Illustrated Catalogue

AND

Price-List

OF

Engineering and Surveying

INSTRUMENTS AND MATERIALS

MADE BY

F. C. KNIGHT & CO.,

400 and 402 Locust Street,

PHILADELPHIA, U. S. A.

PREFACE.

IN presenting this catalogue and price-list of our instruments for your consideration, our object is to put into convenient form for our customers' use a brief description of the leading instruments we manufacture, and do it with a firm belief that we have made such improvements and advances in our instruments as will meet with your approval. While the principles remain the same, we have avoided complications in construction, adhering to simplicity as far as possible. Many new and advantageous features have been added, all of which increase the value of the Instrument to the purchaser.

We do not make a *cheap instrument*; we aim to give the very best instrument possible for the price, and do not care to compete with such as are not up to our standard. We feel confident that, upon investigation, you will find the practicability of, and workmanship on the F. C. KNIGHT and DRAPER INSTRUMENTS, far superior to all others. In construction of instruments, we use none but the best metals and materials; employ expert mechanical skill only, and use the latest improved machinery, thereby attaining the highest possible standard of excellence. *We positively guarantee the accuracy and workmanship of all instruments of our make.*

The business to which we are successors, was originated in 1815 by Edmund Draper, under whose ownership and extremely successful management it was continued for over 67 years, during which time he invented many of the most valuable engineering instruments now in use. His establishment was the leading and largest plant of its kind in the United States. His trade not only extended throughout the United States, but also largely in Central and South America, while his

name was by no means unknown in Europe. Since succeeding to the business, our endeavor has been to keep the DRAPER Instruments up to their original high standard, adding, from time to time, several modern improvements.

The F. C. KNIGHT Instrument is of an entirely different pattern from the DRAPER, as will be seen by comparing the cuts in the catalogue. Many of the principal features of this instrument were originated by the person whose name it bears. The part that needs special mention is the new style of clamp and tangent movement; the utility and superiority of this over all others now in use, can be readily discerned and appreciated.

The object accomplished by this clamp is the overcoming of the possibility of springing the horizontal limb in clamping and unclamping, which has never been positively accomplished heretofore, the cut and description of which you will find on pages 19 and 20.

Repairing

NOTE.

We would call attention to our having special facilities for repairing instruments of any make. We guarantee that they will be repaired (at no higher cost) *and put in as accurate condition*, as if repaired by the maker.

OUR REPAIRING ENDORSED.

C. A. SUNDSTROM, C. E.,
SURVEYOR AND REGULATOR.

DEPARTMENT OF PUBLIC WORKS

OFFICE OF THE
SURVEYOR AND REGULATOR,
8th District, 21st Ward.
9444 Main St., Post Office Building.

Manayunk, Phila., April 18th, 1895.

MESSRS. F. C. KNIGHT & CO.,
400 and 402 Locust St.,
Philadelphia.

It affords me great pleasure to state that the last Transit you repaired for this office is as good as a new instrument, and it seems almost miraculous that anything so badly used up, could be so thoroughly repaired.

Yours truly,
C. A. SUNDSTROM,
Surveyor 8th District.

THE CROSS CREEK COAL CO.
(Coxe Bros. & Co.)
DRIFTON, P. O., LUZERNE CO., PA.

April 23rd, 1894.

MR. FRANK C. KNIGHT,
Philadelphia, Pa.

Dear Sir:—

I have shipped you by to-day's Express prepaid, one Level instrument. Please give it a thorough repairing, have glasses cleaned and worn screws replaced, and the instrument rebronzed before returning. The Transit reached us in good condition, and I am well satisfied with the thorough work you have done.

Yours truly,
E. KUDLICH,
Mining Eng.

DRAPER IMPROVED TRANSIT.

THE Draper Transits are so well and favorably known the world over, that they need no special introduction from us. They have been made for over fifty years, with improvements added from time to time that have kept them up to the requirements of the day. Since becoming the successors to Mr. Draper, the march of improvement has not been lost sight of; it has been our endeavor to make the instrument warrant what it is now termed—a "Draper Improved."

IMPROVEMENTS AND GENERAL DESCRIPTION.

IMPROVEMENTS.—Long centers for short centers; adjustment added to standard for vertical plane of telescope; opposing spring to clamp instead of the opposing screw; have put cups to the leveling screws and covered all the threads to tangent and leveling screws, making them dust-proof. These improvements make this Transit superior to any instrument now offered for a like price.

GENERAL DESCRIPTION.—The object glass is achromatic, telescope perfectly balanced, reversing at eye- and object-ends; has dust- and rain-guard to object-slide; rack and pinion movement to focus cross-wires; object erect; power of telescope 14 to 20 diameters; body of telescope is made of seamless drawn tubing; axle is made of the best bell metal, fitted into grooved bearings in standard with adjustment for vertical plane of telescope; compass-needle with jewelled cap; ground-glass bubble graduated. Horizontal limb has two verniers, marked A and B, to avoid possibility of error when reading angles. The limb is figured with two rows of figures, one into quadrants 0 to 90, and the other 0 to 360. The vernier openings are large and covered with French plate-glass, sealed, water-tight; the centers are compound, extra long, made

of bell and bronze metal (not brass); has improved spring tangent. The tripod is of the well-known Draper shifting feature; the leveling screws are not detachable from instrument, they separate only from tripod head, together with the instrument. The tripod legs are made of mahogany, and are of the round, solid pattern (see cut No. 101, page 40).

The instrument is packed in case in spring packing, is of light-colored wood, hand-polished; has strap and lock; is provided with reading-glass, plumb-bob, lever and screw-driver.

THE DRAPER ENDORSED.

THOS. DALY, C. E.
SURVEYOR AND REGULATOR,
1242 SOUTH BROAD STREET.

DEPARTMENT OF PUBLIC WORKS.

OFFICE OF

FIRST SURVEY DISTRICT.

Philadelphia, July 21, 1894.

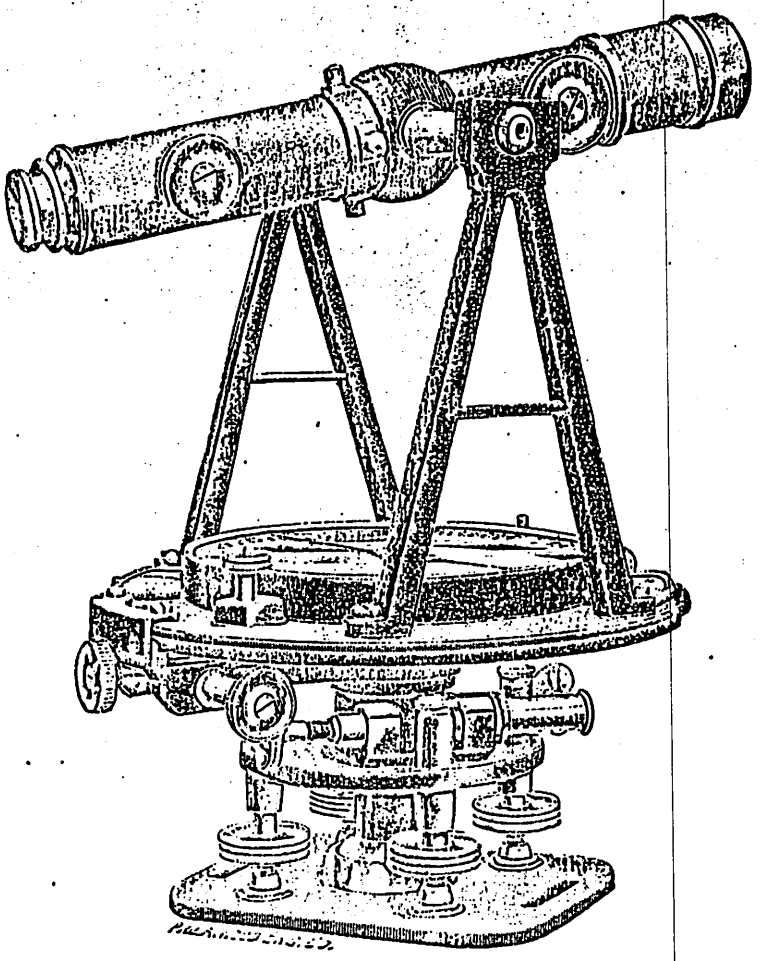
FRANK C. KNIGHT, ESQ.,
Mf'g of Mathematical and Surveying Instruments,
402 Locust St., Phila., Pa.

Dear Sir:—

I have been using the "Draper" instruments of your manufacture in this district for the past two years, and a part of my instrumental outfit at present consists of two transits and a level of your make. I have used these instruments constantly on the various works carried on in this district and find them to be admirably adapted to the same, combining lightness in weight with great steadiness. I cheerfully recommend your instruments to any one requiring them.

Very truly,

THOS. DALY,
Surveyor and Regulator, 1st District.



10. DRAPER IMPROVED PLAIN TRANSIT.

11. DRAPER IMPROVED PLAIN TRANSIT [Small].

No. 10. DRAPER IMPROVED PLAIN TRANSIT.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

Telescope, length,	10½ inches.
Object Glass, aperture,	1¼ inches.
Compass Needle,	4½ inches.
Lower Limb,	6½ inches.

Weight of Instrument and Tripod, 18 lbs.

Price, $160.00

No. 11. DRAPER IMPROVED PLAIN TRANSIT. [Small.]

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

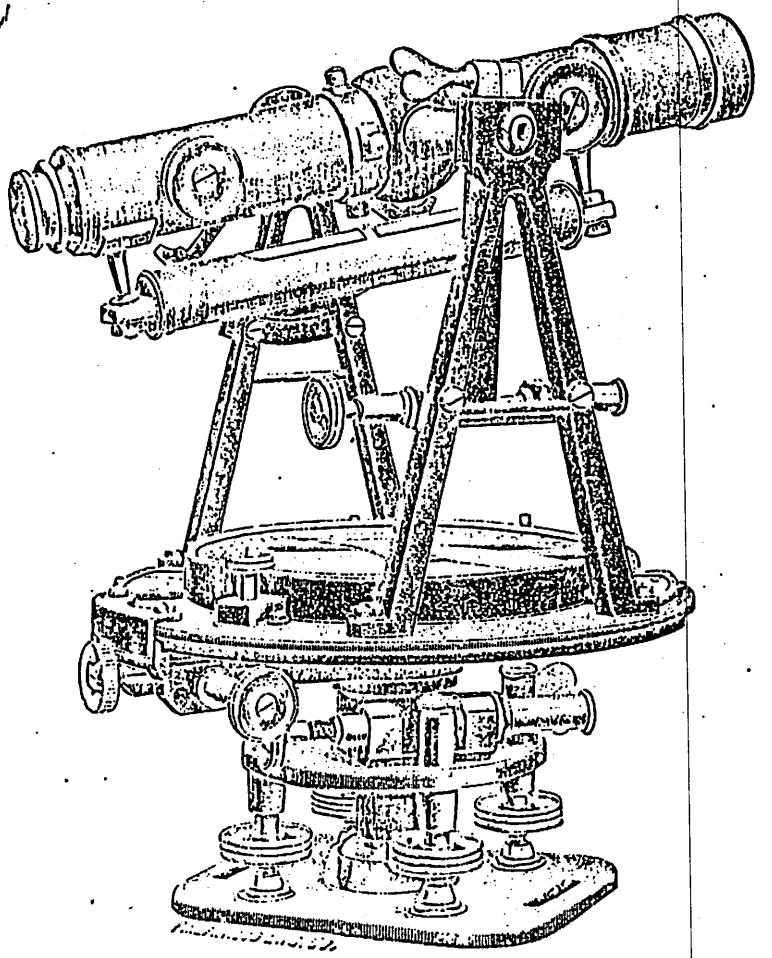
Telescope, length,	7½ inches.
Object Glass, aperture,	⅞ inch.
Compass Needle,	3 inches.
Lower Limb,	4¾ inches.

Weight of Instrument and Tripod, 10 lbs.

Price, $140.00

EXTRAS TO NOS. 10 AND 11 TRANSITS:

Skeleton Legs instead of solid legs, as shown in cut 102, page 40, Price,	$1.50
Adjustable Legs instead of solid legs, as shown in cut 103, page 41,	6.50
Adjustable Stadia Wires,	8.00
Reflector for illuminating cross wires (see cut on page 41),	4.00
Gossamer Water-Proof Bag to protect transit,	1.00



12. DRAPER IMPROVED TRANSIT,
—WITH VERTICAL ARC.—

13. DRAPER IMPROVED MINING TRANSIT,
—WITH VERTICAL ARC.—

No. 12. DRAPER IMPROVED TRANSIT, With Vertical Arc.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

Telescope, length,	10½ inches.
Object Glass, aperture,	1¼ inches.
Bubble under telescope,	6½ inches.
Vertical Arc, radius, figured 0 to 60 each way.	6½ inches.
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	4½ inches.
Lower Limb,	6½ inches.
Weight of Instrument and Tripod,	19 lbs.

Price, $195.00

No. 13 DRAPER IMPROVED MINING TRANSIT, With Vertical Arc.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

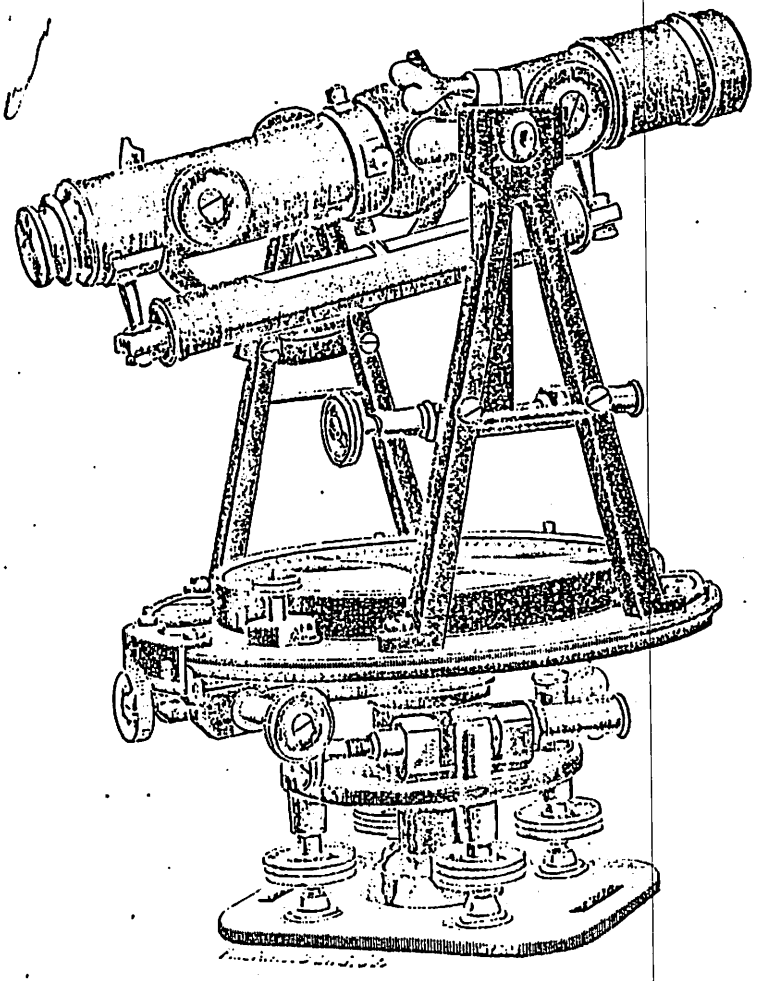
SPECIAL DESCRIPTION:

Telescope, length,	7½ inches.
Object Glass, aperture,	⅞ inch.
Bubble under telescope,	4½ inches.
Vertical Arc, radius, figured 0 to 60 each way.	5 inches.
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	3 inches.
Lower Limb	4¾ inches.
Weight of Instrument and Tripod,	11 lbs.

Price, $170.00

EXTRAS TO NOS. 12 AND 13 TRANSITS:

Skeleton Legs instead of solid legs, as shown in cut 102, page 40,	Price, $1.50
Adjustable Legs instead of solid legs, as shown in cut 103, page 41,	6.50
Adjustable Stadia Wires,	8.00
Reflector for illuminating cross wires (see cut on page 41),	4.00
Gossamer Water-Proof Bag to protect transit,	1.00



14. DRAPER IMPROVED TRANSIT,
—WITH VERTICAL HALF CIRCLE.—

15. DRAPER IMPROVED MOUNTAIN TRANSIT,
—WITH VERTICAL HALF CIRCLE.—

With Vertical Half Circle.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

Telescope, length,	10½ inches.
Object Glass, aperture,	1¼ inches.
Bubble under telescope,	6½ inches.
Vertical Half Circle, diameter, figured from 0 to 90 each way, with vernier reading to minutes.	5 inches.
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	4½ inches.
Lower Limb,	6½ inches.
Weight of Instrument and Tripod,	19 lbs.

Price, $205.00

No. 15. DRAPER IMPROVED MOUNTAIN TRANSIT. With Vertical Half Circle.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

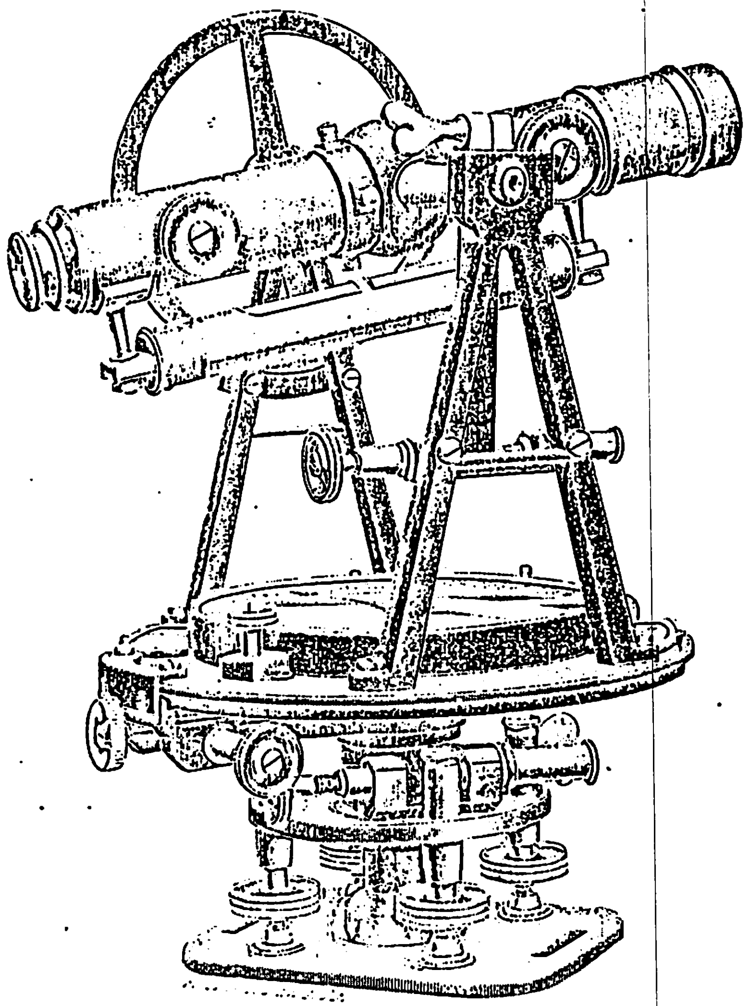
SPECIAL DESCRIPTION:

Telescope, length,	7½ inches.
Object Glass, aperture,	⅜ inch.
Bubble under telescope,	4½ inches.
Vertical Half Circle, figured 0 to 90 each way, with vernier reading to minutes.	4 inches.
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	3 inches.
Lower Limb,	4¾ inches.
Weight of Instrument and Tripod,	11 lbs.

Price, $180.00

EXTRAS TO NOS. 14 AND 15 TRANSITS:

Skeleton Legs, instead of solid legs, as shown in cut 102, page 40,	Price, $1.50
Adjustable Legs, instead of solid legs, as shown in cut 103, page 41,	6.50
Adjustable Stadia Wires,	8.00
Reflector for illuminating cross wires (see cut on page 41),	4.00
Gossamer Water-Proof Bag to protect transit,	1.00



16. DRAPER IMPROVED TRANSIT,

—WITH FULL VERTICAL CIRCLE.—

17. DRAPER IMPROVED MOUNTAIN TRANSIT,

—WITH FULL VERTICAL CIRCLE.—

For Top Telescope Attachment for Vertical Work see Pages 30 and 31.

[illegible] ... make promptly and accurately. See Note Page 5.

With Full Vertical Circle.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

Telescope, length, ... 10½ inches.
Object Glass, aperture, . . 1¼ inches.
Bubble under telescope, . . 6½ inches.
Vertical Circle, diameter, . 5 inches, figured into quadrants, 0 to 90, vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 4½ inches.
Lower Limb, ... 6½ inches.
Weight of Instrument and Tripod, 19½ lbs.

Price, $215.00

No. 17. DRAPER IMPROVED MOUNTAIN TRANSIT. With Full Vertical Circle.

FOR GENERAL DESCRIPTION SEE PAGES 6 and 7.

SPECIAL DESCRIPTION:

Telescope, length, ... 7½ inches.
Object Glass, aperture, . . ⅞ inches.
Bubble under telescope, . . 4½ inches.
Vertical Circle, diameter, . 4 inches, figured into quadrants, 0 to 90, vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 3 inches.
Lower Limb, ... 4¾ inches.
Weight of Instrument and Tripod, 11½ lbs.

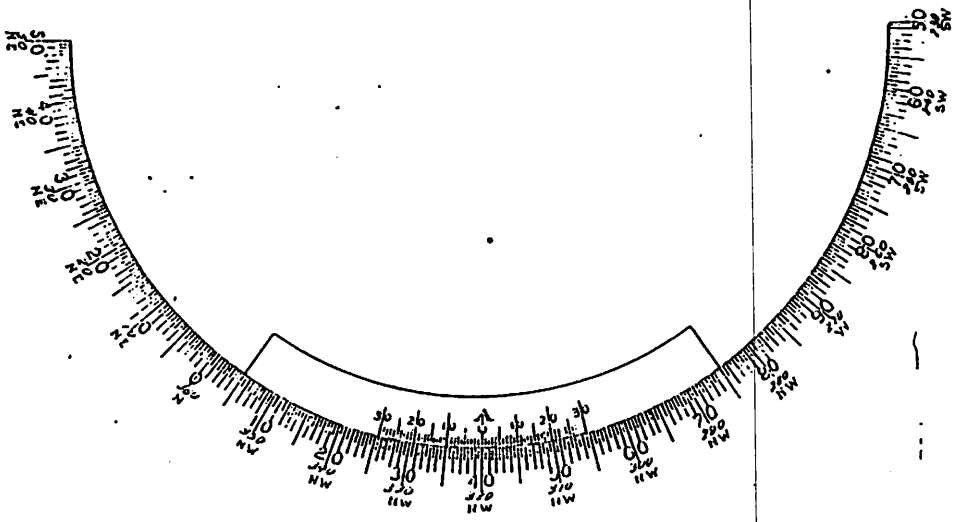
Price, $190.00

EXTRAS TO NOS. 16 AND 17 TRANSITS:

Skeleton Legs instead of solid legs, as shown in cut 102, page 40, ... Price, $1.50
Adjustable Legs instead of solid legs, as shown in cut 103, page 41, ... 6.50
Adjustable Stadia Wires, ... 8.00
Reflector for illuminating cross wires (see cut on page 41), ... 4.00
Gossamer Water-Proof Bag to protect transit, . . 1.00

F. C. Knight Engineering Transits

The F. C. Knight Engineering Transits have achromatic telescopes, perfectly balanced, reverses at eye- and object ends; dust- and rain-guard to slide; improved right and left movement to eye-piece to focus cross-wires accurately; object erect; power of telescope 22 to 28 diameters; body of telescope is made of seamless drawn tubing; eye-piece to telescope is provided with slide to close when instrument is not in use; the axle is *made of the best bell metal* and fitted into grooved bearings in standard with adjustment for vertical plane of telescope; compass-needle has jewelled cap; all bubbles are ground; bubble under telescope is graduated; the plate bubbles are provided with guards;



horizontal limb has two verniers, marked A and B, to avoid possibility of error when reading angles; the limb is figured with two rows of figures, one with quadrants 0 to 90, the other 0 to 360; the quadrants are lettered N. S. E. W., the same as compass; graduations are on *solid sil-*

ver, not silver wash; vernier openings are covered with French plate glass (sealed water-tight); the glass is close to horizontal limb to prevent parallax in reading angles. Ivory reflectors are provided to opening of vernier.

The centers are compound, upper plate center is 3¼ inches long, made of the best bell and bronze metal, not brass as is ordinarily used.

Clamps and tangent are of the new improved F. C. Knight pattern, see description on pages 19 and 20.

Tripod is provided with a shifting head for the accurate centering of instrument over point.

This instrument separates into three parts; the upper part of the instrument is detachable from the leveling screws, and the leveling screws from the tripod.

The tripod legs are of the skeleton pattern, as shown in cut No. 102 on page 40. The instrument is packed separate from leveling screws in a hand polished case, has strap and lock, is provided with reading glass, plumb-bob, two levers, and two screw-drivers (plain and forked).

The case has spring packing throughout to prevent injury to instruments in handling.

Hazleton, Pa., April 27th, 1895.

FRANK C. KNIGHT & CO.,

Dear Sirs:—

I have had in use for the past year a complete outfit of your engineering instruments—Transit, Level, Plummet Lamps and Rods—and find them equal to all they were recommended to be. The new clamp in the Transit Instrument has given complete satisfaction.

Yours truly,

THOS. S. MCNAIR,
C. & M. E.

TRINITY COLLEGE.

Hartford, Conn., April 10th, 1895.

MESSRS. F. C. KNIGHT & CO.,

Gentlemen:—

One of your F. C. Knight Improved Instruments has been in my possession for over a year, and having given it a thorough test I am ready to recommend it very highly.

It has proved itself well adapted to accurate work and rapid manipulation. It maintains its adjustment with the hardest usage.

The improvements, instead of being useless additions of mechanism, prove to be simple devices, by which weight is reduced, accuracy increased and wear and tear on its parts brought to a minimum. One of the most striking examples is your new clamp for the lower plate, which needs but a quarter turn to fasten the upper body; and also your admirable method of focusing the eye-piece, doing away with the screw at the side and insuring an equal wearing of the tube.

In its construction you have combined the most careful workmanship with the highest class of mechanical ingenuity; you have shown it your aim to make a careful study of the needs of an engineer.

Yours sincerely,

ROBT. F. WELSH, C. E.

JOSEPH JOHNSON,

CITY SURVEYOR, ELEVENTH DISTRICT,

24th and 34th Wards,

4039 LANCASTER AVENUE.

Philadelphia, April 30th, 1895.

FRANK C. KNIGHT & CO.,

Dear Sirs:—

We have been using one of your F. C. Knight Transits for nearly one year, and find it to be one of the best we ever had. I take pleasure in recommending your Transit to persons wishing to purchase.

Yours respectfully,

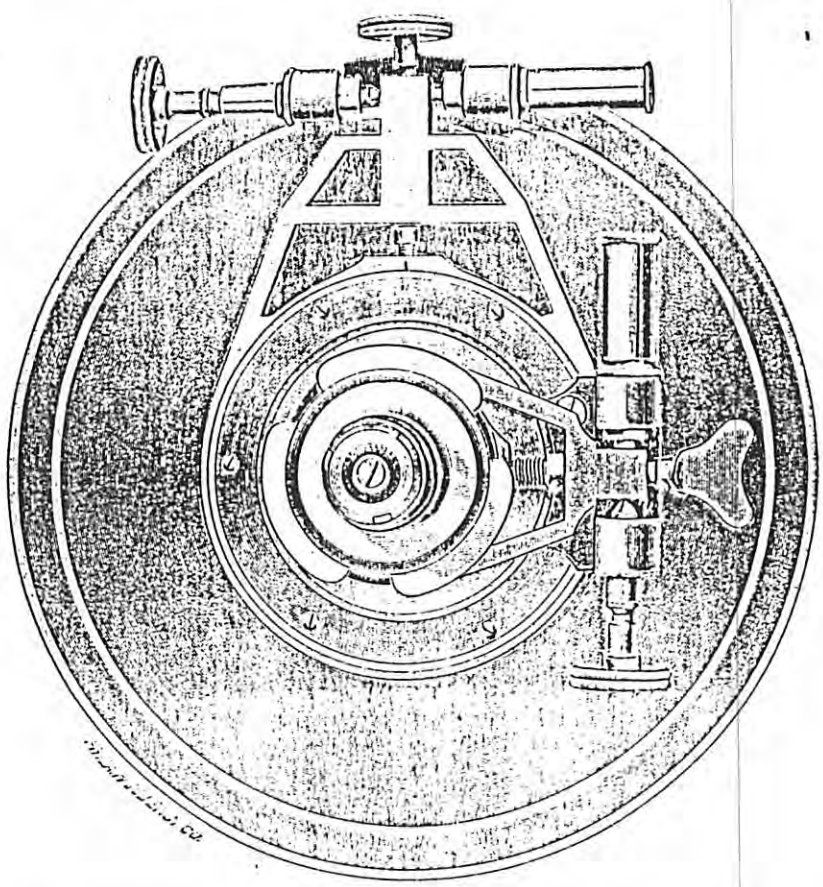
JOSEPH JOHNSON,
Surveyor and Regulator, 11th Dist.

IMPROVED CLAMP & TANGENT.

ATTACHED TO THE

F. C. KNIGHT TRANSITS.

THIS clamp is the invention of our Mr. Knight and is the result of long and careful study and much experimenting on his part. In it he has accomplished the desired end—A PERFECT CLAMP.



The clamp is attached to and clamps on the large flange of the center, it has the largest clamping surface of any horizontal plate clamp constructed. It works entirely upon the center, not affecting either the upper or lower limb. It works with greatest ease and accuracy, is sensitive to the touch of the tangent screw, yet rigid in holding instrument in position. The clamping and un-clamping has positively no effect whatever on the long bubble or sight of the telescope. It is light

in weight. In its construction we have added no additional weight to the instrument. The peculiar construction of this clamp allows the upper and lower limbs to be joined together so closely that it is impossible for any dirt to get between them.

The tangent is on the right of the instrument and is made with a hard german silver 50 threads to the inch screw, working in a bronze metal nut. The opposing springs are made of phosphor bronze.

C. A. SUNDSTROM, C. E.,
SURVEYOR AND REGULATOR.

DEPARTMENT OF PUBLIC WORKS

OFFICE OF THE
SURVEYOR AND REGULATOR,
8th District, 21st Ward.
4444 Main St., Post Office Building.

Manayunk, Phila., April 18th, 1895.

MESSRS. F. C. KNIGHT & CO.,
400 and 402 Locust St.,
Philadelphia.

Dear Sirs:—

It affords me great pleasure to state that the clamps which you attached to three Transits in this office make the most complete and effective arrangement I have ever seen. They present a neat appearance, and the workmanship on them, like on all other work turned out by your establishment, gives unmistakable evidence of a master mechanic.

Yours truly,

C. A. SUNDSTROM,
Surveyor 8th District.

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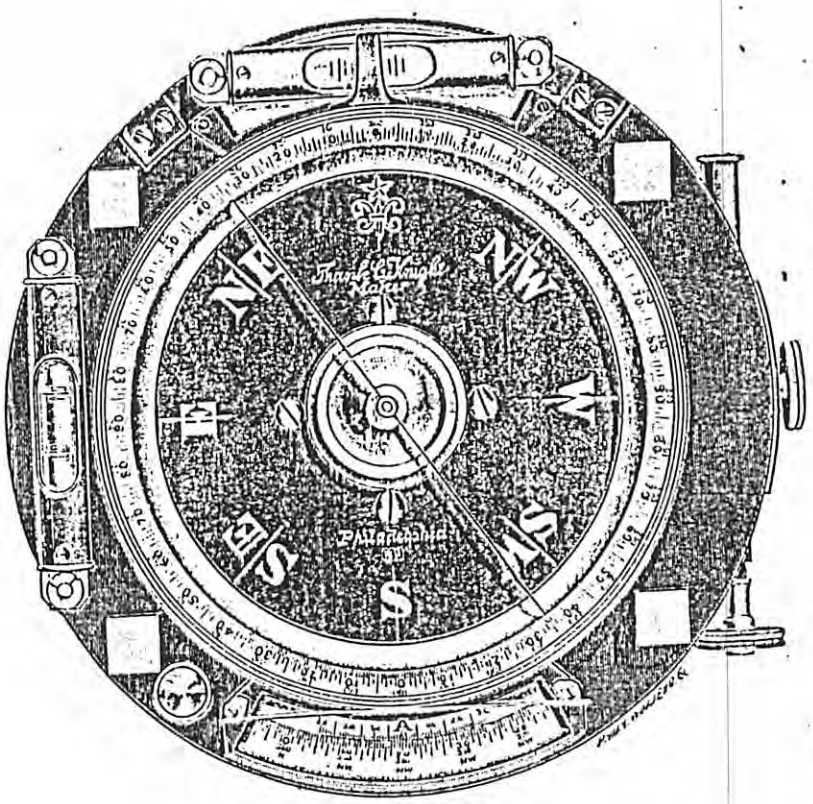
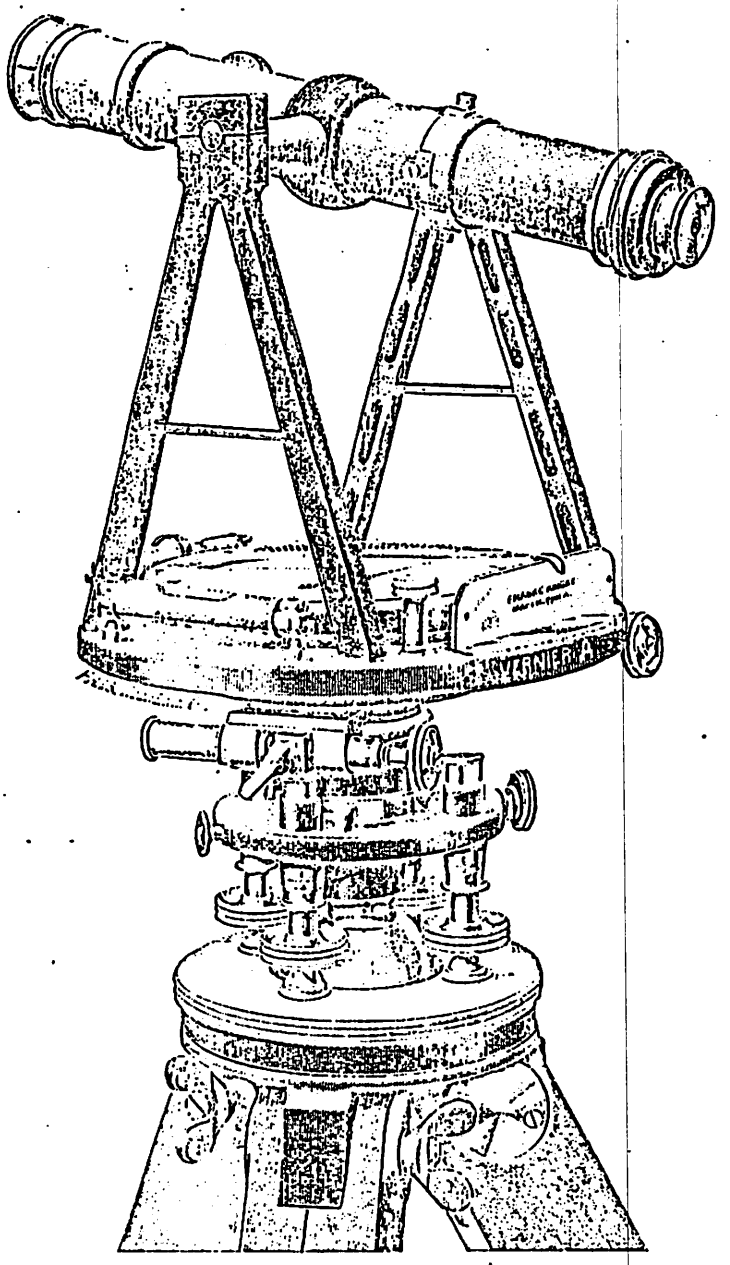


MAIN PLATE.

The above is a view of the Main Plate of the F. C. Knight Transit with the standards off, showing the positions of the verniers and plate levels, the compass ring and the way it is graduated, and its double row of figures, the inner row figured in quadrants 0 to 90, the outer row 0 to 360. The level over vernier B is so elevated as to give an unobstructed view of the vernier. The bubbles are graduated, the one over vernier B is protected by a guard; vernier A has an ivory reflector to throw additional light on vernier. You will note that the raising work of compass needle is so constructed as to allow no aperture for dust to enter the plate, as is usual with most transits.



20. F. C. KNIGHT PLAIN TRANSIT.

21. F. C. KNIGHT PLAIN TRANSIT [Small].

No. 20. F. C. KNIGHT PLAIN TRANSIT.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

SPECIAL DESCRIPTION:

Telescope, length,	11½ inches.
Object Glass, aperture,	1¼ inches.
Compass Needle,	5 inches.
Lower Limb,	6¼ inches.
Weight of Instrument and Tripod,	22½ lbs.

Price, $190.00

No. 21. F. C. KNIGHT PLAIN TRANSIT [Small].

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

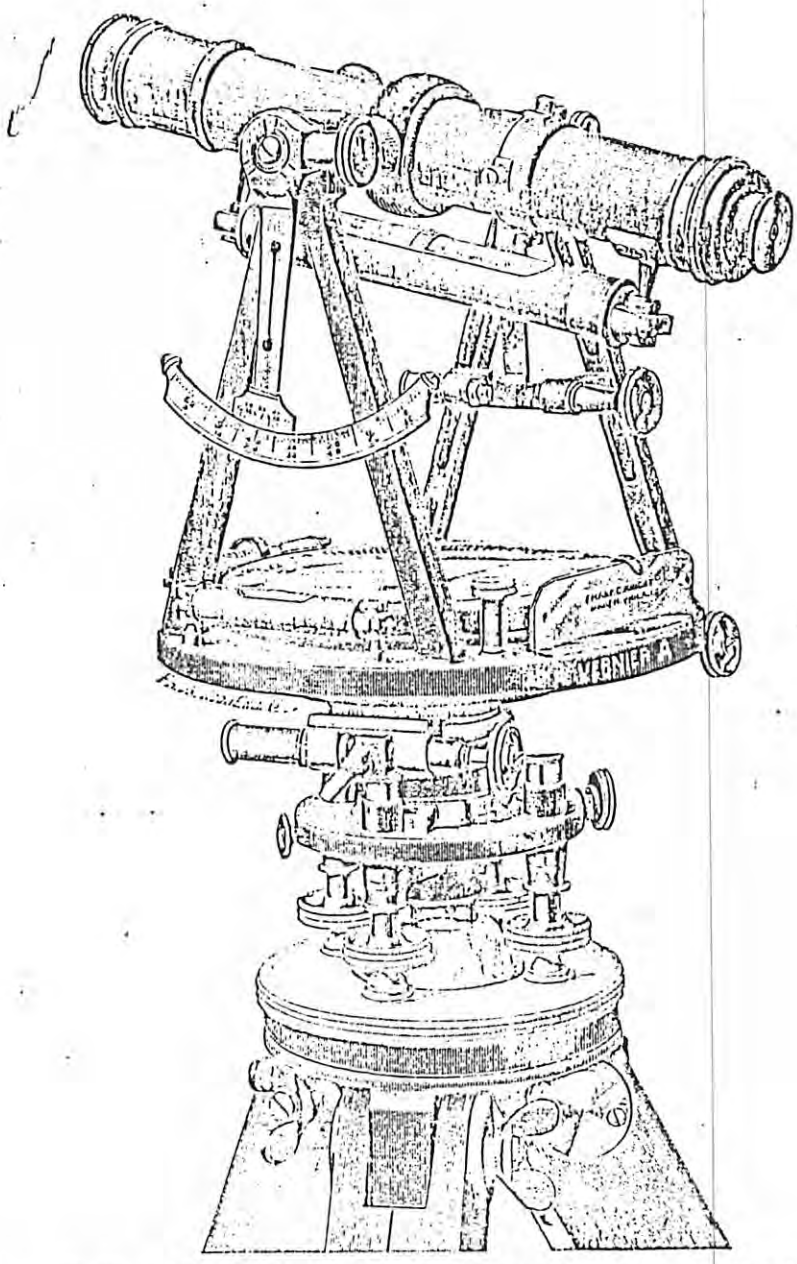
SPECIAL DESCRIPTION:

Telescope, length,	9 inches.
Object Glass, aperture,	1 inch.
Compass Needle,	4 inches.
Lower Limb	5½ inches.
Weight of Instrument and Tripod,	14 lbs.

Price, $175.00

EXTRAS TO NOS. 20 AND 21 TRANSITS:

Adjustable Shifting Legs to tripod, instead of the skeleton legs, cut 103, page 41,	Price, $5.00
Adjustable Stadia Wires,	8.00
Reflector for illuminating cross wires (see cut on page 41),	4.00
Gossamer Water-Proof Bag to protect transit,	1.00



22. F. C. KNIGHT TRANSIT & LEVELING INSTRUMENT,
—WITH VERTICAL ARC.—

23. F. C. KNIGHT MOUNTAIN TRANSIT,
—WITH VERTICAL ARC.—

No. 22. F. C. KNIGHT TRANSIT & LEVELING INSTRUMENT, With Vertical Arc.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

SPECIAL DESCRIPTION:

Telescope, length,	11½ inches.
Object Glass, aperture,	1¼ inches.
Bubble under telescope,	8 inches.
Vertical Arc, radius,	7 inches.
figured 0 to 60 each way.	
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	5 inches.
Lower Limb,	6¼ inches.
Weight of Instrument and Tripod,	24 lbs.

Price, $230.00

No. 23 F. C. KNIGHT MOUNTAIN TRANSIT, With Vertical Arc.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

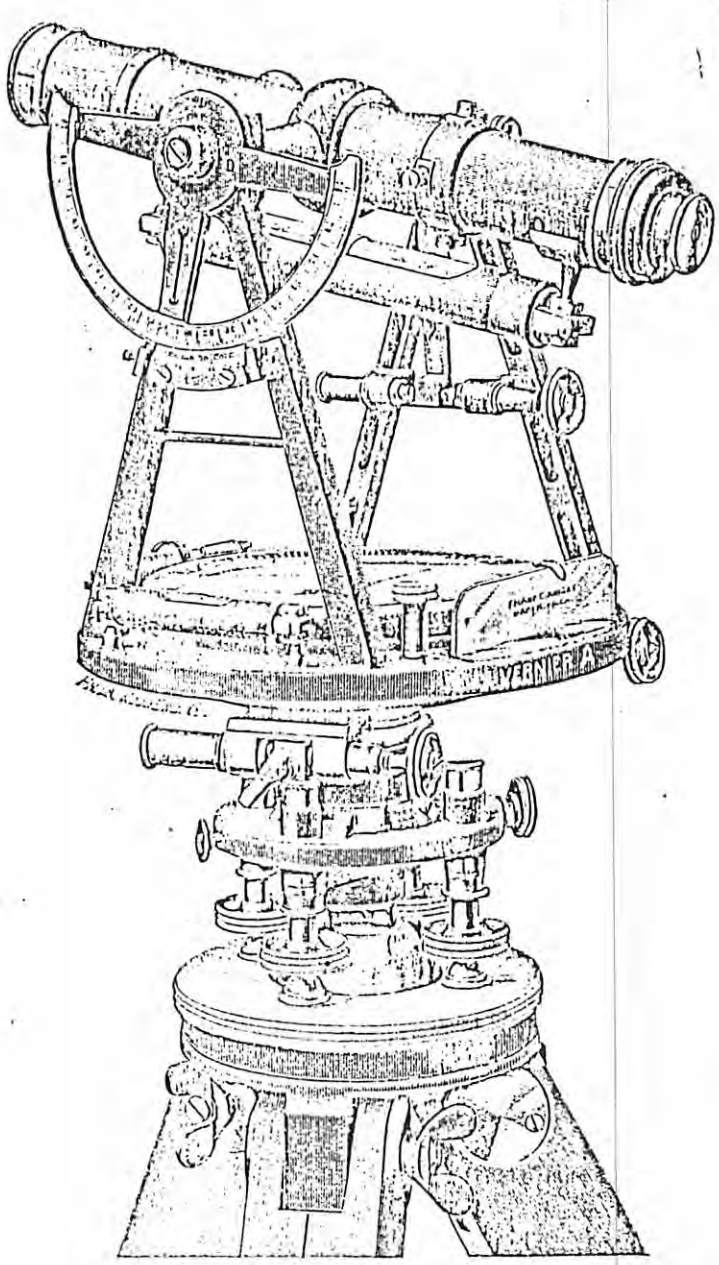
SPECIAL DESCRIPTION:

Telescope, length,	9 inches.
Object Glass, aperture,	1 inch.
Bubble under telescope,	5½ inches.
Vertical Arc, radius,	6 inches.
figured 0 to 60 each way.	
Clamp and Opposing Spring Tangent to axle of telescope.	
Compass Needle,	4 inches.
Lower Limb	5¼ inches.
Weight of Instrument and Tripod,	15 lbs.

Price, $215.00

EXTRAS TO NOS. 22 AND 23 TRANSITS:

Adjustable Shifting Legs to tripod, instead of the skeleton legs, cut 103, page 41,	Price, $5.00
Adjustable Stadia Wires,	8.00
Gradienter Attachment to telescope,	10.00
Reflector for illuminating cross wires (see cut on page 41),	4.00
Gossamer Water-Proof Bag to protect transit,	1.00



24. F. C. KNIGHT TRANSIT & LEVELING INSTRUMENT,
—WITH VERTICAL HALF CIRCLE.—

25. F. C. KNIGHT MOUNTAIN TRANSIT,
—WITH VERTICAL HALF CIRCLE.—

We supply Instruments of our own [illegible]

No. 24. F. C. KNIGHT TRANSIT & LEVELING INSTRUMENT, With Vertical Half Circle.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

SPECIAL DESCRIPTION:

Telescope, length, ... 11½ inches.
Object Glass, aperture, . . 1¼ inches.
Bubble under telescope, . . 8 inches.
Vertical Half Circle, diameter, 5¼ inches, figured 0 to 90 each way, with adjustable vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 5 inches.
Lower Limb, ... 6¼ inches.
Weight of Instrument and Tripod, 24 lbs.

Price, $245.00

No. 25. F. C. KNIGHT MOUNTAIN TRANSIT, With Vertical Half Circle.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

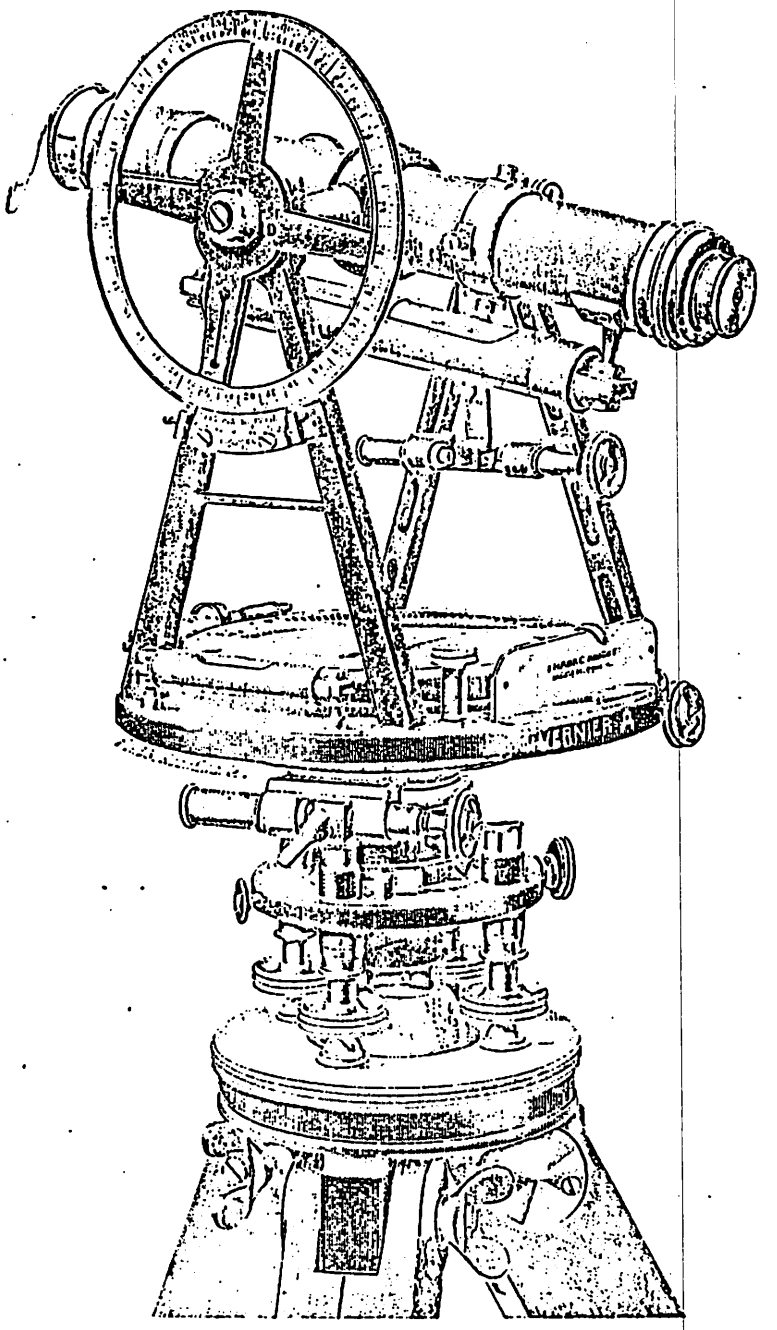
SPECIAL DESCRIPTION:

Telescope, length, ... 9 inches.
Object Glass, aperture, . . 1 inch.
Bubble under telescope, . . 5½ inches.
Vertical Half Circle, diameter, 4 inches, figured 0 to 90 each way, vernier (not adjustable) reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 4 inches.
Lower Limb, ... 5¼ inches.
Weight of Instrument and Tripod, 15½ lbs.

Price, $225.00

EXTRAS TO NOS. 24 AND 25 TRANSITS:

Adjustable Shifting Legs to tripod instead of skeleton legs, cut 103, page 41, . . Price, $5.00
Adjustable Stadia Wires, ... 8.00
Adjustable Vernier to vertical half circle on No. 25, ... 5.00
Gradienter attachment to telescope . . . 10.00
Reflector for illuminating cross wires (see cut on page 41), ... 4.00
Gossamer Water-Proof Bag to protect transit, 1.00



26. F. C. KNIGHT TRANSIT AND LEVELING INSTRUMENT.
—WITH FULL VERTICAL CIRCLE.—

27. F. C. KNIGHT MOUNTAIN TRANSIT,
WITH FULL VERTICAL CIRCLE.

For Top Telescope Attachment for Vertical Work, See Pages 30 and 31.

No. 26. F. C. KNIGHT TRANSIT & LEVELING INSTRUMENT, With Full Vertical Circle.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

SPECIAL DESCRIPTION:

Telescope, length, ... 11½ inches.
Object Glass, aperture, . . 1¼ inches.
Bubble under telescope, . . 8 inches.
Vertical Circle, diameter, . 5¼ inches, figured into quadrants, 0 to 90, with adjustable vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 5 inches.
Lower Limb, ... 6¼ inches.
Weight of Instrument and Tripod, 24 lbs.

Price, $255.00

No. 27. F. C. KNIGHT MOUNTAIN TRANSIT, With Full Vertical Circle.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

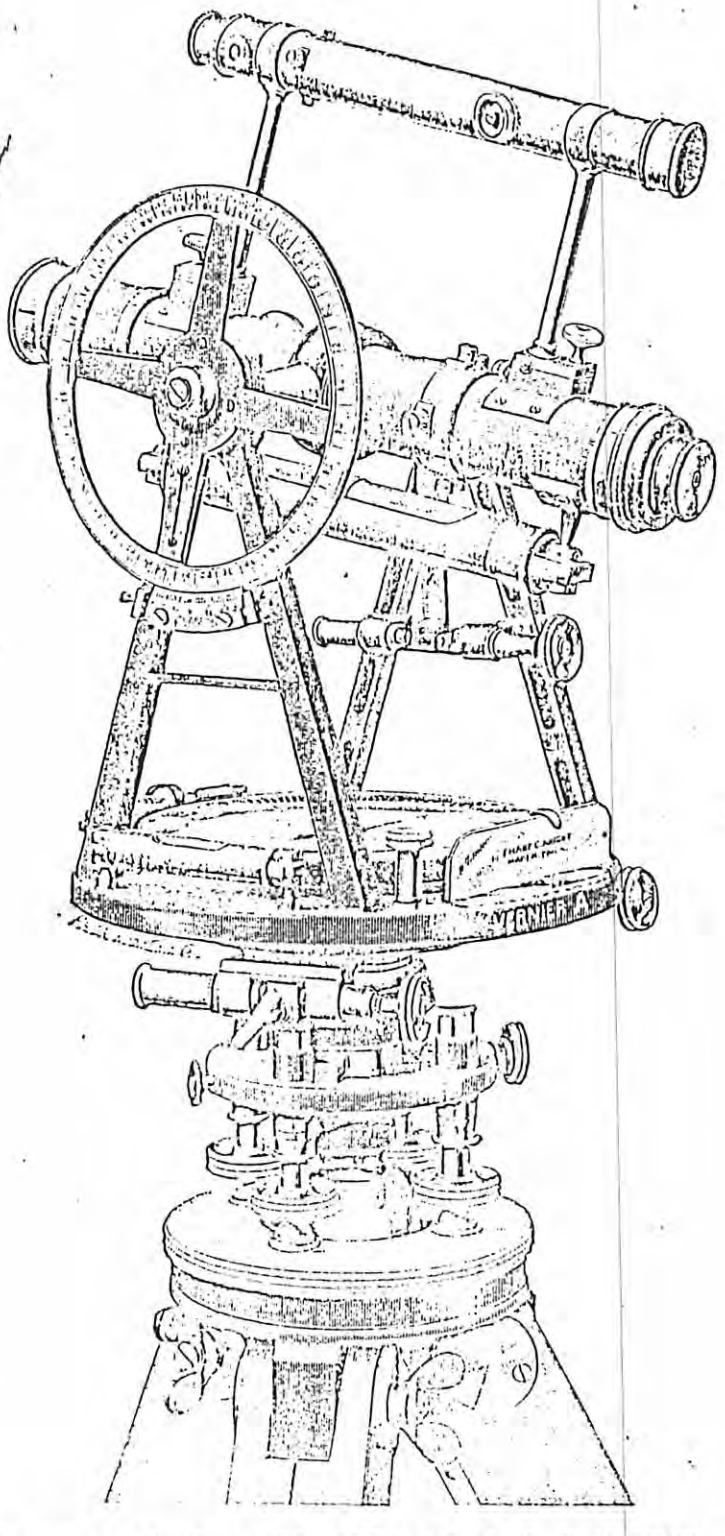
SPECIAL DESCRIPTION:

Telescope, length, ... 9 inches.
Object Glass, aperture, . . 1 inches.
Bubble under telescope, . . 5½ inches.
Vertical Circle, diameter, . 4 inches, figured into quadrants, 0 to 90, vernier (not adjustable) reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 4 inches.
Lower Limb, ... 5¼ inches.
Weight of Instrument and Tripod, 16 lbs.

Price, $235.00

EXTRAS TO NOS. 26 AND 27 TRANSITS:

Adjustable Shifting Legs to tripod instead of skeleton legs, cut 103, page 41, . . Price, $5.00
Adjustable Stadia Wires, ... 8.00
Adjustable Vernier to vertical circle on No. 27 5.00
Gradienter attachment to telescope . . . 10.00
Reflector for illuminating cross wires (see cut on page 41), ... 1.00
Gossamer Water-Proof Bag to protect transit, 1.00



32. F. C. KNIGHT TOP TELESCOPE ATTACHMENT.

No. 32. F. C. KNIGHT TOP TELESCOPE ATTACHMENT, For Vertical Sighting.

Attachable either to the Draper No. 16, or the F. C. Knight Nos. 26 and 27 Transits.

(Cut on Page 30 shows F. C. Knight Instrument No. 26, with Attachment.)

This Top Telescope is made so that it is readily attached to the main telescope. The bases of the columns on which it rests are made V shaped, which fit into grooves running lengthwise with the main telescope. They are provided with steady-pins and clamp-screws. The fitting of the columns in the V shaped grooves, together with these steady-pins screwed firmly, insures a perfect line of collimation with the main telescope.

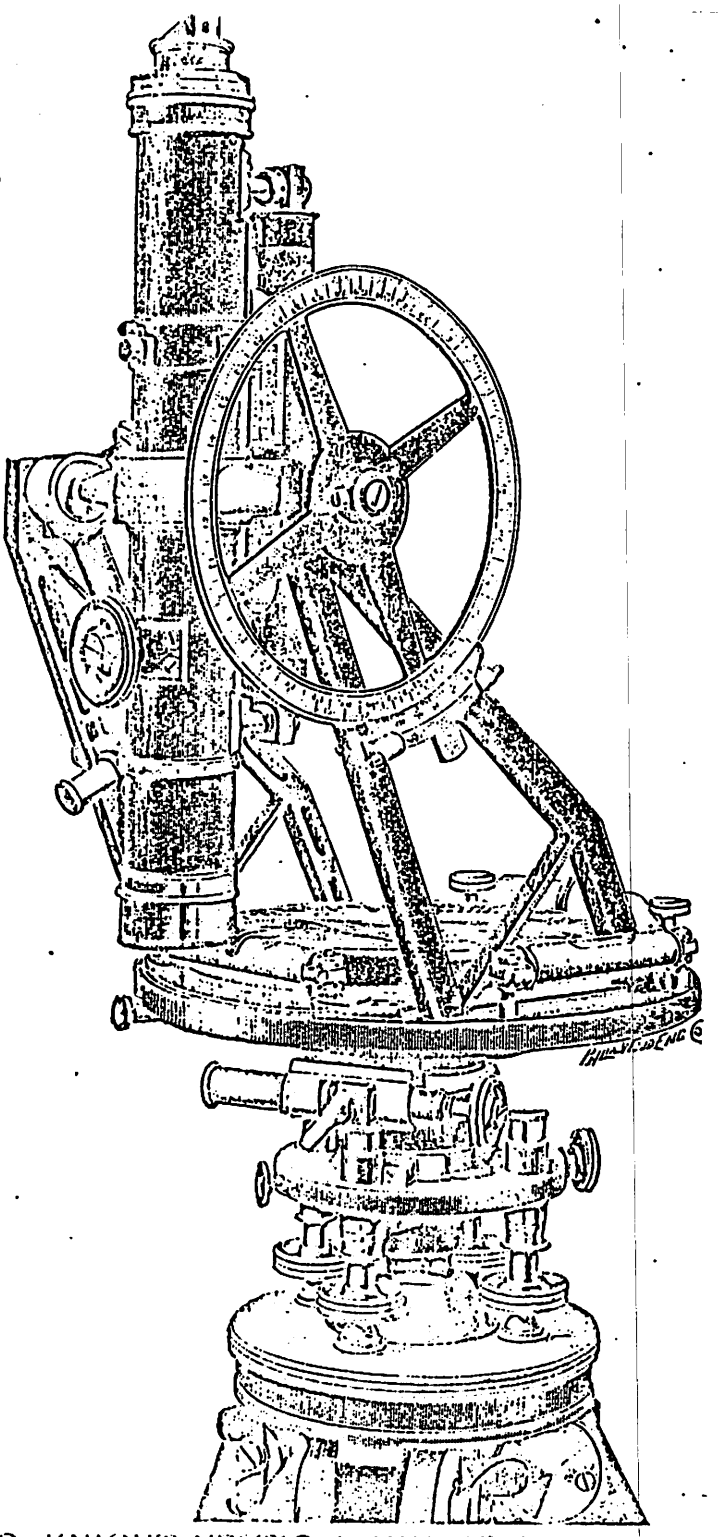
It can be readily attached and detached by the engineer.

Telescope, length, ...	7	inches.
Telescope, power, ...	20	diameters
Object Glass, aperture, . . .	¾	inch.

Price, $30.00

EXTRA TO TOP TELESCOPE ATTACHMENT:

Diagonal Eye-Piece, see cut on page 41 . Price, $8.00



33. F. C. KNIGHT VERTICAL MINING TRANSIT.
34. F. C. KNIGHT LIGHT VERTICAL MINING TRANSIT.

No. 33. F. C. KNIGHT VERTICAL MINING TRANSIT.

FOR GENERAL DESCRIPTION SEE PAGES 16-21.

THE standards on this instrument are made inclined, so as to place the telescope outside of the lower limb when in a vertical position, and to allow the telescope to have a clear vertical sight. The line of collimation is true to center of instrument—vertical and horizontal.

Where much vertical work is done, the utility of this instrument will be apparent to the Mining Engineer at once.

Hazleton, Pa., April 11th, 1895.

FRANK C. KNIGHT & CO.,
Mf'r of Mathematical and Engineers Instruments,
400 and 402 Locust St., Phila., Pa.

Dear Sirs:—

It gratifies me to testify that your new Mining Transit embodies more practical and convenient uses than any transit I have ever used or seen. The INCLINED STANDARDS make it just as easy to survey a vertical shaft or any slope as to survey a level gangway.

The PRISMATIC EYE-PIECE is particularly convenient in vertical or steep slope sights, as well as in many positions in gangways, where direct sights would be impossible.

The WHOLE VERTICAL CIRCLE makes it possible to take vertical angles with the telescope either side up.

The TANGENT MOVEMENTS are very convenient, being in good positions and requiring only one hand to operate them.

The adjustments are all very simple and easily made. The ADJUSTABLE SPRING VERNIER on the vertical circle is a NEW FEATURE and is a great improvement.

All of these possibilities, and more, combined in one instrument, make your new transit the most practical Mining Transit I have ever seen.

Yours truly,

W. S. AYRES,
Min. Eng. for A. Pardee & Co.

For Special Description and Prices see Page 34.

No. 33. F. C. Knight Vertical Mining Transit.

SPECIAL DESCRIPTION:

Telescope, length, ... 11 inches.
Object Glass, aperture, . . . 1¼ inches.
Bubble under telescope, . . . 6 inches.
Vertical Circle, diameter, . . 5¼ inches.
figured in quadrants, 0 to 90, with adjustable spring vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 4½ inches.
Lower Limb, ... 6¼ inches.
Weight of Instrument and Tripod, 24 lbs.

Price, $260.00

No. 34. F. C. Knight Vertical Mining Transit.

SPECIAL DESCRIPTION:

Telescope, length, ... 9½ inches.
Object Glass, aperture, . . . 1 inch.
Bubble under telescope, . . . 5 inches.
Vertical Circle, diameter, . . 4 inches.
figured in quadrants, 0 to 90, with adjustable spring vernier reading to minutes.
Clamp and Opposing Spring Tangent to axle of telescope.
Compass Needle, ... 3½ inches.
Lower Limb, ... 5¼ inches.
Weight of Instrument and Tripod, . 16 lbs.

Price, $240.00

EXTRAS TO NOS. 33 AND 34 TRANSITS:

Adjustable Shifting Legs to tripod, instead of skeleton legs, cut 103, page 41, ... Price, 5.00
Adjustable Stadia Wires, ... 8.00
Reflector for illuminating cross wires (see cut on page 41), ... 4.00
Diagonal Eye-Piece (see cut on page 41) . . 8.00
Gossamer Water-Proof Bag to protect transit, 1.00

VARIATION ATTACHMENT.

Has arc and vernier; with rack and pinion movement. Attachable to both F. C. Knight and Draper Transits.

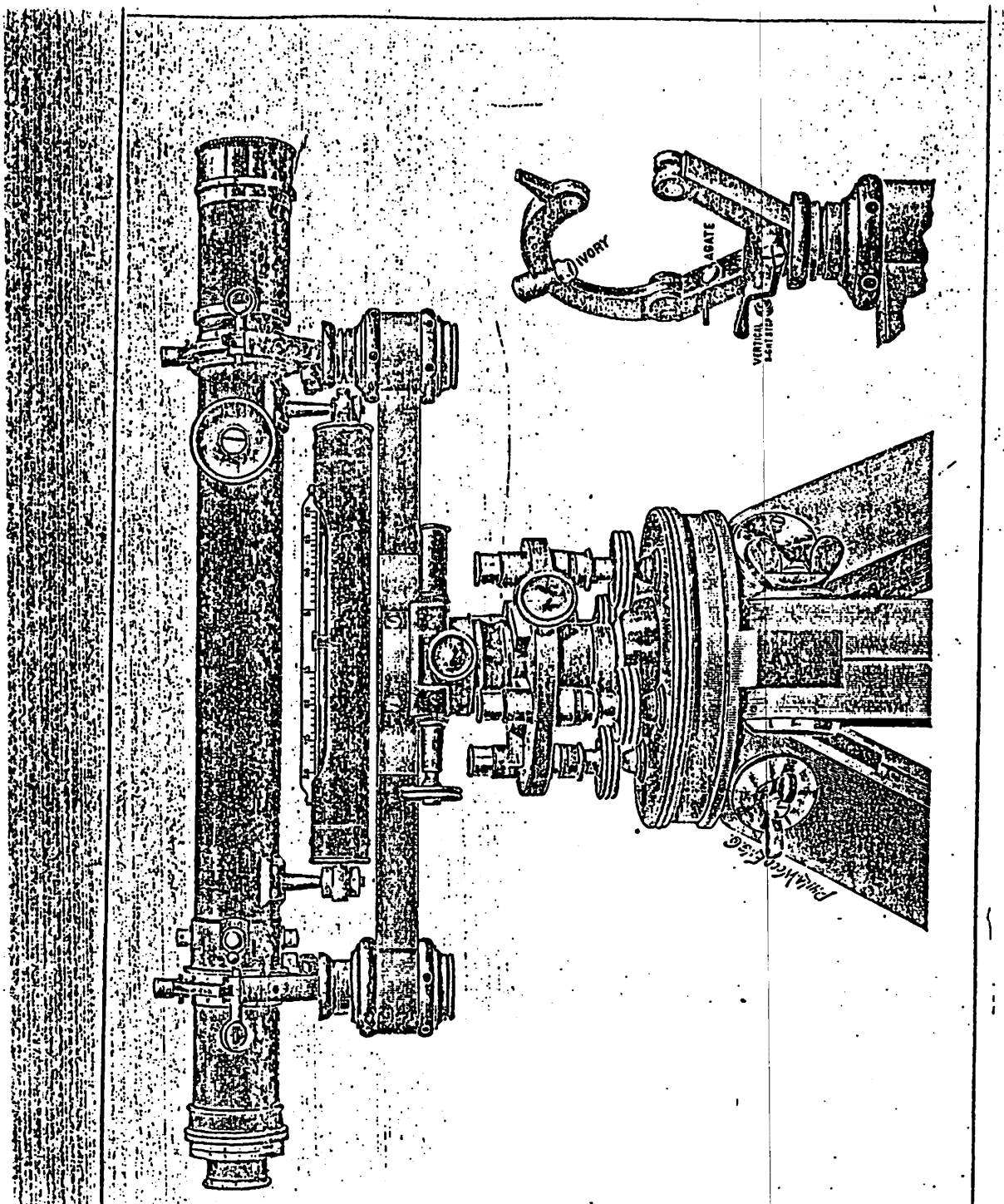
When ordered with new instrument, . . . Price, $10.00

QUICK LEVELING TRIPOD HEAD.

(HOFFMAN'S PATENT)

FOR instantaneously centering and leveling up Engineers' and Surveyors' Instruments. It has been thoroughly tested and found to give entire satisfaction, and is highly recommended by eminent engineers. It can be attached to the F. C. Knight Transits, Levels and Astronomical Instruments at a moderate cost. This improvement, if attached to an instrument, will pay for itself in a few days use, because the engineer or surveyor can do much more work with it in the same time than he could do with the old style single ball-and-socket joint tripod head, which must be leveled up altogether with the leveling screws. With this improvement he can center and level up his instrument in a few seconds, no matter what the shape of the ground or rocks may be—and when leveled it will hold the most sensitive level bubble perfectly steady.

When ordered with new instrument, . . . Price, $8.00



50, 51, 52 and 53.

F. C. KNIGHT ENGINEERS' RAILROAD WYE LEVEL.

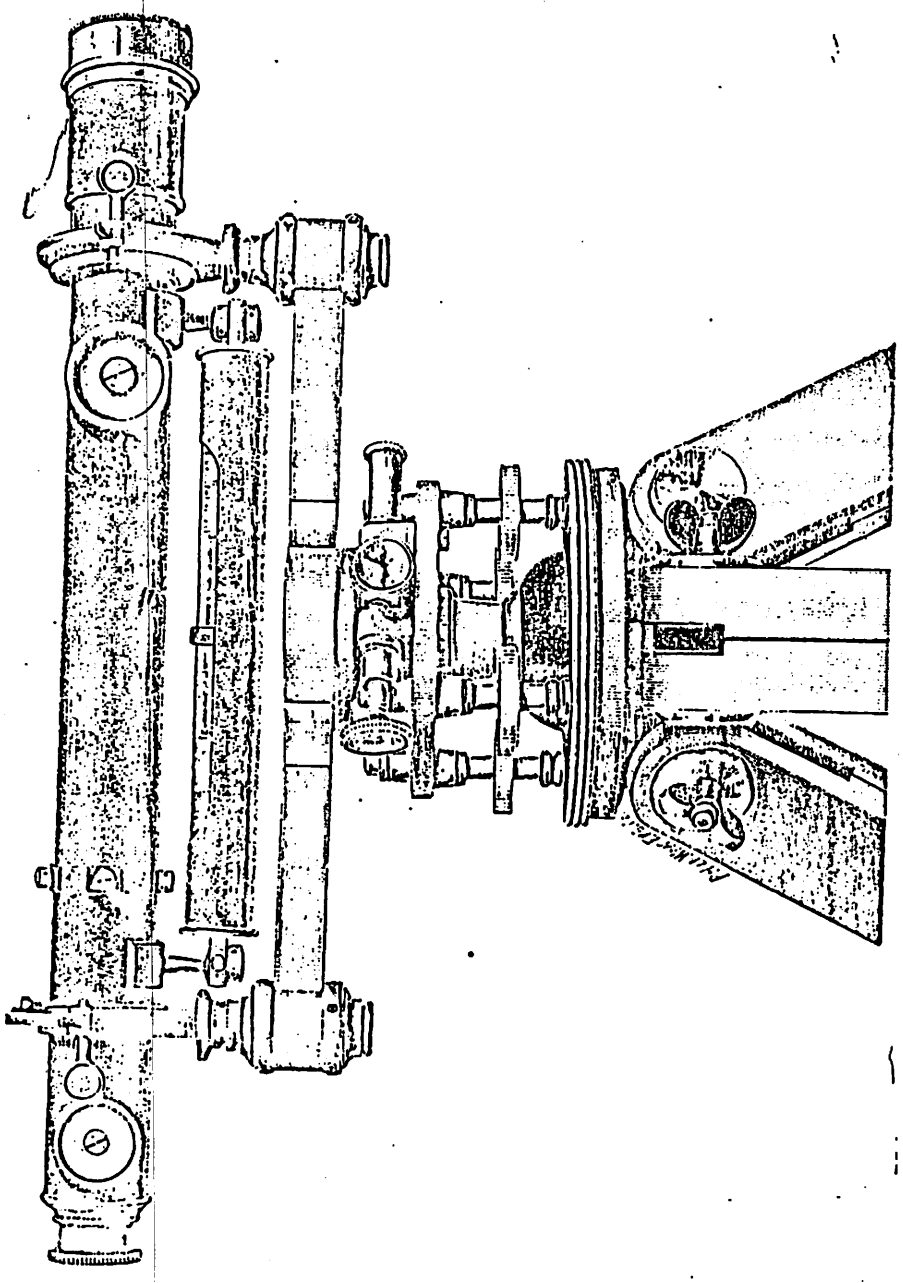
Nos. 50, 51, 52, 53. F. C. KNIGHT ENGINEERS' RAILROAD WYE LEVEL.

HAS achromatic telescope, which is made in four sizes—lengths, 17, 18, 20 and 22 inches, with power varying from 28 to 50 diameters on any length telescope, power optional with purchaser; has dust-and rain-guard; sunshade to object-slide; object-glass 1¼ inches aperture; eye-piece has our improved quick movement for the accurate focusing of cross-wires; line of collimation true on all distances; object erect; spirit-level 6½ inches long, adjustable vertically and horizontally, vial of which is hand-ground, has a german silver graduated scale to read bubble; the wyes, collars on telescope, cross-bar and centers are made of the best bell metal; the telescope rests in wyes on agate bearings; upper spring bearings made of ivory, (with agate and ivory bearings no readjustment of instrument is necessary, as there is no wear, such as is usual on the ordinary metal wyes, see cut on opposite page); one wye is provided with adjustment for altitude; attached to the wyes are adjustable vertical sight stops, they are for the purpose of readily bringing the cross-wires to a true vertical position; the cross-bar is cast hollow, with ribs to strengthen it; centers are long and stout; the clamp and tangent are all on the right of the instrument; has german-silver tangent screw with opposing spring of phosphor bronze; leveling screws on tripod are covered (dust proof); screws work in cups on tripod cap, which prevents wear and assures the more accurate leveling adjustment. This instrument separates into three parts, the upper part being detachable from the leveling screws, and the leveling screws from the tripod. The tripod legs are of the skeleton pattern as shown in cut 102, on page 40. Case, hand-polished, in which instrument is packed separate from leveling screws, has strap and lock, is provided with screw-driver and adjusting-pins.

Weight of instrument and tripod,	18 to 19 lbs.
No. 50—17 inch telescope,	Price, $145.00
" 51—18 " "	150.00
" 52—20 " "	155.00
" 53—22 " "	160.00

EXTRAS TO NOS. 50–53 WYE LEVELS:

Adjustable Stadia Wires,	Price, $8.00
Gossamer Water-Proof Bag to protect instrument from rain and dust,	1.00



55, 56 and 57.
DRAPER IMPROVED WYE LEVEL.

Nos. 55, 56, 57. DRAPER IMPROVED WYE LEVEL.

Has achromatic telescope of a power of 20, 22 and 24 diameters; with dust- and rain-guard; sunshade to object-slide; object glass 1¼ inch aperture; eye-piece has rack movement to focus cross-wires; spirit level 6 inches long, vial of which is hand-ground and graduated, adjustable vertically and horizontally; wyes, collars on telescope and cross-bar are made of the best quality bell metal; wyes are provided with stops to readily set cross-wires horizontally and vertically; one wye is provided with adjustment for altitude; line of collimation true on all distances; object erect; has long center; the upper part of instrument is not detachable from tripod above leveling screws; when packed in case, stands upright; legs of tripod solid, as shown in cut No. 102, page 40; case, hand-polished, has strap and lock; provided with screw-driver and adjusting-pin.

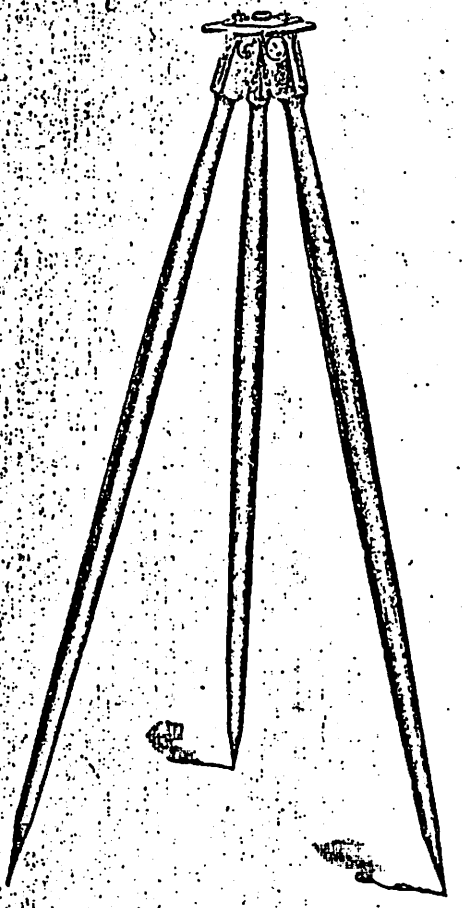
Weight of instrument and tripod, ... 16½ lbs.

No. 55—14 inch telescope,	. . .	Price, $100.00
" 56—15 " "	. . .	105.00
" 57—16 " "	. . .	110.00

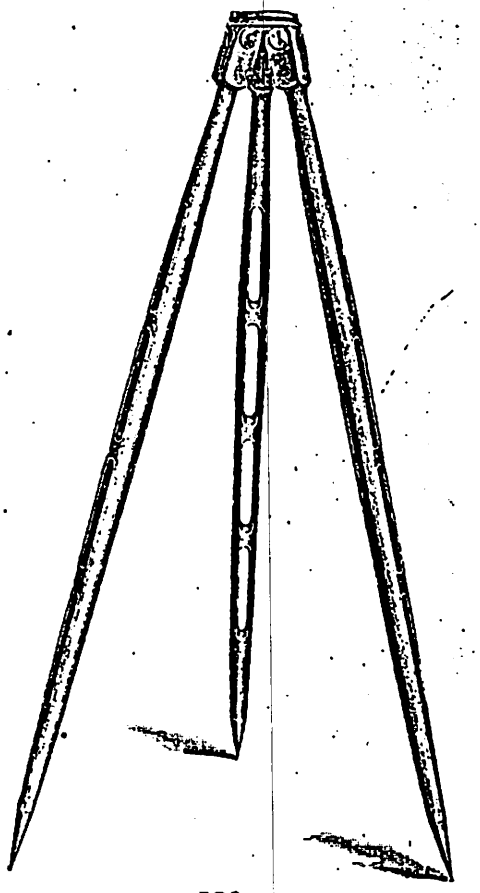
EXTRAS TO WYE LEVEL NOS. 55, 56, 57:

Skeleton Legs, instead of solid legs furnished, as shown in cut No. 103, page 41,	. .	Price, $1.50
Adjustable Stadia Wires,	. . . .	8.00
Gossamer Water-Proof Bag to protect instrument from rain or dust,	. . . .	1.00

TRIPODS.



101
This Tripod accompanies all Draper Instruments.

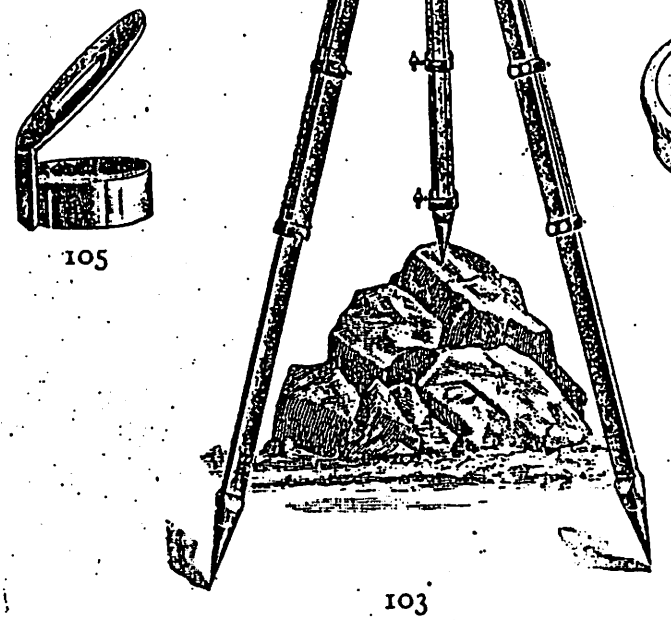


102
This Tripod accompanies all F. C. Knight Instruments.

No. 101—Mahogany Solid Legs,	with head, per set, .	$17.50
" 101— " " "	without " " . .	7.50
" 102— " Skeleton "	with " " . .	19.00
" 102— " " "	without " " .	9.00

40

Extension Tripod.



105

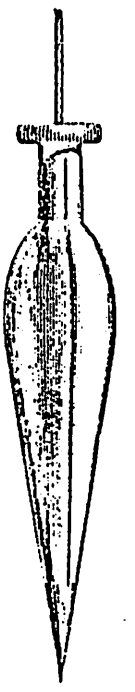
107

103

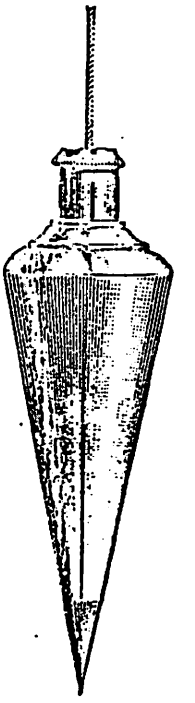
Light, firm and strong, with an adjustment that can be quickly manipulated; has been in use for many years and has received universal commendation.

No. 103—Three Extension Tripod Legs in place of solid legs, furnished with Draper Instrument, ...	$6.50
No. 103—Three Extension Tripod Legs in place of skeleton legs, furnished with F. C. Knight Instrument, . .	5.00
No. 105—Reflector for illuminating cross-wires, . . .	4.00
No. 107—Diagonal Eye-Piece, for vertical sighting, . .	8.00

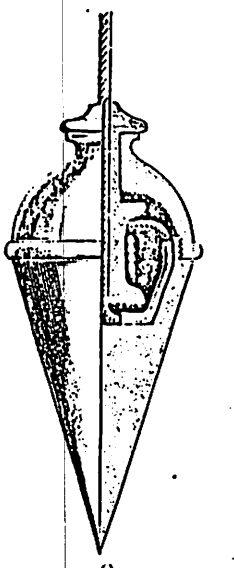
PLUMB BOBS.



109 to 111
This style accompanies all Draper Instruments



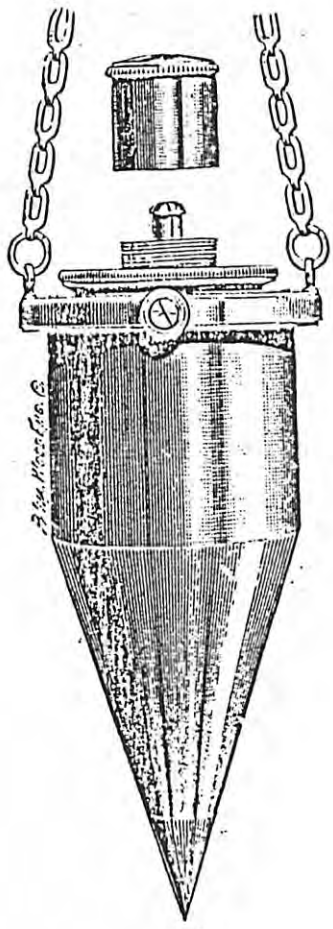
112 to 117
This style accompanies all Knight Instruments



118

		Weight	Price
No. 109.	Bronze Metal, Steel Point, Screw Cap, . .	6 oz.	$1.50
110.	" " " " " " . .	8 oz.	1.75
111.	" " " " " " . .	12 oz.	2.00
112.	" " " " " " . .	4 oz.	1.75
113.	" " " " " " . .	8 oz.	2.00
114.	" " " " " " . .	12 oz.	2.25
115.	" " " " " " . .	14 oz.	2.50
116.	" " " " " " . .	16 oz.	2.75
117.	" " " " " " . .	32 oz.	5.00
118.	" " " " with concealed reel, around which string is wound by turning the milled head on top. The friction upon the reel within will hold the bob at any desired point of the line, ...		2.50
119.	Iron Plumb Bob, nickel plated, same style as No. 109, weight, 21 oz., ...		.75

MINING PLUMB LAMP.



120

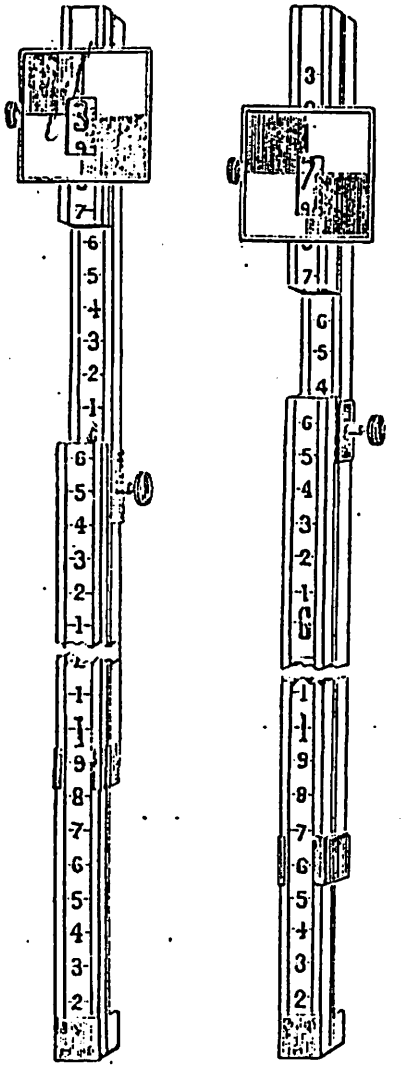
Mining Plumb Lamp is made of bronze metal with steel point; size, 6½ inches long, 2 inches diameter, mounted in universal ADJUSTABLE JOINTS, swung by chains. It is made hollow to hold oil, and provided with burner, forming lamp. Take sight from flame.

Packed in mahogany box with strap.

1 in box, ...	Price, $13.00
2 "	25.00
Leather case with shoulder strap, to hold one lamp,	3.50

43

Leveling Rods and Sight Poles.

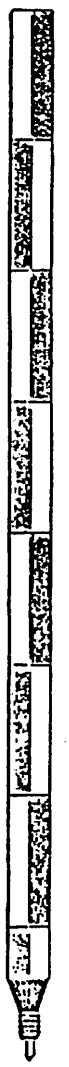


130

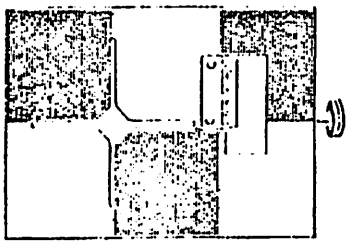
135

142

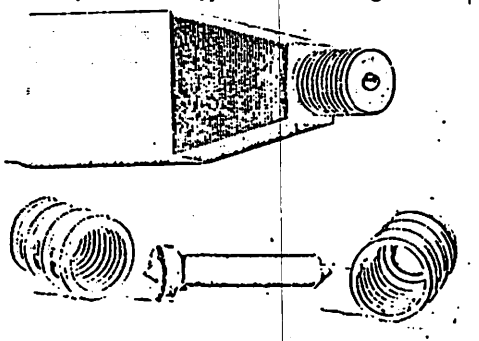
147



150



139



150-a

LEVELING RODS AND SIGHT POLES.

THE Philadelphia Rod, as made by us, is of the original pattern. They are made of light and durable wood, well seasoned; the dividing is warranted accurate; all rods are divided into feet and tenths of feet, and have target and clamp verniers; targets are of the square pattern; other shapes made to order.

No. 130—Mining Rod,	3	ft. long, sliding out to	5	ft.,	Price,	$13.50
" 131— " "	4	" " "	7	"		13.50
" 132— " "	5	" " "	9	"		14.00
" 133—Surveyors' Rod,	6	" " "	11	"		14.00
" 134— " "	7	" " "	12	"		16.00
" 135— " "	7½	" " "	13	"		16.00

ANY SIZE ROD MADE TO ORDER.

SIDE SIGHT TARGET.

For Mining Work, attachable to any Philadelphia Rod of our make.

No. 139 . . . . . Price, $6.00

" if desired instead of the regular target, 3.00

LEVELING POLES.

Wood, Painted Red and White alternately, every foot.

No. 140—Leveling Pole,	5	feet long, ...	Price,	$2.25
" 141— " "	6	"		2.50
" 142— " "	8	"		3.00
" 143— " "	10	"		4.00

SIGHT POLES.

Made of ⅞ heavy seamless tubular brass, with steel shoe, painted red and white, alternately, every foot; all rods over 5 feet part in the middle, with screw connection, for convenience of carrying.

No. 145—Sight Pole,	5	feet long, ...	Price,	$5.00
" 146— " "	6	"		6.25
" 147— " "	8	"		7.00
" 148— " "	10	"		8.00

TUNNEL ROD.

Used where accurate sighting is required. Cut 150 shows the rod complete; 150-a, shows point taken apart with the cap that protects thread when not in use. Size, 3 x 1 in.

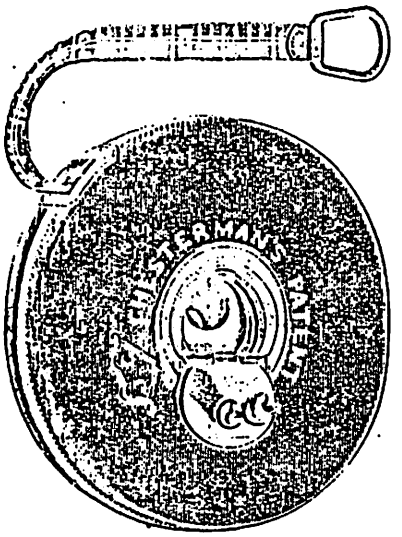
No. 150—Tunnel Rod, 8 feet long, ... Price, $15.00

This style Rod was used by Thos. S. McNair (M. E.) in the construction of the Jeddo Water Tunnel.

THE VARIATION OF STEEL TAPES IN DIFFERENT TEMPERATURES:

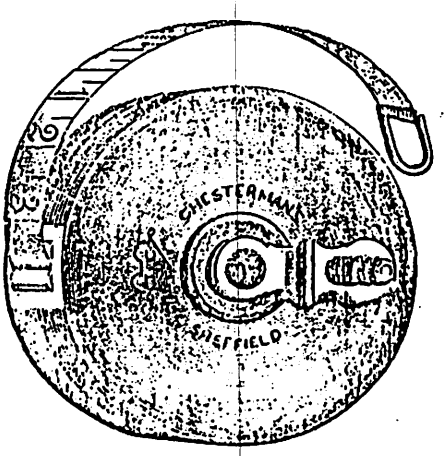
A 100 foot steel tape, manufactured in a temperature of 63 degrees if exposed to a temperature of 90 degrees, will expand 1½ hundredths of a foot.

CHESTERMAN'S TAPES.



190, 191

⅜ in. Steel. Flush Handle.



194, 195

⅝ in. Metallic. Folding Handle.

LEATHER CASES.

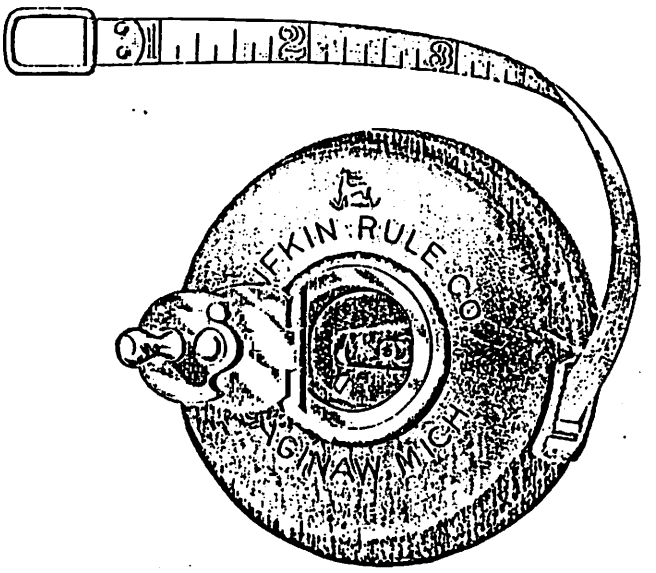
	Feet,	25	33	40	50	66	75	100
STEEL.	Divided into							
No. 190—	Feet, inches, eighths,	5.00	5.75	6.50	7.00	9.00	11.00	14.00
" 191—	" 10ths, 100ths,	5.00	5.75	6.50	7.00	9.00	11.00	14.00
METALLIC.	Divided into							
No. 194—	Feet, inches, eighths,	1.80	2.10	2.35	2.50	3.00	3.60	4.50
" 195—	" 10ths, 100ths,	1.80	2.10	2.35	2.50	3.00	3.60	4.50

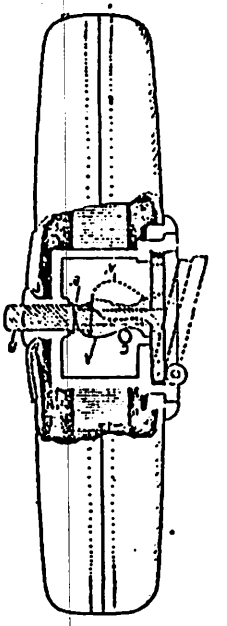
Chesterman's Patent Spring Tape Measures.

German Silver Cases, with Spring Stop.

	Feet,	3	4	5	6	9	12	18
	Divided into							
No. 198—	Feet, inches, 8ths,	1.50	2.00	2.25	2.50	3.50	4.50	6.00
" 199—	" 10ths, 100ths,	1.50	2.00	2.25	2.50	3.50	4.50	6.00

LUFKIN'S TAPES.



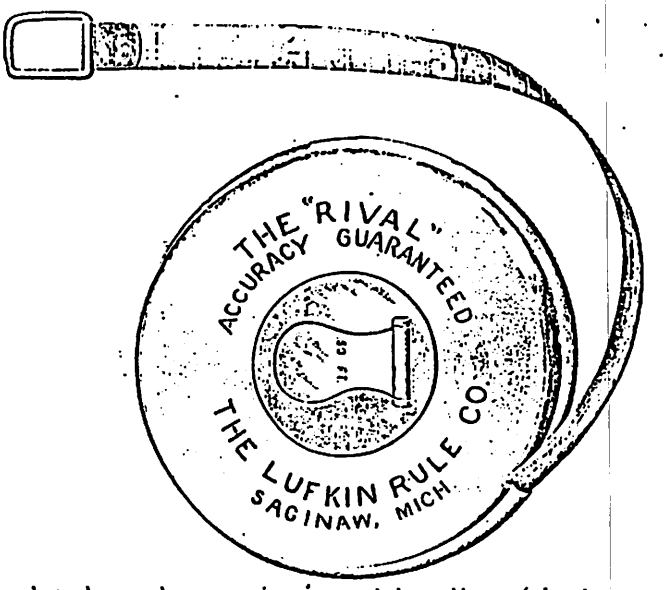


Patented April 11, 1893.

LUFKIN'S "RELIABLE." STEEL.

With double flush handle, opened by pressing pin or button on opposite side; hard leather case; nickel-plated trimmings; measurements guaranteed perfectly accurate.

Feet,	25	33	50	66	75	100
Divided into						
No. 200—Feet, inches, 8ths, .	4.50	5.00	6.50	8.50	10.00	12.00
" 201— " 10ths, 100ths, .	4.50	5.00	6.50	8.50	10.00	12.00
Either of the above nickel-plated,	5.50	6.00	8.00	10.25	11.75	14.00

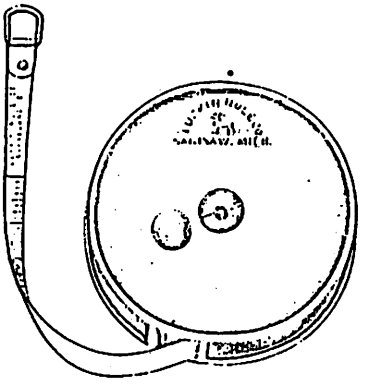


Nickel plated, steel cases, improved handle, 3/8 inch tapes, marked one side only.

	25 ft.	50 ft.	75 ft.	100 ft.
No. 205—Feet divided into inches and eighths,	$4.00	$5.50	$6.75	$8.00
No. 206—Feet divided into 10ths and 100ths,	4.00	5.50	6.75	8.00

LUFKIN'S POCKET STEEL TAPES.

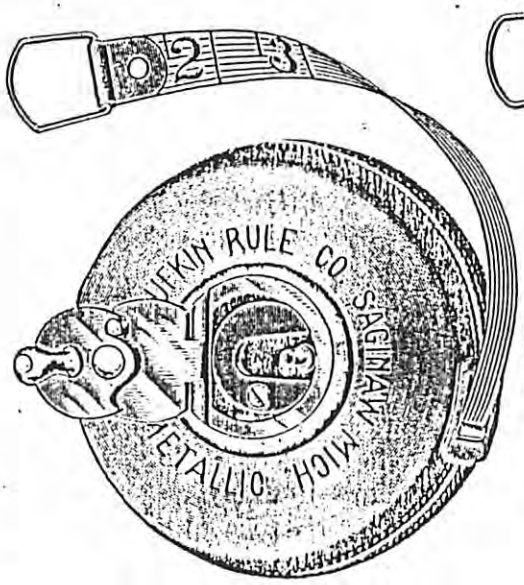
German Silver Cases, Spring Wind, with Stop.



3 feet to 6 feet, 1/4 inch tape; 9 feet to 12 feet, 5/16 inch tape.

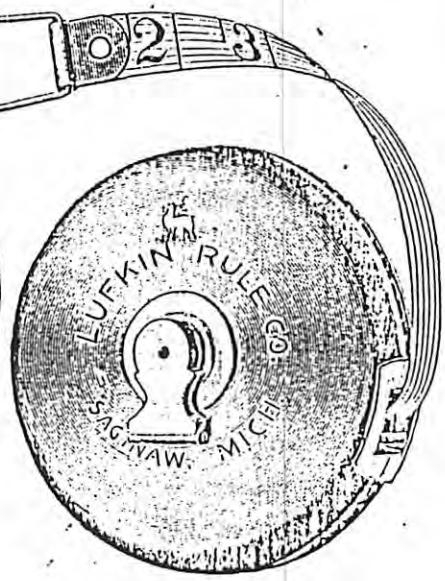
	3 ft.	4 ft.	5 ft.	6 ft.	9 ft.	12 ft.
No. 210—Feet divided into inches and 16ths,	$1.35	$1.75	$2.00	$2.25	$3.25	$4.00
No. 211—Feet divided into 10ths and 100ths,	1.35	——	——	2.25	3.25	4.00

Lufkin's Metallic Tapes.



215–216

FLUSH HANDLE.



217–218

FOLDING HANDLE.

THOROUGHLY WATER-PROOF. LEATHER CASE.

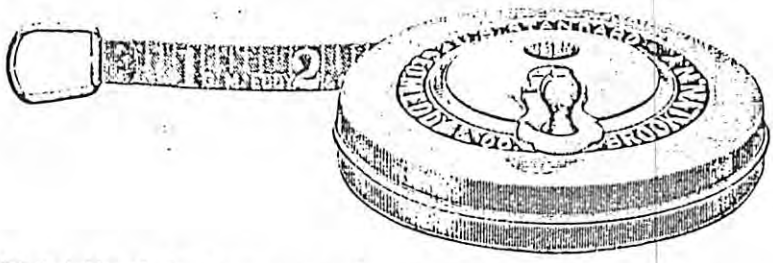
Tapes 5/8 inch wide, made of the best woven linen with metallic warp; hard leather cases; brass trimmings.

These goods are guaranteed to be first-class.

Feet,	25	33	50	66	75	100
No. 215—Feet divided into inches, Links on other side.	1.65	1.95	2.35	2.70	3.00	3.75
" 216—Feet divided in 10ths, 100ths, Links on other side.	1.65	1.95	2.35	2.70	3.00	3.75
" 217—Feet divided into inches,	1.50	1.75	2.20	2.45	2.70	3.40
" 218— " " 10ths, 100ths,	1.50	1.75	2.20	2.45	2.70	3.40

EDDY'S TAPES.

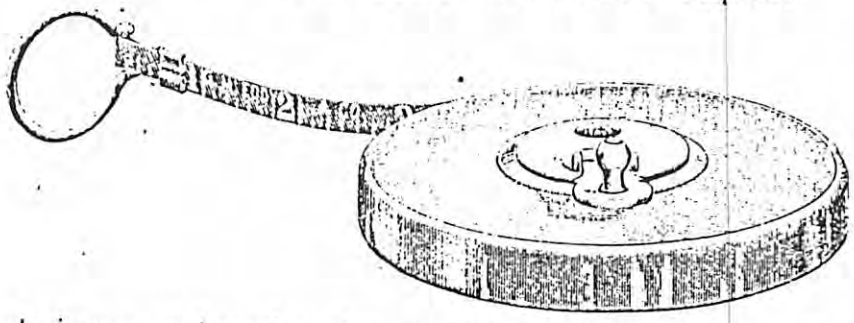
Eddy's Improved Standard Steel Tapes.



Metal lined, leather-covered cases, with improved handles.

		Feet,	25	33	50	66	75	100
	Divided into							
No. 220—	3/8 in. wide, ft., in., 8ths,		4.50	5.00	6.50	8 50	10.00	12.00
" 221—	1/2 " " " "		5.50	6.50	8.50	10.50	12.00	14.00
" 222—	3/8 " ft., 10ths, 100ths,		4.50	5.00	6.50	8.50	10.00	12.00
" 223—	1/2 " " " "		5.50	6.50	8.50	10.50	12.00	14.00

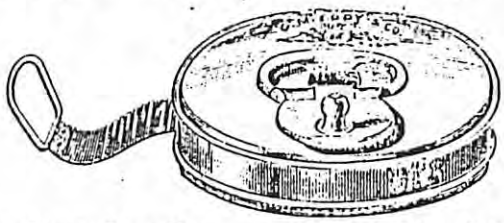
Paine's Patent Standard Steel Tapes.



In iron cases, brass bound, morocco covered, improved handle, 1/4 inch tape.

	Feet,	25	33	50	66	75	100
Divided into							
No. 225—Feet, inches, 8ths,		3.50	4.50	6.00	8.00	9.00	11.00
" 226— " 10ths, 100ths,		3.50	4.50	6.00	8.00	9.00	11.00

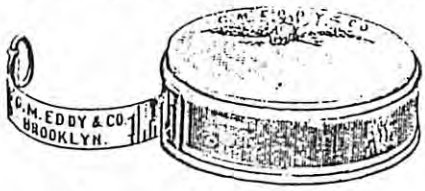
Eddy's Steel Pocket Tapes.



With Flush Handles. Nickel-Plated Cases.

	Feet,	5	10	15	20
No. 235—¼ inch wide,		1.50	2.50	3.26	3.75

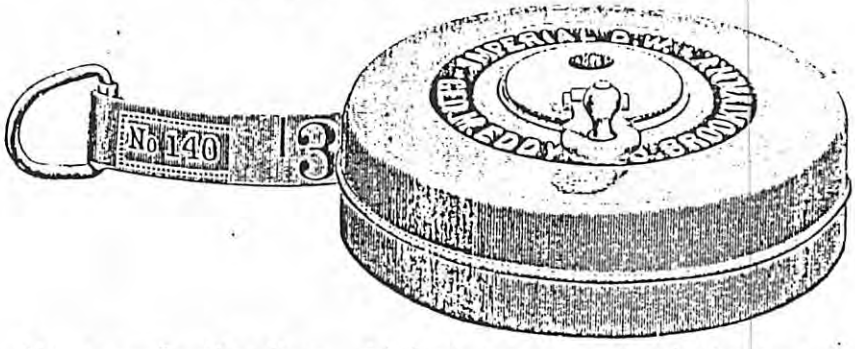
Eddy's Steel Spring Tapes.



German Silver Cases.

	Feet,	3	4	5	6	8	12	15
No. 240—¼ inch wide,		1.35	1.75	2.00	2.25	3.00	4.00	5.00

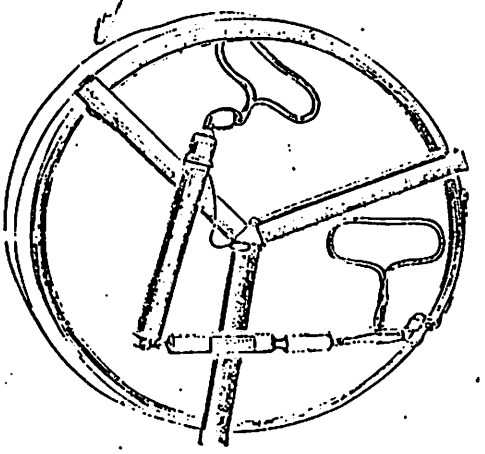
Eddy's Metallic Tapes.



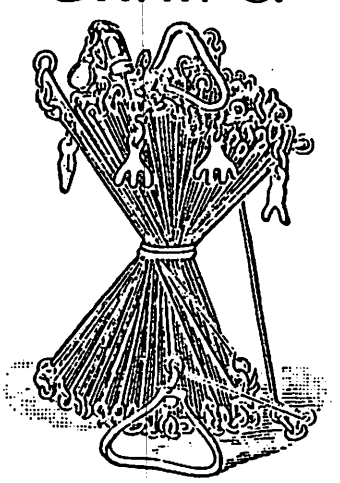
No. 243—Leather Case. ⅝ inch tape; made of the best linen tape, with wire threads, ends reinforced with leather to prevent wear; improved handles.

	Feet,	25	33	50	66	75	100
No. 243—Feet divided into inches,		1.60	1.85	2.35	2.60	2.85	3.50
" 241— " " " 10ths,		1.60	1.85	2.35	2.60	2.85	3.50

STEEL AND BAND CHAINS.



Standard Band Chains.
264



Engineers' and Surveyors' Steel Chains.
265–270

No. 264—Made of heavy steel, three-sixteenths of an inch wide, with brass graduations. In ordering, state number of graduations desired. Used for rough work only.

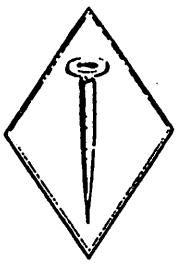
No. 261—100 feet of tape, graduated every ten feet; the last ten feet into single feet, and the last foot into 10ths, . $5.50
" 262—Wooden Reel, - - - - - - - - 3.00
" 263—Clamp Handles, - - - - - - - - 3.00
" 264—Band Chain, complete, - - - - - - - 11.50

No. 265— 50 feet, No. 12 Steel Wire, Oval Rings, not brazed, $4.50
" 266— 50 " " " " " brazed, . 6.00
" 267—100 " " " " " not brazed, 8.00
" 268—100 " " " " " brazed, . 11.00
" 269— 2 Poles " " " " " . 5.50
" 270— 4 " " " " " " . 10.00

Marking Pins.

No. 272—No. 12 Steel Wire, 15 inches, 11 in a set, . . 1.00.
" 273— " 10 " 15 " 11 " . . 1.25
" 274— " 8 " 15 " 11 " . . 1.50
" 275— " 6 " 15 " 11 " . . 2.00

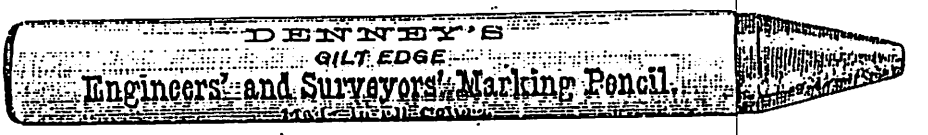
Engineers' and Surveyors' Stake Tacks.



280

Sample,	2 oz.	box,	Price,	$ .16;	by mail, $ .18
	1 lb.	"		.85 "	1.00
	2 "	"		1.60 "	1.90
	3 "	"		2.25 "	2.60
	4 "	"		2.80 "	3.40
	10 "	"		6.00	

Engineers' and Surveyors' Crayon for Marking Stakes.



285

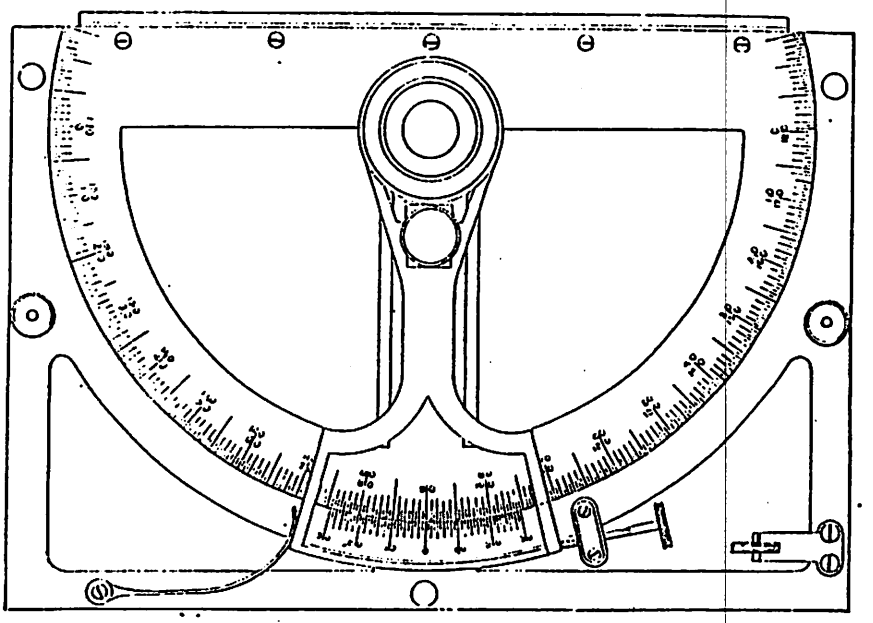
Made in four colors—Red, Yellow, Blue and Black.

Box of one dozen sticks, all of one color, or assorted colors, - $ .50
Postage on box, - - - - - - - - - - .05
Sample by mail, - - - - - - - - - .10

Made specially for us, to meet the demand for a good crayon. Colors all bright. Will mark any kind of surface, wet or dry, and will not rub off.

The Ayres-Crozet Protractor.

(F. C. Knight & Co., Sole Manufacturers.)



(PATENT APPLIED FOR.)

290

The Ayres-Crozet Protractor is divided to ½ degrees; vernier divided to 30 minutes, reading to 1 minute; with improved clamp and tangent screw, and with new thumb movement. Size 8 inches.

In polished walnut or mahogany case, - Price, each, $65.00

THE AYRES-CROZET PROTRACTOR.

No. 290

This new form of the Crozet Protractor is the recent invention of Mr. W. S. Ayres, Mining Engineer for A. Pardee & Co, of Hazleton, Pa., and is graduated the same as a transit in ½ degrees with a 30 minute vernier reading to 1 minute, instead of ¼ degrees and a fifteen minute vernier, as in the old forms, thus avoiding the errors in plotting so frequently made from having the graduation of the Protractor different from that of the Transit.

The new Clamp and Tangent Movement are much more convenient than the old form, being of better constructions and in better locations. The new Thumb Movement is used in bringing the Protractor precisely upon the point from which the line is to be drawn, thus being not only expeditious but making it unnecessary to touch the drawing with the fingers.

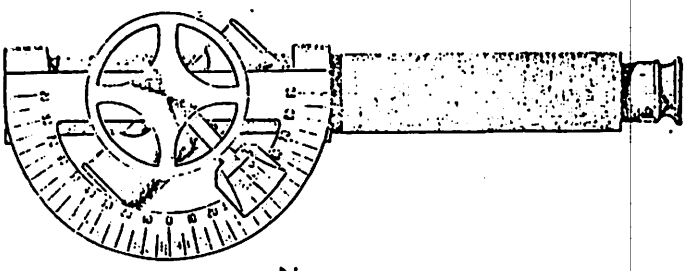
These improvements make the Ayres-Crozet the most practical of all protractors.

It may be used along a straight edge or T square, and angles may be set off with it without the troublesome task of bringing the center of the protractor over the starting point.

This Protractor is particularly adapted to plotting on very large maps that are divided into squares by meridians and parallels.

ABNEY LEVEL AND CLINOMETER.

(With Pritchard Improvement.)

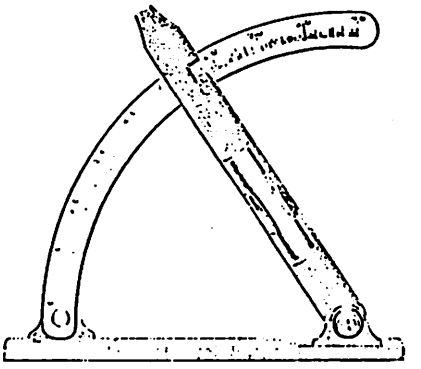


No. 295

Abney's Reflecting Level, with Pritchard improvement, allows the sight of a 90-degree angle to be taken; graduated vernier with clamp. Full size, 5 inches. Packed in case.

Price, $20.00

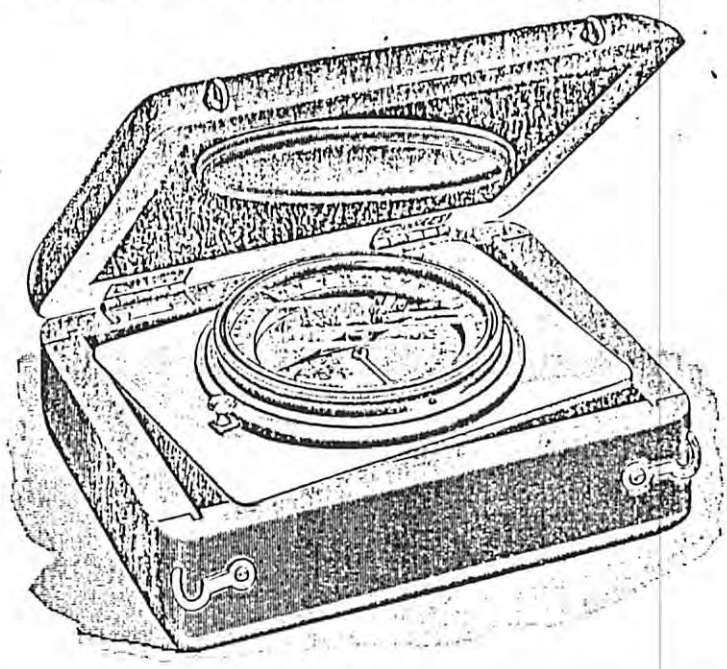
CLINOMETER OR SLOPE LEVEL.



No. 296

Made of bronze metal, 6½ inches long, with folding arc and vernier reading to 3 minutes. Packed in walnut case, . . . $12.00

COMPASS AND CLINOMETER.

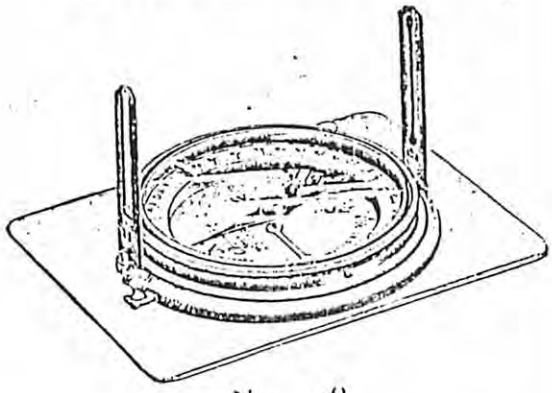


No. 297

Made of bronze metal; has 2 inch needle with stop and cover. Packed in Mahogany Box, ... Price, $10.00

COMPASS & CLINOMETER.

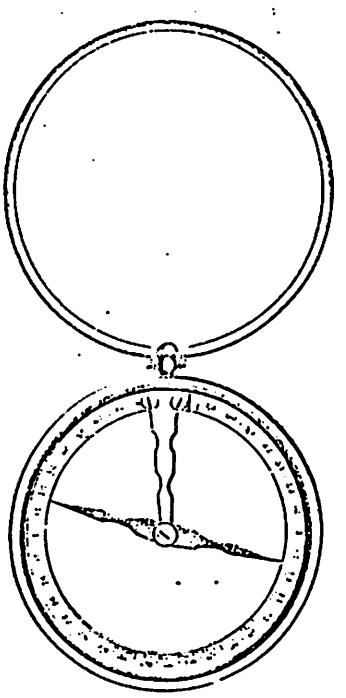
WITH FOLDING SIGHTS



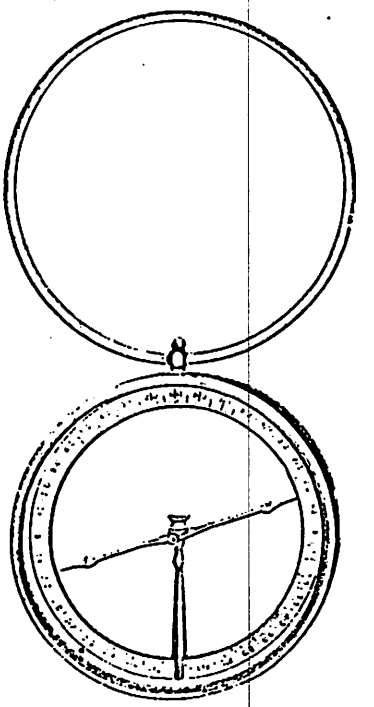
No. 298

Made of bronze metal; has 2 inch needle with stop, folding sight and cover. Packed in Mahogany Box, ... Price, $13.00

MINERS' COMPASSES & DIPPING NEEDLES.



No. 299



No. 300

3¾ inch needle with stop; glass and brass covers on both sides.

No. 299—Plain Needle, ... Price, $10.00

" 300—Norwegian Needle, ... 14.00

A Few Testimonials to our Abilities
IN MANUFACTURING
AND
REPAIRING

ENGINEERING AND SURVEYING IN ALL ITS BRANCHES.
ESTABLISHED 1868.

OFFICE OF
E. G. WEIR,
CIVIL ENGINEER AND SURVEYOR,
4 SOUTH BROAD STREET,

Trenton, N. J., May 4th, 1895.

MESSRS. F. C. KNIGHT & CO.,
Philadelphia, Pa.

My Dear Sirs:—

As you are aware, several months ago you made extensive repairs to my outfit, consisting of Gurley Transit and Young Level. The instruments have been put to severe use ever since they came from your hands and not a flaw or defect of any kind has shown itself; in fact I believe they are doing better work than they ever did. I feel that I must thank you for the very reasonable charges you made. I know they are reasonable for I had had bids from other parties before coming to see you. Wishing for your success, I am,

Yours very truly,

E. G. WEIR.

A. B. COCHRAN. WM. A. COCHRAN.

A. B. COCHRAN & SON,

CIVIL AND MINING ENGINEERS.

Pottsville, Pa., May 6th, 1895.

MESSRS. F. C. KNIGHT & CO.,

Philadelphia, Pa.

Dear Sirs:—

We are pleased to state, that the repairs made by you to our instruments at various times during the last two or three years, have been entirely satisfactory.

Yours truly,

A. B. COCHRAN & SON.

DEPARTMENT OF PUBLIC WORKS.

JOSEPH MERCER,

SURVEYOR AND REGULATOR,

6TH. SURVEY DISTRICT.

Office, 1845 Frankford Avenue.

Philadelphia, May 17th, 1895.

MESSRS: F. C. KNIGHT & CO.,

Dear Sirs:—

I am using your F. C. Knight Engineering and Surveying Instruments purchased 1893, and find much satisfaction by them.

Yours truly,

JOSEPH MERCER,

City Surveyor 6th, District.

OFFICES: { 313 TEMPLE BUILDING, CAMDEN, N. J.
BURLINGTON, N. J.

HENRY S. HAINES,

SURVEYOR GENERAL,

Camden, N. J., April 29th, 1895.

MESSRS. F. C. KNIGHT & CO.,

Philadelphia, Pa.

Dear Sirs :—

"In the serious accidents that have befallen the instruments with which I work, I consider myself fortunate in having found persons so capable and successful as yourselves in putting them in thorough and satisfactory repair. Some of my mishaps have made me almost despair of further service from injured instruments, but to my surprise and pleasure they have left your hands fitted for the most critical use."

Yours truly,

HENRY S. HAINES.

OFFICE OF

HAUPT & FRANKLIN,

CONSULTING ENGINEERS,

18 S. BROAD STREET,

Philadelphia, Pa., May 6th, 1895.

MESSRS. F. C. KNIGHT & CO.,

Dear Sirs :—

The Transit and Level which were repaired by you last year have given satisfaction and are still in good order.

Very truly yours,

HAUPT & FRANKLIN.

INDEX.

NOTICE.

CONDITIONS, TERMS, ETC.

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IN order to avoid unnecessary delays in filling orders, we would ask all purchasers to send us their references with their early correspondence; (where parties are satisfactorily quoted in Dun's or Bradstreets', this, of course, will be unnecessary). Parties not giving satisfactory reference, 25 per cent. of the amount of purchase must accompany the order; balance will be C. O. D. (cash on delivery) of goods.

When orders are for $5.00 or less, remittance in full must accompany the order.

All express and C. O. D charges must be paid by purchaser.

Remittances can be made by personal check, Philadelphia or New York bank drafts, post-office or express money orders.

Packing boxes are not charged for.

All goods are packed with great care, and we will not be responsible for breakage or damage after the express company has receipted for them in good condition.

All goods sold by us are fully guaranteed to be perfect in every particular, as described in Catalogue. Should you find any defect, notify us at once. Any complaints will receive our prompt and careful attention.

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