

# Catalog

With Instructions  
for Adjustment and Use  
of Surveying Instruments



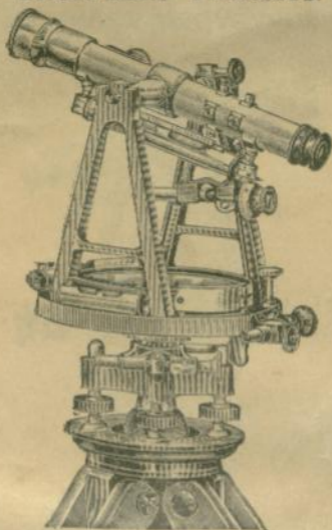
# The L. Beckmann Company

Established 1874  
Incorporated 1903

319 Adams Street, TOLEDO, OHIO

POCKET EDITION

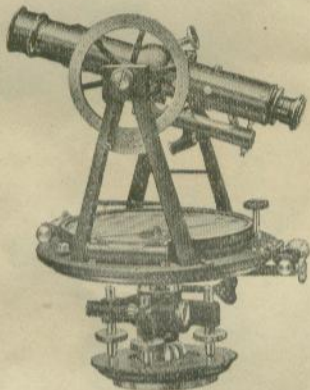
## ENGINEERS' TRANSITS.



Standard size for the highest class of engineering. Diameter of limb graduation,  $6\frac{1}{2}$  inches, two verniers at an angle of 30 degrees from line of telescope read to single or half minutes; needle  $4\frac{1}{2}$  inches long; extra fine achromatic telescope magnifying 25 diameters with all the latest modern improvements, of the best workmanship. Weight of instrument 13 lbs. Packed in fine mahogany box with all accessories.

	Price
No. 1—Transit, with plain telescope.....	\$165 00
No. 2—Transit, with level and clamp telescope . . . . .	180 00
No. 3—Transit, with level and clamp and gradienter to telescope.....	185 00
No. 4—Transit, same as No. 2, but with vertical arc . . . . .	200 00
No. 7—Small mountain transit, with level and clamp to telescope.....	175 00

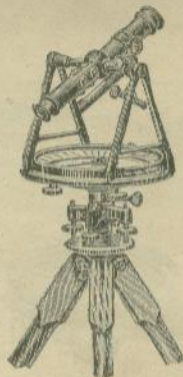
## SURVEYORS' TRANSIT.



No. 17.

No. 17—Surveyors' Transit, made especially for Surveyors, Contractors and Builders. With erecting telescope, 9 in.,  $4\frac{1}{2}$  in. level to telescope, object glass 1 in. diameter, rack and pinion to object slide, spiral motion focusing arrangement to eye piece, clamp and tangent screws to telescope axis, verticle circle  $3\frac{1}{2}$  in. silvered, graduated to degrees and numbered 0-180-0, with vernier reading to five minutes, horizontal limb,  $6\frac{1}{2}$  inch diameter, silvered, graduated to  $\frac{1}{2}$  degrees, and numbered 0-180-0, one double vernier reading to single minutes, vernier opening at an angle of 30 degrees to line sight. Compass needle 5 in., with variation plate, two plate levels, clamp and tangent screws to horizontal plates, 4 leveling screws, shifting center. Instrument packed in a polished wooden box, with sunshade, plumb bob, magnifying glass, and adjusting pins. Weight of Instrument, 11 lbs.  
Price, complete with tripod.....\$115 00

## THE TELESCOPE COMPASS.



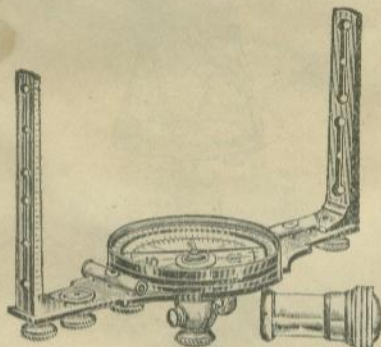
No. 16.

An instrument constructed for the needs of County Surveyors, or all who want to do good land surveying, yet do not care to invest for a regular transit. It is built similar to a large transit, compass needle  $5\frac{1}{2}$  inches long, with variation plate inside the compass box. Fine achromatic telescope  $8\frac{1}{2}$  inches long, with rack and pinion and focusing arrangement for cross wires, clamp and tangent screw for center. It can be provided with level and clamp to telescope. Packed in nice mahogany finished box.

Price

No. 15—Vernier Transit, plain telescope, with tripod, complete.....	\$ 75 00
No. 16—Vernier Transit, with level and clamp to telescope, tripod, com- plete.....	90 00
No. 16A—With full vertical circle, vernier reads to 5'.....	100 00

## SURVEYOR'S VERNIER COMPASS.

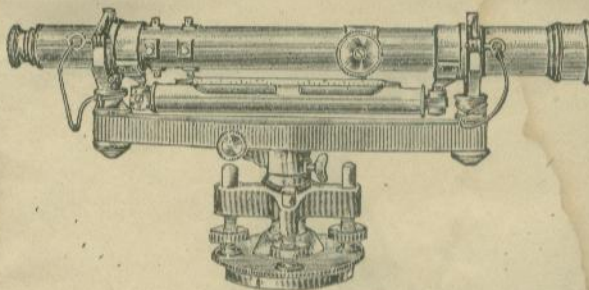


No. 21.

This Compass is of the best and modern construction, of best workmanship. It has detachable sights graduated for taking angles of elevation or depression. The Vernier for the magnetic variation is inside the compass box, to be set by rack and pinion. The needle is 5 inches long and very sensitive. Two straight levels at right angles for setting the Compass level, also an outkeeper is provided.

	Price
No. 21—5 inch Vernier Compass with Jacob staff mounting.....	\$ 35 00
5 inch Vernier Compass with good, substantial tripod in place of staff mountings . . . . .	38 00

## ENGINEERS' LEVELS.



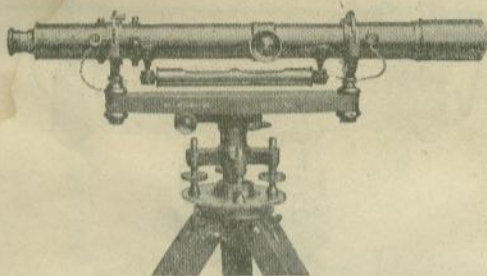
No. 11.

Engineers' level of best workmanship and latest improved construction, with long center of cast steel, highly sensitive, ground level vial, achromatic telescope of 40 diameters power; of the very best workmanship; packed in nicely finished mahogany box with all accessories.

	Price
No. 11 —Engineers' Level, 18 inch telescope . . . . .	\$110 00
No. 11A—Engineers' Level, 20 inch telescope . . . . .	\$110 00
No. 11B—Engineers' Level, 16 inch telescope . . . . .	\$100 00



## SURVEYOR'S LEVEL.



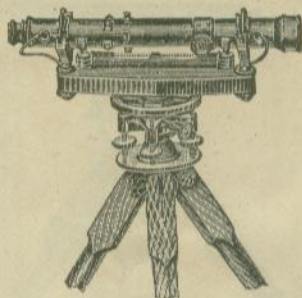
No. 12.

This instrument is especially designed for the use of County Surveyors and Railroad Engineers, who want to do good leveling and do not care for the expensive high-grade level. With the exception of some technical points and the fine finish, it is made the same as the high-grade Engineers' Level. Length of telescope, 16 in., objective,  $1\frac{1}{4}$  in.; length of level vial, 6 in., accurately ground and very sensitive; with clamp and tangent to axis and all adjustments required.

Price

Complete with tripod and packed in nice  
hardwood case, with shade and adjust-  
ing pins . . . . . \$ 75 00

## ARCHITECT'S LEVEL.



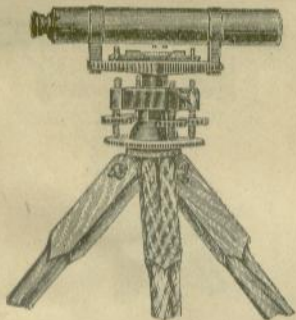
No. 13.

This instrument is constructed the same as the large Y level, but has also a horizontal circle to read by vernier to 5 minutes; it has fine achromatic telescope 12 in. long, magnifying 20 diameters, with rack and pinion for focusing, also focusing arrangement for cross-hairs. It is provided, besides the regular large tripod, with a small trivet, to place instrument on a wall. Constructed especially for architects, builders, millwrights, engineers and surveyors.

Price

No. 13 — Architect's Level . . . . . \$45 00  
No. 13A—Same with clamp and tangent  
screw . . . . . 50 00

## DRAINAGE LEVEL.



No. 14.

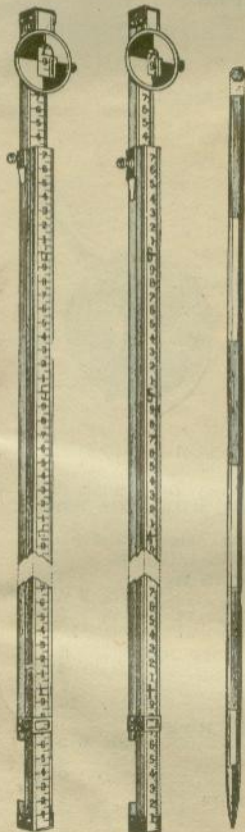
Constructed for the use of builders, farmers and ditchers. It is provided with a powerful achromatic telescope 12 inches long, with fixed cross-hairs inside, with which a leveling rod can be read at 500 feet distance. The sensitive level vial will tell a variation of  $\frac{1}{8}$  of an inch in 100 feet distance after being leveled up. It can be revolved and kept in the level plane. All made of best bronze metal, finely finished and packed in a neat little hardwood box.

Price

No. 14 —American Dumpy and Drainage Level, complete.....\$25 00

No. 14A —Same instrument with horizontal circle, like Architect's Inst. 30 00

## PHILADELPHIA RODS.

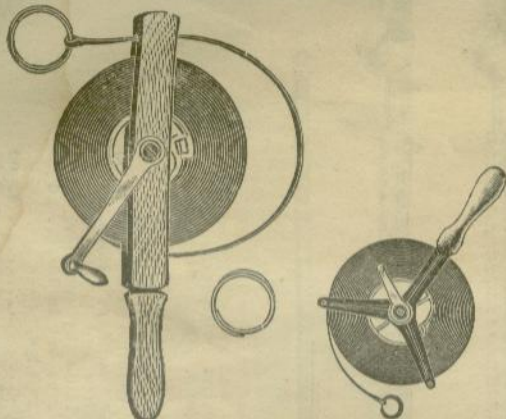


Each

- No. 40—Philadelphia Rod, hardwood, divided into feet and 10ths, vernier reading to 100ths, with target, vernier and clamp, 7 feet, sliding out to 13 feet.....\$12 00
- No. 40A—Philadelphia Rod, like No. 40, but divided into feet, 10ths and 100ths, vernier reading to 1000ths 12 00
- No. 40B—Architects' or Builders' Rods, divided to inches and  $\frac{1}{8}$  inches reading to 64ths by vernier, 6 feet long slides out to 10 ft.. 6 00
- FLAG POLES.**
- No. 44—Flag Pole, 5 feet.....\$2 00
- Flag Pole, 8 feet..... 2 50
- Flag Pole, 10 feet..... 3 00

No. 40. No. 40A. No. 44.

## STEEL TAPES.



Reel No. 1, \$1.25

Reel No. 2, \$1.25

These tapes are marked every foot, with first foot divided in 1/10 of a foot, with plain figure at each mark.

Prices given below are for tapes divided every foot, with first or extra foot in 1/10.

**Tapes Complete with Reel.**

No. 916—100 feet.....	each,	\$ 4 75
No. 916—200 feet.....	each,	7 00
No. 916—300 feet.....	each,	10 00
For each 100 feet more add....		3 00
100 links.....		4 75
200 links.....		7 00
300 links.....		10 00

**Tapes Only With Rings.**

No. 916—100 feet.....	each,	\$ 3 50
No. 916—200 feet.....	each,	6 00
No. 916—300 feet.....	each,	9 00
For each 100 feet more add....		3 00
100 links.....		3 50
200 links.....		6 00
300 links.....		9 00

## INSTRUCTIONS ABOUT USE AND ADJUSTMENT OF INSTRUMENTS. COMPASS NEEDLES.

Of late years since electric railways have become so numerous the difficulty with Compass Needles has increased. Parties riding on electric cars should put the instrument on the rear platform or on the seat, but never on the floor inside of the car. Rubber or glass are insulators for electricity, but do not insulate the magnetism.

The S end of the needle has a fine coil of copper wire which can easily be moved to and from the center to balance the needle properly. The needle is adjusted before it leaves the factory, but should be re-balanced after reaching its destination, as the magnetic bearings vary in different localities.

Needles are oftentimes affected while being used on the street near electric conduits. If the needle is effected it will be noticed after leveling the instrument that the needle is out of balance or the North end adheres to the glass. Wet the finger and touch the glass over the end of the needle; if this does not cause the needle to take its normal position, the needle is at least partly demagnetised.

If, however, the instrument has been abused, or the needle let down on its center in a quick, rough manner, then it is likely that the center pin or jewel is broken or dull, which will cause the needle to act slow and sluggish. In this case it is necessary to sharpen the pin with a very small piece of very fine oil stone by rubbing it around the pin with the face of the stone at an angle of about 40 degrees until the point



is so fine that it will adhere to the fingernail at the slightest touch. For recharging a needle use a magnet, which can be purchased at any hardware store. Draw the S end of the needle several times across the N end of the magnet, and the N end of the needle across the S end of the magnet. Be sure that the ends of the needle, compass circle and also the jewel are clean. Clean the jewel with a clean pointed piece of soft wood. If these minor repairs and adjustments cannot be made satisfactory send the instrument to us and we will make the repairs at a slight charge. The magnet should not be kept near the instrument.

Always keep the needle screwed up against the glass when not in use.

The magnetic needle in almost all parts of the United States points more or less to the east or west of a true meridian. This deviation, which is called the variation of the needle, is not constant, but increases or decreases to a very sensible amount in a series of years.

## HOW TO USE THE COMPASS ON AN INSTRUMENT.

The surveyor should keep the south end towards his person, and read the bearings from the north end of the needle. He will observe that the E and W letters on the face of the compass are reversed from their natural position, in order that the direction of the line of sight may be correctly read.

The compass-circle being graduated to half degrees, a little practice will enable the surveyor to read the bearings to quarter degrees, or even less, estimating with his eye the space bisected by the point of the needle; and as this is as close as the traverse table is usually calculated, it is the general practice.

## HOW TO SET THE VARIATION PLATE.

To set the Variation the surveyor can, by moving the vernier to either side, and with it, of course, the compass-circle attached, set the Compass to any variation.

He therefore places his instrument on some well-defined line of the old survey, and turns the tangent screw or the pinion until the needle of his Compass indicates the same bearing as that given in the field-notes of the original survey.

Then, clamping the vernier, he can run all the other lines from the old field-notes without further alteration.

The principal causes of error in the needle, briefly stated, are the dulling of the pivot and the resulting injury to the jeweled-center, the loss of polarity in the needle, the influence of local attraction.

If a slight difference exists between the old and new readings, it would show the change of the variation of needle from the former date and present time.

The variation of the needle at any place being known, a true meridian, or north and south line, may be run by moving the vernier to either side, as the variation is east or west, until the arc passed over on the limb is equal to the angle of variation, and then turning the Compass until the needle is made to cut the zeros on the graduated circle. The line of sights will then give the direction of the true meridian at this point.



## HOW TO READ THE VERNIER OF VARIATION PLATE, OR OF SURVEYOR TRANSIT, OR ARCHITECT LEVEL AND VERTICAL CIRCLE OF TRANSIT.

First see if plate is divided into full degrees or half degrees. If, in half degrees, the value of each mark is 30'. On the vernier we have 30 marks to equal 29 marks of the limb plate, each mark being 1 minute smaller than on the limb or plate. Now see what line of limb marks the zero or vernier has passed, in the direction that the vernier is turned around the limb, then follow the vernier to find a line which coincides exactly with a line on limb plate; if this be the 8 line and the former reading of zero of vernier was 18° 30' the vernier would stand on 18° 38'. 18 degrees 38 minutes. If vernier is of the folding style, begin to read at zero in the direction that the angle is turned and follow on reverse side up to the center.

If plate is divided in single degrees, 11 parts of plate are divided into 12 parts of vernier; therefore, every mark of vernier represents 5' the reading of vernier is done the same as above, only every mark multiplied with 5.

## ADJUSTMENT OF INSTRUMENTS.

All instruments are carefully adjusted before leaving the factory and should not be meddled with unless absolutely necessary. Transportation may be the cause of instruments being slightly out of adjustment. The following instructions should be carefully read:

**To Focus the Crosshairs in Telescopes**—Turn eyepiece in and out in screw movement till hairs appear sharp cut. They are perfectly focussed if they appear stationary while you move your eye quickly to the right and left.

## ADJUSTMENT OF TRANSIT AND VERNIERED TRANSIT.

For those unacquainted with the adjustment of instruments we will give a short description of same:

**To Adjust the Levels**—Bring the bubbles of the small levels in the center by means of leveling screws and turn the instrument 180°; if the bubble now runs to either side, adjust one-half the error on the small capstan head screws at the end of levels, and the other half by leveling screws and repeat until the bubble stays in the center.

**To Adjust the Standards**—Level up instrument carefully; sight at some high object; clamp instrument, now bring telescope down to bisect some object at the base; reverse instrument 180°; bring telescope to again bisect mark at base and elevate telescope to the top mark. If the wire cut this mark, the telescope moves in a true vertical line; if not, adjust one-half the error by the screw under the telescope bearing in one of the standards, taking care to loosen and tighten the two upper screws of this adjustable journal.

**To Adjust Line of Collimation**—Level up instrument and see if wires are vertical, so that top and bottom of wire cover same object by raising and lowering telescope; if not, loosen the capstan head screws that hold the cross wires (those nearest to telescope axis) and turn them until wire is vertical. Then clamp instrument to sight on a sharp object about 500 feet away, revolve telescope and find a back sight nearly as far off. Now reverse instrument 180° and place wires on back sight; revolve telescope again and see if the wires strike the first object. If not, adjust one-fourth of error on the horizontal

capstan head screw, remembering that on account of inverting property of eye-glass the diaphragm must be moved in that direction which apparently increases the error. After adjusting one-fourth o. error place instrument again on foresight, find new back sight and repeat operations until the wires will cover both objects upon reversing the instrument. The above has reference only to the vertical wire, the most important in transit instruments. In a plain transit no other adjustment is needed.

**To Adjust Level on Transit, Telescope, or to Bring the Level Parallel to Line of Collimation.**—Select a level ground and level the instrument up carefully and clamp the telescope in a nearly horizontal position. Now drive two stakes equal distance from the transit (say 200 or 300 feet) to such a height that the readings on both will be the same, with the telescope well clamped. These two point must be on a level with each other. Now move the instrument to about ten feet off one stake, level it up—clamp the telescope nearly horizontal—and take a reading on the nearest stake and then on the further one. If both readings are not the same move the telescope by means of tangent screw, over nearly the whole error and repeat this until both readings are the same, when the telescope will be truly horizontal, then set the level on telescope by the small nuts on each end, that the bubble will be in the center.

**To Adjust the Vertical Circle.**—Having the instrument firmly set up and carefully leveled, bring into line the zeros of the circle and vernier, and with the telescope find some well-defined point, from one hundred to five hundred feet distant, which is cut by the horizontal wire. Turn the instrument half-way around, revolve the telescope, and fixing the wire upon

the same point as before, observe if the zeros are again in line. If not, loosen the capstan head screws which fasten the vernier, and move the zero of the vernier over half the error; bring the zeros again into coincidence, and proceed exactly as before, until the error is entirely corrected, when the adjustment will be complete.

## TO ADJUST THE VERNIER COMPASS.

**To Adjust the Levels.**—First bring the level-bubbles into the middle by the pressure of the hand on different parts of the plate, and then turn the Compass half-way around; should the bubbles run to the end of the tubes, it would indicate that those ends were the highest; lower them by loosening the screws under the lowest ends and tightening those under the highest ends until, by estimation, the error is half removed; level the plate again, and repeat the first operation until the bubbles will remain in the middle during an entire revolution of the Compass.

## ADJUSTMENTS OF THE ENGINEERS', SURVEYOR'S AND ARCHIECT LEVEL.

First, to make the level parallel to line of collimation, clamp the level bar over two leveling screws, bring bubble in center by means of leveling screws, turn the telescope in the wyes about 15° to 20° and see if the bubble stays in place; if not, correct one-half by the two side screws on the one end of the level, and try again until bubble is stationary. Now bring the bubble in center and reverse telescope in the wyes end for end, carefully, and adjust one-half of error with the nuts under the level, the other half by the leveling screws; repeat opera-



tion until bubble will stay in center.

**To Adjust the Wyes**—Clamp telescope in the wyes and level up over two opposing leveling screws. Now turn the instrument one-half in its center and adjust one-half the error on the nuts of the one adjustable wye—the other one-half with the leveling screws. Repeat operation until the bubble is stationary over both pairs of leveling screws.

**To Adjust the Crosswires or Line of Collimation**—Place the wire on some well defined object about 300 feet off—say the top of a chimney—and revolve the telescope in its bearings, and see if the wire strikes the same object; if not, correct one-half the error by the four capstan-head screws nearest the objective. However, as the eye-piece reverses the image, it should be done same way as described above in "transit adjustment." The crosswires are brought in the center of field by the other set of screws which hold the eye-piece.

## ADJUSTMENTS FOR DRAINAGE LEVEL.

To focus an object, draw the eye-piece in or out until the object appears clear and distinct. Next level up the instruments with the telescope over either pair of leveling screws, then over the opposite pair, now bring it back over the first pair and correct any change that may have taken place. Now reverse the instrument to the opposite direction, if the level bubble does not stay in the center of the vial, adjust one-half the error by the long capstan head screws, which go through the level tube, the other half by the leveling screws. Repeat this operation until the bubble remains in the center of the vial, but be sure to tighten the small screws that press against the large capstan head screws after finishing this adjustment.

To adjust the cross hairs, set the level on an approximately level ground, level up instrument carefully. Pace off 100 steps in opposite directions from the instrument and at each end drive a stick in the ground, so it will be at least 6 feet above the ground. Now have your assistant put a mark on both sticks where you see the cross hairs cut the stick. Now move the instrument to within 15 feet of one of the sticks, level it up carefully and have your assistant put a new mark on the nearest stick, just where the cross hairs cut it, now measure with a rule just how far above or below the second mark is from the first mark. If, for instance, you find it  $2\frac{3}{4}$  inches below the first mark, measure on the other stick  $2\frac{3}{4}$  inches below the first mark and place there a second mark. These two upper marks as well as the two lower marks are absolutely level with each other. Now turn your instrument to the farther stick and see if the cross hairs cut the second mark, if not, adjust by the two flat headed screws on upper and lower side of telescope near eye-piece end. If the cross hairs have to come down, loosen upper screws and tighten lower ones, seemingly increasing the error. After you have corrected almost the full error, try it over again from the near stick to the farther one, and if necessary put a third mark on both sticks, and see if your cross hairs cut both marks.

If, however, you have a well adjusted Engineer's Level to compare, place both instruments near each other so that the telescope centers when leveled up are equally high. Now sight for some object about a mile away with Engineer's Level, bring telescope of Drainage Level on same object and bring cross hairs to cut the same as the other levels, by following instructions as above. In all of the above we only have reference to the horizontal cross hair as the other one is not important.