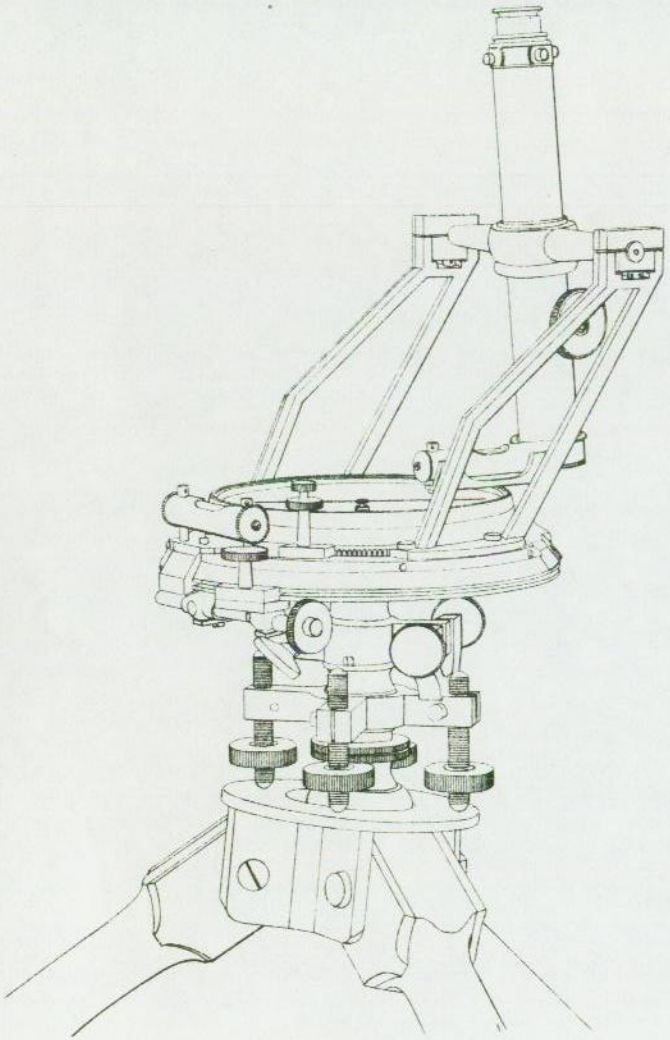

YOUNG'S
IMPROVED MINING TRANSIT,
No. 4.

YOUNG & SONS, Philadelphia.

MINING TRANSITS.

The principal novelty in our Mining Transits is in the arrangement of the Inclined Standards, by which the Engineer is enabled to range the telescope to a vertical line. The result is accomplished without any additional telescope, while the line of collimation remains on line passing through the centre of instrument; consequently all measured horizontal angles have their vertices over the centre point, and no correction for offsett is necessary, avoiding the inconvenience and liability to error of double telescopes. The centres of instrument, as made by us during past six years, being much longer than those of other makers, holds the overbalance of standards steady, while the details being arranged to decrease this overbalance, it does not affect the working of the instrument. It can, if desirable, with a slight addition of weight, be entirely destroyed.

The inclined standards afford a much less obstructed view of the vernier, and the improved vernier, patented by us, secures an accuracy of reading hitherto extremely difficult to obtain.

The PATENT TELESCOPE forms a desirable addition, for these reasons:

1st, That it is calculated to retain adjustment more perfectly.

2d, In the important requisite that the working parts are completely enclosed, thus being protected from dust, dirt and moisture.

3d, That the telescope always remains the same length, and always balanced.

Our GRADIENTER ATTACHMENT measures (where the gradient is not too steep) the inclination *with accuracy and speed*, besides distances and differences of level. For a more detailed account of this Attachment, we would refer to our description of Gradienter.

The minor details of instrument, such as position of verniers to one side of standards, so decidedly preferable where the Engineer is working in confined positions, and so much more favorable for throwing light upon graduations; the dust ring cover to plates, similar to our larger instruments; and the more secure arrangement for attachment to tripod, are such as to recommend it to favorable consideration.

The STEEL CHAIN TAPE, strong, durable, and but little liable to injury, is the best calculated of all for underground or surface work.

The CANDLE LAMP PLUMMET is, in cases, superior to our MINING LAMP PLUMMET, in that it is cleaner, more portable and compact, and can be packed in same box as instrument.

With our Sliding Tripod, Short Tripod, Mining Slide Target Rod, and other improvements, we believe we have supplied the important requisites of the Mining Engineer's outfit.

PRICE LIST IMPROVED MINING TRANSIT.

These Instruments have Inclined Standards (patented); Improved Verniers (patented), Improved Telescope, erect (patented); they have also most of the improvements we have placed upon our City Transit.

PLAIN, Needle 3 inches,	Graduations 4½ in.,	dimensions as	No. 10,	$185 00
" " 4½ "	" 6¼ "	"	No. 6,	215 00
" " 5 "	" 6¾ "	"	No. 6,	225 00

Extra:

Gradienter Attachment, including level on telescope,	$40 00
Level on Telescope, with tangent or opposing screws,	25 00
Vertical Arc,	15 00
" Circle,	18 00
Graduations to read 20 or 30 seconds,	10 00
Stadia Hairs, fixed,	3 00
Reflector Plate, Silver,	4 00
Diagonal Eye Piece,	8 00

IMPROVED VERNIERS,

(PATENTED.)

Since issue of second edition of our Catalogue, there has been granted us a Patent for Improvement in VERNIERS and GRADUATED PLATES, important, as producing

INCREASED ACCURACY IN READING GRADUATIONS,
A REDUCED SIZE OF INSTRUMENT, and
A REDUCTION IN WEIGHT.

The facility of vernier readings is determined by the closeness of vernier and plate. The weight of the Transit instrument is determined mainly by the size of graduated plate, and the necessary proportions of other parts thereto. The graduations of larger and smaller instruments, where difference in size is not too great, being generally performed on same Graduating Engine, there is no difference in the accuracy of the Graduations; but, as the larger the circle has the greater difference between the lines of graduation, it is the more easily read. This same difference can be produced on a smaller circle by a higher magnifying power of the reading glass, the use of which is, however, limited by two serious objections, evident from a consideration of the construction of the vernier and graduated plates as generally used. To read perfectly, two conditions have been heretofore necessary; first, that the vernier and plate should be in close contact, in order that the continuity of agreeing lines on the two should not be destroyed; second, that both plates and vernier should be on same plane, in order to avoid the error of parallax. Exactness in the first of these is impossible, as the surfaces moving upon each other, the edges on both would become rubbed, and the graduations destroyed. There must consequently be some space left, and this space is so enlarged by the magnifying power of reading glass, that the continuity of agreeing lines becomes destroyed, and the readings become uncertain. In addition to this, by the usual method of reading, this space is viewed at an inclination, and the line of sight passing so inclined from edge of vernier to plate, and striking *below* graduations and not against them, rendering accuracy yet more difficult, and produces error of parallax.

The remedy of this first evil is sometimes the adoption of the second, of placing the inside piece, vernier or plate, below the plane of other, so that the diagonal line of sight, when it reaches the inside piece, will strike beyond this space and give a continuity of lines. This construction is generally favored by Engineers; but as heretofore constructed, the accuracy is destroyed by the error of parallax, or by the difference of readings, as the eye is moved to one side or other.

There results from these considerations the indispensable condition, that in order to read verniers perfectly correct, *the eye must be situated in the vertical plane, passing through the agreeing divisions of vernier and plate, and the centre of the instrument.* To enable this to be done with certainty, and at same time to cause the lines on vernier and plate to *appear continuous and have no space between them*, is the object of our invention. We accomplish it, by placing above the first vernier, generally on the vernier glass, a similar vernier, graduated in whole or in part, so that by bringing the eye in range of corresponding graduations on the two, the eye must necessarily be in proper position, and parallax be completely destroyed.

So complete is this simple remedy, that while, without it, there is no certainty of the eye being in proper position by several inches, with it, the motion of the eye the tenth of an inch from its place becomes apparent. It also enables more rapid readings; and in positions where Engineer is cramped for room, as in mines or steep hill sides, the ability to place eye correctly is of exceeding convenience. Coincidence of readings by different persons is secured by this vernier, a result not hitherto attainable.

As an evidence of the importance of this improvement, we are enabled to make our Transit of 6¼ inch graduated plate read more closely than the larger instruments without it; and, while retaining the same telescope, leveling screws, &c., with same tripod, reduce the weight from 2 to 2½ lbs.; and, by reducing tripod proportionally, save at least 4 to 5 lbs., retaining all the merits of the present larger instruments.