# CIVIL ENGINEERS'

AND

# SURVEYORS'

# INSTRUMENTS


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

## 1887.


## W. & L. E. GURLEY,

TROY, N. Y.

Dear Sir:

Please let us call your special attention to the new Illustrated Price List which we send you herewith.

You will notice that many of the wood-cuts are new and illustrate our latest improved instruments.

The wood-cuts of the transits show the new clamp to the horizontal limb, by which the limb is securely fastened without any possibility of springing the plates.

We supply the new tangent screw with an opposing spring (so that all lost motion is avoided) to the limb, the telescope axis and the leveling head of transits and to the leveling head of Engineers' Y Levels.

You will notice that the Verniers to the limb, heretofore placed at right angles to the telescope and beyond the view of the Engineer, without a change of position, are now located in the RIGHT PLACE—at an angle of 30° with the telescope—so that they can be read at once without any movement of the observer.

Among the new instrumenis please see the Reconnoissance Transit, which we think a very desirable instrument where a telescope is needed, and where great accuracy is not so essential as portability.

We think we show here the first really practical Hand Level with telescope that has yet been made; with it better light as well as considerable magnifying power is obtained.

We show also in this pamphlet the new method of attaching the telescopic sight to pocket compasses, dispensing with the cross-bar and making a strong and portable instrument for approximate work.

See the wheelbarrow odometer for use in making County or District Maps; the positive motion odometer for use on a wagon wheel; the illustrations of Price's Current and Direction Meters for measuring the rapidity and direction of streams of water; and here also we show anemometers for use in coal mines and all places where ventilation and a supply of pure air is essential.

When any articles can be sent safely by mail, we have printed the cost of postage for same, so that by remitting with the order the cost of the article and postage the goods can be sent by mail at small expense.

As heretofore, we have made our list prices of Engineers' and Surveyors' Instruments as low as we can put them, and furnish, warranted, instruments of the latest pattern.

**W. & L. E. GURLEY.**

TROY, N. Y., JANUARY, 1887.

The prices named in this catalogue take precedence over those in the 26th Edition of our "Manual," wherever a change in price has been made.

# 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.

**1887.**

# TRANSITS.

No. 3. FIG. 1.

Engineers' Transit, 5 inch needle, Price, $150.00.

## ENGINEERS' TRANSITS.

The cut represents our latest greatly improved Engineers' Transit, so generally preferred in railroad practice.

It has the two opposite verniers of the limb at an angle of 30° with the telescope and thus in front of the observer, so as to be easily read without a change of position.

The sockets are long and the upper parts of the instrument brought down closely to the leveling head, which is itself permanently attached to the centres.

The tangent movements have each a single screw with opposing spring and are very sensitive; the clamp to the limb being also fastened to the solid centre of the instrument instead of the upper plate as heretofore.

The telescopes of all our Transits, Nos. 1 to 24, are now furnished with rack and pinion movements to both eye and object slides without extra charge.

In the Engineers' Transit, the compass circle is usually solid with the upper plate; when, however, it is required to set off the variation of the needle, the instrument is made with movable compass circle like that of the Surveyors' Transit.

SAUGERTIES, N. Y., May 21st, 1885.

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

*Dear Sirs:*—I desire to acknowledge the receipt of Engineers' Transit, as per order, in first-rate condition. It is a fine Transit in every sense of the word, and I feel confident it will be a thorough working instrument in the field.

Please accept my thanks for the thorough and prompt manner in which you have filled my order. Yours respectfully,

W. KIERSTED, JR.

---

CEYLON, OHIO, June 16th, 1885.

MESSRS. GURLEY,

As you have received pay ere this, you are aware that I am well satisfied with the Engineers' Transit. I had it sent on trial for this one reason : that if it did not prove heavy enough I would pay treble express and have a heavier one sent, but this is satisfactory in all respects. Please send me your latest Manual.

Yours truly,

A. P. RUGGLES.

---

CENTRE CONWAY, N. H., January 20th, 1886.

MESSRS. W. & L. E. GURLEY,

I am using one of your Transits which I procured from you in 1876. It has been in constant use ever since in hydraulics, railroad and bridge work. I have made the level on telescope answer every purpose, and could give you results obtained which would surprise you, at least it surprised me. Total cost of repairs in ten years, $0.00. Is good as the best to-day. Yours truly,

J. A. FARRINGTON,

*Civil and Hydraulic Engineer.*

---

BROOKLYN, N. Y., February —th, 1886.

*Gentlemen* :—The Engineers' Transit Instrument, tripod, rod and plumbbobs arrived safely. It is just what I wanted. Thanking you again for so kindly advising me, I remain, Yours truly,

DANIEL J. LEARY, *C.E.*

No. 3 B. Fig. 2½.

Price..... $198.00.

## ENGINEERS' TRANSITS.

| No. | | | | | | | Price. |
|---|---|---|---|---|---|---|---|
| 1.—Engineers' Transit, two verniers to limb, 4-inch needle, plain telescope, *leveling tripod..... | | | | | | | $145 00 |
| 2.— | do | do | do | 4½ | do | do | do | 150 00 |
| 3.— | do | do | do | 5 | do | do | Fig. 1.... | 150 00 |
| 3A.— | do | do | do | 5 | do | but with 4½-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, leveling tripod..... | | 180 00 |
| 3B.— | do | do | do | 5 | do | with 6-inch vertical arc on silver, with vernier moved by tangent screw, and reading to 30 seconds, level on telescope, gradienter combined with clamp and tangent and leveling tripod Fig. 2½..... | | 198 00 |
| 4.— | do | do | do | 5 | do | same as No. 3, but with theodolite axis..... | | 185 00 |

* A "plain" telescope is one without any of the attachments or extras, as we term them, such as the clamp and tangent, vertical circle and level.

## Solar Transit, showing Patent Latitude Level.

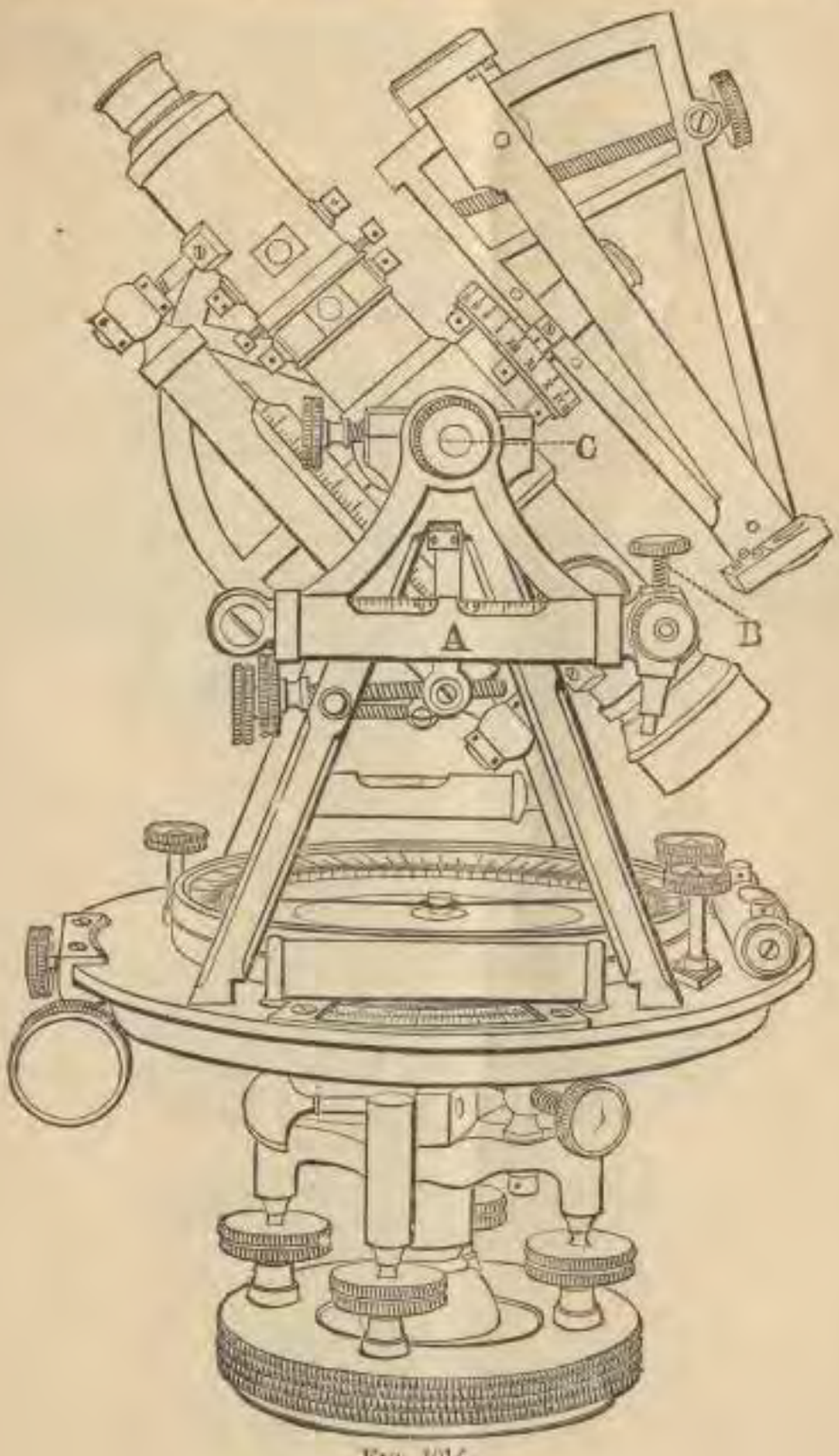



Fig. 10⅛.

PATENT LATITUDE LEVEL. (No. 56).

The outline engraving, Fig. 10⅛, 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.

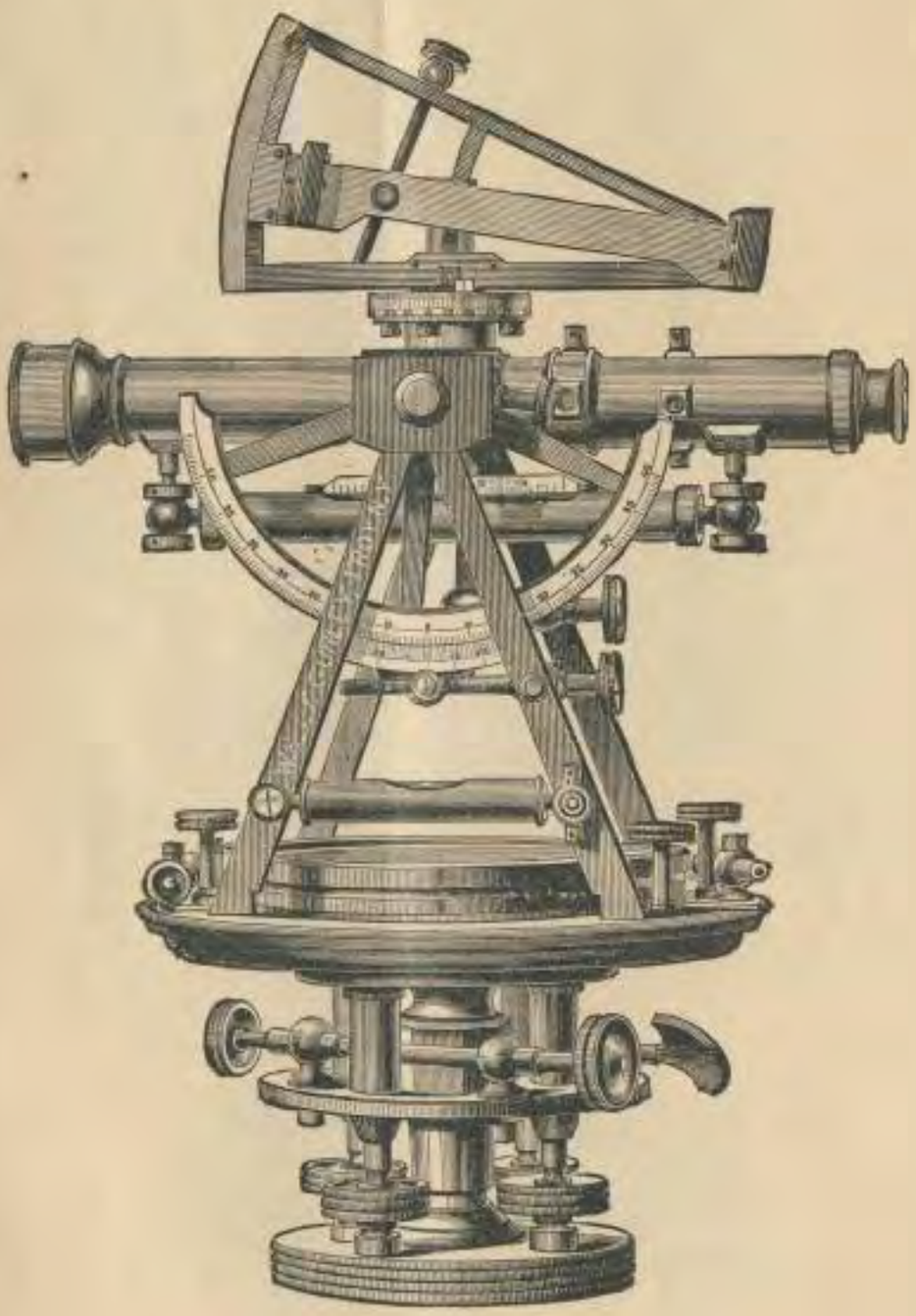
When desired, this latitude level can be attached inside the standards, on the inner surface of the vertical arc, and used in the same manner.

---

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.

## 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.

Note.—The standards, vernier openings, and tangent movements, are now made as shown in No. 3, Fig. 1.

TEGUCIGALPA, HONDURAS, July 16th, 1885.

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

*Dear Gentlemen* :—I take much pleasure in acknowledging the safe arrival of the engineering instruments and supplies that I ordered from your house by advice of Mr. A. T. Byrne, Engineer.

Everything was in perfectly good condition. The Solar Attachment has been much admired by native surveyors. Now that I have become more familiar with your style of workmanship, I shall be a constant advocate of your goods.

Very respectfully yours,

E. CONSTANTINO FIALLOS, *E.M.*

---

RICHMOND, IND., November 21st, 1885.

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

*Gentlemen* :—I have used one of your Solar Transits for five years. The instrument has given perfect satisfaction and is greatly admired by all engineers at this place. Without boasting, I can say that it is by far the best instrument in this part of the State.

ADDISON H. STUDY, *Co. Surveyor.*

---

LONDON, MADISON CO., OHIO, May 29th, 1886.

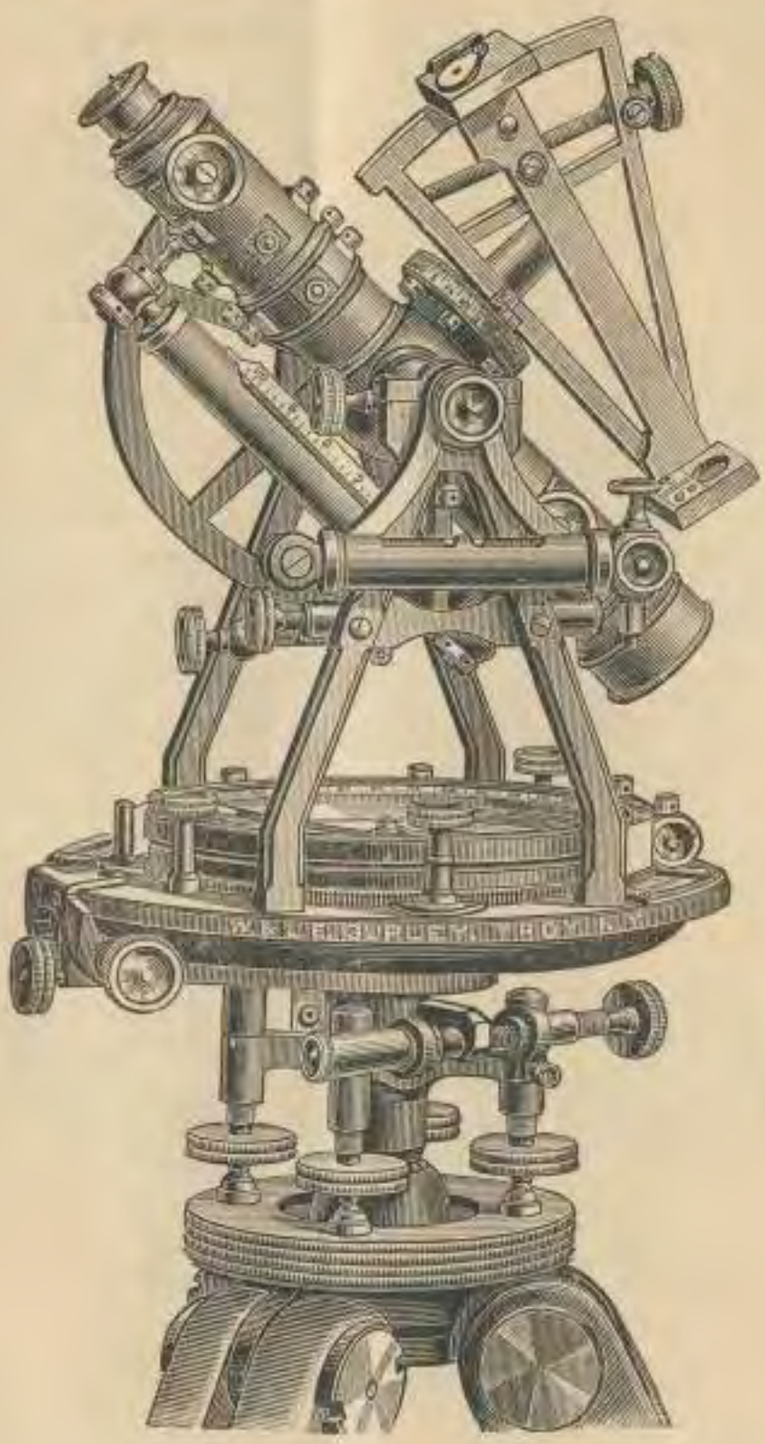
MESSRS. W. & L. E. GURLEY,

*Gents* :—I have just completed a piece of work on which I had an opportunity to put my new transit (No. 5, Fig. 8) on its merits as an angle measurer. It did perfectly all I required of it.

Yours, etc.,

J. ARNETT, *C.E.*

## LIGHT MINING OR MOUNTAIN TRANSITS.



No. 7. FIG. 9.

Price.....$245.00.

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.

This instrument has all our recent improvements in position of verniers, tangent screws, etc., as the Engineers' Transit, Fig. 1, and when ordered with a Solar Apparatus, it has also our new patent latitude level, as shown in the cut.

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, four-inch needle, magnetic variation plate, two verniers to limb, telescope of finest quality, power twenty diameters, patent extension tripod shortening to half length. The instrument is packed in a mahogany case, covered with a light sole-leather case, with straps for "packing." With plain telescope..... $150 00

No. 6A. do do but with 4½ inch vertical circle, level on telescope, and clamp and tangent movement to axis of telescope..... 180 00

No. 7. Light Mountain Transit, with patent solar attachment, vertical arc, level on telescope, and clamp and tangent to axis of telescope, complete, as shown in Fig. 9..... 245 00

No. 7A. do do with level, vertical arc, clamp and tangent to axis of telescope, same as Fig. 9, but omitting solar attachment..... 186 00

COLFAX, WASH. TER., January 29th, 1885.

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

*Gents:*—The Mountain Transit with Solar Attachment bought of you last Spring gives entire satisfaction. It surpasses any instrument I ever saw for keeping its adjustments.

Very respectfully yours,

A. W. WISNER, *U.S.D.M.S.*

---

SATANK, COLORADO, December 16th, 1885.

MESSRS. W. & L. E. GURLEY,

*Dear Sirs:*—Please send me your Solar Ephemeris for 1886. And I also wish to say that since 1881 I have used the Light Mountain Solar Transit of your manufacture. It has always given the best of satisfaction and is to-day as good as when it was sent.

I am, respectfully,

HARRY H. CLOUD, *U.S.D. Surveyor.*

---

LAKE VALLEY, NEW MEXICO, Dec. 29th, 1885.

W. & L. E. GURLEY,

*Gents:*—Please send me one of your Solar Almanacs for 1886. I have now used your Solar Mountain Transit for a long time and must say that it is the best I have ever handled.

Very respectfully,

GEO. BALDERSTON, *M.E.*

---

MINNEAPOLIS, KANSAS, Feb. 27th, 1886.

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

*Dear Sirs:*—The Light Transit, No. 7, is splendid, easy to carry, quickly adjusted and accurate in its workings. Yesterday I had occasion to run a two mile line, setting stakes at every eighty rods with fore and back sights. At the end of the line I was surprised, on reversing the telescope, to see nearly every stake in exact line.

With best wishes, I remain, yours truly,

D. R. CROSBY.

---

TIONESTA, PA., March 4th, 1886.

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

*Gentlemen:*—Since going through your extensive works I am better satisfied than ever with your instruments and rise to give you credit for advancement.

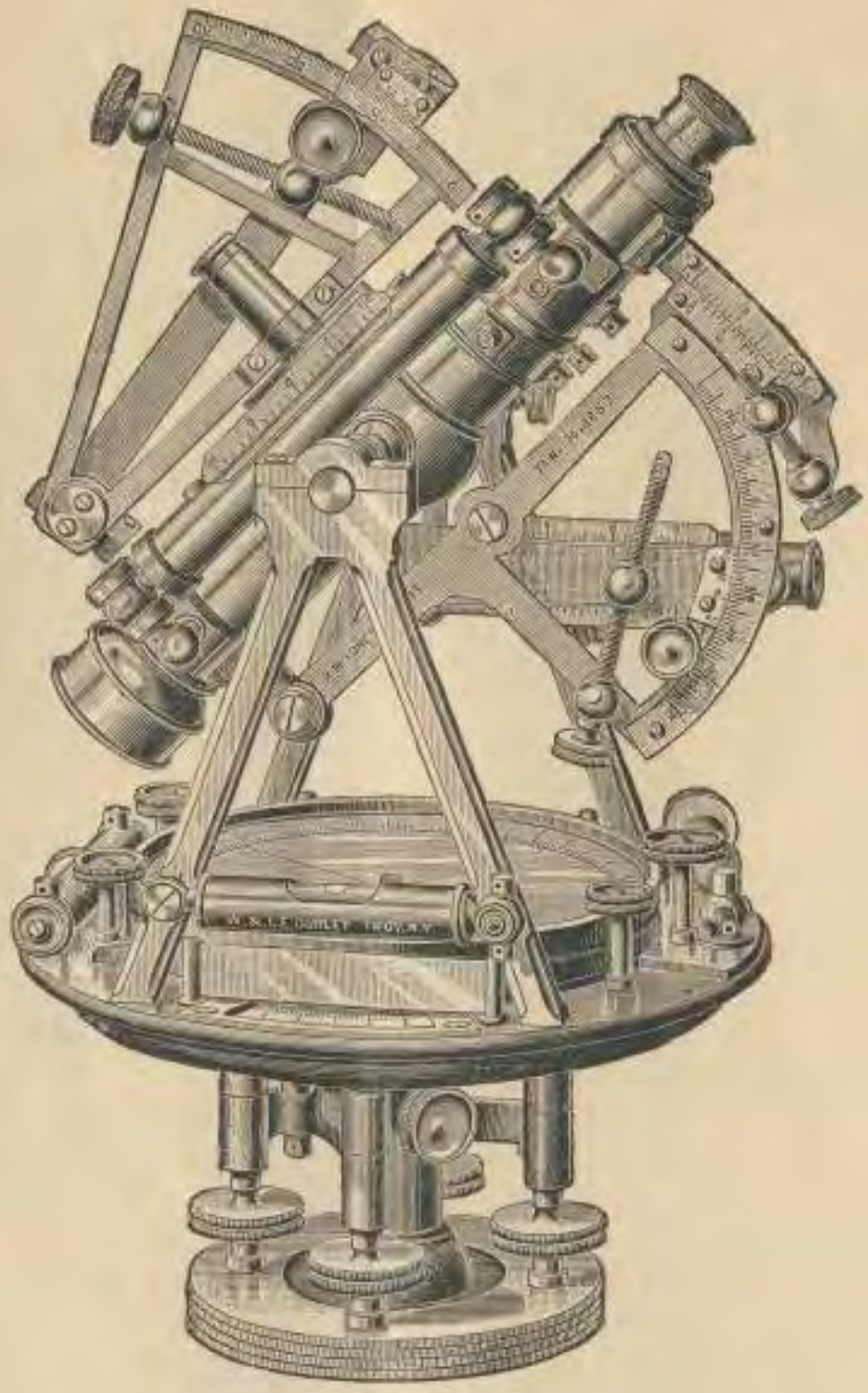
While on the Denver & Rio Grande Railway we used one of your Mountain Transits with first-class results, it performing some of the most difficult problems arising in mountain work.

On account of its portability and accuracy the same instrument was again chosen to make an extensive exploration in Western Asia for the Russian Government in their Russian Pacific Railway through Georgia, Tartary and Afghanistan, and with it being able to get at any time, longitude and latitude. It was selected on this account.

Very truly yours,

F. F. WHITTEKIN, *C.E.*

## LIGHT MOUNTAIN TRANSIT.



No. 8. Fig. 11.

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

Price as shown, including extension tripod.....$299.00.

### 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 | $ 72 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 | 299 00 |

Note.—The standards, vernier openings and tangent movements are now made, as shown in No. 7, Fig. 9.

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.*

---

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.*

---

LARAMIE, WYOMING, May 2d, 1886.

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

*Gentlemen :*—Your favor of April 28th was duly received. All of the transits with Jones' Patent Latitude Arc in use in this country so far have given the very best satisfaction, as they are first-class as a combination instrument for line and level.

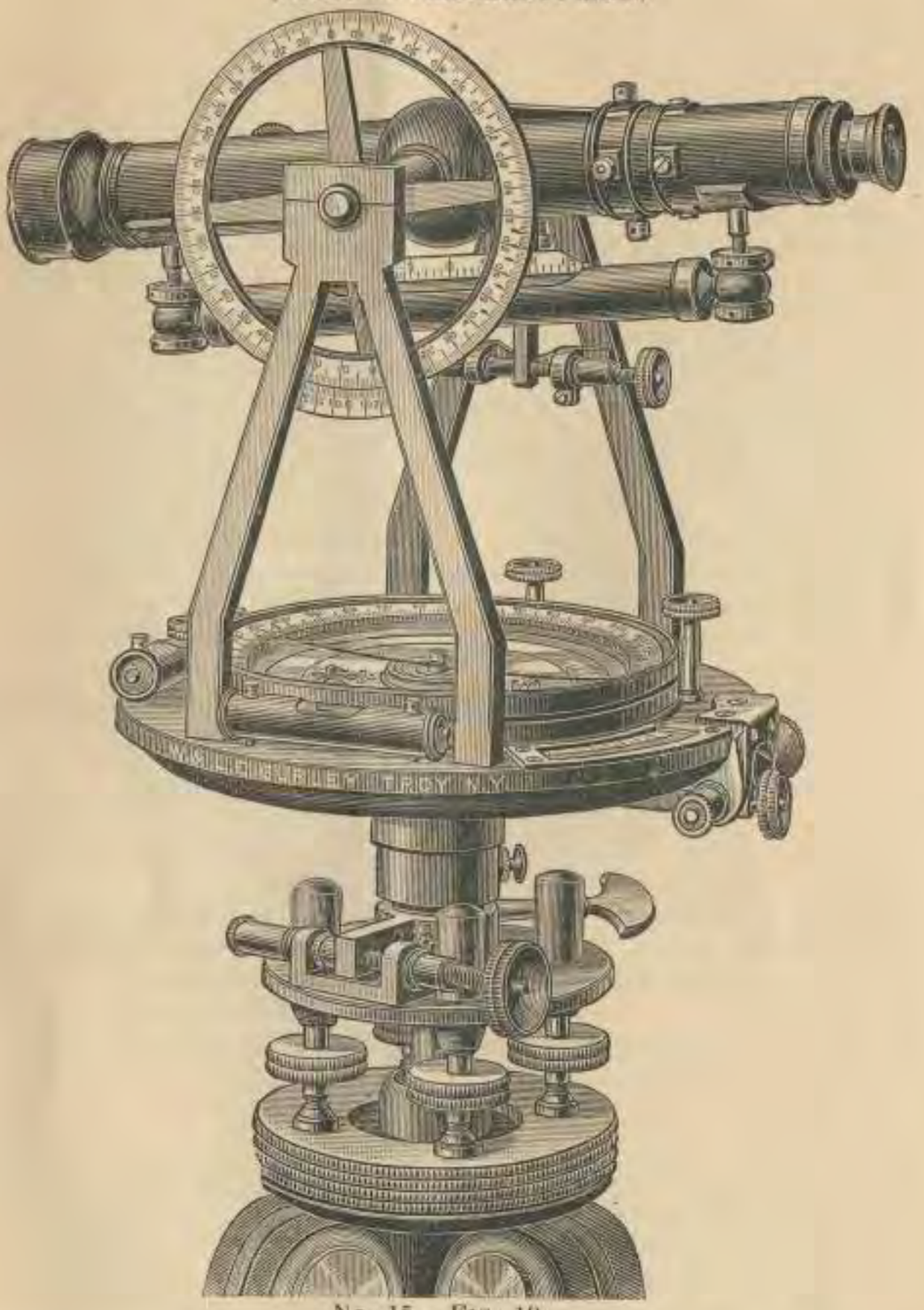
J. B. Menardi, of Buffalo, Johnson Co., and Charles Bellamy, of this place, have had them for their only leveling instruments on ditches, costing as high as $150,000 and I have used my own on the best grades of standard and meridian lines, ditches, mineral surveys, and for underground mining, and find that it is far better for each branch than most special instruments.

I am, yours truly,

R. M. JONES, *C.E.*

## SURVEYORS' TRANSITS.

(WITH TWO VERNIERS TO LIMB.)



No. 15. Fig. 19.

Price ..... .....$160.00.

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 leveling head is arranged with shifting centre, for setting the instrument quickly over a given point, without altering the position of the legs. It detaches from the upper part of the Transit, and is packed separately with the instrument in the box. 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 and placed in front of the observer so as to be read without changing his position. The verniers read to single minutes, and the instrument is furnished with all our later improvements.

### *PRICES,*

No. 12. Surveyors' Transit, 4 inch needle, two verniers to limb, plain telescope.....$125 00
No. 12A. Surveyors' Transit, same as above, but with 4½ inch 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..... 130 00
No. 14. Surveyors' Transit, 5½-inch needle, two verniers to limb, plain telescope..... 130 00
No. 15. Surveyors' Transit, 5 or 5½-inch needle, but with 4½-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, Fig. 19..... 160 00

LITCHFIELD, CONN., June 30th, 1885.

MESSRS. W. & L. E. GURLEY,

You probably recollect my purchasing of you last October, a Surveyors' Transit, and subsequently exchanging for another, (Fig. 19), complete with level, vertical circle, etc. I have tested it thoroughly in running town lines, land surveying, laying out sewers and nearly every kind of work an Engineer has to do. There has been no change made in any adjustment since you sent me the Transit by express. It is now 28 years since I studied this profession and I love good tools, think I have them, and can recommend Transits of your manufacture.

Truly yours,

W. M. P. SHELTON.

---

WEAVERVILLE, CAL., July 30th, 1885.

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

*Dear Sirs:*—Received the Transit, No. 15, Fig. 19, on the 25th, all O. K. Have surveyed a tunnel 1,400 feet long with 27 angles, and think it works fine.

Yours truly,

H. L. LOWDEN, *U. S. Dep. Surveyor.*

---

GRASS VALLEY, CAL., December 19th, 1885.

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

*Dear Sirs:*—I received my Surveyors' Transit (No. 14, and with vertical arc, level and clamp and tangent,) in good condition about two months ago, and have had an excellent oppotunity to test its merits. I am well pleased with it, and appreciate the several improved attachments. The vernier clamp is a very convenient device and much easier manipulated than those of the old pattern. The tangent screws are also an improvement on the old style in general use and save much time.

The instrument is especially adapted to mining engineering, and I will take pleasure in recommending it to those of the profession I meet. Those who have already seen it pronounce it an excellent instrument,

Yours respectfully,

CHAS. E. URENS, *C. E., U. S. Dep. Surveyor.*

---

MELBOURNE, ARK., April 19th, 1886.

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

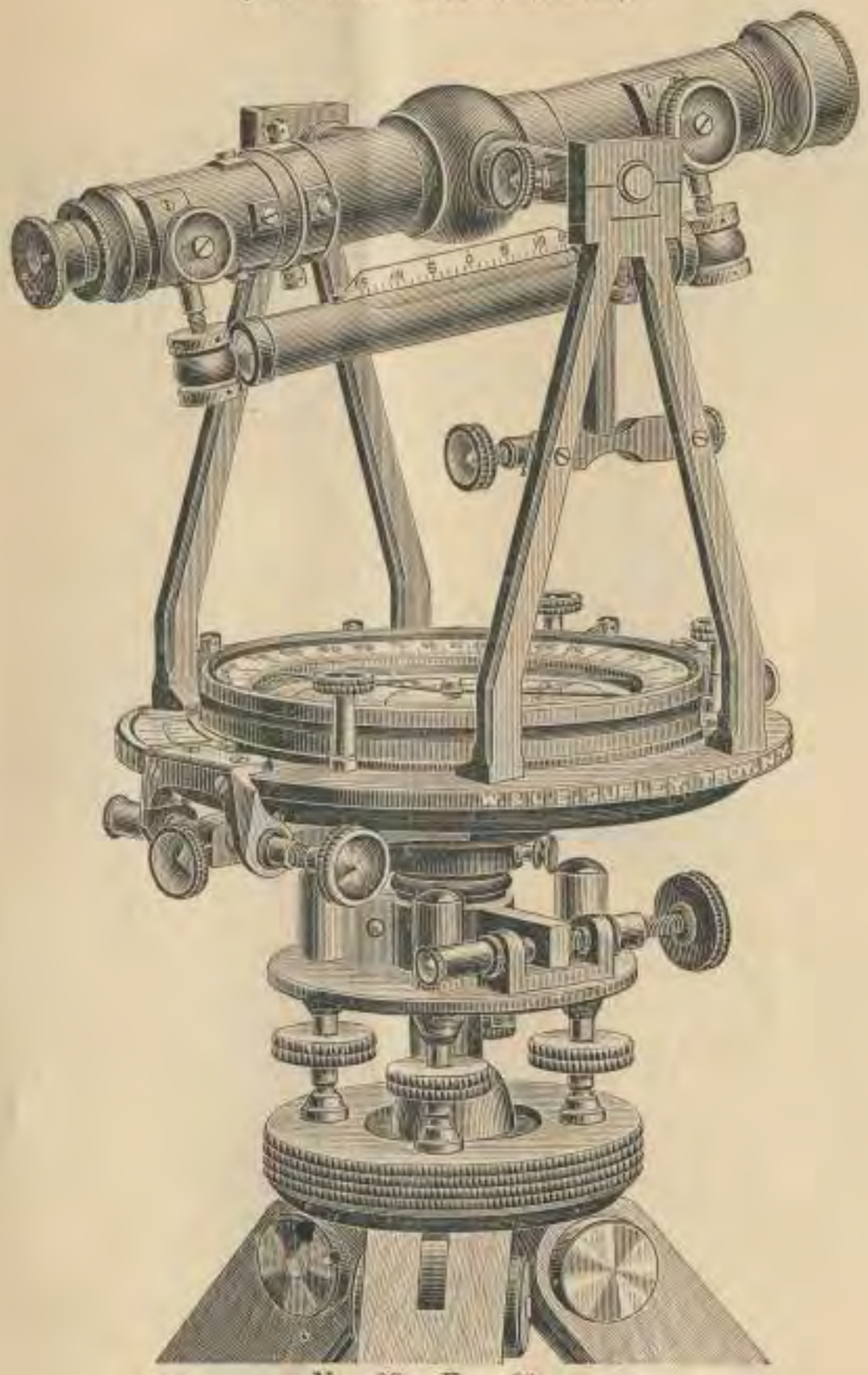
*Gentlemen:*—I have used my Surveyors' Transit, No. 14, on over 200 miles of R. R. both preliminary and location, and it is perfectly satisfactory. Have used also an old level of your make and found it far superior to one bought new of———for $160.00.

Yours very truly,

A. F. BENSON, *C. E., U. S. Mineral Surveyor for Arkansas.*

## SURVEYORS' TRANSITS.

(WITH ONE VERNIER TO LIMB).



No. 23. Fig. 21.

Price.....$133.00

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 leveling head is arranged with shifting centre, for setting the instrument quickly over a given point, without altering the position of the legs. It detaches from the upper part of the Transit and is packed separately with the instrument in the box.

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 and placed like that of the Engineers' Transit, and reads to single minutes. The telescope, as in the other Transits already described, has a rack movement to both eye and object tubes as shown in the cut.

*PRICES:*

No. 20. Surveyors' Transit, 4-inch needle, one vernier to limb, plain telescope.....$110 00

No. 20A. Surveyors' Transits, 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..... 115 00

No. 22. Surveyors' Transit, 5½-inch needle, one vernier to limb, plain telescope..... 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, Fig. 21..... 133 00

HARTFORD, CONN., June 14th, 1885.

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

*Gentlemen:*—The Surveyors' Transit, No. 23, I ordered of you the 9th arrived in good order, and I am very highly pleased with it. There can be no question but that it is capable of doing fine work, and I shall take much pleasure in using it.

With many thanks for your promptness, I remain, yours truly,

W. F. WILLIAMS, *C.E.*

---

EAST HAMPTON, L. I., July 25th, 1885.

MESSRS. W. & L. E. GURLEY,

*Sirs:*—I did not get time to examine the Transit you sent me some days ago, until yesterday, and am pleased to say that I am satisfied with it. I shall keep it.

Yours truly,

WM. H. BARNES.

---

ELIZABETHTOWN, N. Y., October 22d, 1885.

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

*Dear Sirs:*—I received the instrument (Surveyors' Transit, No. 23), you sent me and am very much pleased with it. I used it in the field to-day and it is as fine an instrument to work with as I ever saw.

Yours respectfully,

C. H. SIMONDS.

---

KALIDA, OHIO, June 28th, 1886.

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

*Dear Sirs:*—Transit, No. 22, received in good condition. Adjustments in perfect state. Am sure it will do its work with great precision if properly handled. Thank you for promptness.

D. W. SEITZ.

## THE SOLAR ATTACHMENT.

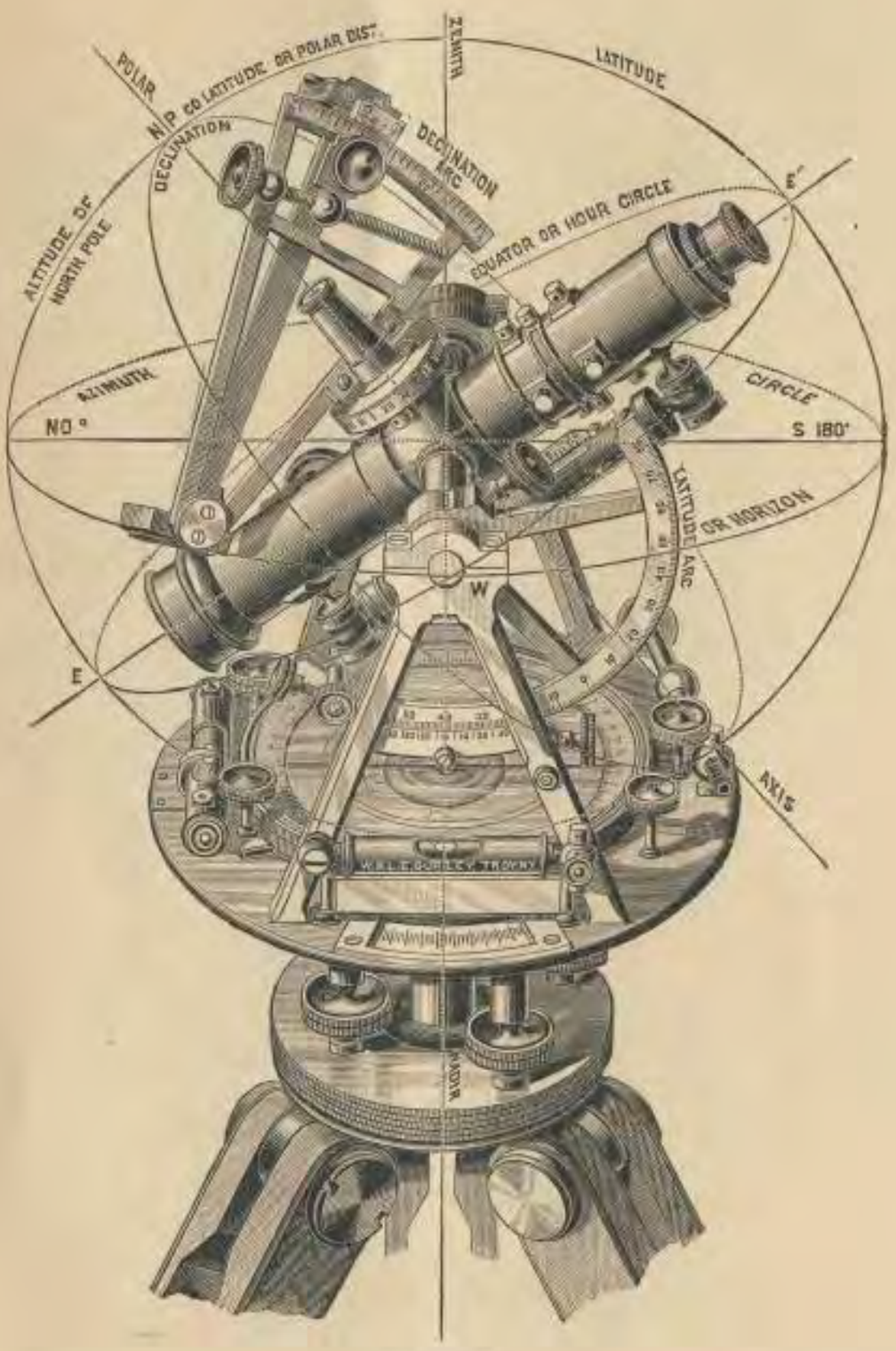



FIG. 10.

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.

---

ROSITA, COLORADO, December 6th, 1883.

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

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

Yours truly,

AUGUST KOPPE, *U. S. Dep. Min. Surveyor.*

---

HOMEWORTH, OHIO, December 21st, 1885.

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

*Gentlemen:*—Please send me the Solar Ephemeris for 1886. I have had one of your Light Mountain Transits with Solar Attachment nearly three years, and the more I use the Solar the better I like it.

Respectfully,

GEO. R. GYGER.

## SURVEYORS' TRANSIT WITH SOLAR ATTACHMENT.

No. 16. Fig. 22.

Price ..... $226.00

The cut represents our Surveyors' Transit with 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 instrument is furnished either with one vernier to limb, as in Fig. 21, or with two verniers to limb, as in Fig. 19.

*PRICES.*

No. 16.—Surveyors' Transit, two verniers to limb, 5-inch needle, with Solar Attachment, vertical arc, level on telescope, clamp and tangent to axis of telescope, leveling tripod, Fig. 22..$226 00

No. 21.—Surveyors' Transit, one vernier to limb, 5-inch needle, with Solar Attachment, vertical arc, level on telescope, clamp and tangent to axis of telescope, leveling tripod, Fig. 22.... 211 00

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

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 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.

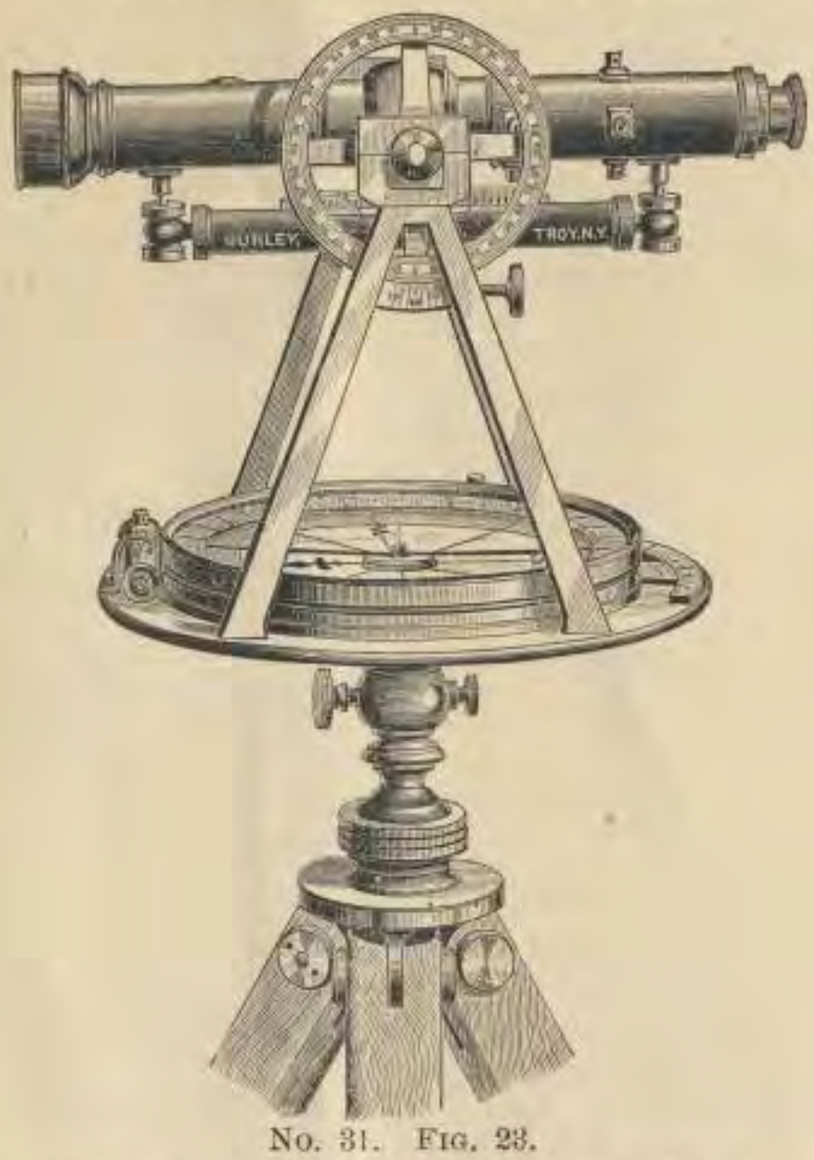
*Gentlemen:*—Your Surveyors' Solar Transit, with all attachments, has been received and examined by me very carefully.

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.

---

*PRICES.*

| | |
|---|---|
| No. 28.—Vernier Transit, 4-inch needle, compass tripod, plain telescope | $70 00 |
| No. 28A.—Vernier Transit, same as above, but with 3½ 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 3½-inch 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 3½-inch vertical circle, level on telescope, clamp and tangent movement to axis of telescope, Fig. 23 | 101 00 |

---

Battle Mountain, Nevada, May 24th, 1886.

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

*Gentlemen* :—The Vernier Transit Compass, which I recently purchased from you, I find to be a very accurate and rapid working instrument, and have had the opportunity to give it a very good trial, having used it in selecting 166 40-acre tracts in a very mountainous country.

Yours respectfully,

J. D. PARK, *C. E.*,

*U. S. Dep. Mineral Surveyor.*

## RECONNOISSANCE TRANSIT.

No. 25. Fig. 22½.

Price..... $115.00.

The Reconnoissance Transit, just introduced by us, has a needle of 4½ inches, a limb of a little over four inches diameter, reading by one double vernier to single minutes, and a clamp and tangent movement to limb, as shown.

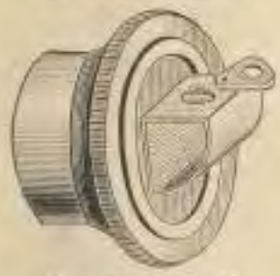
The telescope has a power of from 18 to 20 diameters, and is furnished with stadia for measuring distances; it has also a long level, clamp and tangent to axis, and a vertical circle reading to five minutes.

The compass circle is arranged to set off the variation of the needle, the movement being made by a pinion, not shown in the cut.

It has also, as shown, a leveling head with spring clamp and tangent, and the instrument is set upon our light extension tripod, the legs of which close up to about three feet long.

The weight of the Transit without tripod, is 6¾ lbs., with tripod, complete, 10½ lbs. We anticipate a large demand for this little instrument, as it is capable of excellent work.

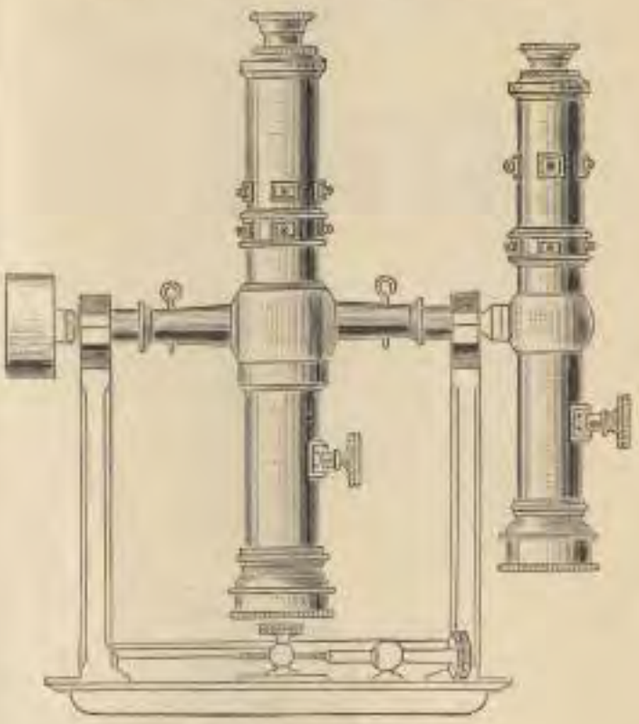
No. 38. Fig. 16.
Plummet Lamp.



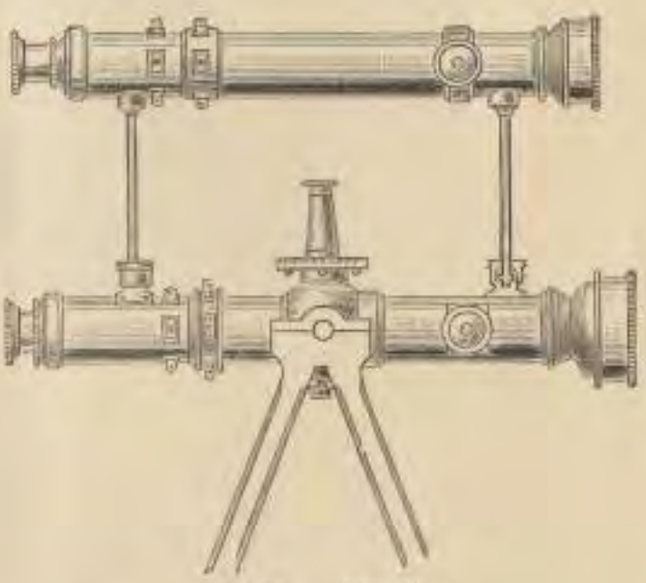
No. 39. Fig. 13.
DIAGONAL PRISM.

No. 40. Fig. 12.
REFLECTOR.

## EXTRA TELESCOPES FOR VERTICAL SIGHTING.



No. 50. Fig. 14.



No. 50. Fig. 15.

## EXTRAS TO TRANSITS.

| | Price. | Post. |
|---|---|---|
| 35.—Patent Solar Attachment | $60 00 | $ .15 |
| 36.—Variation Plate furnished with new Engineers' Transits, Nos. 1 to 4, 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 | .25 |
| 39.—Diagonal Prism for Eye-piece, Fig. 13 | 8 00 | .04 |
| 40.—Reflector for object-glass of Transit Telescope, Fig. 12 | 4 00 | .04 |
| 41.—Vertical Circle, 3½ inches diameter, divided on silver, vernier reading to five minutes | 8 00 | .08 |
| 42.—Vertical Circle, 4½ inches diameter, divided on silver, reading to single minutes | 12 00 | .10 |
| 43.—Vertical Arc, 6 inches diameter, divided on silver, with vernier movable by tangent screw, reading to 30 seconds | 18 00 | .10 |
| 44.—Clamp and tangent movement to axis of telescope | 6 00 | .08 |
| 45.—Gradienter, combined with clamp and tangent, Fig. 18 | 18 00 | .12 |
| 46.—Level on telescope, with ground bubble and scale | 12 00 | .15 |

## EXTRAS TO TRANSITS.

| | Price. | Post. |
|---|---|---|
| 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 | .35 |
| 51.—Graduation 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 4½-inch vertical circle, to read 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. 10½ | 6 00 | .10 |
| 57.—Attached microscopes to read verniers of horizontal limb, per pair | 15 00 | |
| 58.—Quick-leveling tripod head, Fig. 65 | 6 00 | .30 |
| 59.— do do when ordered with new Transit, Nos. 1 to 24, extra | 5 00 | |
| 60.—Leveling tripod head, with clamp and tangent movement, fitted to Vernier Transit Compasses, Nos. 28 to 31, extra | 13 00 | |
| 61.—Patent extension tripod, furnished instead of regular tripod, with any new Transit Nos. 1 to 5, and 12 to 24, extra | 5 00 | |
| 62.—Patent extension tripod, furnished instead of regular tripod, with any new Transit Compass, Nos. 28 to 31, extra | 7 00 | |
| 63.—Patent extension tripod, for Transits, Nos. 1 to 5, and 12 to 24 | 15 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.

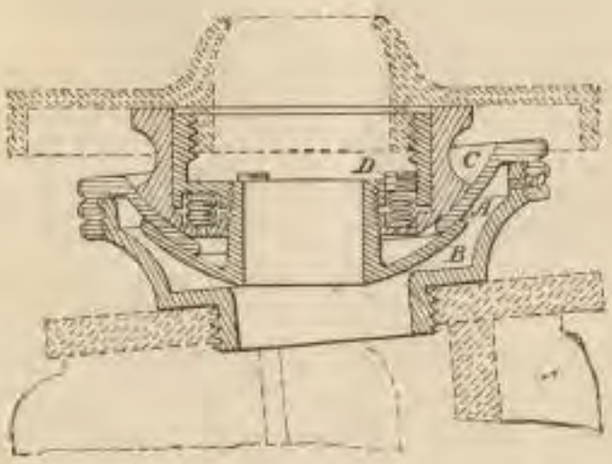



Fig. 65.

Fig. 65 shows the Quick Leveling Attachment designed for Level or Transit, as screwed fast to a Tripod.

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.

***Prices.***—When furnished with a new instrument, $5.00. For same, adapted to any instrument already in use, as in Fig. 65, $6.00.

***N. B.***—When Fig. 65 is ordered for any instrument already in use, 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.

## EXTENSION TRIPOD.


No. 63. 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.

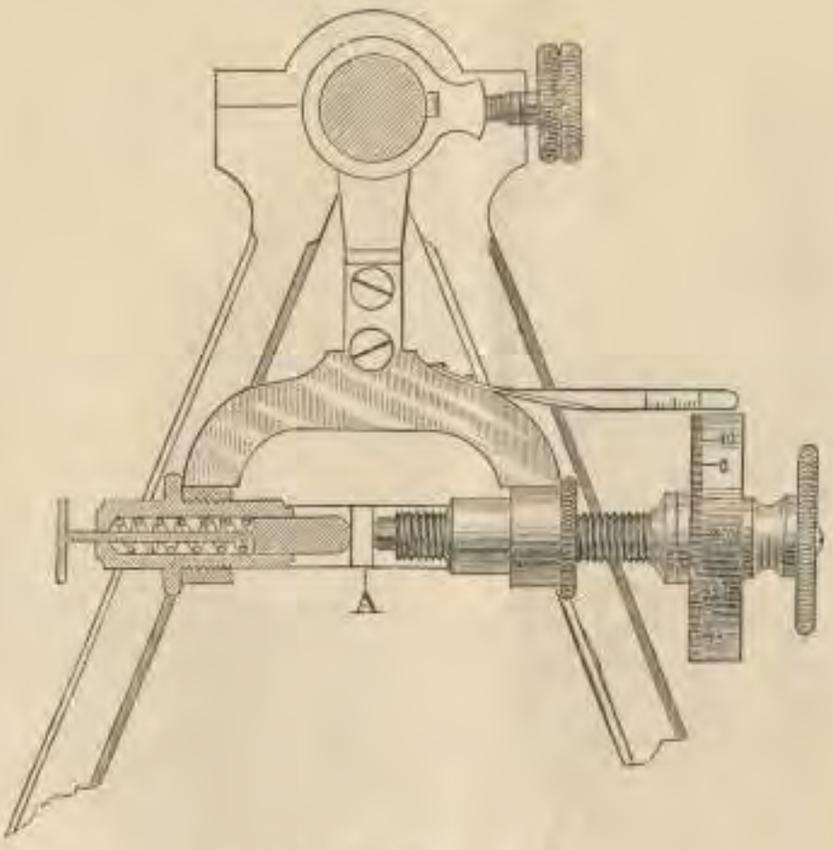
A larger size with bronze head and heavier legs is used with the larger transits and leveling instruments; and a smaller and lighter one with the various pocket compasses.

---

*PRICES.*

No. 61.—Patent Extension Tripod, furnished instead of regular tripod, with any new instrument, Nos. 1 to 5 and 12 to 24, extra ..... $ 5 00
No. 63.—Patent Extension Tripod for Transit or Level ..... 15 00
No. 121.—Patent Extension Tripod furnished with any compass. Nos. 105 to 117 ..... 12 00
No. 170.—Patent Extension Tripod for pocket compasses, Nos. 140 to 162 ..... 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.

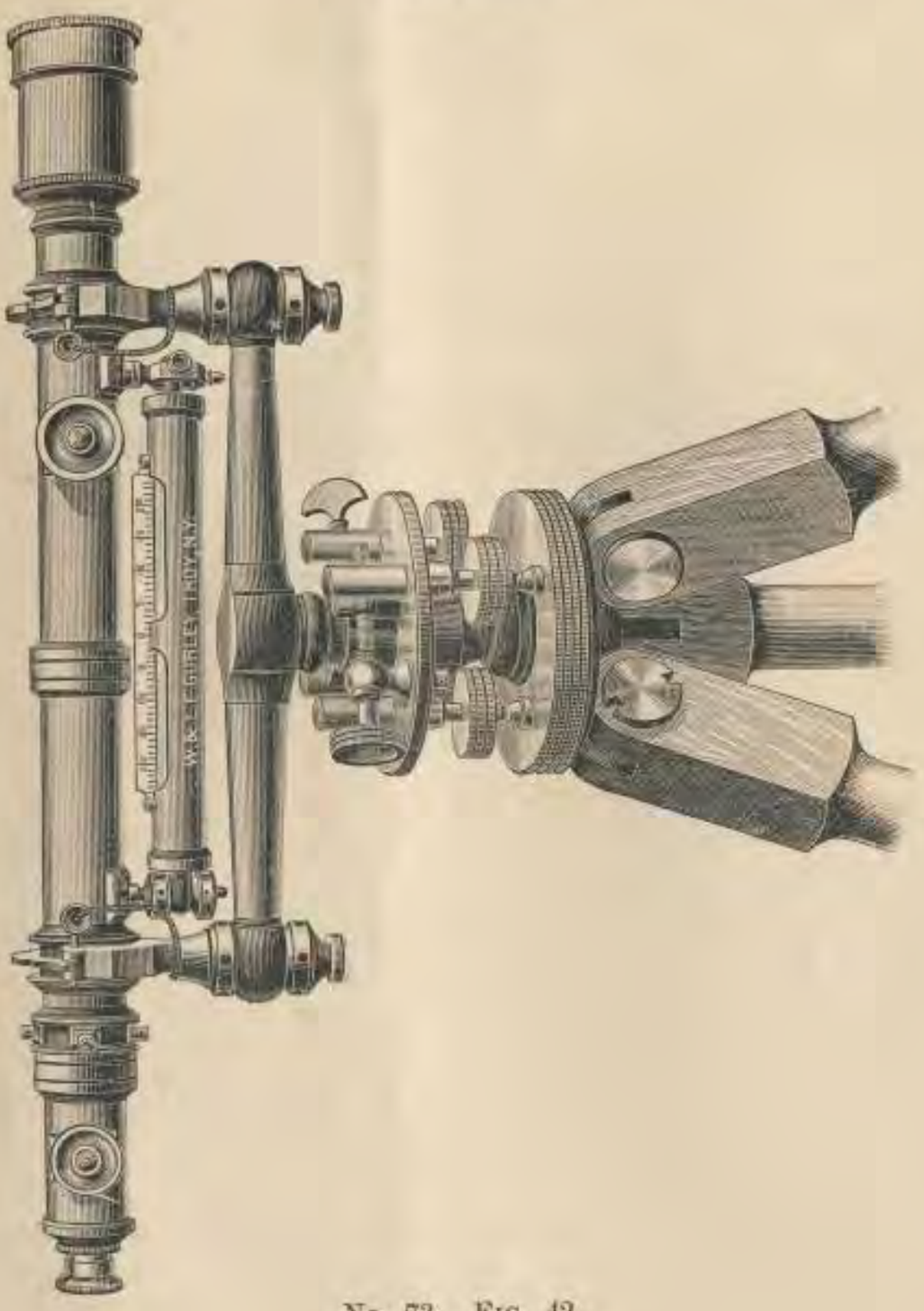
And as the value of a thread is such that a complete revolution of the screw will move the horizontal cross-wire of the telescope over a space of one foot on a rod at a distance of one hundred feet, it is clear that when the screw is turned through fifty spaces on the graduated head, the wire will pass 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-cylindric 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 | 110 00 |
| No. 73.—Twenty-inch do do do Fig. 42 | 110 00 |
| No. 74.—Twenty-two inch do do do | 115 00 |
| No. 80.—Patent Extension Tripod for Level, Nos. 70 to 74, instead of regular tripod, extra | 5 00 |
| No. 81.— do do do No. 75, instead of regular tripod, extra | 7 00 |
| No. 85.—Quick-leveling tripod head, Fig. 65 | 6 00 |
| No. 86.— do do when ordered with new instrument, Nos. 70 to 75, extra | 3 00 |

Note.—Level No. 70 does not have a rack and pinion movement to the eye-piece.

RENSSELAER, IND., December 20, 1884.

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

*Dear Sirs:*—I have used one of your Transits for over six years, and one of your Levels for nearly three years, and am well satisfied. Used the Level for nearly three years without readjusting, and perhaps could have used it as much longer if it had not had a fall.

Very respectfully yours,

LEWIS S. ALTER, *C.E.*

---

CURRY, IDAHO, July 11, 1885.

MESSRS. GURLEY & CO., Troy, N. Y.

*Gents:*—I am pleased to say that the 20-inch Y Level you shipped to me arrived in good order, and I think it the most perfect, best made, most complete and handsomest instrument I ever saw. The quick-leveler I would not be without. I am much pleased with the filling of my order.

Respectfully,

GEORGE TRASK, *C.E.*

---

HOLBROOK, ARIZONA TER., August 13th, 1885.

W. & L. E. GURLEY,

*Gentlemen:*—Will you be kind enough to send me the Solar Ephemeris for 1885.

Instrument (20 inch Y Level) received O. K., and works as well, if not better than any I ever used.

Very Respectfully,

W. L. VINAL, *C.E.*

---

KALIDA, OHIO, March 11, 1886.

*Dear Sirs:*—Please send me catalogue of Surveying Instruments. I am about ready to purchase. The 20-inch Y Level I bought of you, gives entire satisfaction.

Very Respectfully,

D. M. SEITZ, *C.E.*

## 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, $50.00.

The figure represents the Level introduced by us in 1874, and which has since been very largely used by architects, builders, and millwrights, as well as by engineers and surveyors, in the grading of streets, drains, sewers, etc., in all parts of the country. It has a telescope of 12 inches, now furnished with rings, wyes, etc., precisely like the larger levels, 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.

AUSTIN, TEXAS, May 13th, 1885.

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

*Gentlemen :*—The instrument (Architects' Level) ordered from you a few days since arrived on the morning of the 11th. Since that time we have been using it in laying out the foundation of a large hotel, and permit us to say that it is satisfactory in every particular, and has nearly repaid, in time saved, its original cost.

Yours truly,

J. N. PRESTON & SON, *Architects.*

---

BEDFORD, OHIO, May 25th, 1885.

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

*Dear Sirs :*—I have tried the Architects' Level expressed me, and find it beyond all expectations. I have told the express agent to forward the money. Please send me the Manual and other catalogues.

Yours truly,

J. D. TARBELL.

---

GRAND ISLAND, HALL CO., NEB., April 10th, 1886.

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

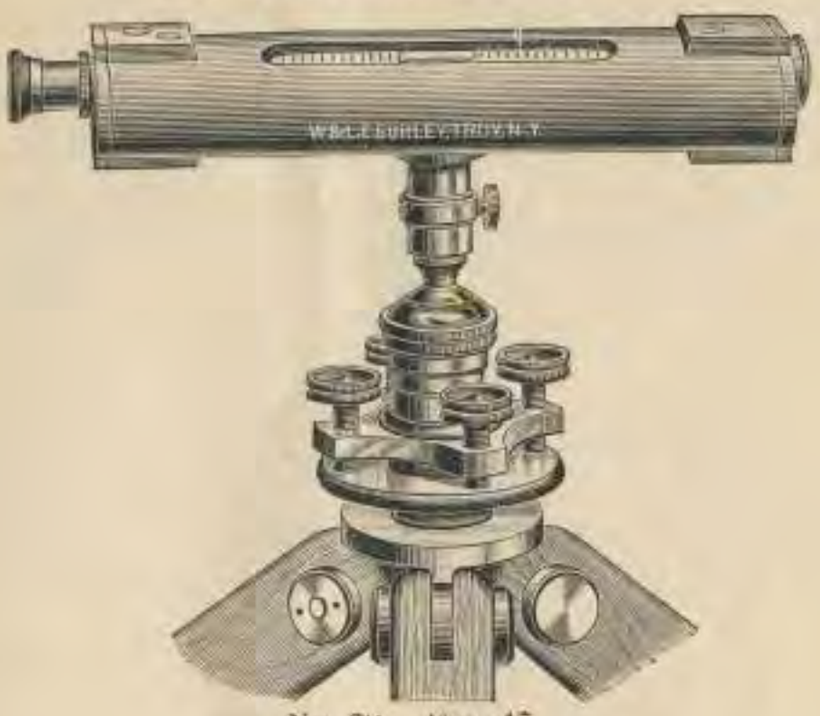
*Dear Sirs :*—I received the Architects' Level which you sent me, have tested it with bench marks here in town, that were given with a 20-inch Y Level, find it correct, have tried angles with it, can count the number of glass in a house ten miles away with the telescope, have ordered the express agent to forward the money. The instrument is worth twice the amount.

Respectfully yours,

WILLIAM ENSIGN, *County Surveyor.*

## FARMERS' OR DRAINAGE LEVEL.

PATENTED OCTOBER 16th, 1883.




No. 78. FIG. 47.

Price .....$25.00.

The figure represents 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.

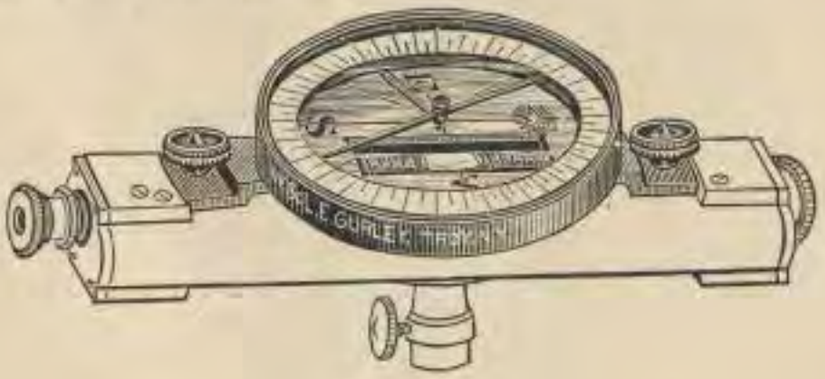



FIG. 47½

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.* | Post. |
|---|---|---|
| No. 76.—Farmers' or Drainage Level, with Jacob-staff mountings | $15 00 | $1 00 |
| No. 77.— do do with plain tripod | 20 00 | 1 60 |
| No. 78.— do do with tripod and leveling screws, Fig. 47 | 25 00 | 1 75 |
| No. 79.— do do do do do and with compass attached, Figs. 47 and 47½ | 30 00 | 2 00 |

McBRIDE, MICH., August 31, 1885.

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

*Gentlemen:*—I like the Drainage Level very much, it being light and easy to handle, and the ball and socket joint makes it very convenient to adjust to a level. I have used it now upon six or seven miles of drain, and like it better the more I use it.

I remain, very truly,

A. J. CHAPPELL.

*P. S.—September 28th*, 1885.—Found this letter among some others to-day. I supposed that it had been sent long ago. Excuse the mistake. The Level works "boss."

A. J. C.

---

OFFICE OF THE DRAINAGE AND FARM JOURNAL,
INDIANAPOLIS, IND., October, 1885.

The Drainage Level of W. & L. E. Gurley, which appears in our advertising columns in this number of the Journal, is worthy of special mention. The well-established character of the manufacturers is a sufficient guarantee of the fitness of the instrument advertised for use in farm drainage. But we can say more—we know it to be an excellent instrument. We have used it in the field, and have found it convenient and accurate.

J. J. W. BILLINGSLEY.

---

SARATOGA, WYOMING, March 15, 1886.

MESSRS. W. & L. E. GURLEY,

*Gentlemen:*—I must tell you what I did with your Farmers' Drainage Level. I leveled a ditch seven miles long beginning at the lower end. Near the upper end we encountered a depression in the ground of about three feet and about a quarter of a mile across. It would have been necessary to either dike or flume across this low place, either of which would be expensive. The owner wanted the lower end as high as we started, and he wished to avoid the expense of diking across the low ground. I made a calculation so as to gain the three feet and commenced again at the lower end. We tried the stakes of the former ditch about every 1,000 feet, and found them all right, and came to the depression exactly right. I could not have done better with the 20-inch Level.

Yours truly,

J. M. STERRETT

---

RIVERSIDE STOCK FARM,
LYONS, FREMONT CO., WYOMING, May 24th, 1886.

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

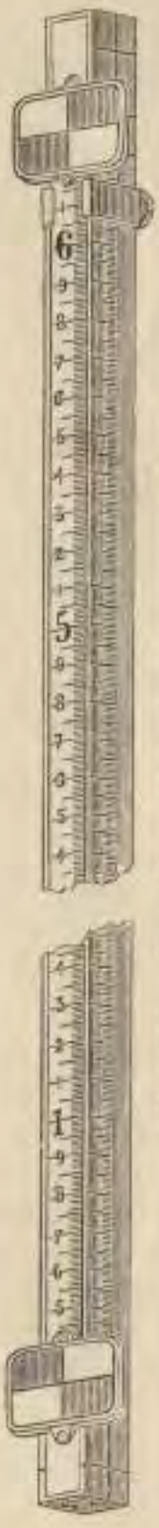
*Dear Sirs:*—The Farmers' Drainage Level, etc., received all right. I don't see how Ranchmen could get along without it after once using it. "It's a Daisy."

Yours respectfully,

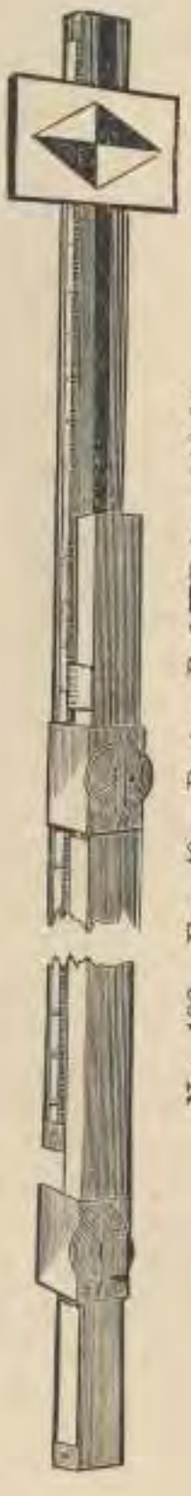
R. H. HALL.

## 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.

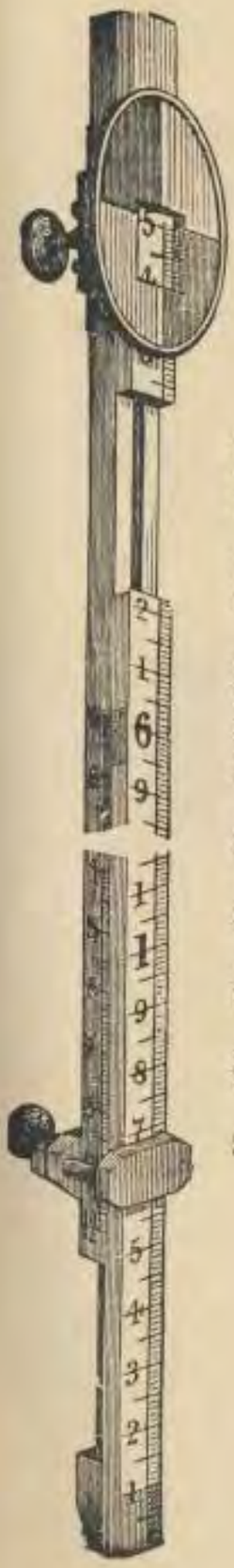
No. 194. Fig. 48.—*Philadelphia Rod.* Price, $16.00.

### *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, 7⅛ ft. closed, sliding to 13 ft., Fig. 48 | | 16 00 |
| No. 195.—New York Rod, 6⅞ 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 5⅛ ft. closed, sliding to 14½ ft., Fig. 52 | | 18 00 |
| No. 197.— do in 4 parts, 5 ft. closed, sliding to 16 ft | | 20 00 |
| No. 199.—Telemeter, or Stadia Rod, 6 ft. folded, unfolding to 12 ft | | 12 00 |
| No. 200.—Telescopic Rod, 5 ft. long, sliding to 14 ft. Fig. 53A | | 24 00 |
| No. 201.—Cross Section Rod, 10 ft. long, with level vial at each end, Fig. 53D | | 10 00 |

NOTE.—Any of the above Rods with Metric measure, at same price.

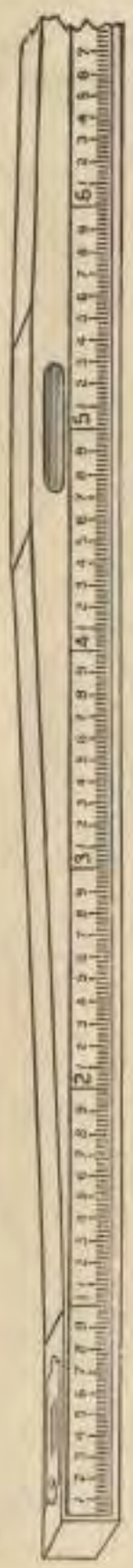
## LEVELING RODS (Continued).



No. 195. Fig. 50.—*New York Rod.* Price, $16.00.

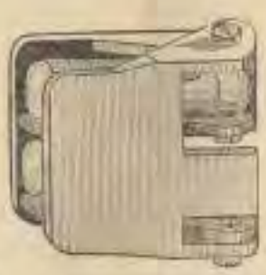
No. 196. Fig. 52.—*New York Rod, in 3 parts.* Price, $18.00.

No. 200. Fig. 53A.—*Telescopic Rod.* Price, $24.00.



No. 201. Fig. 53D.—*Cross Section Rod.* Price, $10.00.

Fig. 53C.
*Rod Level as Applied to a Rod.*



No. 215. Fig. 53B,
*Rod Level.*
Price, $3.00.

## FLAG STAFFS, ETC.

210.—6 feet long, with steel-pointed shoe, and divided off in feet, which are painted red and white, alternately ..... $2 00

211.—8 feet long, with steel-pointed shoe, and divided off in feet, which are painted red and white, alternately ..... 2 25

212.—10 feet long, with steel-pointed shoe, and divided off in feet, which are painted red and white, alternately ..... 2 50

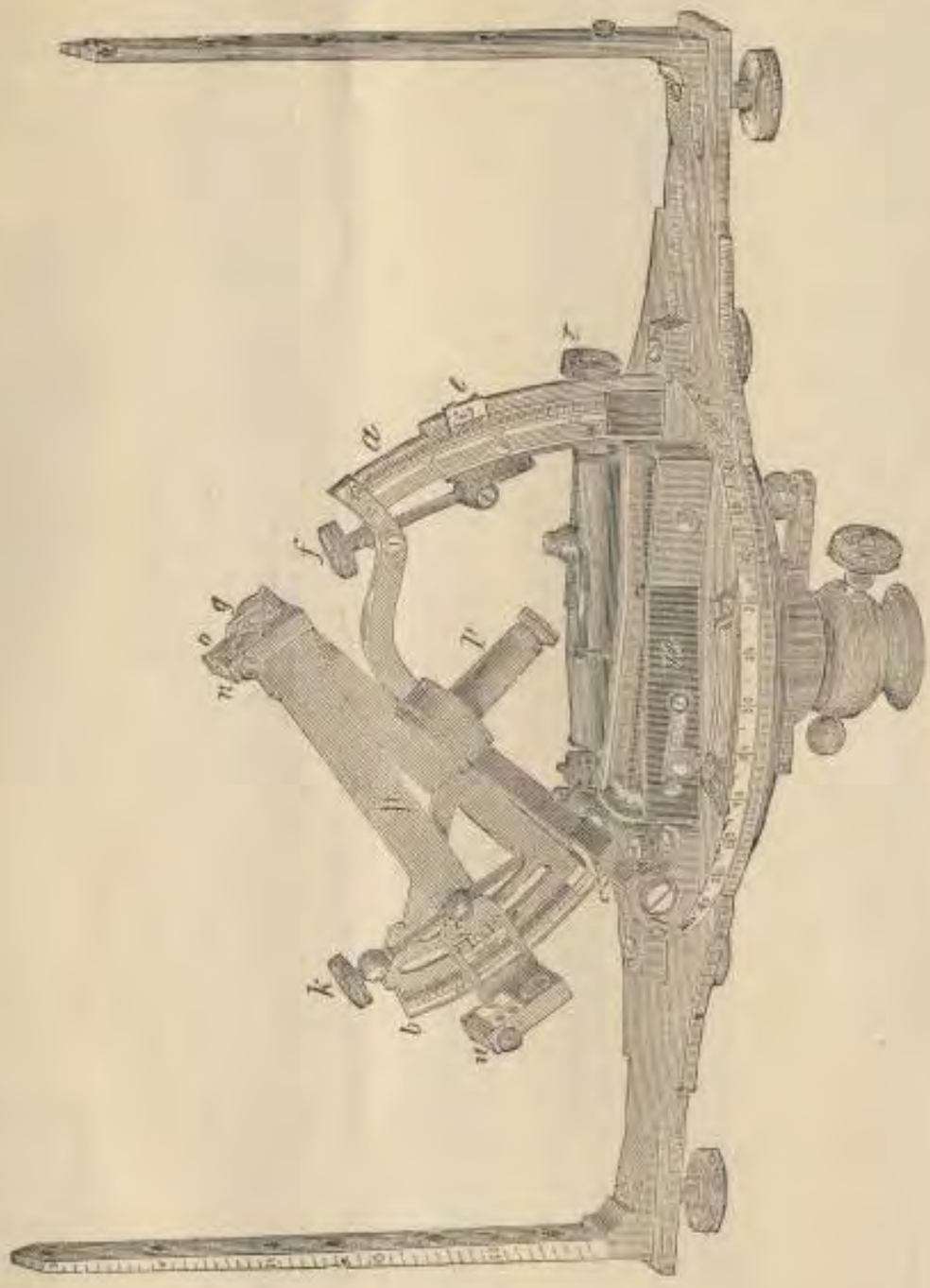
213.—Aligning or Ranging Pole, 6 feet long, hung in gimbals ..... 4 00

Note.—This pole consists of an iron tube, $\frac{3}{16}$ of an inch diameter, 6 feet long, with solid steel point, and being hung in gimbals always assumes a vertical position. It is divded and painted same as No. 210.

Note.—Nos. 210 to 213 divided metrically, at same price.

215—Rod level for plumbing a rod or flag staff, Figs. 53B and C.. ..... ..$3 00 $0 10

## THE SOLAR COMPASS.



No. 100. FIG. 25.

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

---

BADGER, DOUGLAS CO., WASH. TER., February 8th, 1886.

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

*Gentlemen:*—Please send me your Solar Ephemeris for 1886. I have now in use Burt's Improved Solar Compass, Engineers' Transit, 18 inch Y Level, and five inch Vernier Compass, all of your make, and for my business, mixed surveying and engineering, I could not find a better outfit.

Respectfully yours,

JOSEPH M. SNOW,

*U. S. Dep. Land and Min. Surveyor.*

HANCOCK, MICH., August 7th, 1885.

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

*Gents:*—The Pocket Solar, Fig. 33, to hand. It is all I expected and is really a very complete little instrument. I am pleased with it. I instructed the express agent to remit you to-day.

Very truly yours,

JOHN PENBERTHY, *Mining Surveyor.*

---

EUREKA, CAL., November 19th, 1885.

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

*Gentlemen:*—Please send me your Pocket Ephemeris for 1886. The instrument lately repaired, or rather made over by you, is giving first-rate satisfaction. Have just bought one of your Solar Compasses, Fig. 25, that has been doing duty out in the mountains of Colorado for about ten years, and from all appearances is good for twenty years more. I have six instruments doing the work of this County and have never had reason to complain of the results obtained with a Gurley, hence they have the preference of this office.

Yours respectfully,

A. T. SMITH, *County Surveyor.*

---

219 4½ STREET,
WASHINGTON, D. C., April 1st, 1886.

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

*Gents:*—I re-ship you to-day, by Adams Express, the Solar Compass, Fig. 25, and tripod you so kindly lent me. I have treated them to an exhibition before Honorable Congressmen and hope it will have no bad effect on them. I think the instrument is the finest of its kind I ever saw. Allow me to congratulate you on providing the Surveyor with such perfect instruments. Hoping it may reach you in as good condition as it is shipped, I remain,

Very truly yours,

JOHN BURT.

---

IRON MOUNTAIN, MICH., April 12th 1886.

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

*Gentlemen:*—The Pocket Solar, Fig. 33, I purchased from you last year gives me entire satisfaction, and if you ever have occasion to recommend a compass for use in this country I would advise you to recommend no other.

Very truly yours,

H. ARMSTRONG.

## THE POCKET SOLAR COMPASS.


No. 140B. 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 4½ inches diameter, divided to half degrees and reading by its one double vernier horizontal angles to single minutes.

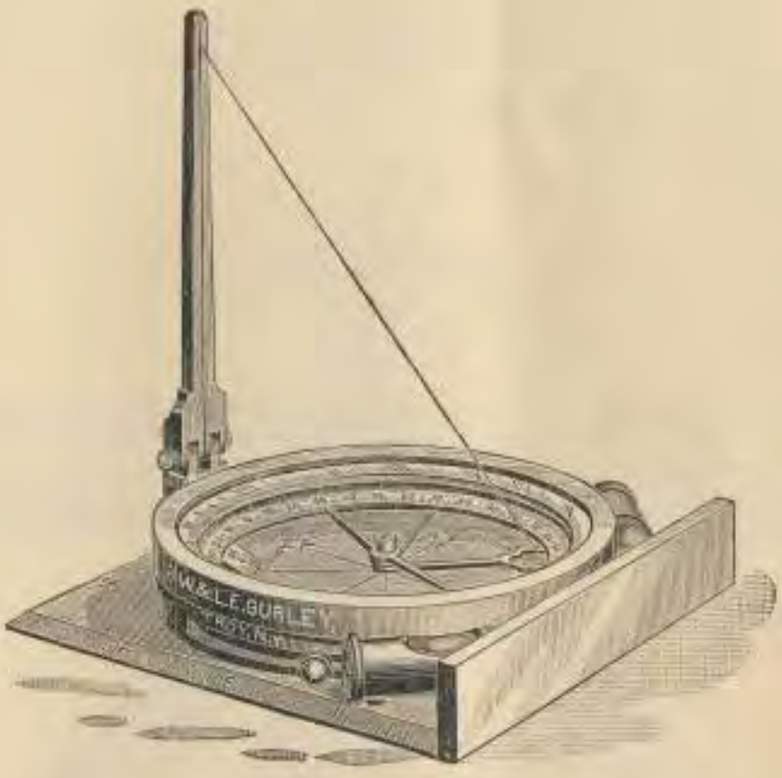
The arrangement of the plates is similar to that of the large Solar Compass, the under plate carrying the sights revolving around the upper or compass plate, to which are attached the solar apparatus, levels, etc.; there is also a clamp with tangent-screw between the two plates, and another to the whole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

### *PRICES.*

| | | Post. |
|---|---|---|
| No. 140A.—Pocket Solar Compass, with staff mountings and mahogany box | $100 00 | $1 25 |
| No. 140B.— " " " " Light Tripod, as in Fig. 33 | 105 00 | 2 00 |
| No. 140C.— " " " " Light Extension Tripod | 110 00 | 2 25 |
| No. 140D.— " " " " " " " and Leveling Plates | 120 00 | 2 50 |
| No. 141.—Side Telescope and Counterpoise fitted to new Pocket Solar Compass | 25 00 | 50 |
| No. 142.—Leather Case with Shoulder Straps for new Pocket Solar Compass | 5 00 | 50 |

## 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°, 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.

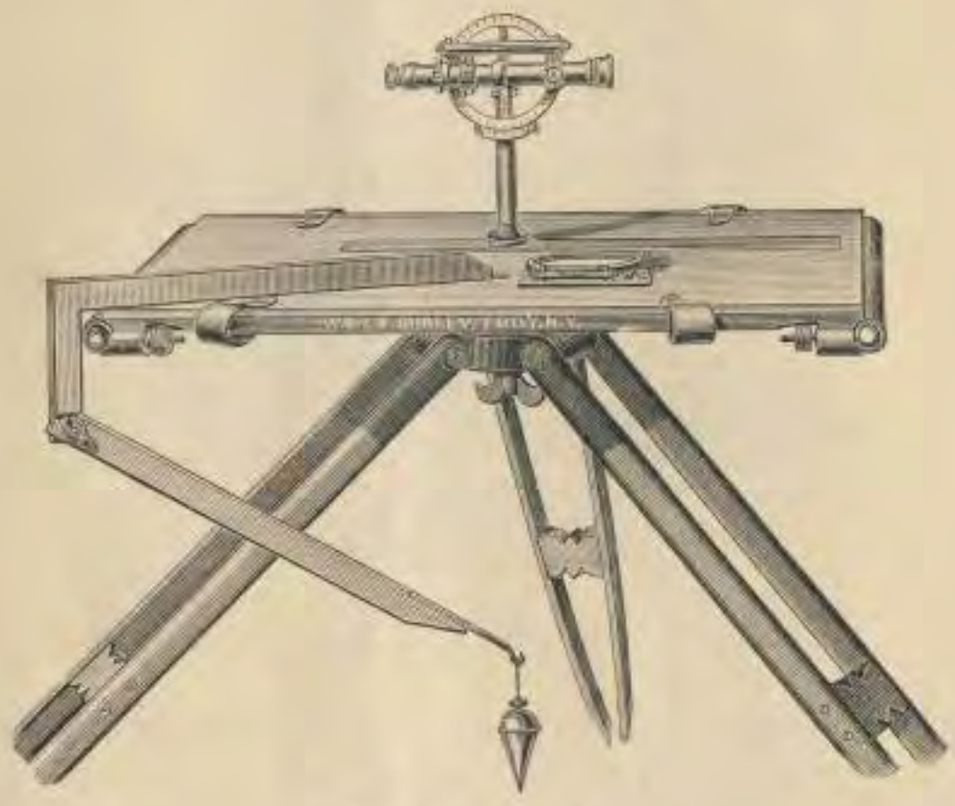
---

| | *PRICE*, | Post. |
|---|---|---|
| No. 148.—Simple Dial Compass, with removable hour arc, graduated for any latitude as ordered, two levels, and clinometer, Fig. 41..... | $16 00 | .30 |

## 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.....$130.00.

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 five 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 | $130 00 |

## 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 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.

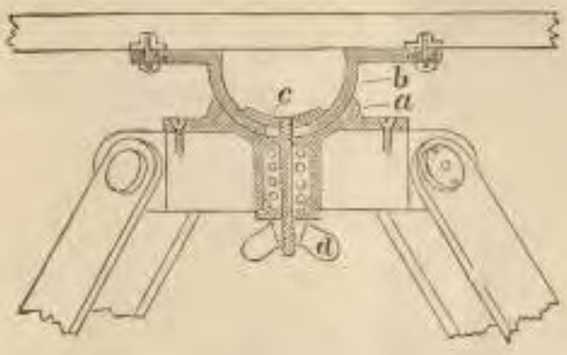



FIG. 55.

## 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 or three inch 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.—Plan 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

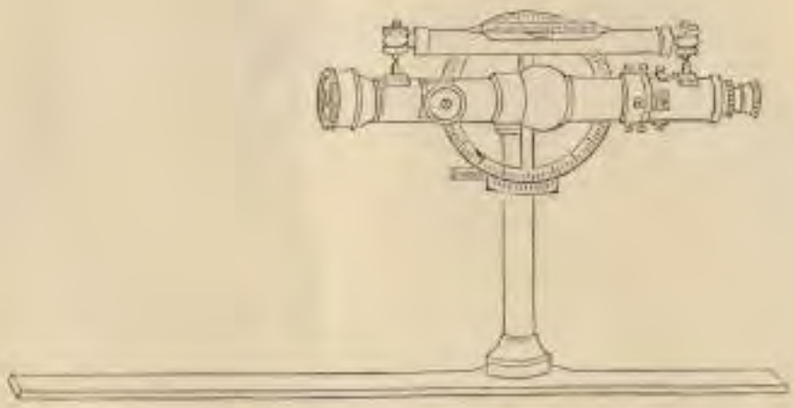
Fig. 57 shows the simple Alidade, to which is fitted the telescopic sight, having a level, clamp and tangent, and vertical circle reading to five minutes, attached to the telescope, which is also supplied with micrometer wires.

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. 132, 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.

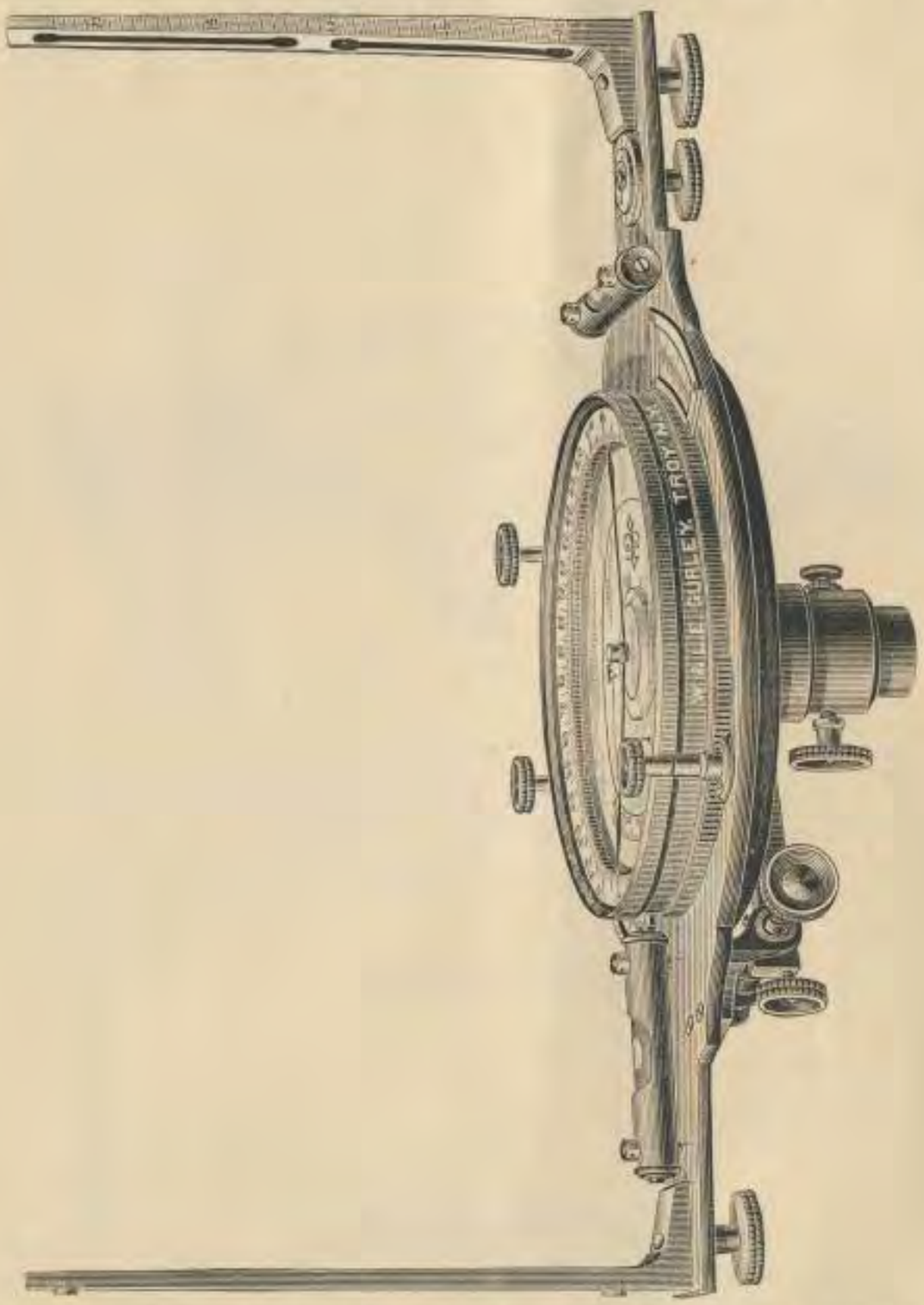
It is placed on the brass rule precisely like that of the one described with Fig. 54, and is adjusted and used in the same manner.

---

*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, 4½-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 Compass*, 5½-inch Needle. No. 107. Fig. 29. Price, $75.00

## RAILROAD COMPASSES.

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. The verniers are now placed in front of the observer, and the tangent movement to limb is made like that of our best Transits. In mahogany box, with lock and strap.

---

*PRICES.*

No. 105.—Railroad Compass, 5½-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, 5½-inch needle, two verniers to limb, Fig. 29..... 75 00

## VERNIER COMPASSES.

No. 112. FIG. 30.

Price.....$40 00.

*PRICES.*

No. 110.—Vernier 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.—Vernier Compass, same as above, but with 5-inch needle..... 35 00
No. 112.—Vernier Compass, same as above, but with 6 inch needle and vernier outside, as shown in engraving, Fig. 30..... 40 00

## PLAIN COMPASSES.

No. 117. FIG. 31.

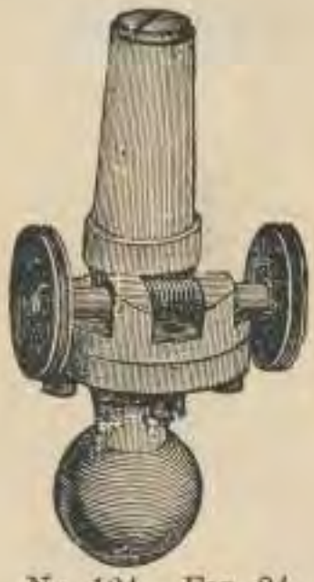
Price.....$35 00.

*PRICES.*

No. 115.—Plain 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.—Plain Compass, same as above, but with 5-inch needle..... 30 00
No. 117.—Plain Compass, same as above, but with 6-inch needle Fig. 31..... 35 00

## Extras to Compasses.

| | | Post. |
|---|---|---|
| No. 120.—Compass Tripod, cherry legs | $ 5 00 | $1.25 |
| No. 121.—Patent Extension Tripod, furnished with any compass, Nos. 105 to 117 | 12 00 | 1 50 |
| No. 122.—Compass Tripod, with leveling screws, and clamp and tangent movement | 18 00 | .... |
| No. 123.—Compass Tripod Mountings, without legs | 4 00 | .50 |
| No. 124.—Compound Tangent Ball, Fig. 24 | 6 00 | .25 |
| No. 126.—Leveling adopter, large size, Fig. 27 a | 7 00 | .30 |



No. 124. Fig. 24.

*a No.* 126.

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.

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,

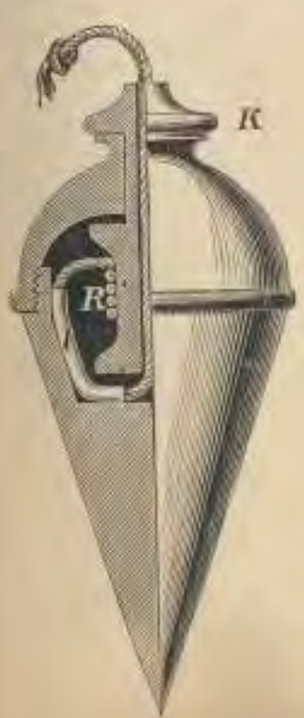
THOMAS KELBAUGH, *Surveyor.*

New York City, December 29th, 1884.

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

*Gentlemen:*—I have just heard from the 6-inch Vernier Compass sent to West Virginia. It gives great satisfaction to the purchaser, and four surveyors, upon examination, pronounced it the finest and best compass they ever saw. Yours truly,

J. M. PELTON.




## ADJUSTABLE PLUMB BOBS.

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

| No. | Price. | Post. |
|---|---|---|
| 350.—10 oz | $2 50 | $ .12 |
| 354.—30 oz | 5 00 | .35 |

## BRASS PLUMB BOBS.

| | | | | | |
|---|---|---|---|---|---|
| 355.—Steel point, screw head, | | | 3 oz | $1 00 | $ .04 |
| 356.— | do | do | 6 oz | 1 25 | .07 |
| 357.— | do | do | 10 oz | 1 50 | .12 |
| 358.— | do | do | 14 oz | 2 00 | .16 |
| 359.— | do | do | 20 oz | 2 50 | .23 |
| 360.— | do | do | 24 oz | 3 00 | .28 |
| 361.— | do | do | 32 oz | 3 50 | .37 |

## TELESCOPIC SIGHT.

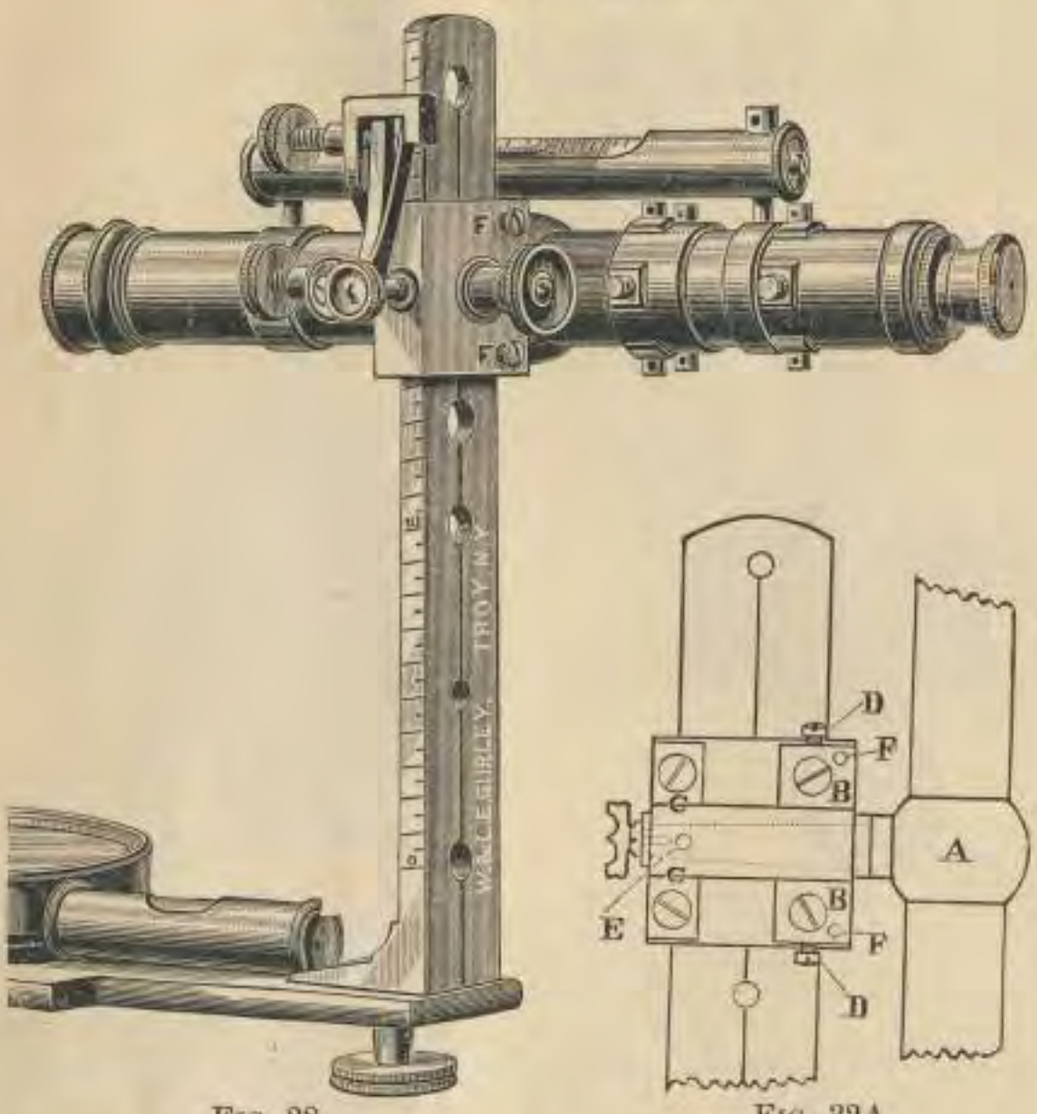



FIG. 28.




FIG. 32A.

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.* | | Post. |
|---|---|---|
| No. 130.—Nine-inch Achromatic Telescope, power about 10 diameters | $12 00 | $0.40 |
| No. 131.—Nine-inch Achromatic Telescope, larger diameter of object glass and power about 20 diameters | 17 00 | .45 |
| No. 132.—Same Telescope as No. 131, but furnished with micrometer or stadia wires for measuring distances | 20 00 | .50 |
| 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 | |

---

PLYMOUTH, IND., Jan. 15, 1885.

W. & L. E. GURLEY.

*Sirs :*—I want to tell you I took the levels for a ditch of six miles length with one of your telescopes with level attached to a six-inch needle compass, and afterward it was tested by an old Railroad Civil Engineer with a first-class Y Level and found only an error of one inch in a mile. Now if that was an accident, I hope I may always meet with just such ones. I believe I can do just as good a job as many of the Y Levels.

Yours, etc., A. NORTH.

---

PRAIRIE GROVE, ARK., Dec. 21, 1885.

*Gentlemen :*—The telescopic sight is simply perfection, could not work without it. I run over hills, across streams, around a section and close very nicely, never missing.

W. E. ROSSER.

**Plain Pocket Compass.**

Nos. 150 to 154. Fig. 38.

No. 173 *a*.

Fig. 64.

**Vernier Pocket Compass.**

Nos. 155 and 156. Fig. 36.

Price as shown, 3⅛-inch needle, with tripod, $21.00.
If 4⅛-inch needle, and tripod, $23.00.

## Pocket Compasses and Extras.

| | Price. | Post. |
|---|---|---|
| 150.—With folding sights, 2½-inch needle, very serviceable for retracing lines once surveyed | $8 00 | $ .18 |
| 151.—Same as above, with jacob-staff mountings, Fig. 38 | 10 00 | .30 |
| 152.—With 3⅛-inch needle, and jacob-staff mountings, Fig. 38 | 12 00 | .40 |
| 153.—Same as above, and two levels | 13 50 | .40 |
| 154.—Same as 152, but without jacob-staff mountings | 10 00 | .30 |
| 155.—Vernier Pocket Compass, with folding sights, staff mountings, two levels, and 3½-inch needle, Fig. 36 | 16 00 | .40 |
| 156.—Same as above, 4⅛-inch needle, Fig. 36 | 18 00 | .70 |
| 167.—Leather case with shoulder strap, for pocket compasses, according to size, 2 00 to 5 00 | .15 to | .50 |
| 168.—Tripod for pocket compasses, Nos. 140 to 162 | 5 00 | .75 |
| 169.—Tripod for pocket compass, with leveling plates and clamp and tangent | 15 00 | 1.00 |
| 170.—Patent extension tripod for pocket compass | 10 00 | 1.00 |
| 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 | .20 |

**Leveling Adopter;** the appliance shown in Fig. 64, at *a*, for use with the Pocket Compasses, &c., gives in connection with the ball, a rapid and accurate means of leveling any of the smaller instruments.

| | Price. | Post. |
|---|---|---|
| 1162.—Prismatic Azimuth Compass, brass, 4 in. diam | $22 00 | .20 |
| 1163.—Pocket Alt-Azimuth, with Telescope for travelers and military surveyors. Altitudes, azimuths, compass bearings, clinometer degrees and levels are all obtained by this instrument. Size 6½ x 2½ x 1⅝, in case | 50 00 | .30 |
| 1164.—Pocket Sextant, with Telescope, very accurate | 42 50 | .30 |
| 1165.—Surveyor's Cross—for right angles | 3 00 | .25 |
| 1166.—Pedometer, for measuring distances walked, watch form and size, nickel-plated case | 5 00 | .05 |

## 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, consists 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. | | Post. |
|---|---|---|
| 178.—3-inch needle, glass on both sides, wood box, stop to needle, Fig. 39 | $12 00 | $ .20 |
| 179.—3-inch needle, glass on both sides, brass covers, stop to needle | 12 00 | .25 |
| 180.—3-inch needle, glass on one side, brass cover, stop to needle | 12 00 | .20 |
| 181.—"Norwegian Needle," glass on both sides, brass covers, 3-inch needle, superior article, Fig. 40 | 12 00 | .30 |
| 182.—Same as above, 4-inch needle | 15 00 | .40 |

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

## VERNIER POCKET COMPASSES.

WITH TELESCOPIC ATTACHMENT, etc.


No. 162. FIG. 37.

Price, complete as shown..... $63 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 ..... 60 00
No. 162.— do do do No. 132, Fig. 37 ..... 63 00

---

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.*

## RAILROAD POCKET COMPASSES.


No. 159D. Fig. 35.

Price, as shown..... $82.00.

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.

| No. | *PRICES.* | | | | | Post. |
|---|---|---|---|---|---|---|
| 157.— | Railroad Pocket Compass, with folding sights, staff mountings, two levels 3½-inch needle, with limb reading to five minutes | | | | $23 00 | .60 |
| 158.— | Railroad Pocket Compass, 4½-inch needle, clamp and tangent to limb, with limb reading to one minute | | | | 33 00 | .90 |
| 159A.— | Railroad Pocket Compass, 4½-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 | | | | 70 00 | |
| 159B.— | Same as above, but with telescopic sight No. 131 | | | | 75 00 | |
| 159C.— | do | do | do | No. 132 | 78 00 | |
| 159D.— | do | do | do | No. 132, and with leveling adopter, as shown in Fig. 35 | 83 00 | |

CARBON HILL, HOCKING CO., OHIO, May 16th, 1885.

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

*Gentlemen :*—I write to inform you that I have received Railroad Pocket Compass and tripod as ordered, and desire to say that it has far exceeded my expectations. I had no idea that I could obtain such a useful compass for such a low rate.

Yours respectfully,

JAMES R. BIRKBECK.

---

SPRINGFIELD, OHIO, March 25th, 1886.

*Gentlemen :*—I unpacked my compass (No. 159C) last night. It seems to be O. K. It is a little beauty, away above my expectations.

Yours truly,

PAUL F. MUELLER.

---

GREENWOOD, ILL., April 5th, 1886.

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

*Gents :*—The instrument (No. 159C) came April 1st. I am more than well pleased, it being certainly much more of an instrument of the kind than I anticipated getting, and I have to-day notified the ex-agent to forward the money to you.

Very respectfully,

CHAS. H. TRYON.

---

HARRODSBURG, KY., May 12th, 1886.

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

*Gentlemen :*—It will be two weeks to-morrow since I received your Railroad Pocket Compass No. 159B for trial, and in that time I have made several surveys where great degree of accuracy was required, and find it thoroughly satisfactory in every particular. I have just finished dividing a piece of land, making eight lots, and did it almost entirely by triangulation and found all the calculated bearings and distances to agree with actual measurement with instrument. I have also made a survey with it which balanced to within one-400th of a link. I am very much pleased with it. I think that it is the finest instrument for land surveying I have ever seen. The longest line that I have run with it was 325 rods, and I could set the flag at that distance with greater degree of accuracy than I could with ordinary compass at the distance of 25 rods. Suffice it to say that I am pleased with it in every particular.

Yours truly,

E. G. MANN, *Surveyor.*

## RAILROAD POCKET 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 3½ 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. If sent by mail add for postage on the Compass, 90 cents, and on the tripod, $1.00.

## LOCKE'S HAND LEVEL.

No. 185. Fig. 59.

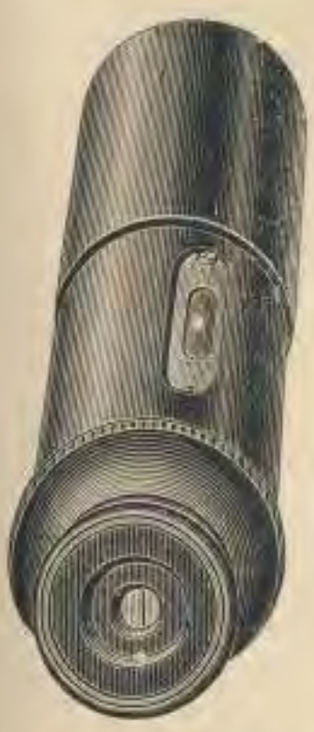
Consists of a brass tube about six inches long, having, as shown in the figure, a small level on top and near the object end, there being also an opening in the tube beneath through which the bubble can be seen, as reflected by a glass prism, immediately under the level. The level of any object in line 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.*

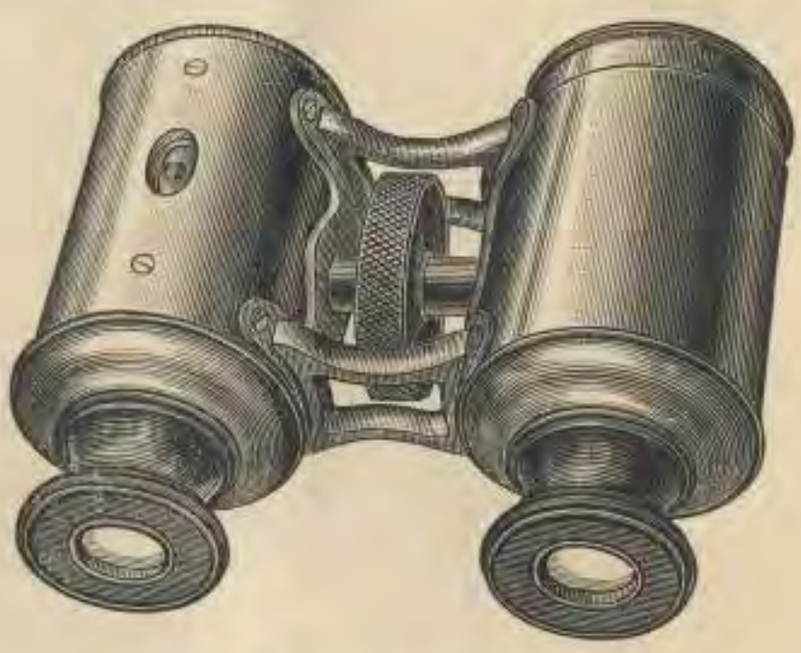
| | | Post. |
|---|---|---|
| No. 185.—Locke's Hand Level, Bronze, in box, Fig. 59 | $9 00 | .12 |
| No. 186.— do do Nickel Plated, in box, Fig. 59 | 10 00 | .12 |

## NEW TELESCOPIC HAND LEVELS.

(PATENT APPLIED FOR.)



No. 183. Fig. 58¼.



No. 184. Fig. 58½.

The cuts above shown represent two forms of a telescopic hand level just devised by us, in which, besides the ordinary lenses of an opera glass, are included a reflecting prism, level vial, and cross wire.

When the monocular hand level, Fig. 58¼, is held truly horizontal, the observer will see the object through the larger concave segment of the eye lens, and at the same time note through the small convex segment the position of the cross wire, bisecting the bubble upon the surface of the object to which the level is directed.

The use of the binocular hand level, Fig. 58½, gives a clearer view of an object than is possible with a single tube, there being now no light lost by the interference of the prism and level vial.

*PRICES.*

| | | Post. |
|---|---|---|
| No. 183.—Monocular Hand Level, in case, Fig. 58¼ | $12 00 | .15 |
| No. 184.—Binocular Hand Level, in case, Fig. 58½ | 15 00 | .30 |

## THE ABNEY LEVEL AND CLINOMETER.


No. 187. Fig. 60.

Price.....$15.00.

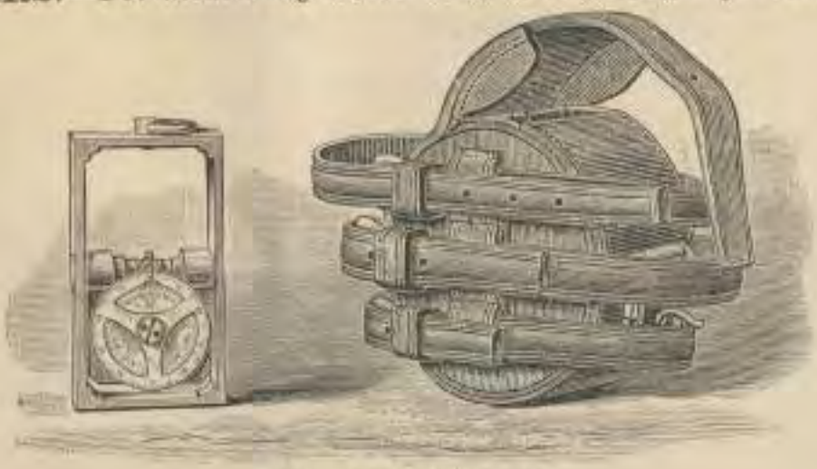
The Abney Level, Fig. 60, is an English modification of that shown in Fig. 59, combining with it an excellent clinometer, as represented in the cut.

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.

| | Price. | Post. |
|---|---|---|
| No. 187.—Abney Level, an improved "Locke's Hand Level," giving angles of elevation, and is also divided for slopes, as 1 to 1, 2 to 1, etc., in case, Fig. 60 | $15 00 | .15 |
| No. 187A.—Ditto, and with compass and staff socket attached | 18 00 | .20 |

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



No. 366. Fig. 61.

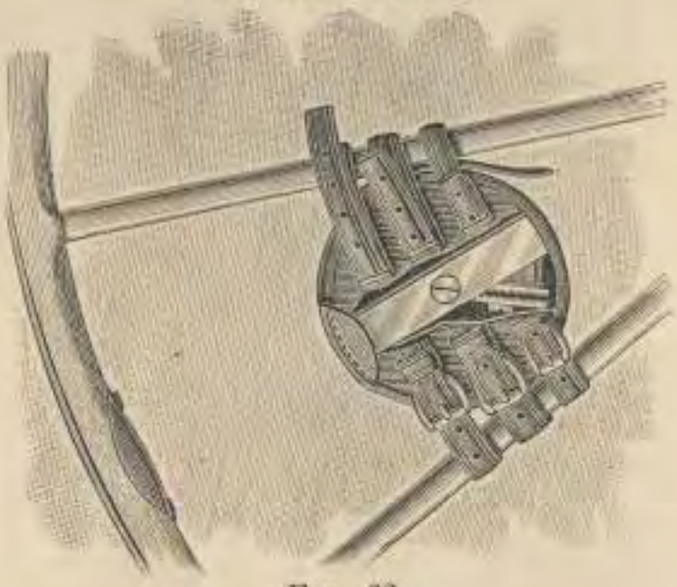


Fig. 62.

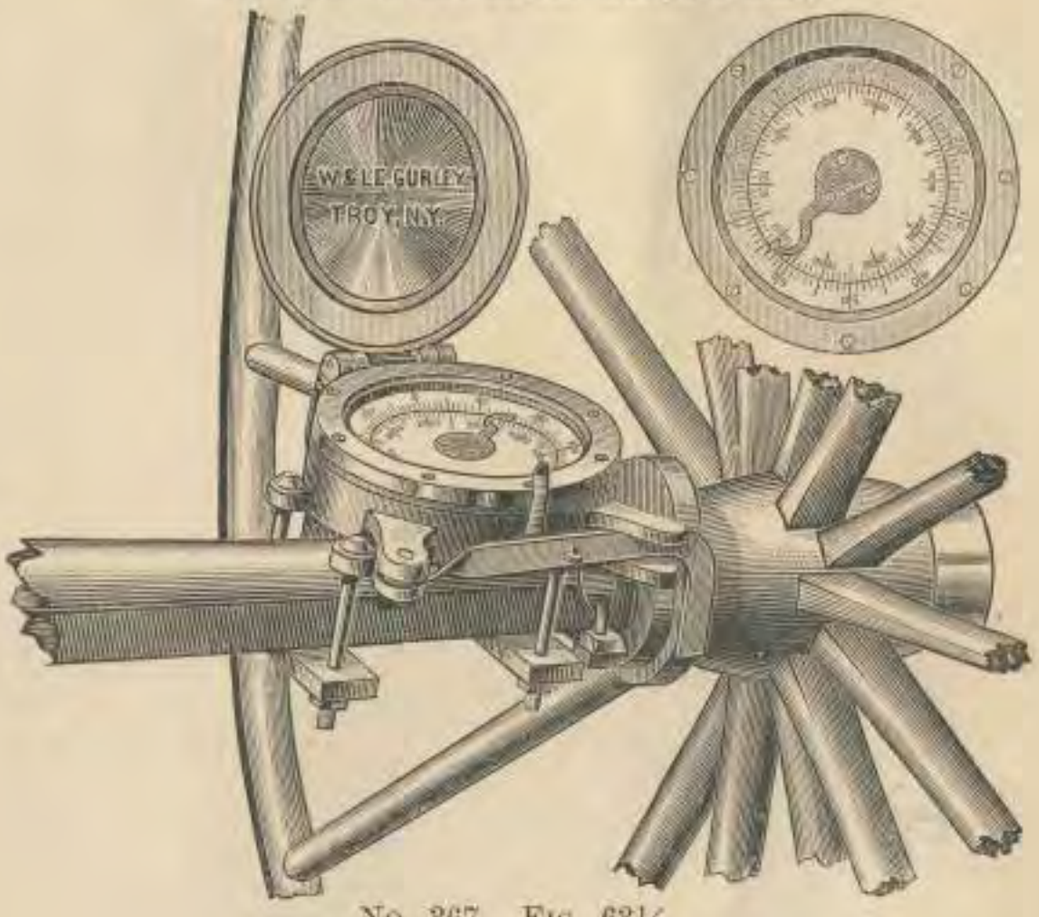
No. 365. Fig. 63.

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 multiplying it by the number of revolutions recorded on the dials.

| | *PRICES.* | Postage. |
|---|---|---|
| No. 365.—Odometer, Fig. 63, outside dial, with bolts for attaching, complete | $10 00 | $ .90 |
| No. 366.—Odometer, Figs. 61 and 62, inside dial, with leather case and straps | 15 00 | .75 |

## POSITIVE MOTION ODOMETER.




No. 367. Fig. 63¼.

Price..... $20.00.

The Odometer represented in Fig. 63¼, for counting the revolutions of a carriage wheel, is of the most substantial construction.

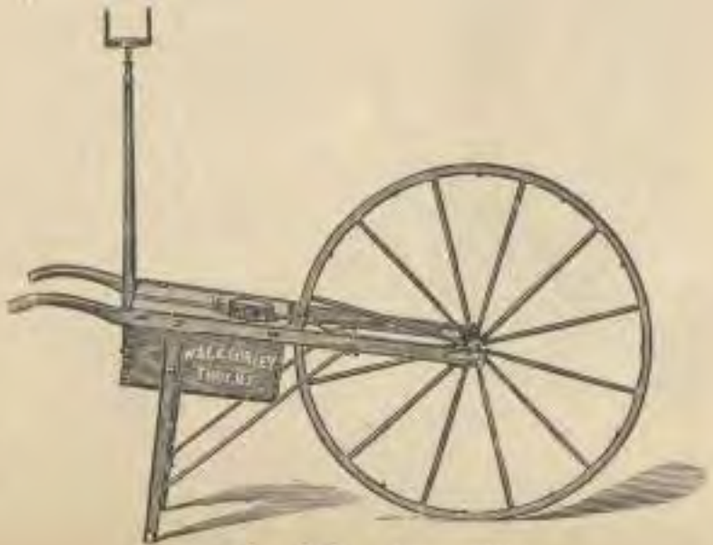
The wheel work is contained in a solid metal case, with glass covering the face of the dial.

On the chamfered surface are 100 divisions, which are figured in tens and read by an index carried forward one space on the dial by every upward movement of a steel lever shown underneath.

A wheel with 99 divisions upon it revolves under the index, immediately beneath the divided edge of the dial and is carried forward a single division on the dial by every complete revolution of the index; the wheel is numbered from 0 to 9900.

This Odometer is intended to be fastened to the axle of a wagon by the bolts as shown, a cam on the hub of the wheel giving the upward motion to the steel lever above described.

## WHEELBARROW ODOMETER.



No. 368. Fig. 63½.

(See next page.)

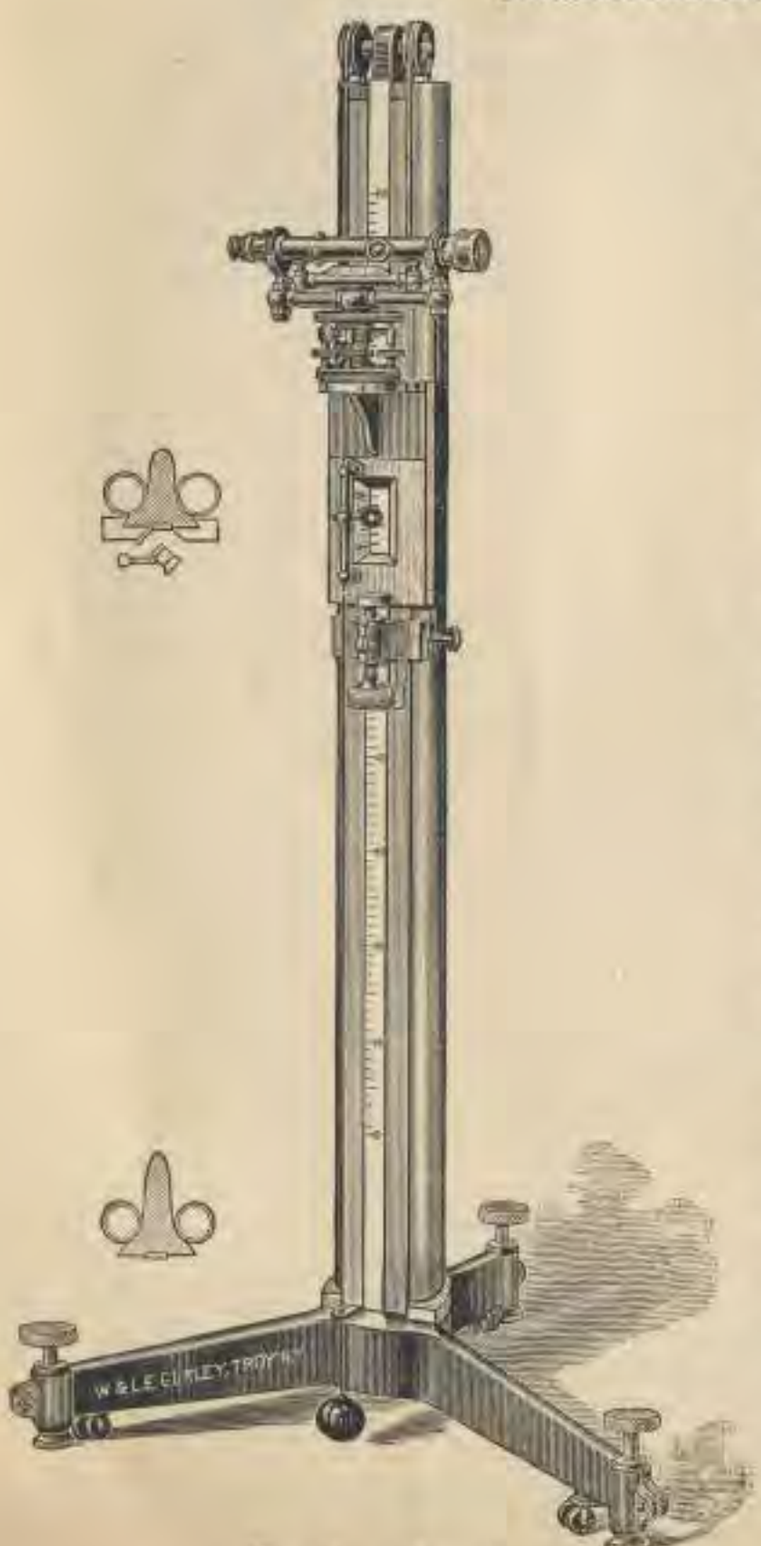
An apparatus often used in surveys for county maps, measuring roads, etc., is represented in Fig. 63½. The wheel is carefully made with brass axle bearings and tire, the last having a perimeter of just half a rod. The braces, bolts and all the other metal work are also made of brass to avoid any attraction of the magnetic needle.

The upright staff carries a vernier pocket compass with 3½-inch needle by which bearings may be taken at any point desired. The number of revolutions of the wheel are counted by the odometer, Fig. 63¼, fixed to the top of the wooden box; motion being conveyed through a brass rod carried forward by a cam on the axle of the wheel.

*PRICES.*

No. 368A.—Wheelbarrow Odometer, complete, Fig. 63½..... $120 00
No. 368B.— do do Fig. 63½, omitting Compass ..... 104 00

## CATHETOMETER.




No. 89. Fig. 67.
Price, as shown..... $250.00.

In Fig. 67 is represented an improved form of the Cathetometer, an instrument designed to measure with precision minute differences in height.

It consists of a solid brass tripod or base supporting a standard of the same metal, the cross section of which is shown at different points by the small figures on the left. A sliding carriage upon which is secured the small leveling instrument, and which has also a vernier scale as shown, is balanced by heavy lead weights, suspended within the brass tubes on either side by cords attached to the upper end of the carriage, and passing over the pulleys shown at the top of the column.

The movable clamping piece below the carriage is fixed at any point required by the screw, shown at its side.

The screw passing through its centre is of steel, cut accurately to a given number of threads, the value of which is known.

The head of the screw is divided into one hundred equal parts, and having an index at its side affords a ready means of reading a very small movement of the carriage as it is carried up or down by the end of the screw.

The scale shown in front of the standard is divided as may be required, either into feet and hundredths, or in parts of a metre, and read by the vernier on its side; there being also a microscope as represented sliding on a rod to read any point of the vernier.

The column is made acurately plumb by noting the position of a line suspended from the top and attached to a brass ball below.

The operation of plumbing the line is effected by the three leveling screws in the arms of the tripod below.

The small leveling instrument has a fine telescope furnished with the usual cross wires, determining a point or line on the object observed.

The level is carefully adjusted before it is screwed to its place; the telescope having a movement in azimuth of about 9°, can be turned to a number of objects if desired.

In the instrument represented the scale is divided 8 millimetres, which, by the vernier, is read to 1-20ths., and by the divided head of the micrometer screw to 1-100ths of a millimetre, the smallest movement being easily detected by the cross wires of the telescope.

Of course, any fractional part of a foot could be read with equal facility.

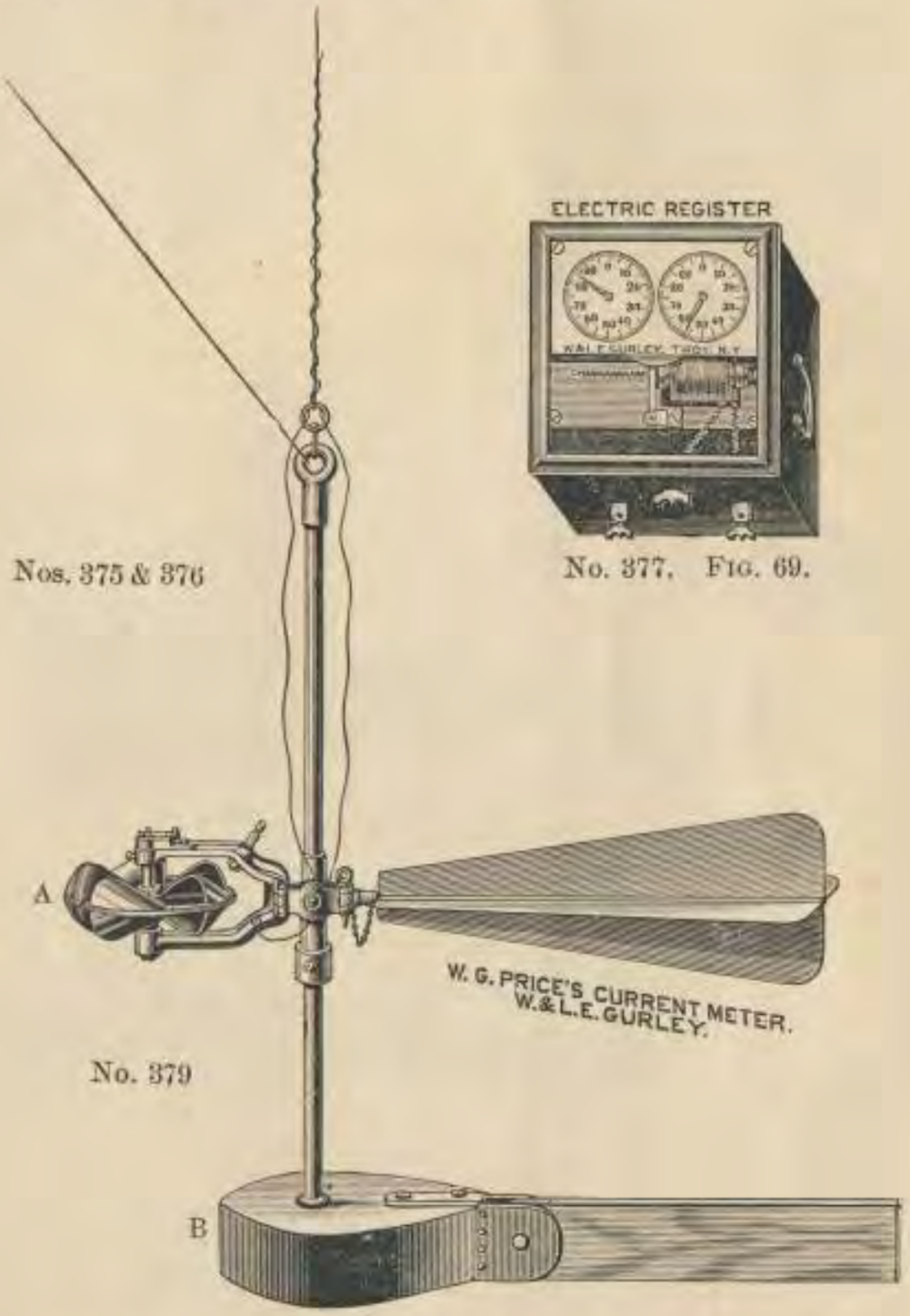
This Cathetometer weighs about 150 lbs. and is extremely solid, substantial and accurate in all its indications.

## CURRENT METER.

This instrument, now so generally used to ascertain the velocities of currents in harbors, rivers, and smaller streams, is shown in its best and most substantial form in Fig. 68, invented by W. G. Price.

The Price Meter is the result of six years' experience in measuring the velocity of water in the Ohio and Mississippi Rivers by different methods, while the inventor was in the employ of the U. S. Engineer Corps.

It is used by the U. S. Engineer Corps, the U. S. Coast and Geodetic Survey, and by hydraulic engineers in different parts of the country.







No. 377. Fig. 69.

Fig. 68.

We make two sizes of this meter. The larger size is intended for deep-water and harbor surveying, where great strength is required, and usually the weight is to be employed: the smaller size is designed for use in smaller rivers and streams, and is used either with or without the weight.

## ELECTRIC REGISTER.

The number of revolutions of the meter-wheel is recorded by an electric register, actuated by a battery of two or three cells.

The electric register, Fig. 69, is inclosed in a mahogany case, showing two dials under a glass face, and has an electro-magnet which, when the circuit is made, moves a lever, at the end of which is a pawl carrying forward a ratchet-wheel one tooth at every break of the current.

## SUB-CURRENT DIRECTION METER.

The Sub-Current Direction Meter, Fig. 71, is designed to determine the direction, both horizontally and vertically, of under-currents in harbors, rivers, etc.

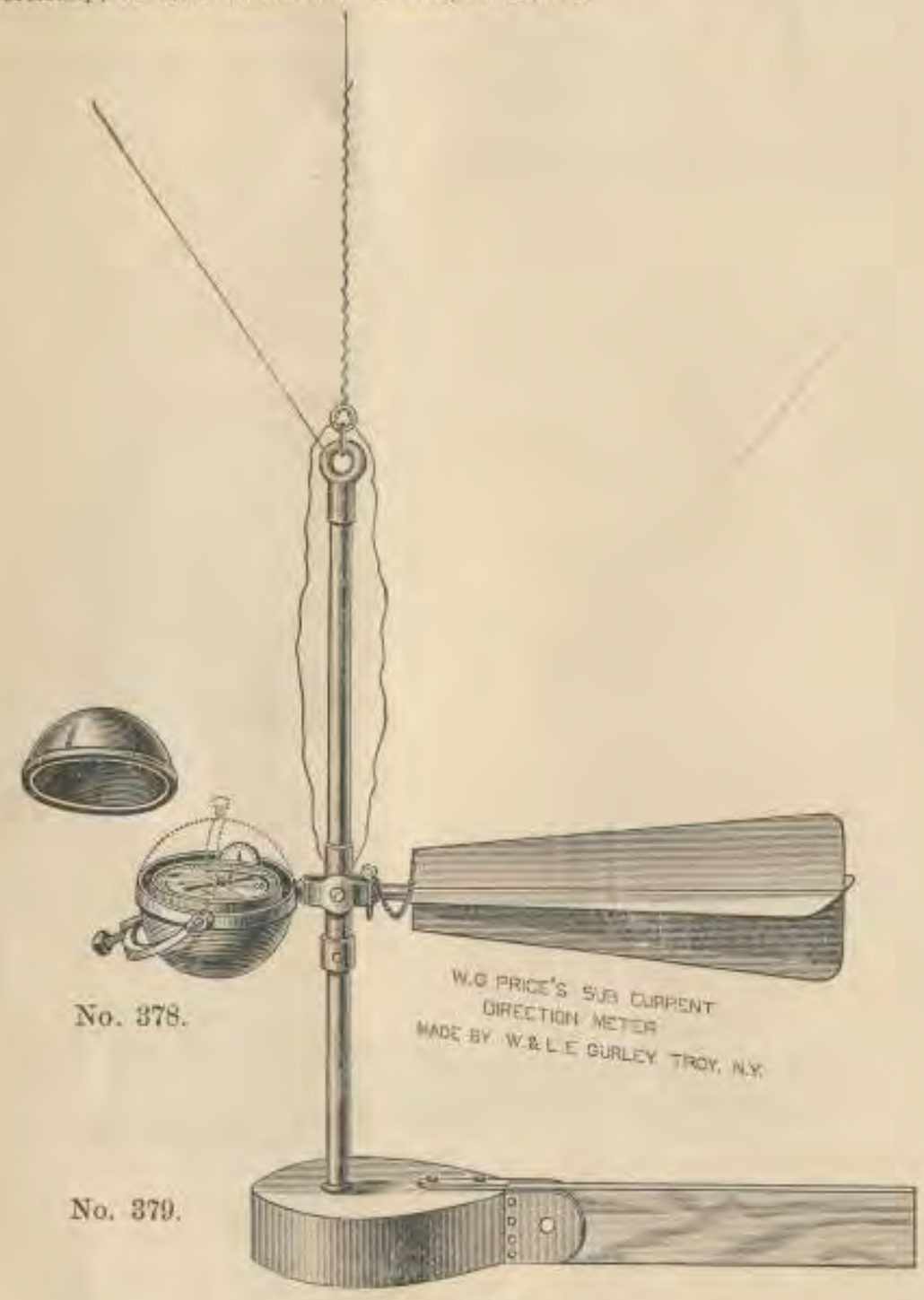



FIG. 71.

The compass circle is divided to degrees, and figured as usual, the zero divisions being in line with the axis of the meter; it has a needle of 3½ inches suspended upon a hardened centre pin, upon which it plays freely and settles in the magnetic meridian, giving with the divisions of the compass the bearing of the station where the meter is used; it has also a glass cover to protect the needle.

Under the centre of the compass-box, and fastened to it, is an electro-magnet which, when the magnetic circuit produced by the battery, as described with the Current Meter, is completed, actuates an armature and thus unlocks a device which at once raises and firmly clamps the needle against the glass without in any manner changing its direction.

### *PRICES.*

| | |
|---|---|
| No. 375.—Deep Water and Harbor Meter, Fig. 68A | $100 00 |
| No. 376.—River and Smaller Stream Meter, do | 100 00 |
| No. 377.—Electric Register, Fig. 69 | 50 00 |
| No. 378.—Sub-Current Direction Meter, Fig. 71 | 100 00 |
| No. 379.—Lead Weight, 60 lbs., and connections, for Harbor Meter No. 375, Fig. 68, B | 15 00 |
| No. 380.—Brass tubing, jointed, in 4-feet lengths, and graduated in feet and tenths, for Meter No. 376, per foot | 1 25 |
| No. 381.—Laclanche Battery, 3 cells, in case | 8 00 |
| No. 382.—Insulated connecting wires for Battery, per foot | 03 |
| No. 385.—Boyden's Hook Gauge, Fig. 72 | 25 00 |

MANCHESTER, N. H., September 14th, 1885.

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

*Gentlemen :*—I have just returned from the Northwest, where I had occasion to put my "Price" Current Meter to some severe tests in the waters of the upper Mississippi River, and found its action to be very reliable.

Yours very respectfully,

J. T. FANNING, *C.E.*

---

NEW ORLEANS, LA., December 7th, 1885.

W. G. PRICE, C.E.

*Dear Sir :*—The gauging operations of the Mississippi River Commission have been conducted on a very large scale. The usual devices of floats, rods and meters have each been largely used and comparative tests made. I think the preference has been given to meters on good grounds. At first difficulty was found in procuring a meter adapted to the peculiar and trying conditions of a turbulent drift and sediment-bearing stream.

This was largely overcome by the meter of your device and construction. The strength and simplicity of parts given while extreme sensitiveness was retained by ingenious bearings make it a valuable instrument to Hydraulic Engineers for a very large scope of gauging work.

Very respectfully,

B. M. HARROD, *C.E.*

---

WASHINGTON, D. C., December 7th, 1885.

W. G. PRICE, C.E.

*Dear Sir :*—Having been engaged in hydraulic work since 1879, the greater part of the time being devoted to gauging rivers, and having used various methods and different kinds of current meters, it gives me great pleasure to say that yours proved to be the most satisfactory both as to simplicity of construction and manipulation, possessing accuracy and at the same time being able to withstand considerable hard usage without injury. I used one of your Meters in gauging the Mississippi River, at Red River Landing, La., also the Red and Atchafalaya. The meter was used nearly every day for over seven months, sometimes under the most adverse conditions and currents, and at depths from one-half to one hundred feet.

Four of your meters were used this summer in the current observations of the resurvey of New York Harbor under the direction of the U. S. Coast and Geodetic Survey, and were used in obtaining velocities at all depths from top to bottom of the Hudson, East River, the Narrows and the several Kills, and gave entire satisfaction.

Respectfully yours,

HOMER P. RITTER, *U. S. Ass't. Engineer.*

St. Louis, Mo., January 2d, 1886.

Mr. Wm. G. Price.

*My Dear Sir:*—It gives me pleasure to recommend your Current Meter to the engineering profession and others engaged in hydraulic research.

In a large experience, which includes the gauging of the Mississippi, Atchafalaya, St. Francis and Yazoo Rivers, I am enabled to give you briefly here a few of the many important features possessed by your instrument which are absent from the other forms of meters now on the market:

*First.*—Your general construction is typical of strength, your wheel, vane and auxiliary parts are the embodiment of strength and durability, which is an important feature, as slight jars due to contact with submerged floating débris are of frequent occurrence, especially in great rivers like the Mississippi. Such jars often cause, unnoticed, a change of rate, which, in turn, introduces errors in the velocity measurements. With your meter this can never occur without detection.

*Second.*—Your electric contact is invincible; I have never known it to fail.

*Third.*—Your bearings give the smallest frictional co-efficient of any meter at present in use, which for silt-bearing streams like the Mississippi River is an indispensable feature.

*Fourth.*—Your form of meter weight and connections are admirable and facilitate greatly the work of manipulation in the field.

These are a few of the many good points your meter possesses, and to those who will give it a trial I feel confident it will fully commend itself.

Very respectfully yours,

JOHN EWENS, *C.E.*,

*U. S. Ass't Civil Engineer.*

Fig. 72.

No. 385. Price, $25.00

# BOYDEN'S HOOK GAUGE,

So called from the name of its inventor, is used in determining the depth of water flowing over weirs, etc.

As represented in Fig. 72, it has a frame of wood, three feet long and four inches wide, in a rectangular groove of which another piece is made to slide, carrying a metallic scale divided to feet and hundredths, and figured from zero to two feet, and two-tenths, as shown.

Connected with the scale is a brass screw passing through a socket, fastened to another shorter sliding piece, shown above, which can be clamped at any point on the frame, and the scale with hook moved in either direction by the milled head nut.

There is also a vernier attached to the frame, and movable under the screw-heads which secure it, in order to adjust its zero to correspond with the point of the hook. The vernier reads the scale to thousandths of a foot.

The hook is of brass, and has a sharp point which, when raised to the surface of the water at rest, indicates its precise level.

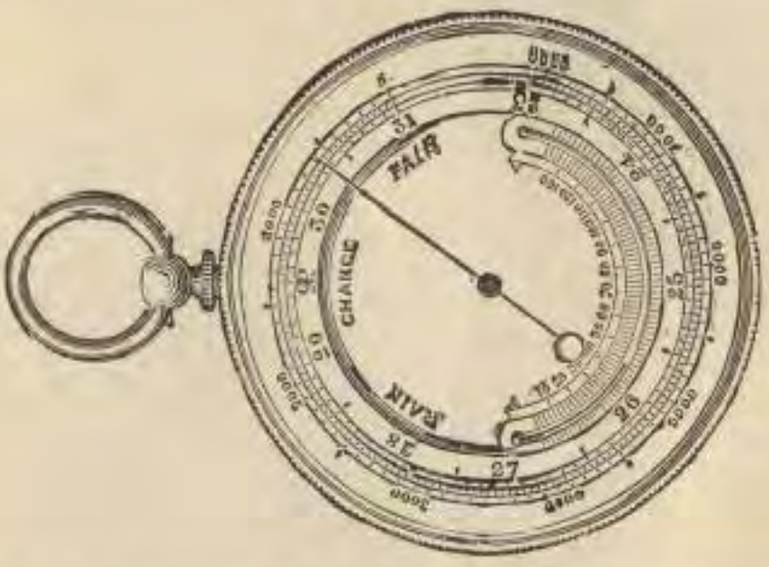
## ANEROID BAROMETERS.

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

No.

370.—Mountain Aneroid Barometers, compensated for temperature, with brass cases and silvered dials, in morocco cases, accompanied by a hand-book of instructions.
These instruments are of very great service to the engineer and tourist, as well as to the scientific observer, and are rapidly coming into general use.

| | | Price. | Post. |
|---|---|---|---|
| A.—Pocket Aneroid, 1⅞-inch diameter, altitude scale to 8000 feet. | | $18 00 | .10 |
| B.— do do do | 10000 feet. | 19 00 | .10 |
| C.— do do do | 16000 feet. | 21 00 | .10 |
| D.— do do do | 20000 feet. | 23 00 | .10 |
| E.— do do do | 16000 feet, and thermometer. | 23 00 | .10 |




| | | |
|---|---|---|
| H.—Pocket Aneroid, 2⅝-inch diameter, altitude scale to 10000 feet, with thermometer, and opposite side with pocket compass. | $25 00 | .20 |
| J.— do do do 16000 feet. | 27 00 | .20 |
| K.—Pocket Aneroid, 2⅝-inch diameter, altitude scale to 3000 feet. | 19 00 | .18 |
| L.— do do do 5000 feet. | 19 00 | .18 |
| N.— do do do 10000 feet. | 20 00 | .18 |
| O.— do do do 16000 feet. | 22 00 | .18 |
| P.— do do do 20000 feet. | 24 00 | .18 |
| Q.— do do do 10000 feet, and thermometer. | 23 00 | .18 |
| R.— do do do 16000 feet, and thermometer. | 25 00 | .18 |
| X.—Plain Aneroid, no altitude scale, 5-inch diameter, with thermometer and open face to show mechanism, for parlor use. | 15 00 | .65 |
| Y.— do but 6¾-inch diameter. | 19 00 | |

## SURVEYING AND MINING ANEROIDS.

| No. | | Price. | Post. |
|---|---|---|---|
| 371A.—Surveying Aneroid, 3-inch diameter, compensated for temperature, silvered metal dial, reading by vernier to two feet, with magnifier, in leather sling case, with altitude scale to - - - - 6000 feet. | | $40 00 | .50 |
| B.— do do do | 10000 feet. | 43 00 | .30 |
| C.— do 5-inch diameter, do | 5000 feet. | 45 00 | .70 |
| D.— do do do | 10000 feet. | 48 00 | .70 |
| E.— do do do | 15000 feet. | 50 00 | .70 |
| F.— do do do | 20000 feet. | 53 00 | .70 |
| G.—Mining Aneroid, 3-inch diameter, but arranged to register 2000 feet below sea-level to 4000 feet above. | | 40 00 | .30 |

The Surveying and Mining Aneroid has been constructed especially for the use of Surveyors and Engineers, for ascertaining slight variations in gradients, levels, etc., and from its extreme sensitiveness will be found of considerable utility in Mining and Surveying work generally.

The Vernier Scale is moved by a rack-work adjustment, and a magnifying lens which rotates on the outer circumference of the Instrument facilitates the reading of minute quantities.

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

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

## ANEMOMETERS.

*For Measuring the Pressure and Velocity of Currents of air in Coal mines, and Ventilators, Flues, etc., of Public Buildings.*

"Robinson's" improved and simplified. The improvement consists—1st.—In a re-arrangement of the works, which admits of the column carrying the arms and cups rising from the *centre* instead of from one *corner*, as in the models now in use; and, 2ndly, in an arrangement by which the enumeration is effected by two hands which can be moved to "zero" on the commencement of an observation, thus obviating the necessity of taking a reading of the present condition of the Index before proceeding to make a fresh observation.

No. 372.A—Robinson's Improved Anemometer, central column, adjustable index.....$32 00

No. 372B.—Robinson's Anemometer, original pattern, 4 Dials, reading to 1,000 miles. ..... 35 00

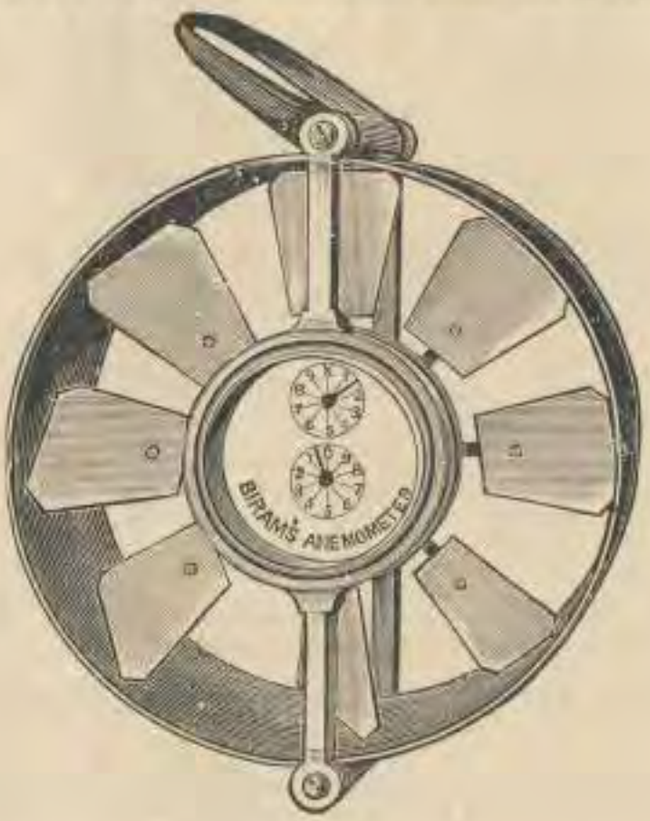
To ascertain the velocity of the wind for a short period: Take two readings of all the dials with an interval of twelve minutes. The difference of these readings, divided by ten, is the velocity of the wind in miles per hour.

Formula for velocity and pressure of the wind:

The pressure varies as the square of the velocity, or $P. \propto V.^2$ The square of the velocity in miles per hour multiplied by .500 gives the pressure in lbs. per square foot, or $V.^2 \times .005 = P.$ The square root of 200 times the pressure equals the velocity, or $\sqrt{200 \times P.} = V.$

"Biram's"—For registering the velocity of currents of air in mines, tunnels, &c., by means of a light fan, the revolutions of which are recorded on a dial in the centre of the instrument.

This Instrument placed in the passage of a mine registers automatically the rate at which the air is travelling through it, and a simple observation will detect any slackening of the current arising from obstruction of the ways, or want of attention at the ventilating furnace, or fan wheel.

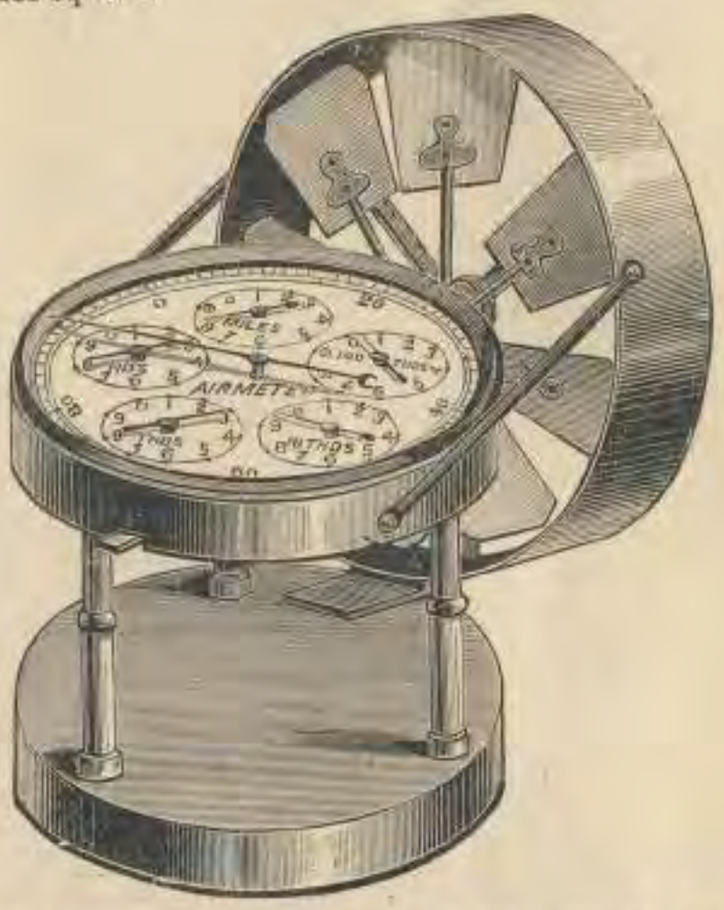



| No. | | | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 373A.—Biram's Anemometer, | 4 | in. | diam., | reading to | 1,000 | feet, | without | disconnector | ..... | $22 00 | .30 |
| 373B.— do | do | 5 | do | do | 1,000 | do | do | do | ..... | 23 50 | .40 |
| 373C.— do | do | 6 | do | do | 1,000 | do | with | disconnector | ..... | 25 00 | .50 |
| 373D.— do | do | 6 | do | do | 100,000 | do | do | do | ..... | 30 00 | .50 |
| 373E.— do | do | 6 | do | do | 10,000,000 | do | do | do | ..... | 40 00 | .50 |
| 373F.— do | do | 12 | do | do | 10,000,000 | do | do | do | ..... | 45 00 | |

Pocket Size (3 *inches diameter*)—Is made in the form of a watch—the top and bottom of the case, when opened, form a base for the instrument, a check-spring passing through the pendant acts as a stop to the movement, on being pressed by the finger at the expiration of the time necessary to make the observation. The movement is jewelled at four points. The outer circle of divisions on the dial records by single feet up to one hundred: the smaller dial continues the enumeration up to one thousand feet.

| No. | | | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 373G.—Watch Anemometer, very small and sensitive, in white metal hunting case, reading to 1,000 feet..... | | | | | | | | | | $40 00 | .10 |

The portable "*Air Meter*" for the measurement of currents of air through Mines, Tunnels, Sewers and the Ventilators of Hospitals, Public Buildings, etc. The indications are obtained by means of a delicately poised fan-wheel, the recordings being commenced by the long hand, which traverses the extreme outer circumference of the main dial for the passage of one hundred feet of air. The enumeration is continued up to ten millions of feet (say 1,894 miles), by a series of smaller dials as shown in the illustration. A "Disconnector" projecting from the band of the instrument, opposite the fan-wheel, serves to throw the mechanism out of gear, and arrest its action when required. The instrument is packed, with the usual Universal jointed socket holder, in a box about four inches square.




| | | Post |
|---|---|---|
| No. 374A.—The Portable Air Meter, 6 dials, diameter of fan wheel 2¾ inches, with disconnector, which is extensively used for testing the ventilation of Hospitals, Schools and Public Buildings, forms also, an admirable Pocket Anemometer for tourists | $30 00 | $ .30 |
| No. 374B.—Air Meter, same as preceding, with 2 dials, and reading only to 1,000 feet... | 25 00 | .30 |

## How to Use the Anemometer.

The Anemometer consists of a series of vanes, which revolve with the action of the air-current, the number of revolutions, or numbers proportioned to the revolutions, being registered by a pointer on the face of a dial, forming part of instrument itself. It is made of four sizes, 4, 5, 6 and 12 inches; is very portable, and not at all liable to get out of order. The mechanism is placed either in front of the wheel, or in a small separate box over the fan-wheel, and the registering apparatus consists of one or more dials. An observer has only to record the position of the several indices at the first observation (by writing the lower of the two figures on the respective circles, between which the index points, in their proper order), and deduct the amount from their position at the second observation, to ascertain the velocity of the air which has passed in the interval. This multiplied by the area in feet of the passage, where the instrument is placed, will show the number of cubic feet which has passed during the same period.

Thus, suppose the observation of one minute gives:

| | |
|---|---|
| Second Reading | 5,525 |
| First Reading | 5,325 |
| | 200 |
| Add correction, say | 30 |
| | 230 |

Size of passage in feet, 10x5x330=16,500 feet per minute.

The correction added above is the value of the constant of friction, which must be found for each machine by actual experiment.

## To Find the Velocity of the Air in the Passage,

Proceed thus:—Suppose the Anemometer indicates 330 feet per minute. 330÷88=3.75 or 3¾ miles per hour, 88 being 1–60th of a mile.

To ascertain the force of the air current, multiply the square of the velocity of the air in feet per second by .0023.

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

## FOR TRANSITS.

| | Price. | Post. |
|---|---|---|
| Needle and centre pin | $ 2 50 | .03 |
| Ground glass level vial for plate or standard, each | 50 | .02 |
| do do brass mounted complete, for plate or standard, each | 2 50 | .05 |
| do do for telescope, each | 1 50 | .05 |
| Cap for eye-piece or object-glass, each | 75 | .03 |
| Shade for object-glass | 75 | .03 |
| Clamp screws for horizontal limb, each | 75 | .02 |
| Tangent screw for levelling head | 1 50 | .03 |
| Clamp do do | 75 | .03 |
| Leveling do do each | 1 50 | .05 |
| Eye-piece complete | 6 00 | .05 |
| Object-glass complete | 6 00 | .03 |
| Platina cross-wires and diaphragm | 3 00 | .04 |
| do stadia do do | 5 00 | .05 |
| Striding, or Adjusting Level, Fig. 10¼ | 3 00 | .10 |

## FOR Y LEVELS.

| | | |
|---|---|---|
| Ground glass level vial | $ 2 00 | .10 |
| Cap for eye-piece or object-glass, each | 75 | .03 |
| Clamp screw for leveling head | 75 | .03 |
| Tangent do do | 1 50 | .03 |
| Leveling do do each | 1 50 | .05 |
| Eye-piece complete | 6 00 | .05 |
| Object-glass complete | 7 00 | .04 |
| Platina cross-wires and diaphragm | 3 00 | .04 |
| do stadia do do | 5 00 | .05 |

## FOR SURYEYORS' COMPASSES.

| | | |
|---|---|---|
| Needle and centre pin | $ 2 50 | .03 |
| Plain glass level vials, each | 15 | .02 |
| do do brass mounted complete | 1 50 | .05 |
| Brass cover for compass of our make | 1 00 | .15 |
| Outkeeper | 1 00 | .03 |
| Staff mountings, brass head (without spindle) | 2 50 | .18 |
| do steel point | 60 | .18 |
| Ball-spindle, fitted | 1 50 | .10 |
| Compass sight vanes, each | 2 50 | .15 |
| Clamp screw for spindle or sight vane | 75 | .03 |
| Tangent screw for moving vernier | 1 50 | .03 |
| Staff mountings complete for pocket compass | 2 50 to 3 50 | .08 |

## MISCELLANEOUS.

| | | |
|---|---|---|
| Patent Extension Tripod, Fig. 17, for Engineers' 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 | |
| Tripod head with bolts, do do | 5 00 | .40 |
| Wooden Cap, with brass screw plate, for tripod head | 75 | .10 |
| Ring for tripod legs | 15 | .02 |
| Brass bolts do each | 50 | .03 |
| Metal points do do | 50 | .05 |
| Screw drivers, each | 20 | .03 |
| Steel adjusting pins, each | 5 | .01 |
| Brass wrench for centre pin | 10 | .01 |
| Glass circle for compass face | 25 | .15 |
| Mahogany case with lock and key and leather strap, fitted complete for Transit or Level | 6 00 | |
| 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 | .02 |
| Plumb-bob for Transit or Level | 1 50 | .12 |
| Target and springs for New York or Philadelphia Rod | 5 50 | .25 |
| Clamp for New York Rod | 2 50 | .10 |
| Rubber hood for Transit or Level | 1 00 | .08 |
| Chamois skin, best quality | 65 | .10 |
| Chain handles, each | 75 | .08 |
| Chain tallies, per set of nine | 50 | .05 |
| Clamp screw and band for extension leg | 85 | .05 |

# 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 and the Reconnoissance Transit, 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 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-two 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 (1887) 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 used 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-two 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.

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, the new sockets alone costing from $15 to $20.

| | |
|---|---|
| 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 of course, its complete re-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

These prices are in addition to the cost of repairs.

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

PAYMENT OF REPAIRS, etc., may be made at 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.

---

STONINGTON, CONN., March 29th, 1886.

MESSRS. W. & L. E. GURLEY,

*Gents:*—With your stadia wires I could make more accurate measurements on ordinary farm surveys than could be accomplished with even experienced chainmen, the balancing of the surveys demonstrating the fact. I am satisfied, however, that a vertical circle to make a proper allowance on long courses with considerable angle of elevation and depression would be desirable.

Yours truly,

GEO. D. STANTON.

---

HOMEWORTH, OHIO, April 10th, 1886.

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

*Gentlemen:*—In reply to yours asking for results of stadia measurements made by me, I enclose plan showing some very nice applications of the method, with unusual results, considering that the work was done by two observers. I have had it close very nicely in a great many cases in actual practice and in experimenting where everything was favorable. I have had a great many stadia measurements agree exactly with a carefully measured line, so that I use the stadia with much confidence and in many places its use is much more rapid and quite as accurate as the chain.

Respectfully yours,

GEO. R. GYGER.

AMSTERDAM WATER WORKS,
AMSTERDAM, N. Y., July 3d, 1885.

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

*Gentlemen :*—The Transit came all right, and seems to be in splendid condition. Your charge was an agreeable surprise to me. I want to thank you, and to say in the future I shall be one of your firm friends and will be always ready to say a good word for you to my friends.

Yours very truly,

A. H. DE GRAFF, *Supt. and Engineer.*

---

MORRISTOWN, N. J., June 29th, 1885.

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

*Gentlemen :*—Please find enclosed check for amount of bill. The Transit has arrived and is just like all of your work, for which please accept thanks. I do not exactly like the idea of your making no charge for regraduating the limb. The work has been done (although against instructions), and I get the benefit of it ; should I not pay for it? which I shall be very happy to do if you will send me amount.

Yours very truly,

RICH. M. STITES, *Civil Engineer.*

---

WARREN, PA., January 23d, 1886.

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

*Dear Sirs :*—Inclosed please find New York draft for fifteen 50-100ths dollars for repairing Transit shipped your firm by Geo. O. Cornelius.

I had some doubts about it ever being put in repair, so badly had it been used in the past two years, but it is now as good as new, for which please accept draft and my sincere thanks.

Very truly,

L. D. CORNELIUS.

---

SAN ANTONIO, TEXAS, July 10th, 1886.

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

*Dear Sirs :*—The instrument reached our hands on the 7th inst. and we found it to be most satisfactorily repaired and exceeding by far our expectations. The amount of your bill was duly paid to the Pacific Express Company.

Yours respectfully,

COTERA & NESBITT,
*Civil Engineers and Surveyors.*

# MISCELLANEOUS.

The goods mentioned on the following pages are partial lists only, abridged from our Manual and Supplement.

## CHAINS.

| No. | | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|---|
| 220 — 66 feet, 100 links, with oval rings, No. 8 refined iron wire | | | | | | | | | $4 00 | $1.40 |
| 221.— 66 | do | 100 | do | do | 10 | do | | | 3 50 | 1.00 |
| 222.— 33 | do | 50 | do | do | 8 | do | | | 2 50 | .74 |
| 223.— 33 | do | 50 | do | do | 10 | do | | | 2 25 | .55 |
| 225.—100 | do | 100 | do | do | 10 | best | steel | wire | 8 50 | 1.25 |
| 227.— 50 | do | 50 | do | do | 10 | do | | | 4 75 | .70 |
| 229.— 66 | do | 100 | do | do | 10 | do | | | 7 00 | 1.00 |
| 231.— 33 | do | 50 | do | do | 10 | do | | | 4 00 | .55 |

## STEEL BRAZED CHAINS.

| No. | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|
| 235.—100 feet, 100 links, No. 12 steel, spring temper, brazed links and rings | | | | | | | | $11 50 | $ .90 |
| 236.— 66 | do | 100 | do | do | do | do | do | 10 00 | .70 |
| 237.— 50 | do | 50 | do | do | do | do | do | 6 00 | .50 |
| 238.— 33 | do | 50 | do | do | do | do | do | 5 50 | .35 |

Our steel brazed chains 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.

## SPANISH VARA AND FRENCH METRE CHAINS.

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

| No. | | | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 240.—10 varas or 10 metres, | | | 50 | links, | No. | 10 | refined | iron | wire | $2 25 | $ .48 |
| 241.—20 | do | 20 | do | 100 | do | 10 | do | | | 3 50 | .85 |
| 244.—10 | do | 10 | do | 50 | do | 10 | best | steel | wire | 4 00 | 55 |
| 245.—20 | do | 20 | do | 100 | do | 10 | do | | | 7 00 | 1.00 |
| 248.—10 | do | 10 | do | 50 | do | brazed links and rings | No. 12 | steel | wire, tempered | 5 50 | .35 |
| 249.—20 | do | 20 | do | 100 | do | do | do | do | do | 10 00 | .70 |

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

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

## GRUMMAN PATENT STEEL CHAINS.

| No. | | | | | | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260.— 66 feet, No. 15 tempered steel wire, 100 links, weight 1¼lbs., with 10 extra links | | | | | | | | | | | | $9 00 | $ .26 |
| 261.— 33 | do | do | do | 50 | do | ¾lbs., | do | 5 | do | | | 5 00 | .18 |
| 262.—100 | do | do | do | 200 | do | 2 lbs., | do | 15 | do | | | 11 50 | .38 |
| 263.— 50 | do | do | do | 100 | do | 1 lb., | do | 10 | do | | | 6 00 | .22 |
| 268.— 50 feet, No. 18 tempered steel wire, 100 links, with attachments of spring-balance, level, and thermometer, for very accurate measurements; weight ¾lb | | | | | | | | | | | | 15 00 | .18 |
| 271.—Spring-balance to use with chains Nos. 260 to 263 | | | | | | | | | | | | 2 00 | .06 |

## MARKING PINS.

| No. | | | Price. | Post. |
|---|---|---|---|---|
| 275.—Set of 11 Pins, | | iron wire, No. 4 | $1 50 | $ .40 |
| 276.— | do | steel wire, No. 6 | 2 00 | .32 |
| 278.— | do | steel wire, No. 6, loaded | 3 00 | 1.10 |
| 279.— | do | steel wire, No. 10, very light, with leather case | 2 00 | .12 |
| 280.—Timber scribes or Marking irons, each | | | 1 25 | .05 |

## CHESTERMAN'S METALLIC TAPE MEASURES.

Made of linen thread, interwoven with fine brass wire and in substantial leather cases.

| No. | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 285.— | Metallic tape measures, | 33 | feet | long, | in | 10ths or 12ths, each | $2 10 | $ .10 |
| 287.— | do | 50 | do | do | do | | 2 50 | .15 |
| 288.— | do | 66 | do | do | do | | 3 00 | .18 |
| 292.— | do | 100 | do | do | do | | 4 50 | .25 |

## CHESTERMAN'S STANDARD STEEL TAPE MEASURES.

All steel; the most accurate, durable and portable measures in substantial leather cases.

| No. | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 302.— | Steel tape measure, | 25 | feet | long, | in | 10ths or 12ths, each | $5 00 | $ .08 |
| 303.— | do | 33 | do | do | do | | 5 75 | .10 |
| 305.— | do | 50 | do | do | do | | 7 00 | .12 |
| 306.— | do | 66 | do | do | do | | 9 00 | .14 |
| 308.— | do | 100 | do | do | do | | 14 00 | .20 |

## PAINE'S PATENT STANDARD STEEL TAPES.

| No. | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 325.— | Steel tape measure, | in leather case, | 33 | feet | long, | 10ths or 12ths | $5 50 | $ .10 |
| 326.— | do | do | 50 | do | do | | 8 00 | .15 |
| 327.— | do | do | 66 | do | do | | 10 00 | .18 |
| 329.— | do | do | 100 | do | do | | 15 00 | .25 |
| 331.— | do | in japanned case, | 33 | do | do | | 4 50 | .10 |
| 332.— | do | do | 50 | do | do | | 6 00 | .15 |
| 333.— | do | do | 66 | do | do | | 8 00 | .18 |
| 335.— | do | do | 100 | do | do | | 12 00 | .22 |

Tapes Nos. 325 to 335, with metric measure on reverse side, at an extra cost of 5 cents per foot.

## STEEL RIBBON CHAIN-TAPES.

Our own manufacture, for testing chains or tapes, or for bridge work,
Ribbon ⅛ or ¾ inch wide, graduated.

| No. | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 345.— | Steel Ribbon, | 33 | feet | long, | with handles and skeleton reel | | $3 75 | $ .16 |
| 346.— | do | 50 | do | do | do | | 4 50 | .20 |
| 347.— | do | 66 | do | do | do | | 5 00 | .23 |
| 348.— | do | 100 | do | do | do | | 6 00 | .30 |

Nos. 345 to 348 are graduated each foot up to ten feet, and at each ten feet thereafter, and also at each sixteen and one-half feet.

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 $6.00 + 9.00 = $15.00.

| No. | | | | | | | Price. |
|---|---|---|---|---|---|---|---|
| 349A.— | Steel Ribbon, | 200 | feet | long, | with handles and substantial reel | | $16 00 |
| 349B.— | do | 300 | do | do | do | do | 21 00 |
| 349C.— | do | 500 | do | do | do | do | 30 00 |

Tapes Nos. 349A, B and C are graduated at each five feet the entire length, and are mounted on a mahogany reel of solid sides and swivel handles.

# DRAWING INSTRUMENTS.

*(PARTIAL LIST.)*

## CASES OF BRASS DRAWING INSTRUMENTS.

| No. | | Price. | Post. |
|---|---|---|---|
| 530. | Rosewood Box; pair of six-inch Dividers, with pen and pencil points and lengthening bar; pair of 4½-inch plain Dividers, Drawing Pen, pair of 3½-inch Dividers, with pen and pencil points; Brass Protractor, Horn Protractor, Wood Rule | $2 00 | $ .15 |
| 533. | Rosewood Box; pair of 6-inch needle point Dividers, with pen and pencil points, and lengthening-bar; pair of 4½-inch plain Dividers; pair of 3½-inch needle-point Dividers, with pen and pencil points, Drawing Pen, Brass Protractor, Horn Protractor, Wood Rule, with lock and key and the instruments set in a tray so that the colors may be put below | 3 00 | .25 |
| 534. | Same as No. 533, with addition of Spring Bow Pen | 4 00 | .25 |

## CASES OF FINE GERMAN-SILVER INSTRUMENTS.

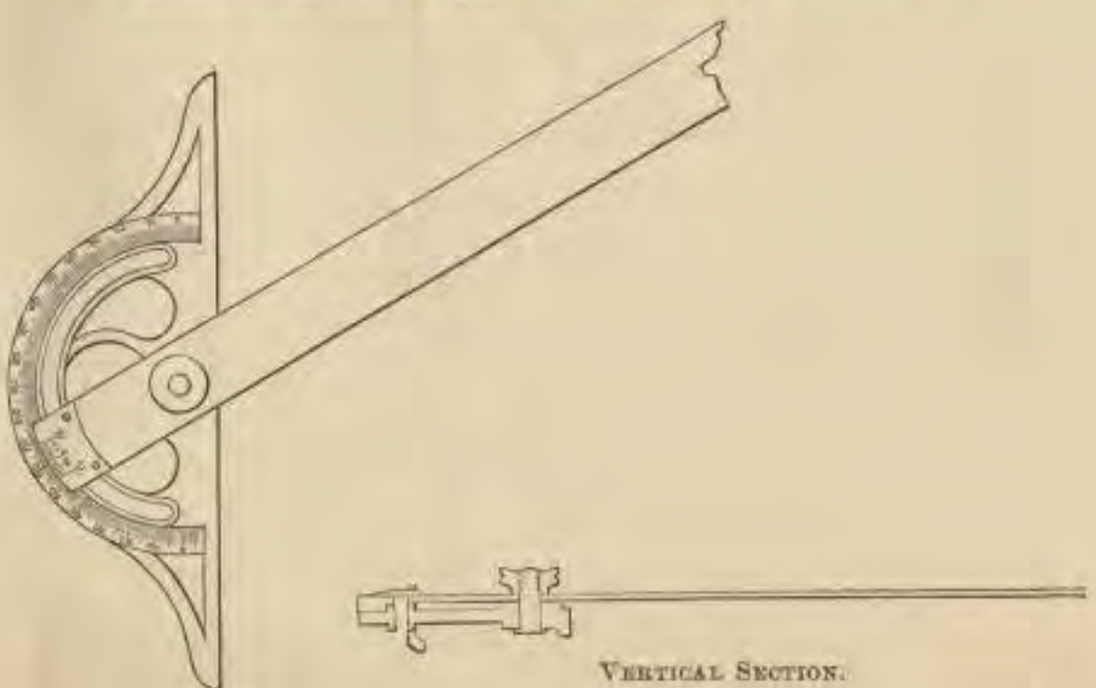
| No. | | Price. | Post. |
|---|---|---|---|
| 582. | Morocco Box; pair of 5½-inch needle point Dividers, with pen and pencil points, pair of 5-inch plain Dividers; Drawing Pen | $3 50 | $ .10 |
| 583. | Same as No. 582, with addition of steel points to Dividers and lengthening-bar | 5 00 | .12 |
| 586. | Morocco Box; pair of 5½-inch Dividers, with pen, pencil, and needle-point and lengthening-bar; pair of 5-inch plain Dividers, Spring-Bow Pen, Drawing Pen | 6 50 | .15 |
| 587. | Morocco Box; pair of 5½-inch Dividers, with pen, pencil and needle point and lengthening bar; pair of 5-inch plain dividers, pair of 4-inch Dividers, with pen, pencil and needle-point, two Drawing-Pens | 9 75 | .15 |
| 588. | Same instrument as No. 587, with addition of Spring-Bow Pen | 11 00 | .18 |

## PROTRACTORS.

| No. | | Price. | Post. |
|---|---|---|---|
| 630. | Railroad Curve Protractor, of horn, 8 inches diameter, having laid off on it twenty-three curves from half degree to 8 degrees, with a radius of 400 feet to the inch | $1 60 | $ .04 |
| 631. | Horn Protractor, 5 inches diameter, whole circle, half degrees | 1 00 | .03 |
| 636. | do 6 do half circle, do | 30 | .03 |
| 638. | do 8 do do do | 80 | .04 |
| 640. | Brass Protractor, 4 do do do | 35 | .02 |
| 641. | do 5 do do do | 55 | .04 |
| 642.A | do 5 do whole circle, beveled edge, whole degrees, fine quality | 1 25 | .10 |
| 644. | German Silver Protractor, 5 inches diameter, half circle, half degrees | 85 | .04 |
| 645. | do do 6 do do do | 1 00 | .04 |

## NEW LIMB PROTRACTOR.

BRONZE HEAD, STEEL BLADE, VERNIER TO ONE MINUTE.



VERTICAL SECTION.

| No. | | | | | Price. | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 665. | Protractor, blade 24 inches long | | | | $8 00 | Nickel-plated. | $8 75 | $ .60 |
| 666. | do | do | 30 | do | 8 75 | do | 9 65 | .70 |
| 667. | do | do | 36 | do | 9 50 | do | 10 50 | .80 |

# PLOTTING SCALES.

| No. | | Price. | Post. |
|---|---|---|---|
| 675. | Ivory Rectangular Protractor, 6 inches long, 1¾ inches wide, with scales as follows; front sides divided around edges from 0 to 180 degrees in single degrees, scales of ¼, ⅓, ¾, 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 | .03 |
| 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 ⅛, ¼, ⅜, ½, ⅝, ¾, ⅞, 1, 1⅛, 1¼ inches to the foot, scale of chords, and line of 40 parts lower edge. On the reverse side, scales of 20, 25, 30, 35, 40, 45, 50, 55, 60 parts to the inch, diagonal scale of $\frac{1}{100}$ths | 3 25 | .04 |
| 678. | Ivory Rectangular Protractor, same as No. 677, but has the Protractor divided in ½ degrees | 4 00 | .04 |
| 693. | Ivory Scale, 12 inches long, with 16 scales, as follows: ⅛, $\frac{1}{16}$, ¼, ⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾, 2, 2¼, 2½ and 3 inches to the foot, the first division of each scale subdivided in 12 parts, each | 3 00 | .05 |
| 694. | Same as No. 693, but with the first division of each scale subdivided into 10 parts, each | 3 00 | .05 |
| 700. | Boxwood Protractor, 6 inches long, 1¾ inches wide, whole degrees, with 6 scales of equal parts, 4 scales of feet and inches, 2 scales of chords, and diagonal scale | .50 | .03 |
| 703. | Flat Boxwood Scale, 12 inch, divided ⅛, ¼, ½, 1, or ⅜, ¾, 1½, 3 in. to the foot, each, | 1 25 | .05 |
| 706. | Boxwood Chain Scales, 12 inches long, graduated on two edges with either 10 and 20 parts, or 20 and 40, or 30 and 50, or 40 and 60 | 1 25 | .05 |
| 708. | Boxwood Scale, 12 inches long, with 16 scales, as follows: $\frac{1}{32}$, $\frac{1}{16}$, ¼, ⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾, 2, 2¼, 2½, and 3 inches to the foot, the first division of each scale subdivided into 12 parts, each | 1 25 | .05 |
| 709. | Same as No. 708, but with the first division of each scale subdivided into ten parts, each | 1 25 | .05 |
| 719. | Flat Metallic Chain Scale, 12 inches long, graduated on two beveled edges, 10 and 20, or 20 and 40 parts to the inch, each | 3 00 | .10 |
| 719.A— | do with 30 and 50, or 40 and 60 parts, each | 3 75 | .10 |
| 719.H— | do 30 centimetres long, divided to millimetres | 3 00 | .10 |
| 722. | Triangular Scale of Boxwood, 12 inches long, graduated 10, 20, 30, 40, 50, and 60 to the inch | 2 00 | .05 |
| 723.— | do do do 20, 30, 40, 50, 60, and 80 to the inch | 2 00 | .05 |
| 728. | Triangular Scale of Boxwood, 12 inches long, graduated $\frac{3}{32}$, $\frac{1}{16}$, ⅛, ¼, ⅜, ½, ¾, 1, 1½, and 3 inches to the foot, and 16ths of inches | 2 00 | .05 |
| 730. | Metallic Triangular Scale, 12 inches, graduated same as No. 722 | 3 00 | .08 |
| 731.— | do do do No. 723 | 3 00 | .08 |
| 732.— | do do do No. 728 | 3 00 | .08 |
| 749. | Triangular Boxwood Scale, metric measure, 30 centimetres long | 2 00 | .05 |
| 1096. | Combination Rule, One Foot, two Fold, boxwood. It combines in itself a Carpenter's Rule, Spirit Level, Square, Plumb, Bevel, Indicator Brace, Scale, Draughting Scale of equal parts, T Square, Protractor, Right-angle Triangle, and Parallel Rule | 2 00 | .10 |

# POCKET RULES.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1081. | One Foot, four Fold, boxwood, edge plates | $ | 25 | .02 |
| 1082.— | do do do brass edges, bound | | 50 | .03 |
| 1086. | Two Feet, do do edge plates | | 35 | .03 |
| 1087.— | do do do brass bound, with drafting scales | | 70 | .05 |
| 1088.— | do do do inside edges beveled, with drafting scales | | 85 | .03 |
| 1091. | One Foot, four Fold, ivory, German-silver mounted, graduated in 8ths, 10ths, 12ths, 16ths, and 100ths of a foot on edges | 1 | 35 | .03 |
| 1092. | One Foot, four Fold, ivory, graduated in 8ths, 10ths, 12ths, 16ths, and 100ths, with German-silver edges, bound | 1 | 00 | .04 |
| 1093. | One foot, four Fold, ivory, Caliper, graduated in 8ths, 10ths, 12ths, and 16ths | 2 | 00 | .04 |
| 1093A. | One Foot, four Fold, ivory, Caliper, graduated in 8ths, 10ths, 12ths, and 16ths, with German-silver edges, bound | 2 | 50 | .05 |
| 1094. | Two Feet, four Fold, ivory, German-silver mounted, with 8ths, 10ths, and 16ths inches, and ¼, ⅓, ¾, and 1 inch drafting scales | 4 | 00 | .08 |
| 1095. | Two Feet, four Fold, ivory, same as No. 1094, German-silver, bound | 5 | 00 | .10 |

# MISCELLANEOUS.

| No. | | Price. | Post. |
|---|---|---|---|
| 1032. | Adjustable Curve Ruler, 14½ inches long | $1 50 | $ .10 |
| 1033. | do do 30 do | 2 87 | .30 |

These rulers can be instantly adjusted and retained to any form of curve. This tool is recommended by architects and draughtsmen. It is well made and neatly finished in nickel plate.

| | | | |
|---|---|---|---|
| 1036. | Ebony Parallel Ruler, brass mounted, 9 inch | 50 | .05 |
| 1037. | do do do 12 inch | 75 | .10 |
| 1062. | Marion's Section-Liner, German-silver slide and screws, with either polished satin-wood, or rubber triangle, and ruler | 2 00 | .10 |
| 1111. | Improved Trammel Points, medium size, per pair | 1 35 | .10 |
| 1117. | Horse Shoe Magnet 3 inches long | 25 | .04 |
| 1118. | do do 4 do | 35 | .06 |

## POCKET COMPASSES.

| No. | | Price. | Post. |
|---|---|---|---|
| 1150. | Pocket Compass, watch pattern, gilt, enameled or metal face, stem stop, Bar needle, 1¼ inches in diameter | $4 50 | $ .04 |
| 1151. | do but 1½ inches in diameter | 5 50 | .04 |
| 1152. | do nickel-plated case, with hinged cover, spring catch and stop to needle in joint of cover, 1½ inches in diameter | 3 50 | .05 |
| 1153. | do nickel-plated case, with hinged cover, spring catch and stop to needle in joint of cover, 2 inches in diameter | 4 50 | .05 |
| 1156. | Pocket Compass, watch pattern, nickel-plated hunting case, bar needle, 1½ inches in diameter, raised ring, metal face | 3 75 | .04 |
| 1158. | Pocket Compass, nickel-plated hunting case, raised ring, stop to needle, folding sights, 2¾ inches in diameter | 7 00 | .10 |
| 1159A. | Geological Compass, of Brass, with pendulum for ascertaining the angle of dip in rocks | 4 00 | .05 |

## SIMPLE MICROSCOPES, TO FOLD IN CASES.

| No. | | Price. | Post. |
|---|---|---|---|
| 1201. | Rubber Case and Frame, Double Convex Lens, 1 inch | $ .50 | .02 |
| 1203. | do do 1½ " | 1 00 | .02 |
| 1205. | do do 2 " | 1 50 | .04 |
| 1250. | Reading or Picture Glass, rubber frame, wood handle, double convex lens, 2 inch | 1 00 | .04 |
| 1252. | do do do do do 3 inch | 1 75 | .07 |

## ACHROMATIC TELESCOPES.

1325.

| No. | | Price. | Post. |
|---|---|---|---|
| 1325. | Telescope, wood body, 3 draws, 15 inches drawn out, 6 inches shut, object-glass 1 inch in diameter, power 13 times | $2 50 | $ .12 |
| 1326. | Telescope, wood body, 3 draws, 16 inches drawn out, 6 inches shut, object-glass 1⅝ inches in diameter, power 16 times | 3 50 | .15 |
| 1327. | Telescope, wood body, 3 draws, 23 inches drawn out, 8 inches shut, object-glass 1¾ inches in diameter, power 20 times | 4 75 | .20 |
| 1328. | Telescope, wood body, 3 draws, 30 inches drawn out, 10 inches shut, object-glass 1⅞ inches in diameter, power 25 times | 7 00 | .30 |
| 1329. | Telescope, wood body, 4 draws, 37 inches drawn out, 11 inches shut, object-glass 1⅞ inches in diameter; superior glass; power 35 times | 12 00 | .60 |
| 1330. | Telescope, wood body, 4 draws, 42 inches drawn out, 11½ inches shut, object-glass 2⅛ inches in diameter, power 40 times | 20 00 | .64 |
| 1331. | Telescope, wood body, 4 draws, 48 inches drawn out, 13½ inches shut, object-glass 2⅜ inches in diameter, power 50 times | 30 00 | .75 |

## TOURISTS' GLASSES.

1341.—Tourist's Achromatic Spy-glass, with brass body, covered with black Turkey morocco; 3 draws, 17 inches long when drawn out, 6 inches long when shut up; object-glass 1¼ inches diameter; sun-shade to slip beyond the object-glass; heavy leather caps to cover both the eye-glass and object-glass; strong leather strap to sling over the shoulder. Power 20 times ..... 8 00 .15

1342.—Same as No. 1341, but is 21 inches long when drawn out, 7 inches long when shut up; object-glass 1⅜ inches diameter. Power 25 times ..... 11 00 .20

1343.—Same as No. 1341, but is 24 inches long when drawn out, 9 inches long when shut up; object-glass 1¾ inches diameter. Power 30 times ..... 14 00 .25

1344.—Signal Service Spy-glass, same as No. 1341, but has 4 draws, and is 36 inches long when drawn out, 10 inches long when shut up; object-glass 2 inches diameter. Power 35 times ..... 20 00 .35

1345.—Rifle Spy-glass, 10½ inches long, body covered with black leather; achromatic object-glass ½ inch in diameter. Power 10 times ..... 2 50 .10

1350.—Wooden Tripod Stand, with vertical and horizontal motion, upon which to place a spy-glass; an exceedingly useful article, as a glass of much power cannot be held in the hand with sufficient steadiness to produce the best effect ..... 5 00 .85

1351.—Brass Clamp with Gimlet Screw, to fasten a spy-glass to a post or tree, three sizes to fit any of the foregoing spy-glasses ..... $1 50 to 3 00 .05

## ASTRONOMICAL TELESCOPES.

| | | Price |
|---|---|---|
| 1355. | Astronomical Telescope. Polished wood body, 47 inches long, mounted on firm tripod stand, achromatic object-glass 3 inches in diameter, one terrestrial eye-piece, rack and pinion for adjusting the focus. Power 50 times | $65 00 |
| 1356. | Astronomical Telescope. Same as No. 1355, with one terrestrial eye-piece giving power of 50 times and one celestial eye-piece giving power of 100 times | 70 00 |
| 1357. | Astronomical Telescope. Body of Brass, 35 inches long, has rack and pinion for focusing, achromatic object-glass 2½ inches in diameter, terrestrial eye-piece, power 40 times; celestial eye-piece, with black sun-glass, power 80 times; firm tripod stand of walnut, having horizontal and vertical movements, walnut case, with lock and key, for receiving the body and eye-pieces | 70 00 |
| 1358. | Astronomical Telescope. Same as No. 1357, but with body 40 inches long, achromatic object-glass 3 inches in diameter, terrestrial eye-piece, power 50 times; celestial eye-piece, with black sun-glass, power 100 times, with walnut case | 100 00 |

# MARINE AND FIELD GLASSES.

*(PARTIAL LIST.)*

The power and sharpness of definition of a Field Glass depends upon the diameter of the object-glass; the greater the diameter the higher the power, and more clearly distant objects are seen.

These glasses are designated and priced according to the diameter of the object-glasses in French lines, eleven lines being equal to one inch.

| No. | | Price. | Post. |
|---|---|---|---|
| 1300. | Six-Lens Achromatic Field Glass, metal body, covered with morocco, sun-shade to extend over the object-glasses, and leather case with strap. | | |
| | A.—Body 4¾ inches long; object-glasses 21 lines in diameter | $7 50 | $ .30 |
| | C.— do 6¼ do do 26 do | 9 50 | .40 |
| 1301. | U. S. Army Signal Service Six-Lens Achromatic Marine or Field Glass, metal body, covered with Turkey morocco, sun-shade to extend over the object-glass, and heavy leather case, with strap. | | |
| | A.—Body 5⅜ inches long; object-glasses 21 lines in diameter | 13 00 | .35 |
| | B.— do 5⅞ do do 24 do | 14 50 | .40 |

| | | | |
|---|---|---|---|
| 1302. | Bardou's U. S. Army Signal Service Marine or Field Glass, six-lenses, achromatic object-glasses, metal body, covered with Turkey morocco, sun-shade to extend over the object-glasses, and heavy leather case, with strap; very superior. | | |
| | A.—Body 6 inches long when adjusted, object-glasses 21 lines in diameter | $16 50 | $ .40 |
| | C.— do 7⅛ do do do 26 do | 20 50 | .60 |
| 1303. | Bardou's U. S. Army Signal Service Marine or Field Glass, six-lenses, achromatic object-glasses, body covered with Turkey morocco, with hinge adjustment for different widths of eyes, sun-shade to extend over the object-glasses, in fine leather case, with strap. | | |
| | B.—Body 6¾ inches long when adjusted, object-glasses 24 lines in diameter | 20 50 | .55 |
| | C.— do 7⅛ do do do 26 do | 22 50 | .60 |
| 1304. | **Binocular Telescope.** This form of Marine and Field Glass has great power and wonderful optical qualities. It is one of the best instruments for yachting, deer-stalking, military service, and general field use. It is furnished with screw shades, a strong sole-leather case, and a strap. | | |
| | A.—Body 9 inches long; 11 lines or 1 inch, power, 16 diameters | 35 00 | .60 |
| | B.— do 9½ do 14 do 1¼ do 18 do | 45 00 | .65 |
| 1305. | **Rancheman's Glass.** Six-Lens Achromatic Field Glass, metal body covered with morocco, sun-shade to extend over the object-glasses, in fine leather case, with strap. A superior glass. | | |
| | Body 6¾ inches long, object-glasses 26 lines in diameter | 18 00 | .50 |

Note.—We also have constantly on hand a full and choice assortment of plain and fancy Opera Glasses of best make. Sizes from 10 to 19 lines diameter. Prices, from $3.50 to $25.00 each.

# DRAWING PAPER.*

## WHATMAN'S DRAWING PAPERS, BEST QUALITY.

| No. | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|
| 1400.—Demy, | 20×15 | per sheet, | $ .05; | per quire, | | $1 00 | $ .20 |
| 1401.—Medium, | 22×17 | do | .07; | do | | 1 40 | .28 |
| 1403.—Super Royal, | 27×19 | do | .10; | do | | 2 20 | .45 |
| 1408.—Double Elephant, | 40×26 | do | .25; | do | | 5 50 | 1.12 |

## BLEACHED MANILLA, BUFF TINT.

FOR WORKING DRAWINGS, IN ROLLS OF ABOUT 50 POUNDS.

| No. | | | | | Price. | Post. |
|---|---|---|---|---|---|---|
| 1415.—36 inches wide, thick, per pound, 15 cts.; per yard | | | | | $0 10 | $ .12 |
| 1416.—40 | do | do | do | 15 cts.; do | 12 | .14 |

## AMERICAN WHITE ROLL DRAWING PAPER.

VERY STRONG, IN ROLLS OF 40 TO 50 POUNDS.

| No. | | | | | Price. | Post. |
|---|---|---|---|---|---|---|
| 1420.—36 inches wide, smooth surface, per pound, 60 cts.; per yard | | | | | $0 25 | $ .12 |
| 1421.—42 | do | do | do | 60 cts.; do | 30 | .14 |

## BEST EGGSHELL DRAWING PAPER.

IN ROLLS OF 30 TO 40 POUNDS.

| No. | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|
| 1429.—36 inches wide, medium, rough surface, per pound, 45 cts.; per yard | | | | | | $0 30 | $ .13 |
| 1430.—42 | do | do | do | do | 45 cts.; do | 35 | .15 |
| 1432.—58 | do | heavy, | do | do | 45 cts.; do | 50 | .20 |

NOTE.—*The pound price applies only to full, unbroken rolls.*

## MOUNTED DRAWING PAPER.

WHITE, MOUNTED ON MUSLIN, IN ROLLS OF 10 YARDS.

| No. | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|
| 1438.—American, | 36 | inches wide, | smooth surface, | per roll, | $8 00; per yard | $0 90 | $ .18 |
| 1439.— do | 42 | do | do | do | 9 00; do | 1 00 | .20 |
| 1444.—Eggshell, | 36 | do | rough surface, | do | 8 00; do | 90 | .18 |
| 1445.— do | 42 | do | do | do | 9 00; do | 1 00 | .21 |
| 1447.— do | 58 | do | do | do | 13 50; do | 1 50 | .28 |

Large pieces for City, County, or State Maps, mounted to order.

## TRACING PAPER.

| No. | | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|---|
| 1450.—English, in rolls of 20 yards, 40 inches wide, per roll | | | | | | | $4 00 | $ .35 |
| 1451.—French, common, in rolls of 11 yards, 43 inches wide, per roll | | | | | | | 1 50 | .14 |
| 1454.—Parchment, | do | 33 | do | 38 | do | do | 8 00 | .55 |
| 1455.—German, | do | 43 | do | 22 | do | do | 5 00 | .55 |
| 1456.—Vegetable Royal, 25×19 inches, per sheet, 12 cts.; per quire | | | | | | | 2 20 | .13 |
| 1459.—"Flaxine" tracing paper, very strong, 31×21 inches, per sheet, 12 cts.; per quire | | | | | | | 2 50 | .17 |
| 1460A.—Bond paper, 21×16 inches, per sheet, 6 cts.; per quire | | | | | | | 1 00 | .12 |

*NOTE.—Small quantities of paper, and paper of great width, must be put on a wooden roller when sent by mail. Several yards can be put on a single roller, with but little extra cost for postage

## TRACING OR VELLUM CLOTH.

IN ROLLS OF 24 YARDS, FACE GLAZED AND BACK DULL.

| No. | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|
| 1466.—Imperial, 30 inches wide, per yard, 35 cts.; per roll | | | | | | $6 90 | $ .62 |
| 1467.— do | 36 | do | do | 40 cts.; | do | 7 50 | .80 |
| 1468.— do | 42 | do | do | 50 cts.; | do | 10 50 | .95 |

## PREPARED SENSITIVE OR BLUE PROCESS PAPERS.

ALWAYS READY FOR IMMEDIATE USE.

| No. | | | | | | Price. | Post. |
|---|---|---|---|---|---|---|---|
| 1470.—Demy, | 21×16, per dozen sheets | | | | | $0 85 | $ .12 |
| 1471.—Super Royal, | 28×20, | do | | | | 1 65 | .20 |
| 1473.—Double Elephant, | 40×27, | do | | | | 3 50 | .45 |
| 1474.—Sensitized Paper, | 30 | inches wide, | per roll of 10 yards | | | 3 00 | .35 |
| 1476.— do | 42 | do | do | do | | 5 00 | .55 |
| 1477.—White Ink, for making alterations on Blue Process copies, per bottle | | | | | | 25 | .05 |

## BLUE PROCESS PAPER, NOT PREPARED.

| No. | | Price. | Post. |
|---|---|---|---|
| 1481. | —30 inches wide, thick, per roll of 10 yards | $1 50 | $ .35 |
| 1483. | —42 do do do do | 2 00 | .55 |

## TOWNSHIP PLOTTING PAPER.

| No. | | Price. | Post. |
|---|---|---|---|
| 1495. | —Township Plotting Paper, rulings 6x6 blocks, blocks 1 inch square, per quire | $0 60 | $ .06 |
| 1496. | — do do 12x12 do 2 do do | 75 | .16 |

## PROFILE PAPER.

| No. | | Price. | Post. |
|---|---|---|---|
| 1500. | —Plate A, 42x15 inches, horizontal, ruling, 4, vertical, 20 to in., per sheet | $0 40 | $ .05 |
| 1501. | —Plate B, 42x13¾ do do 4, do 30 do do | 40 | .05 |
| | Nos. 1500, 1501, per quire | 8 50 | .60 |
| 1503. | —Continuous Profile Paper Plates, A or B, rulings 20 inches wide, per yard | 30 | .04 |
| 1505. | —Metric.—In Continuous Roll, rulings 50 centimetres wide, in millimetres, per yard | 30 | .04 |

## CROSS SECTION PAPERS.

| No. | | Price. | Post |
|---|---|---|---|
| 1520. | —Topographical Paper, 17x14 inches, ruled 400 feet to the inch, per sheet, 6 cts.; per quire | $1 25 | $ .08 |
| 1522. | —Cross Section Paper, Plate C, rulings 20x16 inches, 8 feet to inch, per sheet, 25 cts.; per quire | 5 00 | .32 |
| 1524. | —Cross Section Paper, Plate G, rulings 22x16 inches, 10 feet to inch, every fifth line line heavy, per sheet, 25 cts.; per quire | 5 00 | .32 |
| 1525. | —Cross Section Paper, Plate H, rulings 21x16 inches, 16 feet to inch per sheet, 25 cts.; per quire | 5 00 | .32 |
| 1526. | —Cross Section Paper, Metric, rulings every two millimetres, size of sheet, 50x40 centimetres, per sheet, 25 cts.; per quire | 5 00 | .32 |

## CONTINUOUS PROFILE BOOKS.

They are printed upon fine sheets of paper, and mounted upon a continuous piece of muslin and bound in book form.

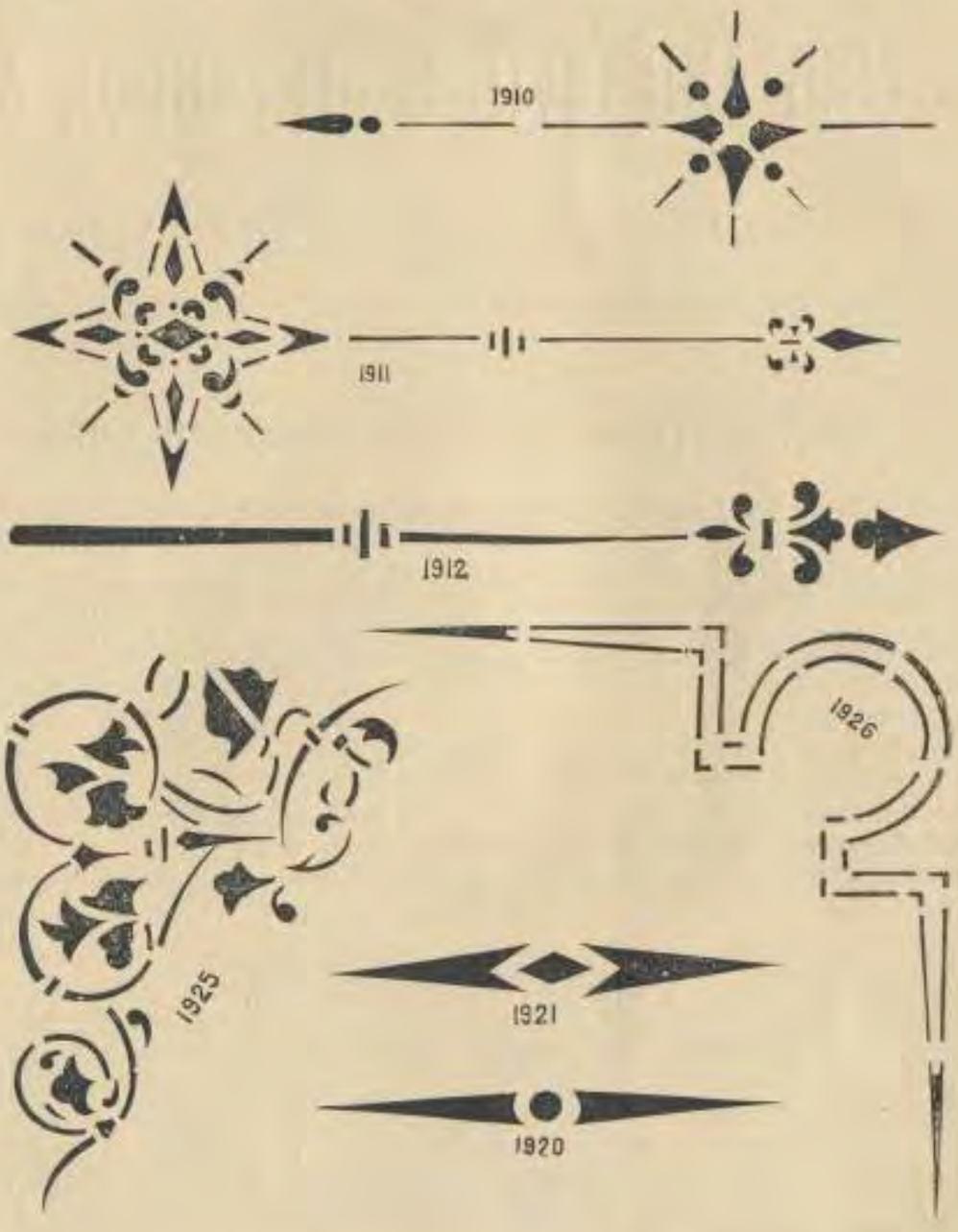
| No. | | Price. | Post. |
|---|---|---|---|
| 1550. | —Plate A, 8x5¼ inches, profile 12 miles, morocco binding | $2 50 | $ .06 |
| 1551. | — do do do 25 do do | 3 00 | .08 |
| 1552. | — do do do 50 do do | 5 00 | .12 |
| 1553. | — do do do 100 do do | 8 00 | .20 |
| 1554. | —Plate B, 8x4¾ in., do 12 do do | 2 50 | .06 |
| 1555. | — do do do 25 do do | 3 00 | .08 |
| 1556. | — do do do 50 do do | 5 00 | .12 |
| 1557. | — do do do 100 do do | 8 00 | .20 |

## ENGINEERS' FIELD BOOKS.

| No. | | Price. | Post. |
|---|---|---|---|
| 1560. | —Level Books, 7x4 inches, per dozen, $5 00; each | $0 50 | $ .05 |
| 1561. | —Transit Books, 7x4 inches, per dozen, 5 00; each | 50 | .05 |
| 1562. | —Record Books, 7x4 inches, per dozen, 5 00; each | 50 | .05 |
| 1563. | —Cross Section Books, 8x7 inches, for Topography, per dozen, $10 00; each | 1 00 | .10 |
| 1564. | —Profile Level Books, 7x4 inches, per dozen, $7 50; each | 75 | .05 |
| 1570 | —Lyons' Tables, for finding at a glance the true cubical contents of Excavations and Embankments for all Bases, and for every variety of Ground and Side Slopes | | |
| | Sheet No. 1.—General Tables for all Bases and all Slopes; per sheet | 25 | .05 |
| | do 2.—For Side Hill Cuts and Fills: per sheet | 25 | .05 |
| 1571. | —Zimmerman's Universal Table, for Excavations and Embankments, adapted to any Base and Slope whatever, and the calculations of all solids to which the Prismoidal Formula is applicable | 1 00 | .04 |

## STENCIL PLATES.


1900. 1901. 1902. 1903. 1904. 1905




| Height of Letters, | ¼ in. | ⅜ in. | ½ in. | ⅝ in. | ¾ in. | 1 in. |
|---|---|---|---|---|---|---|
| 1900.—Alphabet | $1.25 | $1.35 | $1.50 | $1.65 | $1 80 | $2.00 |
| 1901.—Alphabet | 1.75 | 1.85 | 2.00 | 2 25 | 2.50 | 2.75 |
| 1902.—Alphabet | ..... | 4.00 | 4.25 | 4 50 | 4.75 | 5.00 |
| 1903.—Alphabet | 1.75 | 1.85 | 2.00 | 2.25 | 2.50 | 2.75 |

## FIGURES.

Set of Figures to match any above styles of letters, at one-half the price of the alphabet.

| | |
|---|---|
| Postage on each alphabet, ¼, ⅜, or ½ inch | $0.05 |
| do set of figures, do do | .03 |
| do each alphabet, ⅝, ¾, or 1 inch | .08 |
| do set of figures, do do | .05 |

| No. | Price. | Post. |
|---|---|---|
| 1910.—North point, full size | $0 65 | .02 |
| 1911.— do do | 1 00 | .02 |
| 1912.— do do | 75 | .02 |
| 1920.—Dasher, 1¾ inches long | 25 | .01 |
| 1921.— do 1½ do | 25 | .01 |
| 1925.—Ornamental Corner | 1 25 | .02 |
| 1926.— do do | 1 00 | .02 |

# PARTIAL LIST OF STANDARD WORKS

ON

# SURVEYING AND CIVIL ENGINEERING, &c., &c.

*Sent post paid on receipt of price, and registered for an extra cost of ten cents.*

## ARCHITECTURE, CARPENTRY AND BUILDING.

| | PRICE |
|---|---|
| BROOKS, S. H.—Erection of Dwelling Houses, with Specifications, Quantities of Materials, etc. 27 plates | $1 00 |
| HATFIELD, R. G.—The American House-Carpenter. Eighth edition. 8vo | 5 00 |
| KEMP, EDWARD.—On Landscape Gardening. 12mo. Illustrated | 2 50 |
| WOODWARD, G. E.—Cottage and Farm Houses. With 178 designs | 1 00 |
| do Suburban and Country Houses. With 70 designs | 1 00 |

## ASTRONOMY.

| | |
|---|---|
| LOOMIS, E.—Practical Astronomy, with a collection of Astronomical Tables. For the use of amateur observers, practical surveyors and engineers. 8vo | 2 00 |
| NAUTICAL ALMANAC.—Published by authority of the Secretary of the Navy, Washington | 75 |
| NEWCOMB, S.—Popular Astronomy. 8vo. Illustrated | 2 50 |

## BRIDGES, ROOFS, ETC.

| | |
|---|---|
| BOLLER, A. P.—Practical Treatise on the Construction of Iron Highway Bridges. Illustrated. | 2 50 |
| GREENE, C. E.—Roof Trusses. 8vo | 1 25 |
| do Bridge Trusses. 8vo | 2 50 |
| do Arches. Wood, Iron and Stone. 8vo | 2 50 |
| HAUPT, H.—Bridge Construction. With practical illustrations. 8vo | 3 50 |
| WADDELL, J. A. L.—Practical Work on Iron Bridges for Highways. 8vo. Illustrated | 4 00 |
| WHIPPLE, S.—Bridge Building. Fourth edition. 8vo | 4 00 |

## CHEMISTRY, PHYSICS, ETC.

| | |
|---|---|
| EISSLER, M.—Modern High Explosives. 8vo. Illustrated, 1886 | 4 00 |
| GANOT-ATKINSON.—Elementary Treatise on Physics, experimental and applied. 8vo | 5 00 |
| MOTT, H. A., JR.—Chemists' Manual. Assaying, Blowpipe Analysis, Mineralogy, Specific Gravities, etc | 5 00 |
| PLYMPTON, G. W.—The practical use of the Blowpipe. 12mo. Illustrated | 1 50 |

## CONSTRUCTIONS, STRENGTH OF MATERIALS, ETC.

| | |
|---|---|
| DU BOIS, PROF. A. J.—Strains in Framed Structures. Fully illustrated. 4to | 10 00 |
| GILLMORE, GEN. Q. A.—Treatise on Limes, Hydraulic Cements and Mortars. 8vo | 4 00 |
| HATFIELD, R. G.—Theory of Transverse Strains, and its application to Buildings, Girders, Trusses, etc. 8vo | 5 00 |
| HUNTINGTON, W. S.—Roadmaster's Assistant and Sectionmasters's Guide | 1 50 |
| JERVIS, J. B.—Railway Construction and Management. 12mo | 2 00 |

## DRAWING.

PRICE.

ANDRE, G. G.—Draughtsman's Hand-book of Plan and Map Drawing. 8vo. $3 75
COPLEY, F. S.—A Set of Alphabets of all the Various Hands of Modern use; also the Mechanical and Analytical Construction of Letters, Figures and Titles. 3 00
MAHAN, D. H.—Industrial Drawing; Description and Uses of Drawing Instruments, Construction of Plane Figures, the Projections and Sections of Geometrical Solids, Architectural Elements, Mechanism, and Topographical Drawing. Revised by Prof. D. F. Thompson. 1 vol. and atlas, 8vo. 3 50
MAXTON, J.—Workman's Manual of Engineering Drawing. 12mo. 1 80
SMITH, R. S—Manual of Topographical Drawing. 8vo. Plates. New edition. 3 00
STANLEY, W. F.—Mathematical Drawing Instruments; with hints upon drawing and coloring. 12mo. 2 00
TUTHILL, W. B.—Practical Lessons in Architectural Drawing. 8vo. Illustrated. 2 50

## ELECTRICITY, TELEGRAPHY, ETC.

LOCKWOOD, T. D.—Electricity, Magnetism, and Electric Telegraphy. 8vo. 378 pages, 152 illustrations. $2 50
SAWYER, W. E.—Electric Lighting by Incandescence, for interior illuminations. 8vo. 2 50
URQUHART, J. W.—Electric Light; Its Production and Use. Directions for Working Galvanic Batteries, Electric Lamps and Dynamo-Electric Machines. 8vo. With 94 illustrations. 3 00

## GEOLOGY, MINING AND METALLURGY.

BAUERMAN, H.—Metallurgy of Iron, and Analysis of Iron Ores, etc. Fifth edition. 12mo. $2 00
BODEMANN, T.—Assaying of Lead, Silver, Copper, Gold and Mercury. 12mo. 2 50
BOWIE, A. J., Jr.—Treatise on Hydraulic Mining, in California. 313 pages, 72 illustrations. 5 00
DANA, J. D.—Manual of Mineralogy, including Observations on Mines, the Reduction of Ores, etc. 12mo. 2 00
do Text-book of Geology. 12mo. 2 50
OVERMANN, F.—Treatise on Metallurgy; Mining and Metallurgical Operations. 372 engravings. 8vo. 5 00

## HYDRAULIC AND SANITARY ENGINEERING.

ADAMS, J. W.—Sewers and Drains for Populous Districts, Embracing Rules and Formulæ for the dimensions and construction of works of sanitary engineers. Second edition. 8vo. $2 50
BAYLES, J. C.—House Drainage and Water Service in Cities and Towns. 8vo. 3 00
BOX, THOS.—Practical Hydraulics; rules and tables for engineers, etc. 12mo. 2 00
FANNING, J. T.—Water Supply Engineering; relating to the Hydrology, Hydrodynamics, and Practical Construction of Water-works in North America. 8vo. 180 illustrations. 5 00
FRENCH'S Principles, Process, and Effects of Draining Lands. 12mo. 1 50
LATHAM, B.—Sanitary Engineering; the Construction of Works of Sewerage and House Drainage. Illustrated, enlarged edition. 12 00
STALEY-PIERSON.—The Separate System of Sewerage. 8vo. Illustrated, 1886. 2 50
STEWART, H.—Irrigation for the Farm, Garden, and Orchard. Illustrated. 1 50
WARING, G. E.—Sanitary Drainage of Houses and Towns. 12mo. 2 00
do Drainage for Profit and Health. Illustrated. 12mo. 1 50

## POCKET-BOOKS, TABLES, ETC.

BOILLEAU, J. T.—Complete Set of Traverse Tables, showing the difference of latitudes and the departure to every minute of the quadrant. 8vo. $5 00
BURT, W. A.—Key to the Solar Compass; also description of the Surveys and Public Land System of the United States; suggestions for an outfit for a survey of four months, etc. 2 50
CLEVENGER, S. V.—A Treatise on the method of Government Surveying. With complete Mathematical, Astronomical and Practical Instructions, for the use of United States Surveyors. 2 50
HENCK, J. B.—Engineer's Field-Book. Containing Formulæ for laying out Curves, determining Frog Angles, Leveling, calculating Earthworks, etc.; also numerous tables. 2 50
SCRIBNER, J. M.—Pocket Table Book. Logarithms of Numbers, Logarithmic Sines and Tangents, Natural Sines and Natural Tangents, the Traverse Table, and Excavation and Embankment Tables. 1 50

## POCKET-BOOKS, TABLES, ETC.—Continued.

| | Price. |
|---|---|
| SEARLES, WM. H.—Field Engineering. A Hand Book of the Theory and Practice of Railway Surveying, Location and Construction, and a large number of Useful Tables | $3 00 |
| SHUNK, W. F.—The Field Engineer. The Survey, Location, and Track-work of Railroads. Rules and Tables applicable to the Standard and Narrow Gauge | 2 50 |
| TRAUTWINE, J. C.—Excavation and Embankments | 2 00 |
| do Railroad Curves. New edition | 2 50 |
| do Civil Engineer's Pocket-Book of Mensuration, Trigonometry, Surveying, Hydraulics, Hydrostatics, Strength of Materials, Masonry, Wooden and Iron Roof and Bridge Trusses, Stone Bridges and Culverts, Trestles, Pillars, Suspension Bridges, Dams, Railroads, Turnouts, Water Stations, Earthwork, Foundations, Retaining Walls, etc. New edition | 5 00 |

## SURVEYING AND ENGINEERING

| | |
|---|---|
| BELLOWS-HODGMAN.—Manual of Land Surveying. Illustrated. 1886 | $2 50 |
| DORR, B. F.—The Surveyor's Guide, with Rules and Tables. 1883 | 2 00 |
| DAVIES, CHAS.—Elements of Surveying and Leveling; Topography and Mining Surveying. 12mo | 2 50 |
| GILLESPIE, W. M.—Practical Treatise on Surveying. The two volumes "Land Surveying" and "Leveling and Higher Surveying," are now revised and united in this volume. Revised and enlarged by Cady Staley, Ph. D. 8vo, Cloth, 677 Pages | 3 50 |
| do Higher Surveying. Leveling, Topography, Mining Surveying, &c. 8vo | 2 50 |
| do Principles and Practice of Road-Making. 12mo. Tenth edition | 2 50 |
| GILLMORE, GEN. Q. A.—The Construction of Roads, Streets and Pavements. 70 Illustrations. 12mo | 2 00 |
| HAUPT, L. M.—A Manual of Engineering Specifications and Contracts. 8vo. Illus. | 3 00 |
| do The Topographer; his Instruments and Methods. Fully illustrated. 8vo | 4 00 |
| HAWES, J. H.—System of Rectangular Surveying; a Manual of U. S. Gov. Surveying. 8vo | 3 00 |
| JOHNSON, J. B.—Text Book of Land and Railroad Surveying; also Hydrographic, Geodetic and Mining Surveying. 8vo. Illus. 1886 | 3 50 |
| MURRAY, D.—Manual of Land Surveying; with Tables of Logarithms, Traverse Table, &c. 12mo | 2 00 |
| ROBINSON'S Surveying and Navigation. With use of instruments, essential Elements of Trigonometry, Mensuration, and the necessary Tables. Edited by Oren Root, A.M., of Hamilton College. 8vo | 2 25 |
| SIMMS, F. W.—A Treatise on the Principles and Practice of Leveling. Fifth edition. 8vo | 2 50 |
| STONE, J. B.—Magnetic Variation in the United States 12mo. | 1 50 |
| VOSE, GEO. L.—Hand-book of Railroad Construction, with plans, maps, &c. The most complete hand-book of railway construction yet published | 12 50 |
| WELLINGTON, A. M.—The Economic Theory of the Location of Railways. 275 Engravings and 160 tables | 5 00 |
| do Railway Earthworks, with Diagrams. 2 vols. Illustrated | 5 00 |

## MISCELLANEOUS.

| | |
|---|---|
| ALEXANDER, J. H. Weights and Measures, Ancient and Modern, reduced to Standard of the United States of America. 8vo | $3 50 |
| BENJAMIN, PARK.—Engineers' and Mechanics' Recipes. Thirteenth edition. 12mo, 300 pp. | 2 00 |
| BOWDITCH, N.—American Practical Navigator. 8vo | 2 25 |
| KNIGHT, E. H.—American Mechanical Dictionary; a description of Tools, Instruments, Machines, and Engineering, &c. 4 vols., 8vo, illustrated | 27 50 |
| LIPPINCOTT'S Pronouncing Gazetteer of the World. 4to, sheep | 10 00 |
| URE'S Dictionary of Arts, Manufactures, and Mines. Revised, 4 vols | 36 00 |
| WEBSTERS' Unabridged Dictionary. 4to. Sheep | 12 00 |

*NOTE.—Our full list of books mailed to any address on application.*

# MISCELLANEOUS.

The following is a partial list of articles which we keep constantly in stock for the field and office use of the Surveyor and Engineer:

Drawing Instruments of French, German and Swiss Manufacture, in loose sets, or in cases.

Protractors of Horn, Brass, German Silver, Rubber, Ivory and Paper.

Ivory Chain Scales. Architects' Ivory Scales. Boxwood Chain Scales.

Architects' Boxwood Scales. Flat Metallic Chain Scales.

Paper Scales. Triangular Scales of Boxwood and Metal

Metric Scales and Rules.

Standard Steel Rules. Straight Edges of Steel, Rubber and Wood.

Triangles of Rubber, Rosewood, Satinwood, Hardwood, Steel and German Silver.

T Squares of Hardwood, Rosewood, Satinwood, Rubber and Steel.

Ovals, Hyperbolas and Parabolas, Batter Slopes, Lettering Triangles.

Irregular Curves of Wood, Rubber and Horn.

Railroad Curves of Cardboard, Wood, and Rubber.

Adjustable Curve Ruler. Section Liners. Pantographs.

Parallel Rulers of Ebony, Brass and German Silver, plain or on rollers.

Thumb Tacks and Horn Centres. Horse Shoe Magnets.

Pocket Rules. Pocket Spirit Levels. Pocket Compasses.

Improved Trammel Points. Reading and Picture Lenses.

Magnifiers and Simple Microscopes, to Fold in Cases. India Ink.

Windsor & Newton's Water Colors, Hard Colors in Cakes, or Moist in China Pans, or Liquid in Bottles.

Ink Slabs and Saucers, Cabinet Nests. Water Color Slide-lid Boxes.

Empty Japanned Tin Box, for Moist Colors. Water Color Brushes.

Soennecken's Round Writing Pen. Gillott's Steel Pens,

Mapping, Lithographic, and Lithographic Crow Quill Pens.

Lead Pencils for Writing or Drawing, Black or Assorted Colors.

India Rubber. Sponge Rubber for Cleaning Drawings. Steel Erasers.

Drawing Boards, and Adjustable Drawing Tables.

Letter Paper, Foolscap, Commercial Note, Legal Cap, Envelopes, Small to Large, White and Buff Tint.

Rubber Bands. Mucilage. Oilstones. Blow Pipes.

Carpenters' and Masons' Spirit Levels.

Thermometers, Hydrometers, Rain Gauge, Stencil Alphabets and Figures.

NOTE.—A fully illustrated Price List of the above-named goods sent by mail on application.

# SPECIAL NOTICE.

Curley's "Manual of the Principal Instruments used in American Engineering and Surveying" (26th edition), a book of 350 pages, contains Traverse Tables, and is illustrated with more than eighty wood-cuts of instruments and attachments.

It gives full prices and complete instructions for adjustments, and is used as a text-book in many of the Schools and Colleges of the country.

The Supplement to the "Manual" contains 140 pages, and has a Price List, fully illustrated, of nearly everything required for the field or office work of the Surveyor or Engineer, and will be sent to any address, post paid, on application.

Unless the purchaser is already supplied, a copy of the "Manual" will be sent with every new field instrument on application. The "Manual" complete, with Supplement, will be sent to any address, post-paid, on receipt of 50 cents.

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. The postage required is mentioned in the second column of the price list.

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

We are not responsible for goods sent by mail.

In ordering, please give Catalogue Numbers, and Edition of Manual or Circular describing the Articles wanted.