when the return of the instrument is required, and the precise location to which it should be forwarded. It should also be remembered that each instrument is made to fit its own spindle, and no other; and therefore this part, with the parallel plates and leveling screws, if it has any, should always be sent with it.

The legs and brass heads in which they are inserted need never be sent, unless themselves in need of repairs.

COMPASSES.—These come to us with the plates sprung, the sights bent or broken, the glass or level vials fractured, and the pivot so dulled as to render the needle sluggish and unreliable. The cost of repairing the defects above named, ranges from \$2 to \$8 or \$10. A new pair of sights fitted costs \$5; a new needle, with jeweled centre and pivot complete, \$2.50; a new jeweled centre, \$1.50; regraduating compass circle, \$5.00.

The compass should always be accompanied by the ball spindle, and if a new ball spindle is required, the whole instrument, or at least the socket in which the spindle fits, should be sent with the letter sent to us; a new ball spindle costs \$1.50.

TRANSIT INSTRUMENTS.—The repairs of the Vernier Transits cost about the same as those of the compasses above stated.

The injuries sustained by the falls of Engineers' and Surveyors' Transits are usually much more serious; in these the plates, standards and cross-bars of telescopes, are often bent, and sockets or centres usually so deranged as to be entirely useless.

The cost of repairing an instrument with such injuries ranges from 10 to 30, or even 50 dollars, the new sockets alone costing from 15 to 20 dollars.

Variation Plate added to any Engineers' Transit sent for repairs, costs	\$15 00
Regraduating horizontal limb and verniers.....	10 00
Regraduating vertical limb and vernier.....	5 00



**PLATINUM CROSS-WIRES.**—None but a practised hand and provided with the best facilities can properly set the platinum wires in a cross wire diaphragm, and it is useless, therefore, to send a parcel of wire for that purpose.

The only way in which they can be replaced without sending the telescope is to take out the ring and send it to us with its screws, washers, etc., and we will return it properly secured.

The price of platinum cross-wires, plain, replaced in old ring, is..... \$2 00  
 Stadia wires, replaced in old ring..... 3 00  
 If sent by mail, add 15c. for postage and registry.

When it is desirable to substitute platinum for spider-web, a new ring, with screws, etc., will be required.

The price of platinum cross-wires with diaphragm, screws, etc., plain,  
 is..... \$3 00  
 Stadia wires, with diaphragm, etc..... 5 00

**LEVELING INSTRUMENTS** are generally much less injured by falling than Transits, the damages being included usually in the bending of the cross-bar, the springing of the sockets, and the breaking of the level vial.

The cost of repairs varies from 5 to 15 dollars; a new level vial set in the tube costs two dollars.

**REPOLISHING INSTRUMENTS.**—The cost of repolishing an instrument, involving also, of course, its complete renovation and adjustment, varies with the different kinds, but may be stated generally as follows:

Compasses, from..... \$5 to \$10  
 Transits, do ..... 15 to 20  
 Levels, do ..... 12 to 15

No additional charge is made for bronzing or blackening an instrument when repolished.

**PAYMENT OF REPAIRS, etc.,** may be made at the the express office where the instrument is received, the customer paying for the first transportation of the instrument to us or not, as he may prefer. Whenever the freight is paid in advance, the express receipt should be mailed immediately to us.

W. & L. E. GURLEY,

*Mathematical Instrument Makers,*

FULTON ST., OPPOSITE NORTH END OF UNION R. R. DEPOT,  
 TROY, N. Y.



TUCSON, ARIZONA, September 27th, 1883.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs:*—The Transit which you fixed up for me in 1880 has given perfect satisfaction in every respect. I have centred accurately an inch and a quarter flag-staff at a distance of fifty-one hundred feet. The Vertical Circle is, without any exception whatever, the best I have ever seen on any instrument, and the fixed telemeter wires are spaced absolutely accurately.

Very respectfully,

N. S. FROST, *Civil Engineer.*

NEW YORK CITY, April 8th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen:*—Transit and tripod received. I am very much pleased with the way in which the work has been done. As soon as I can spare my Level I will send it up and have it repaired.

Respectfully,

B. R. GUION,

*Ass't Engineer Dep't of Public Parks.*

MAINE STATE COLLEGE, ORONO, ME.,

April 12th, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Dear Sirs:*—Please find enclosed check for amount of your bill. I am much pleased with the condition of the instruments and the moderate charges. Please return the bill as a voucher.

Yours, very truly,

G. H. HAMLIN,

*Professor of Mathematics.*

ROCKDALE, TEXAS, May 2d, 1884.

MESSRS. W. & L. E. GURLEY, Troy, N. Y.

*Gentlemen:*—My Compass came some two weeks ago. It works as well as when new, and the tripod is much better than a jacob-staff. Thanking you kindly and heartily,

I remain, yours very truly,

JOHN D. FREEMAN.



## SPECIAL NOTICE.

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Many of our smaller instruments, such as drawing instruments, pocket compasses, chains, tapes, small packages of paper and parts of large instruments, can be sent by mail, securely packed, and at much lower rates than are charged by express companies. Packages not exceeding four pounds in weight can be sent in this way within the United States, at a cost of one cent per ounce. Packages sent by mail to Canada, are limited to eight ounces in weight, and the postage is ten cents for each package.

**In all cases where goods are to be sent by mail, the cash for postage as well as for the goods must accompany the order.**

All articles can be registered at an extra cost of ten cents for each package besides regular postage.

**We are not responsible for goods sent by mail.**

Price List of all our DRAWING INSTRUMENTS, DRAWING MATERIALS, AND BOOKS—a fully Illustrated Catalogue of one hundred pages—sent to any address postpaid, on application.

For the convenience of our customers, we will furnish any articles not on our list, but described in the catalogue of any American manufacturer or dealer in mathematical or optical instruments, at catalogue prices.



## DRAWING INSTRUMENTS.

(PARTIAL LIST.)

## CASES OF BRASS DRAWING INSTRUMENTS.

530.—Rosewood Box ; pair of 6-inch Dividers, with pen and pencil points and lengthening bar ; pair of $4\frac{1}{2}$ -inch plain Dividers, Drawing Pen, pair of $3\frac{1}{2}$ -inch Dividers, with pen and pencil points ; Brass Protractor, Horn Protractor, Wood Rule.....	\$2 00
532.—Rosewood Box ; pair of 6-inch needle point Dividers, with pen and pencil points, and lengthening-bar ; pair of $4\frac{1}{2}$ -inch plain Dividers ; pair of $3\frac{1}{2}$ -inch needle-point Dividers, with pen and pencil points, Drawing Pen, Brass Protractor, Horn Protractor, Wood Rule, per set. . .	2 75
533.—Same as No. 532, but with lock and key and the instruments set in a tray, so that the colors may be put below, per set.....	3 00
534.—Rosewood Box ; with lock and key, the instruments set in a tray, so that colors, etc., may be put below ; pair of six-inch needle-point Dividers, with pen and pencil points, and lengthening-bar ; Drawing Pen, pair of $4\frac{1}{2}$ -inch plain Dividers, Brass Protractor, Horn Protractor, pair of $3\frac{1}{2}$ -inch needle-point Dividers, with pen and pencil points ; Spring Bow Pen, with needle-point ; Wood Rule ..	4 00
535.—Same as No. 534, with addition of a pair of Proportional Dividers, has no Brass Protractor, but has Wood Triangle and Irregular Curves.....	6 00

## CASES OF FINE GERMAN-SILVER INSTRUMENTS.

*For Engineers, Architects, and Machinists.*

580.—Morocco Box ; pair of $5\frac{1}{2}$ -inch Dividers, with pen, and pencil points, Drawing Pen.....	\$3 00
581.—Morocco Box ; pair of 4-inch Dividers, with pen, pencil, and needle points, and lengthening-bar ; Drawing Pen....	4 00
582.—Morocco Box ; pair of $5\frac{1}{4}$ -inch Dividers, with pen and pencil points, pair of 5-inch plain Dividers ; Drawing Pen .....	2 50
583.—Same as No. 582, with addition of needle-points and lengthening-bar, to $5\frac{1}{4}$ -inch Dividers, per set.....	5 00
584.—Morocco Box ; round corners, for carrying in the pocket ; pair of $4\frac{3}{4}$ -inch Dividers, with hinge in one leg, needle points, with pen and pencil points, and lengthening bar, Spring-Bow Pen, needle-point, pair of 4-inch plain Dividers, rounded point, Drawing Pen, Ivory handle, 5-inch Ivory rule, divided into eighths, per set.....	7 50
586.—Morocco Box ; pair of $5\frac{1}{2}$ -inch Dividers, with pen, pencil, and needle-points, and lengthening bar ; pair of 5-inch plain Dividers, Spring-Bow Pen, Drawing Pen.....	6 50
587.—Morocco Box ; pair of $5\frac{1}{4}$ -inch Dividers, with pen, pencil, and needle points, and lengthening-bar ; pair of 5-inch plain Dividers, pair of 4-inch Dividers, with pen, pencil and needle-point, two Drawing-Pens, per set.....	9 75
588.—Same instrument as in No. 587, with addition of Spring-Bow Pen, per set. ....	11 00

Swiss Instruments, same number of pieces, of extra fine finish, and best quality, cost about twice as much as the above.

Besides the above-described cases, we have loose instruments of all kinds, as well as cases containing a larger number of pieces, and costing more money.

NOTE.—Our "SUPPLEMENT TO MANUAL" contains a fully-illustrated price list of all our Drawing Instruments and Materials, and will be sent by mail on application.



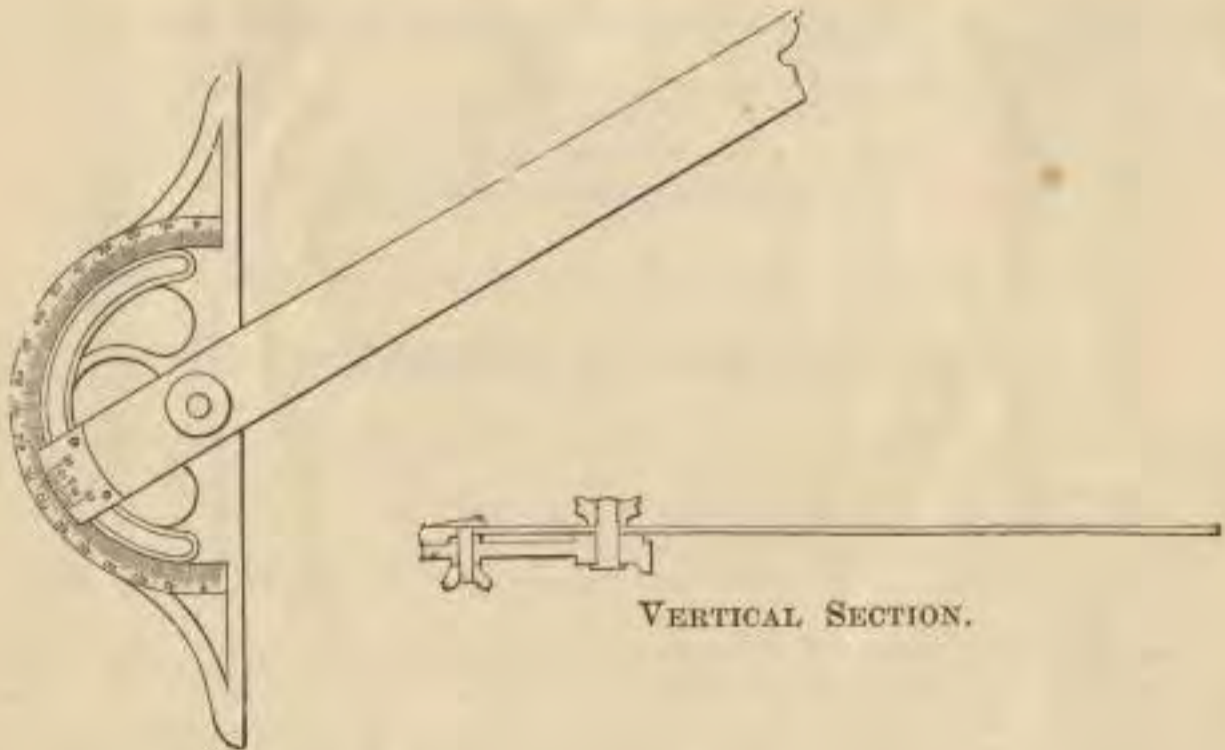
PROTRACTORS OF HORN, BRASS, GERMAN SILVER, AND RUBBER.

No.							PRICE.
630.—	Railroad Curve Protractor, of horn, 8 inches diameter, having laid off on it twenty-three curves from $\frac{1}{2}$ degree to 8 degrees, with a radius of 400 feet to the inch.....						\$1 60
635.—	Horn Protractor, 5 inches diameter, half circle, half degrees.....						25
636.—	do	6	do	do	do	do	30
637.—	do	7	do	do	do	do	50
638.—	do	8	do	do	do	do	80
639.—	Brass Protractor, 4		do	do	whole degrees.....		10
640.—	do		4	do	half degrees...		35
641.—	do	5	do	do	do	do	55
642.—	do	6	do	do	do	do	65
643.—	German-Silver Protractor, 4 inches diameter, half circle, whole degrees.....						50
644.—	do	do	5	do	do	half degrees.....	85
645.—	do	do	6	do	do	do	1 00
646.—	do	do	7	do	do	do	1 15
647.—	do	do	5	do	do	beveled edge, half degrees..	1 25
648.—	do	do	6	do	do	do	2 00
649.—	do	do	7	do	do	do	2 65
650.—	Hard Rubber Protractor, 6		do	do	do	do	3 00
651.—	do	do	8	do	do	do	3 75
652.—	do	do	6	do	whole circle	do	3 75
653.—	do	do	8	do	do	do	5 00

Other sizes and graduations to order.

NEW LIMB PROTRACTOR.

BRONZE HEAD, STEEL BLADE, VERNIER TO ONE MINUTE.



No.					PRICE.
665.—	Limb Protractor, blade 24 inches long.....				\$8 00
666.—	do	do	30	do	8 75
667.—	do	do	36	do	9 50
668.—	do	do	42	do	10 25
669.—	do	do	48	do	11 00

If with nickel-plated blades, 50 cts. to \$1.00 extra. Longer blades made to order.



## PLOTTING SCALES.

No.		PRICE.
675.	Ivory Rectangular Protractor, 6 inches long, 1 $\frac{3}{4}$ inches wide, with scales as follows: front sides divided around edges from 0 to 180 degrees in single degrees, scales of $\frac{1}{4}$ , $\frac{1}{2}$ , $\frac{3}{4}$ , and 1 inch to the foot, and scale of chords. Reverse side scales of 30, 35, 40, 45, 50 and 60 parts to the inch, scale of chords and diagonal scale of inches and $\frac{1}{100}$ ths.....	\$1 50
677.	Ivory Rectangular Protractor, 6 inches long by 2 inches wide, with scales as follows: front side, the edge divided in single degrees from 0 to 180 degrees, scales of $\frac{1}{8}$ , $\frac{1}{4}$ , $\frac{3}{8}$ , $\frac{1}{2}$ , $\frac{5}{8}$ , $\frac{3}{4}$ , $\frac{7}{8}$ , 1, 1 $\frac{1}{8}$ , 1 $\frac{1}{4}$ , inches to the foot, scale of chords, and line of 40 parts on lower edge. On the reverse side, scales of 20, 25, 30, 35, 40, 45, 50, 60 parts to the inch, diagonal scale of $\frac{1}{100}$ ths.....	3 25
678.	Ivory Rectangular Protractor, same as No. 677, but has the Protractor divided in $\frac{1}{2}$ degrees.....	4 00
685.	Ivory Sector, 6 inches long, opens to 12 inches long.....	2 25
696.	Ivory Scale, 6 inches long, for school drawing.....	75
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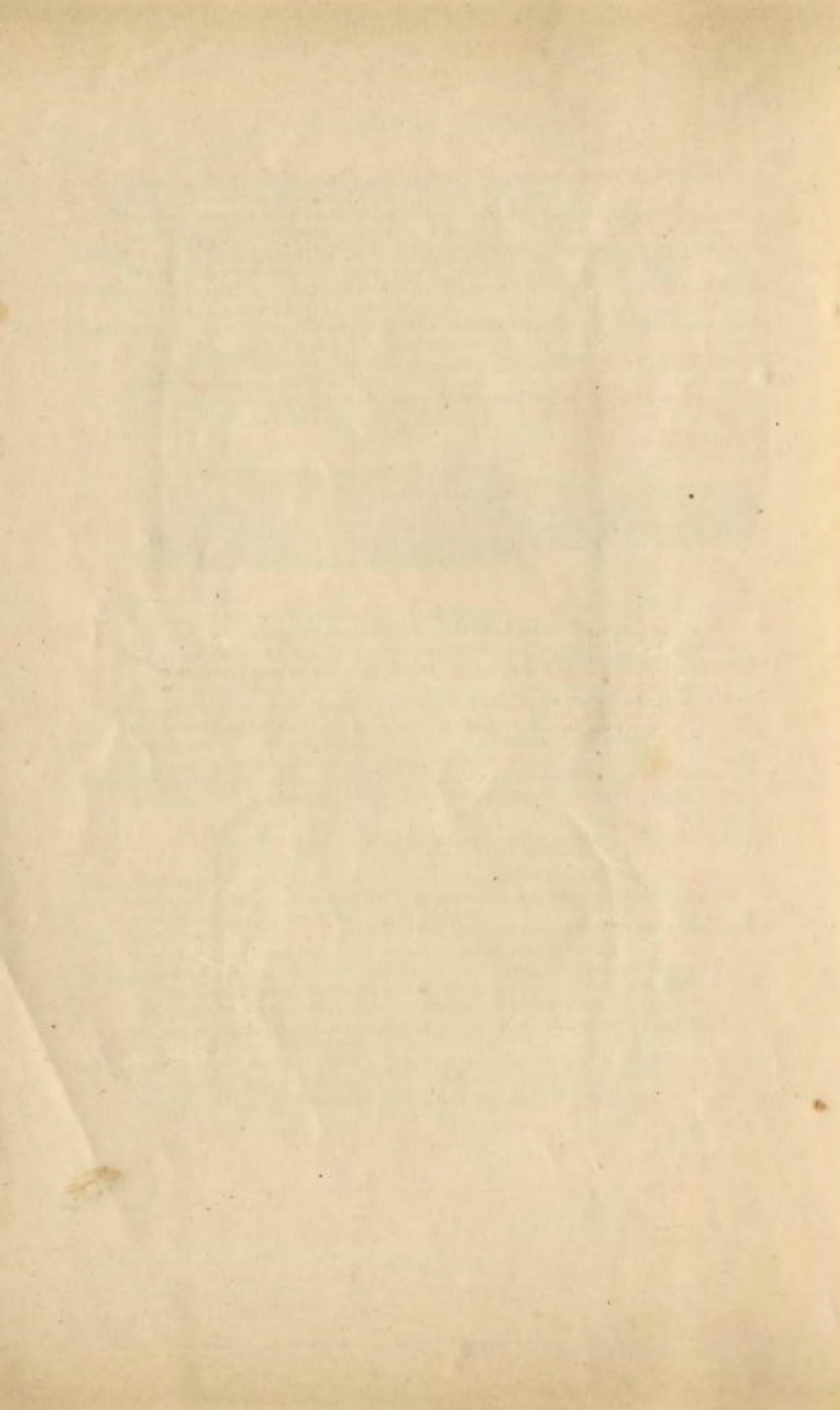
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These tables, suitable for architects' offices, counting-rooms, &c., or for home use, can be readily fixed at any height from 30 to 44 inches, with the top horizontal, vertical, or inclined at any angle, while the instrument shelf and drawers always remain level. In any of these positions the top can be allowed to rotate, or the whole firmly clamped. Total weight, 55 pounds.

1820.—Smithsonian Rain Gauge, made entirely of brass. This gauge has been adopted by the Smithsonian Institute and U. S. Patent Office, and is the most simple in its construction of any now in use. It is furnished with a graduated scale which reads to 10ths and 100ths of inches; also a wooden cylinder to insert in the ground for the protection and ready adjustment of the instrument.	5 00
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