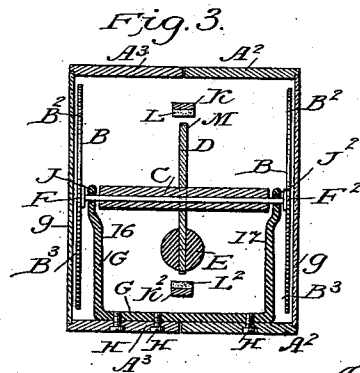
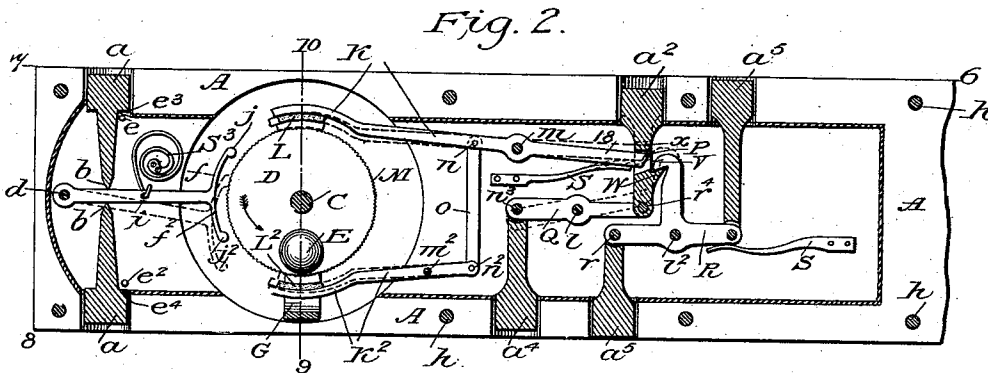
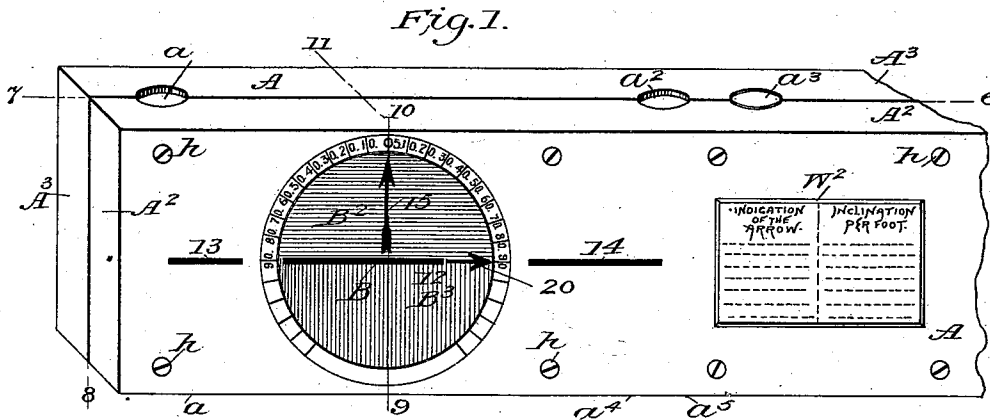


(No Model.)

O. H. WOODWORTH.
LEVELING INSTRUMENT.

No. 532,515.

Patented Jan. 15, 1895.



Witnesses.

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LEVELING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 532,515, dated January 15, 1895.

Application filed April 30, 1894. Serial No. 509,525. (No model.)

To all whom it may concern:

Be it known that I, ORSON H. WOODWORTH, a citizen of the United States, residing at Columbia City, in the county of Whitley and State of Indiana, have invented certain new and useful Improvements in Leveling-Instruments; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in leveling instruments for the use of carpenters, masons, civil engineers and others, and consists in the construction, arrangement and combination of its various parts or elements, all substantially as hereinafter described and illustrated.

In the accompanying drawings similar letters and figures of reference indicate corresponding parts of the invention throughout the several views.

Figure 1 of said drawings is a front elevation in perspective of the exterior of the instrument. Fig. 2 is a longitudinal, central, sectional detailed view on line 6, 7, 8, and Fig. 3 is a transverse, central sectional view of the parts bisected by line 9, 10, 11.

A indicates the stock or frame of the instrument,—said stock being usually made in two equal front and rear portions, A^2 and A^3 , firmly united by bolts or screws, h , h .

B is an index disk, the upper half of which is shown by B^2 , and the lower half by B^3 . The disk is made integrally of a thin piece of metal or other suitable material and the upper and lower halves of its face are separated by a heavy, dark line, 12, drawn centrally across the face, thus dividing it into upper and lower halves, which are enameled, painted or colored in different and contrasting colors,—as red for the upper and blue for the lower half of said face,—thereby providing that when the instrument is applied to any surface having any inclination from the exact horizontal, that fact shall be plainly indicated by arrow 15, attached to or emblazoned on the upper half of the face B, and also by the different and contrasting colors

of the two halves of said face, the heavy line 12 between them and the two heavy lines, 13 and 14, drawn longitudinally and centrally on the outer front surface of stock A, as shown in Fig. 1.

C is the shaft, pivoted at both ends, F and F^2 ,—said pivots working freely in jeweled, polished or anti-friction-wheel bearings, J and J^2 , attached to or formed in the upper ends of standards 16 and 17, forming parts of the shaft-supporter, G, screwed or bolted to the stock, as at H, H, H.

Locking disk, D, is firmly attached to and carried by shaft C, and is finely milled on its periphery, M, and carries near its lower edge, just inside of said milled periphery, the gravity weight, E, securely affixed to said disk. The index disks, B, are firmly attached to the outer ends of, and carried by, the pivots, F and F^2 , and the weight, the arrow on each index disk, the contrasting colors thereon and the heavy line separating them into halves, being all arranged and adjusted as set forth to produce that result, it follows that when the unlocked instrument is applied to a horizontal surface, the arrow will point perpendicularly and the face of each index disk will assume in relation to the whole instrument the position shown in Fig. 1.

K and K^2 are the locking clamps or jaws, having their clamp-carriers, 18 and 19, jointed to the stock at m and m^2 . Point P, of clamp-carrier 18, extends to and is inserted under shoulder, x , of push-pin a^2 , and held up against said shoulder by mainspring S. To clamp-carrier 18, at n , is jointed bar o , the lower end of which is jointed at n^2 , to clamp carrier 19, which is jointed to the stock at m^2 , and carries clamp K^2 .

Clamps K and K^2 are provided with soles or linings L and L^2 , made of soft leather, rubber, or other suitable material adapted to catch and adhere to the milled periphery M, and thus hold disk D, securely locked without slipping, when the locking clamps and their soles simultaneously close on the opposite edges of said milled periphery.

The two halves A^2 and A^3 , of stock A, are hollowed out or cut away on their inner faces sufficiently to admit the operative parts of the instrument, and said parts are mostly attached to the inner face of the rear half of

the stock, as shown in Figs. 2 and 3; but said operative parts may be attached to a metal plate or plates fastened to the interior of one or both halves of the stock.

5 Push-pin a^2 , extends down to and is jointed, at r^4 , to bar Q, which is jointed to the stock at l and jointed at r^3 to inner end of push-pin a^4 . Push-pin a^3 has its inner end jointed to one end of bar R, at r^2 , and the inner end of
10 push-pin a^5 is jointed at R to the other end of said bar, or piece R, which is jointed to the stock at l^2 and is provided with an upward extension T, provided with the hook or catch V adapted to engage the hook or catch W
15 formed on push-pin a^2 ,—said catch V being held up in position to engage catch W by means of the constant pressure of spring S^2 on piece R.

20 Double push-pin a , extends entirely through the instrument between the front and rear halves of the stock, and at its middle, at b , a notch is formed to receive the oscillating rod c , one end of which is freely jointed to the stock at d , and the other having two flexible
25 prongs or arms, f and f^2 ,—said rod also having the free end of the spring S^3 turned up and through a hole, i , in said rod and thereby normally holding it in the position shown, with its arms or prongs, f and f^2 , near, but
30 not touching, the milled periphery of disk D. Said push-pin a , is prevented from turning side-wise, and from being pushed too far up or down in the stock, by means of the stops e and e^2 inserted in the stock, and also by the
35 shoulders, e^3 and e^4 , formed in said push-pin.

40 All the push-pins move freely up and down between the two halves of the stock and in the grooves to which they are adapted as shown, and all the various parts employed in the locking, unlocking, or other practical manipulations of the instrument, are so attached,
45 pivoted, or jointed to each other, or to the stock, as to admit of the free and properly adjusted movement of all the operative parts of the invention.

50 The degree scale surrounding the index disk, B, may be marked on the stock or on a part attached thereto, and is covered and protected by the glass, g , which may be placed very near the face of said disk, because there is nothing projecting outwardly therefrom.

55 Spear-head 20, on disk B, points to "0" on the degree scale when the instrument is applied to perpendicular surfaces, and in such cases performs the same office that the arrow does when the instrument is applied to horizontal surfaces.

60 It is evident that an index disk may be carried on the outer ends of one or both pivots of the shaft, as may be preferred, and if but one disk be employed, that one should be used in the front half of the instrument, as in Fig. 1.

65 By properly proportioning the devices described, the locking clamps, K and K^2 , are so adjusted in their simultaneity of movement and in the equal degree of pressure exerted

by each when disk D and its attachments are being locked that the clamps both close on directly opposite sides of the milled periphery at the same instant and with the same
70 degree of pressure,—thereby effectually preventing any slipping of the soles of the clamps on the milled periphery, any variation of the index or locking disks, and any bending or
75 breaking of the pivots or injury to the pivot bearings.

W² is a tablet inserted in the front side of the instrument and showing a list or table of inclinations per foot corresponding with the
80 degrees on the scale as pointed out by the arrow when different levelings are taken and the results secured by locking the instrument. This list or table is enameled or otherwise in-
85 scribed on the tablet, which is made of porcelain, metal or other suitable material and sunk in the front side of the stock, where it may be conveniently referred to at any time.

Having thus indicated and described the various parts or elements constituting my in-
90 vention, I now proceed to describe the practical operation and use thereof.

Assuming that the operative parts of the instrument are in the unlocked positions indicated in the drawings, (Figs. 2 and 3,) and that
95 we wish to take a measurement or leveling of a given surface,—we place the instrument on said surface, with push-pins a^2 and a^3 upward, and then, with a finger, push down briskly on, and quickly withdraw the finger from, the
100 head of push-pin a . This pushing movement presses notch b , in push-pin a , against oscillating rod c , turns it on its pivot or joint d , and carries arm f of said rod against the milled edge of locking disk D, at about point
105 j , on said disk, and said arm being flexible, its point adheres closely to said milled edge or periphery and pushes the disk around until arms f^2 and f and rod c reach the positions indicated by the broken lines and j^2 , and then
110 by the action of spring, S^3 , in returning to its present position and carrying rod c and push-pin a back to their present positions, an oscillatory motion is imparted to disk D, and through it to weight E, shaft C, pivots F and
115 F^2 , and the index disks B, attached to and carried by said pivots. This oscillatory motion continues for a short time until the weight settles to its lowest attainable point, stops the motion and causes the arrow 15, on the index
120 disk, to point perpendicularly to the mark or figure on the degree scale corresponding with the horizontality, or variation therefrom, of the surface on which the instrument is resting.
125 When the oscillatory motion has entirely ceased, a light pressure downward on push-pin a^3 , or upward on push-pin a^2 , throws extension T outward, as per broken lines, and thus disengages catch V from catch W,—
130 whereupon mainspring S instantly presses point P upward, carries push-pin a^2 to the upper surface of the instrument and push-pin a^4 to the lower surface thereof, turns clamp-carrier 18 on its pivot or joint m , and, through

bar *o*, turns clamp-carrier 19 on its pivot or joint m^2 , and thus closes the clamps K and K^2 simultaneously against directly opposite edges of disk D,—thereby instantly locking said disk and all its attachments securely in position,—said locking being the direct result of disengaging catches V and W and thus permitting the mainspring to actuate the carriers and the clamps carried by them. After thus locking the instrument it can be removed from the aforesaid surface and carried about at will for close and careful examination, with the disks, arrow, shaft and weight remaining rigidly locked in position for inspection,—thus furnishing a portable record of the comparative horizontality of the surface to which the instrument was last applied and its operative parts locked before removal therefrom. This lockable feature of the instrument renders it especially valuable for taking levels of surfaces in the dark, or those difficult or inconvenient of access. Many persons with defective sight, or otherwise incompetent to take levels with ordinary instruments, are fully competent to apply this one to almost any given surface, operate the oscillatory devices thereof by pressure on push-pin *a*, and lock or unlock its operative parts by pressing push-pins a^2 , a^3 , a^4 , or a^5 . The unlocking is effected by pressing on push-pin a^2 from the top, or on a^4 from the bottom, of the instrument,—the effect in either case being to cause catch V to engage catch W and thereby withdraw the pressure of the clamps from the milled edges of disk, D, as shown in Figs. 2 and 3.

When the instrument rests unlocked on a horizontal surface, the arrow points perpendicularly and lines 12, 13 and 14 are exactly in line with each other. These lines are made plain and prominent, and any variation of the instrument from a true horizontal throws all of said lines out of coincidence and quickly catches the eye of the observer.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a leveling instrument, the combination of the front and rear parts, A^2 and A^3 , of the stock A,—the push-pins a^2 , a^3 , a^4 and a^5 , interposed in grooves between said parts and operable digitally from the top or bottom of the instrument,—the clamp-carriers, 18 and 19, jointed to the stock and connected by the bar, *o*,—the clamps, K and K^2 , provided with soles, L and L^2 ,—locking disk D, provided with its milled periphery M, mounted on pivoted shaft C, and carrying weight E,—said shaft with its pivots adapted to bearings, J and J^2 ,—the index disks, B, carried on the outer ends of said pivots, and the supporter, G, with its standards, 16 and 17, substantially as set forth.

2. In a leveling instrument, the combination of the front and rear parts of the stock,—the double push-pin, *a*, interposed in grooves between said parts and operable from the top

or bottom of the instrument,—the notch, *b*, adapted to receive the oscillating rod, *c*,—said rod jointed to the stock at *d*,—spring S^3 , turned up through the hole, *i*, in said rod,—the arms, *f* and f^2 , of said rod,—the locking disk D, actuatable by said arms,—the shaft C, carrying said disk centrally on said shaft and carrying the index disks B, on the outer ends of its pivots, and the supporter G, with its standards, 16 and 17, substantially as set forth.

3. In a leveling instrument, the combination of the front and rear parts of the stock,—the supporter G, attached to and connecting said parts by fastenings, H, H, H, and supporting the pivoted shaft C, in the bearings J and J^2 , of its standards 16 and 17,—said shaft thus supported and having the locking disk D, rigidly affixed thereto,—said disk carrying the weight E, and having its extreme periphery finely milled or toothed and thereby adapted to engage the soles L and L^2 , of the clamps K and K^2 , and thus lock the instrument, substantially as set forth.

4. In a leveling instrument, the combination of the stock,—the clamp-carriers jointed to the stock and connected by bar, *o*,—the clamps adapted to close on opposite edges of the milled periphery of the locking disk,—said locking disk,—the shaft carrying said disk and the weight attached thereto and having its pivots supported in the bearings of the standards of supporter attached to the front and rear parts of the stock, substantially as set forth.

5. As a means for unlocking the clamps from the locking disk of a leveling instrument by pressure on one or more push-pins, the combination of the front and rear parts, A^2 and A^3 , of the stock, A,—the mainspring S, bearing under point P, of clamp-carrier 18,—the shoulder X, on push-pin A^2 ,—the catch W formed on push-pin a^2 and adapted to engage catch V on extension T,—said catch V,—said extension, T,—bar Q carrying said extension and centrally jointed to the stock at *l*, and also jointed at r^3 to upper inner end of push-pin a^4 , and at r^4 to the lower inner end of push-pin a^2 , and said push pins a^2 and a^4 jointed to opposite ends of bar Q, substantially as set forth.

6. In a leveling instrument, the combination of the clamp-carriers, 18 and 19, jointed to the stock at *m* and m^2 , and connected by means of bar, *o*, jointed to said carriers at *n* and n^2 ,—the clamps, K and K^2 , on said carriers and provided with soles L and L^2 ,—the milled periphery, M, of locking disk, D,—said locking disk mounted on pivoted shaft, C, and carrying weight, E,—said shaft with its pivots supported in bearings, J and J^2 ,—the index disks, B, attached to and carried on the outer ends of said pivots, and the supporter, G, with its standards, 16 and 17, substantially as set forth.

7. As a means of locking the clamps on the locking disk of a leveling instrument by press-

ure on one or more push-pins, the combination of the front and rear parts, A^2 and A^3 , of the stock A,—the push-pins a^3 and a^5 ,—the bar R jointed to the inner ends of said push-pins at r and r^2 , and centrally jointed to the stock at l^2 ,—the upward extension T, from said bar,—the catch V on said extension,—the catch W on push-pin a^2 , and the spring S^2 pressing upward on bar R, substantially as set forth.

8. In a leveling instrument, the combination of the stock,—the mainspring actuating the clamp-carriers by upward pressure under point P,—the clamp carriers jointed to the stock,—the bar connecting said carriers,—the clamps,—the locking disk and the weight carried thereby,—the pivoted shaft supported in the bearings of the standards by means of its pivots, and the index disks carried on said pivots, substantially as set forth.

9. In a leveling instrument, the locking disk,—the weight attached thereto and the milled or toothed periphery thereof,—the pivoted shaft carrying said disk,—the shaft supporter and its standards provided with pivot-bearings,—the pivots and the index disks carried thereby on the outer ends thereof, and the front and rear parts of the stock to which the shaft supporter is attached,—in combination with the herein described means and devices for locking the locking disk and holding said disk, the pivoted shaft and the index disks securely in locked position, substantially as set forth.

10. In a leveling instrument, the locking disk,—the weight attached thereto and the milled or toothed edge thereof,—the pivoted shaft carrying said disk,—the shaft supporter and its standards provided with pivot bearings,—the pivots and the index disks carried thereby on the outer ends thereof, and the front and rear parts of the stock to which the shaft supporter is attached,—in combination with the herein described means and devices for unlocking the locking disk and releasing said disk and the pivoted shaft and index disks from their previously locked positions, substantially as set forth.

11. In a leveling instrument, the combination of the stock,—the oscillating rod jointed thereto,—the double push-pin to actuate said rod,—the notch in said push-pin adapted to receive said rod,—the spring extending through a hole in said rod, the two arms of said rod adapted to oscillate the locking disk,—said locking disk,—the weight carried by said disk,—the shaft and the index disks attached to the outer ends of the pivots thereof, substantially as set forth.

12. In a leveling instrument, the locking disk,—the weight attached thereto and the milled or toothed edge thereof,—the pivoted shaft carrying said disk,—the shaft supporter and its standards provided with pivot bearings,—the pivots and the index disks carried thereby on the outer ends thereof, and the front and rear longitudinal parts of the stock

to which the shaft supporter is attached,—in combination with the means and devices herein described for imparting an oscillatory motion to the combined locking disk, weight, pivoted shaft and index disks before taking a measurement by the instrument, substantially as set forth.

13. As means and devices for locking and unlocking the locking disk and thereby holding in position or releasing said disk and its connected parts at will, the push-pins a^2 and a^4 and the bar Q jointed to their inner ends,—catch W,—shoulder x ,—point P, of carrier 18,—mainspring S, and the carriers 18 and 19 connected by bar, o ,—in combination with push pins a^3 and a^5 ,—bar R, jointed to said push-pins,—spring S^2 , and extension T provided with catch V adapted to engage catch W, substantially as set forth.

14. In a leveling instrument, an oscillating rod attached to the stock and provided with two arms adapted to impart an oscillating motion to a locking disk having a serrulated periphery and carried by a pivoted shaft having index disks attached to the outer ends of its pivots, and said locking disk lockable by clamps to hold said disk and its rigidly connected parts in position, as desired.

15. In a leveling instrument, a locking disk carrying a weight, having its periphery milled or toothed and said disk rigidly attached to a pivoted shaft revoluble on its pivots to the outer ends of which index disks are attached, substantially as set forth.

16. In a leveling instrument, index disks carried on the outer ends of the pivots of a pivoted shaft upheld in the bearings of the standards of a supporter attached to and connecting the front and rear parts of the stock,—said shaft having firmly affixed thereto a locking disk carrying a weight and the periphery of said disk being milled or toothed and thereby adapted to being instantly locked without slipping and held in position by clamps K and K^2 , carried by the clamp carriers 18 and 19, and actuated by a mainspring pressing under point P,—said pressure being transferable at will to said carriers and clamps by tripping the connection of catches V and W, or said pressure may be readily withdrawn from said clamps and carriers by pressure on push-pins a^2 , a^3 , a^4 or a^5 , as required, substantially as set forth.

17. In a leveling instrument, clamps carried by clamp carriers and adapted to the instantaneous locking of the locking disk and the parts rigidly connected therewith by means of a mainspring pressing upward under point P, and which pressure (when the clamps are open) may be tripped and released at will and allowed to instantly close the clamps on the milled periphery of the locking disk by digital pressure on push-pin a^3 or a^5 , substantially as set forth.

18. In a leveling instrument, the instrument stock, consisting of the front and rear parts, A^2 and A^3 , firmly but separably united

by screws or other suitable means and one or both of said parts cut away interiorly or excavated sufficiently to admit and inclose the operable elements of the instrument and permit of their proper attachment to one or both of said parts, in combination with a tablet, W², inserted in the front surface of said stock, substantially as set forth.

19. In a leveling instrument, the instrument stock, consisting of the front and rear parts, A² and A³, firmly but separably united by screws or other suitable means and one or both of said parts cut away or excavated interiorly sufficiently to admit and inclose the operable elements of the instrument and their proper attachment to the interior of one or both of said parts,—the grooves formed in said two parts for the reception and operation between said parts of the push-pins, *a*, *a*², *a*³, *a*⁴ and *a*⁵, and the tablet inserted in the exterior front surface of the instrument stock,—in combination with rod *c*, stops *e* and *e*², spring S³, supporter G, clamp carriers 18 and 19, spring W, bar Q, bar R and spring S²,—all permanently attached to the interior of said stock as shown, substantially as set forth.

20. In a leveling instrument, the instrument stock made in two nearly equal longitudinal parts, A² and A³, firmly but separably united and cut away or formed with sufficient space interiorly to admit and inclose the operable parts of the instrument and said longitudinal parts having grooves formed therein for the admission and free movement between said parts of the push pins *a*, *a*², *a*³, *a*⁴ and *a*⁵, substantially as set forth.

21. In a leveling instrument, the instrument stock made in two nearly equal front and rear longitudinal parts, A² and A³, firmly but separably united and cut away or formed with sufficient space interiorly to admit and inclose the operable elements of the instrument, and said longitudinal parts having

grooves formed in their inner surfaces for the admission and free movement between them of the push-pins *a*, *a*², *a*³, *a*⁴ and *a*⁵,—in combination with the herein described means and devices connected with and actuatable by double push-pin *a*, for imparting an oscillatory motion to the locking disk and the parts rigidly connected therewith, and the means and devices connected with and actuatable by push pins *a*², *a*³, *a*⁴, and *a*⁵, for locking and unlocking the locking disk and the parts rigidly connected therewith, substantially as set forth.

22. The stops *e* and *e*², inserted in the stock, and the shoulders formed in double push pin *a*, substantially as and for the purposes set forth.

23. In a leveling instrument, the herein described means and devices for tripping the engaged catches, V and W, and effecting the instantaneous locking of the locking disk,—consisting of the push pins *a*³ and *a*⁵, jointed to the outer ends of bar R,—said bar centrally jointed to the stock, actuated by spring S³, provided with its upward extension T, on which is formed catch V, adapted to engage catch W, formed on push-pin *a*²,—point P, of clamp carrier 18, pressed upward against shoulder *x*, of push-pin *a*², by mainspring S, and thus holding the clamps unlocked from the periphery of the locking disk until by pressure on the outer ends of one or both of the push pins, *a*³, *a*⁵, catch V is tripped from its engagement with catch W, and being thus released the mainspring presses point P upward, closes the clamps on opposite sides of the locking disk and thereby instantaneously locking said disk, weight, shaft and index disks in position, substantially as set forth.

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Witnesses:

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