WEAVER®

Safety Lane

Electric Eye
Headlight Tester Manual

Model Year 1937

DISCONTINUED No Parts Are Available

Section One – Operating Instructions

Section Two – Manual of Headlight Service

Section Three – Headlight Service and How to Sell It

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OPERATING INSTRUCTIONS

for Using

Weaver Electric Eye Headlight Tester

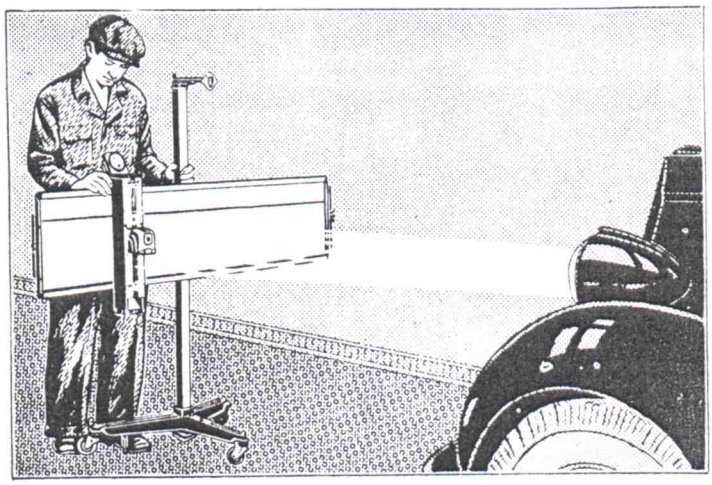
IMPORTANT —

ESTABLISH A

HEADLIGHT SERVICE DEPARTMENT

IN YOUR SHOP

WHERE ALL TESTS CAN BE MADE WITH ASSURED ACCURACY



Headlight adjustment is one of the most exacting services from a standpoint of accuracy. Variation of just one degree from proper aim means deflection of the beam 3 1/2 feet out of line at a distance of 200 feet — enough perhaps to throw the "hot spot" off the road and seriously reduce the distance of effective illumination and vision.

Under such circumstances it is obvious that your Weaver Electric Eye Headlight Tester, or any other device, should not be used "just anywhere" on the garage floor. Precautions should be taken to see that the Tester stands on a PERFECTLY flat place, and that both car and Tester are in the same plane — perferably level.

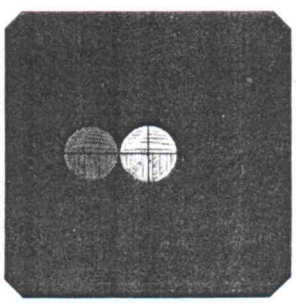


FIG. 1

The Testers are calibrated at the factory for a perfectly level floor, and before attempting to service headlights, test the floor where Tester is to be used as to its suitability for headlight work. First make sure that the spot where the Tester is to stand is quite smooth —enough so that the Tester wheels may move wherever necessary without meeting bumps or hollows that will tilt the screen. Then place the Tester in this smooth area, and drive a car to suitable working distance. Adjust the Tester screen up or down until both images on the ground glass are squarely centered on the horizontal cross hair with white image squarely centered on vertical cross hair, as in Fig. 1. Measure carefully the height of headlight center above floor and cut

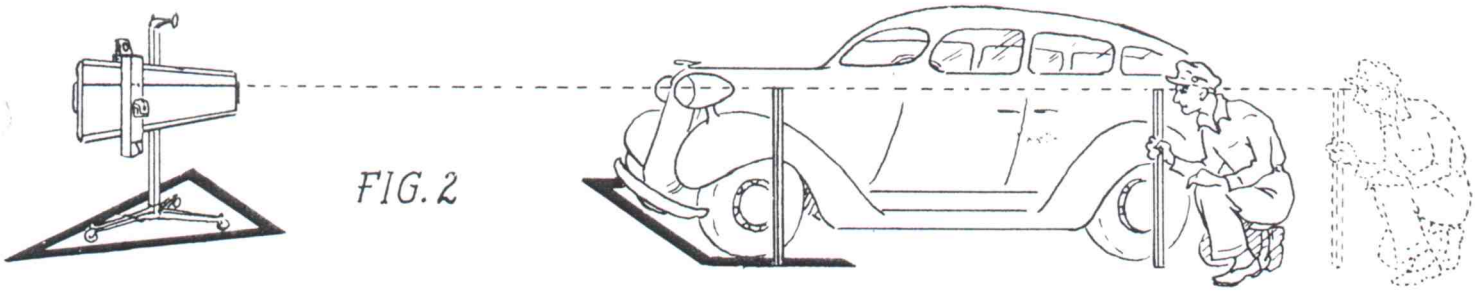


FIG. 2

two sticks to this exact length. Place beside front and rear wheels (as in Fig. 2) and sight along their tops. They should line up exactly with the black line on the screen panel. If not in line, move Tester screen up or down until the black line lines up with sticks, and adjust screws at back of screen so that the image comes on cross hair. (See Fig. 3).

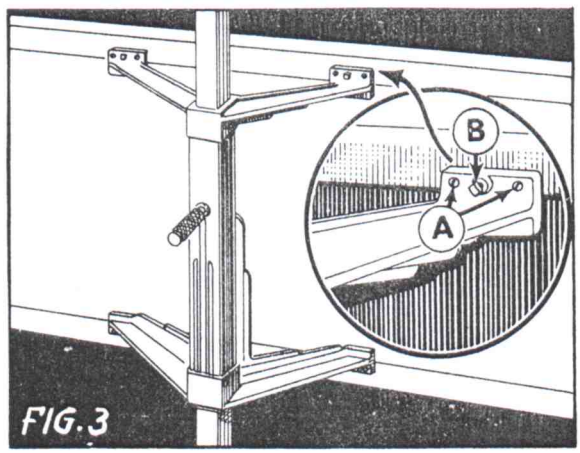


FIG.3

Having found a suitable location for headlight service, we earnestly recommend that you mark it by painting lines on the floor, using the dimensions shown in Fig. 4. Note that the inner edge of the car guide line should indicate the correct location of the headlight lenses — cars to be tested should be stopped with lenses directly over the near edge of the line. Such markings not only serve to keep your headlight testing accurate, but will departmentalize and dress up your headlight service.

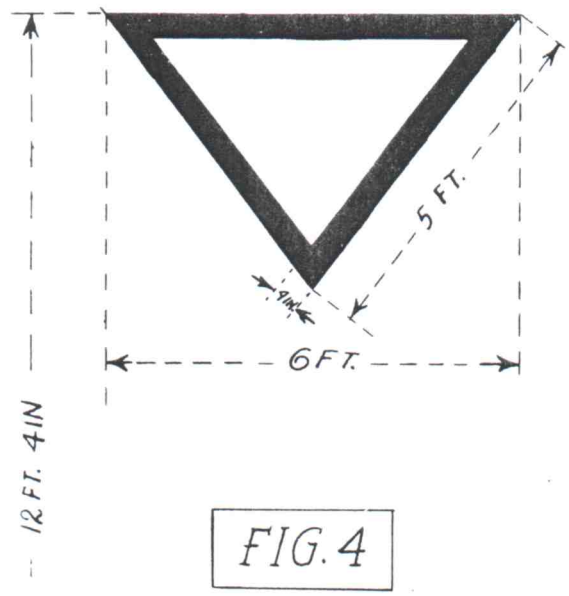
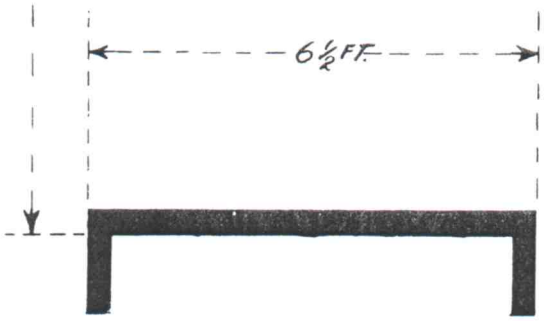
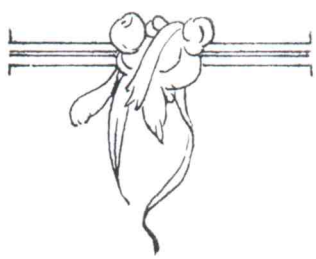


FIG.4

Most shops find it a real help to use a portable cabinet with drawers for their headlight work. It will be found convenient to hold tools, cotton, metal polish, bulbs and other parts. Those who really "do a job" of headlight service will mount a voltmeter in their cabinet, and be prepared to test the actual voltage delivered to the headlights. Weaver does not make such a cabinet — we merely recommend it as a great convenience.





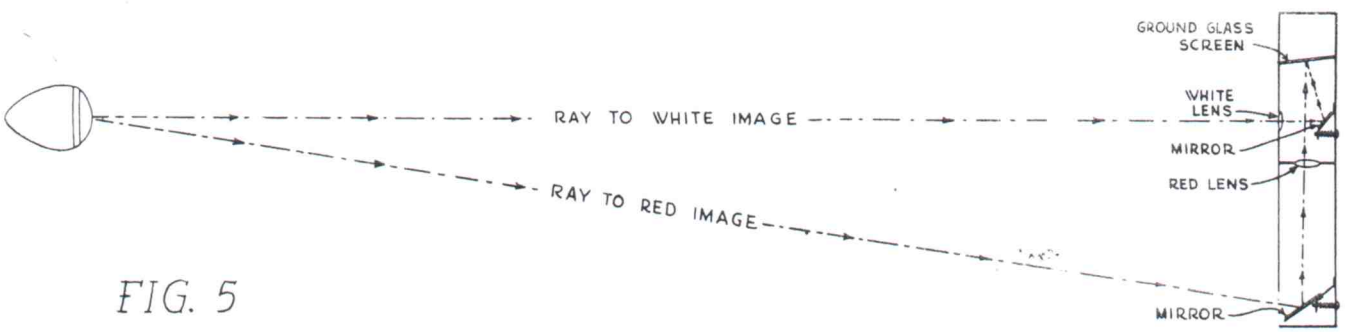


FIG. 5

Diagrammatic cross section showing how the Optoscope works

HOW TO USE THE ELECTRIC EYE TESTER

1. PLACING THE TESTER

(a) Set the Tester about ten feet in front of the car (avoid direct sunlight) and with the car lights turned off, adjust the meter to zero using the knob on the face of the dial. This eliminates the effect of daylight on the meter, so that the entire reading represents the illumination of the headlights alone.

(b) Turn on the car headlights to the highest and brightest beam. You can easily tell which beam is which by the pattern on the screen of the Tester. Most modern cars change from the high beam to passing lights by means of a foot switch, usually placed at the left of the clutch pedal. In adjusting to the high beam, watch the pattern on the screen and make sure the wiring is not crossed (see NOTE to instruction (k).

(c) Place the Optoscope approximately straight in front of one of the headlights. As you look in the top of the Optoscope you will see a ground glass (see Fig. 1) on which appear two images of the headlight — one white and the other red. Move the screen up or down until the white image is centered on the horizontal cross line (the line parallel with the screen). It is easy to center this image since the exact center will either show the bright spot of the bulb filament, or a dark spot if the filament is shielded.

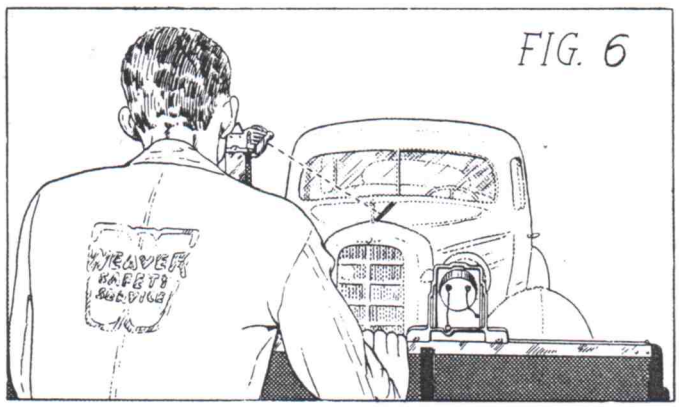
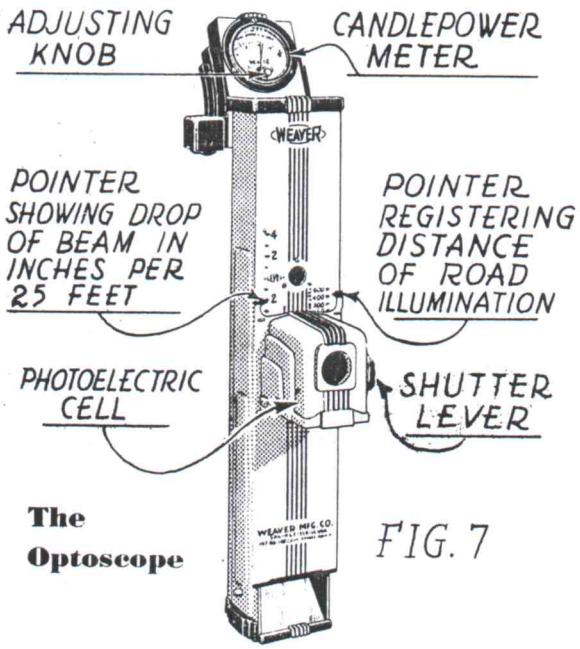


FIG. 6

(d) Next move the Tester toward or away from the car until the red image is also centered on the horizontal cross line. This places the Tester exactly ten feet from the headlight.

(e) Sight over the Tester to line it up squarely with the car, using the sights to aim as if to shoot a bullet straight along the hinge of the hood (see Fig. 6).

(f) Look the Tester in place by pressing the foot lock at the rear of the Tester. Check at once with the Optoscope to make sure you have not changed the distance of the Tester from the car.



The Optoscope FIG. 7

2. TESTING THE AIM OR BEAM ANGLE

(g) Adjust the screen again exactly for height, same as in instruction (c) above. This places the line on the screen and the word "LEVEL" on the Optoscope at the same height above the floor as the headlight center. Next slide the Optoscope to right or left along the screen until the white image is centered on the vertical cross line (the line at right angles to the screen). This places the Optoscope squarely in front of the headlight.

(h) Move the photoelectric cell up or down on the face of the Optoscope until the highest possible reading is obtained on the meter. Note: Keep the glass face of the Photoelectric Cell free from dust by polishing occasionally with a soft cloth.

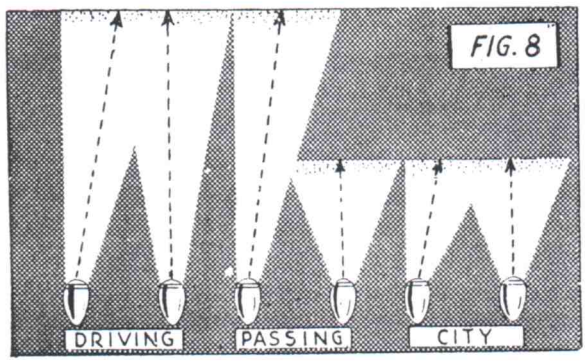


FIG. 8

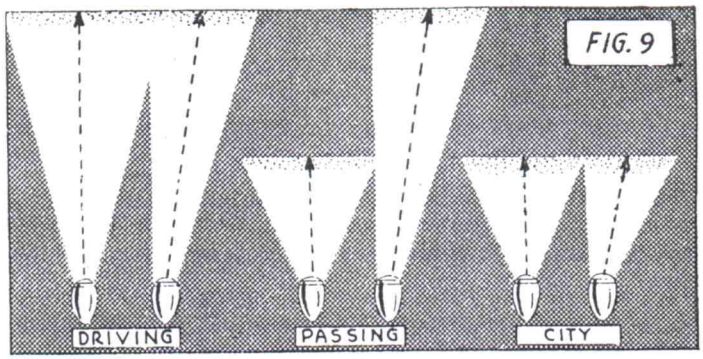


FIG. 9

IMPORTANT: If headlights are so bright that they overtax capacity of the candlepower meter, use the shutter (see Fig. 7) before the photoelectric cell, which cuts the aperature approximately in half. With shutter in use, lights will have about double the candlepower registered on the meter.

The pointer at the left now indicates the elevation or drop of the beam in inches for each 25 feet. (See Fig. 7). Thus if the pointer registers 2 below level on the Optoscope, the beam drops 2 inches in 25 ft. The pointer at the right gives the approximate distance of effective road illumination in feet — an exclusive patented feature of the Weaver Electric Eye Headlight Tester. Move the Optoscope to right or left on the screen and see if it is possible to increase the reading on the meter. The point of the highest reading indicates the beam center. If it is slightly to the right of straight ahead, read instruction (k) carefully before making adjustment.

3. TESTING AND ADJUSTING FOCUS

(i) After placing the Optoscope in position to secure the highest possible reading on the meter (or in other words, at beam center) turn the focus adjusting screw slightly forward or backward to increase if possible the reading on the meter. The point of highest reading shows the correct focus of the light. Note that most newer cars are equipped with headlights having fixed focus, hence adjustment is unnecessary.

4. ADJUSTING THE AIM

(j) The actual mechanical operation of changing the aim of the headlight is so simple as to require no description here. The requirements of different State Laws are so varied that they cannot be summarized in these pages. The operator is urged to familiarize himself with the requirements of his own State - and to use the standards contained in instruction (m) when no State or local ordinance applies. On page 5 are shown locations of adjusting screws on the various types of headlights in common use today.

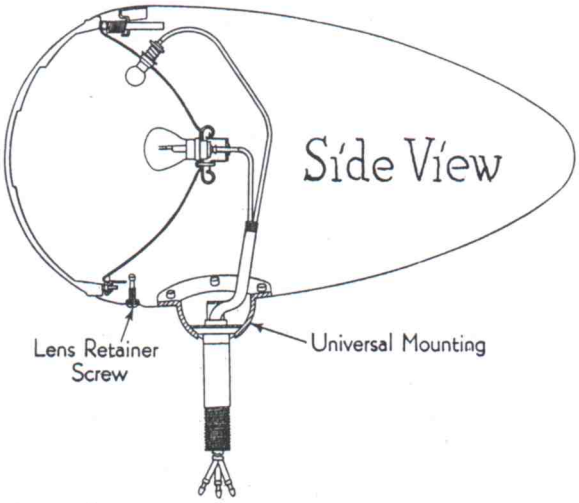
5. ASSYMMETRIC OR "CROSS BEAMS"

(k) Asymmetric headlights are coming into more general use year after year, and the mechanic who would render efficient headlight service must learn to recognize and identify them. Most such headlights have lenses marked "RIGHT" and "LEFT", since they are not interchangeable and must be used on the side where they belong. When servicing cars with which you are not familiar, this RIGHT-LEFT marking will immediately lead you to suspect asymmetric headlights. To determine for sure if they are asymmetric, watch the beam pattern on the screen of the Headlight Tester as you change from driving to passing beam and back again. With asymmetric type headlights, only one beam changes, the other remaining in the same position for both driving and passing.

There are two types of asymmetric or cross beam lights in common use today. One is shown in Fig. 8, used on Chevrolet, Oldsmobile, Buick, etc. Note that the left headlight beam is aimed 2 1/2° to the right, and does not drop for passing. The right beam is aimed straight ahead, and drops for passing.

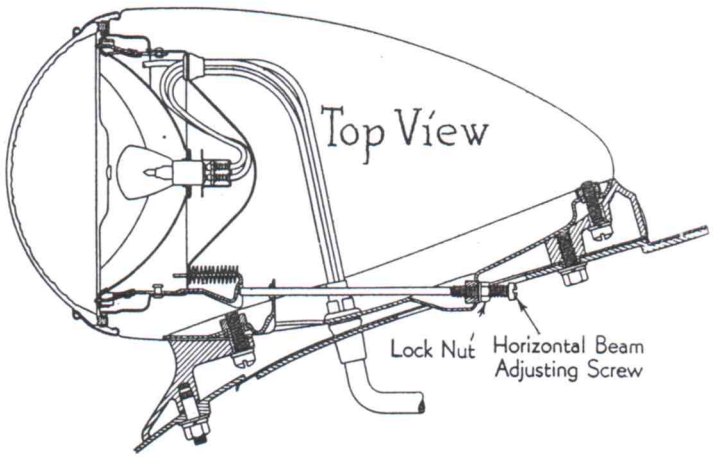
Location of Headlight Adjusting Screws

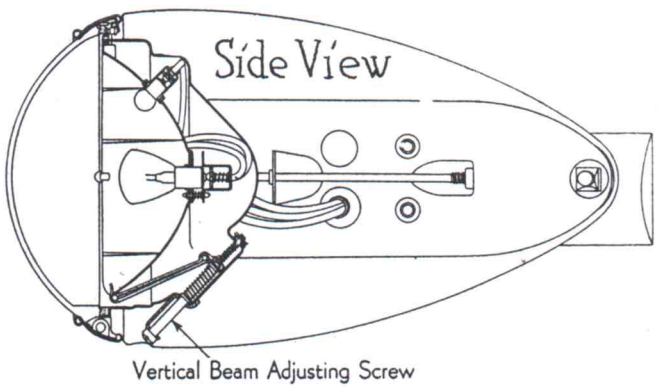
UNIVERSAL MOUNTING



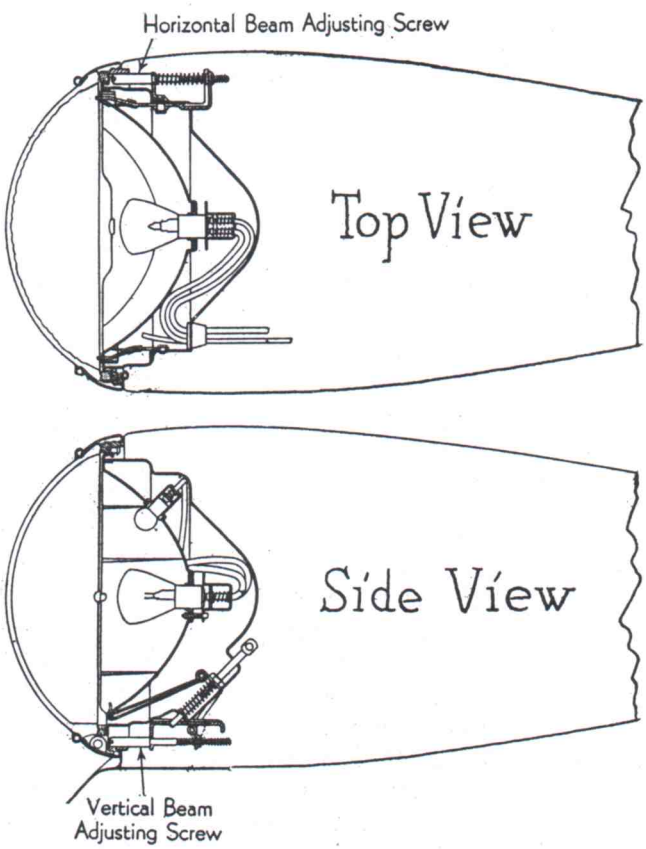
With this type mounting loosen the lamp mounting bolt nuts sufficiently to permit the lamps to be moved in any direction on their brackets. As soon as one lamp is aimed correctly, the nut on that lamp bracket should be tightened securely.

RADIATOR MOUNTED

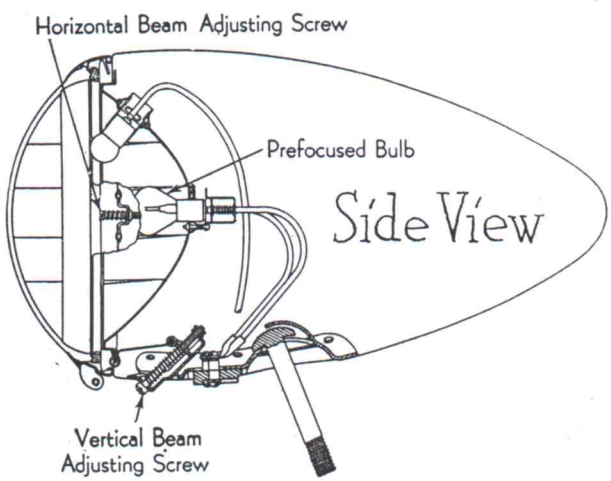




FENDER MOUNTED



TILTING REFLECTOR



CHRYSLER & DE SOTO AIRFLOW MODELS

On these cars, remove the outer rim of headlight. This gives access to three adjusting screws by which aim can be adjusted either horizontally or vertically without removing lens.

Illustrations reproduced by courtesy of MoToR, the Automotive Business Magazine

The second type asymmetric beam is shown in Fig. 9 and is used on Chrysler, Dodge, Packard, etc. Note that in this case the right headlight beam is aimed 2 1/2° to the right and does not drop for passing. The left headlight beam is aimed straight ahead and drops for passing.

In adjusting and aiming asymmetric beam headlights, obviously the mechanic must first discover which beam drops for passing and aim it straight forward, with the customary 2" drop. Then the stationary beam is aimed 2 1/2° to the right of straight forward, and given the same 2" drop (i.e. 2 inches in 25 feet). Use the gun sight to line up the Tester with the center line of the car.

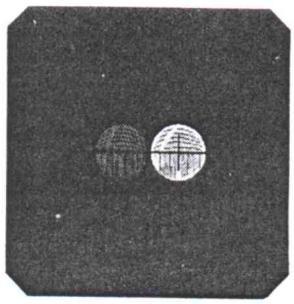
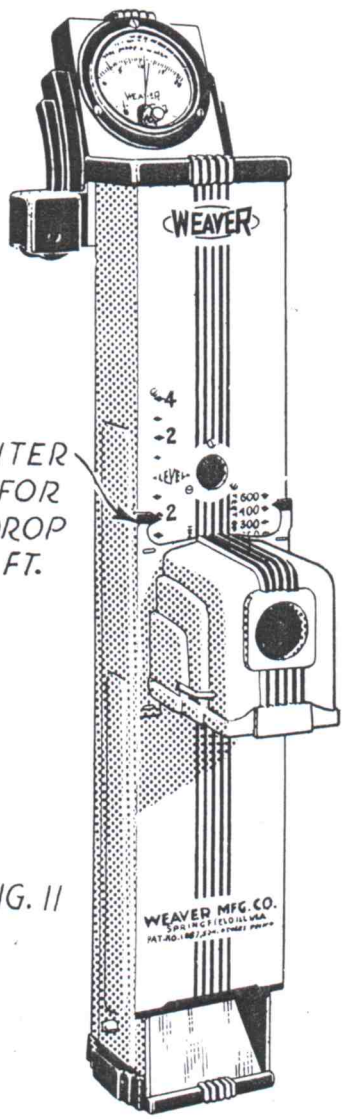


FIG. 10

When the white image on the Optoscope screen is centered on the horizontal cross hair, the painted line on the screen (and the word "LEVEL" on the Optoscope are level with the center of the headlights.

Move the Tester forward or backward until both red and white images are centered on the horizontal cross hair. This places the Tester exactly ten feet from the headlights. Recheck with gun sight to make sure you are properly lined up, and lock the Tester to the floor.



POINTER SET FOR 2 IN. DROP IN 25 FT.

FIG. 11

When aiming the beam that drops, (the right headlight in Fig. 8 on the left headlight in Fig. 9) slide the Optoscope right or left along the screen until the white image is centered on the vertical cross hair, to the position shown in Fig. 3. This places it squarely in front of the headlight. Slide the photoelectric cell up or down until the pointer shows 2" below level as in Fig. 4. Now adjust the headlight right and left, up and down, to give the maximum candlepower reading possible.

When aiming the stationary beam (the left headlight in Fig. 8 or the right headlight in Fig. 9) slide the Optoscope left or right along the screen until the white image is centered on the vertical cross hair, to the position shown in Fig. 1. This places it squarely in front of the headlight. Since this beam should be aimed 2 1/2° to the right, the Optoscope should now be moved exactly 5 1/4 inches to the right. If you have one of the newer Testers, this will bring the white image squarely centered on a short vertical cross line, as shown in Fig. 10. (With this short cross line, the 5 1/4 inch measurement is unnecessary — just place the Optoscope so the image is centered on the short cross line; no need to place the Optoscope straight ahead first). Now set the photoelectric cell so the pointer is aimed at 2" below level (as in Fig. 11) and adjust the headlight up or down, right or left as necessary, to give the highest possible candlepower reading.

NOTE: Occasionally you may find by watching the pattern on the screen when the foot switch is pressed, that the left beam goes up when the right beam drops (or vice versa). This indicates that the wires leading to one of the headlights have been crossed. To correct, the wires leading to the bulb socket in one headlight should be interchanged. This will make both lights raise and lower together as they should. This applies to ordinary headlights, not the multibeam type.

6. INCREASING ROAD ILLUMINATION

(l) When a headlight falls below minimum brilliance (as indicated by the red line on the meter) it is imperative to give the driver adequate illumination. As a matter of fact, most headlights should register 10 or over on the meter if properly serviced. Polishing the reflectors and lenses, the bulbs too if dirty, and securing correct focus will show definite results on the meter. Replacement of worn bulbs may be necessary — they lose brilliance as they grow older. Any or all of the following may contribute to poor illumination:

Dirty lenses or bulbs
Rusty or dirty reflectors
Defective wiring
Poor ground connections
Corroded or dirty switch contacts
Battery not fully charged
Old, weak bulbs
Improper focus

NOTE: The reading on the meter is given directly in thousands of candlepower. A reading of 6 means 6000 candlepower. Minimum intensity under normal weather conditions should be not less than 7500 candlepower, or 3700 for each light. Hence the red line on the meter at 3.75 indicating minimum illumination which should be permitted. Good headlights on modern cars will generally give a reading of 10,000 candlepower or over for each headlight.

7. SERVICE STANDARDS

(m) Special requirements of State or local ordinances should be followed carefully. When no such ordinances govern, the following standards will be found generally applicable:

AIM should be straight ahead (except for multibeam type lamps as described in instruction (k) and should drop 2 inches in 25 feet (see instruction (h)).

FOCUS should be adjusted carefully as described in instruction (i).

BRILLIANCE should be stepped up as much as possible, with the red line on the meter as an absolute minimum for any car or truck. Any modern car capable of modern highway speeds should register 100 or more.

8. A MERCHANDISING UNIT

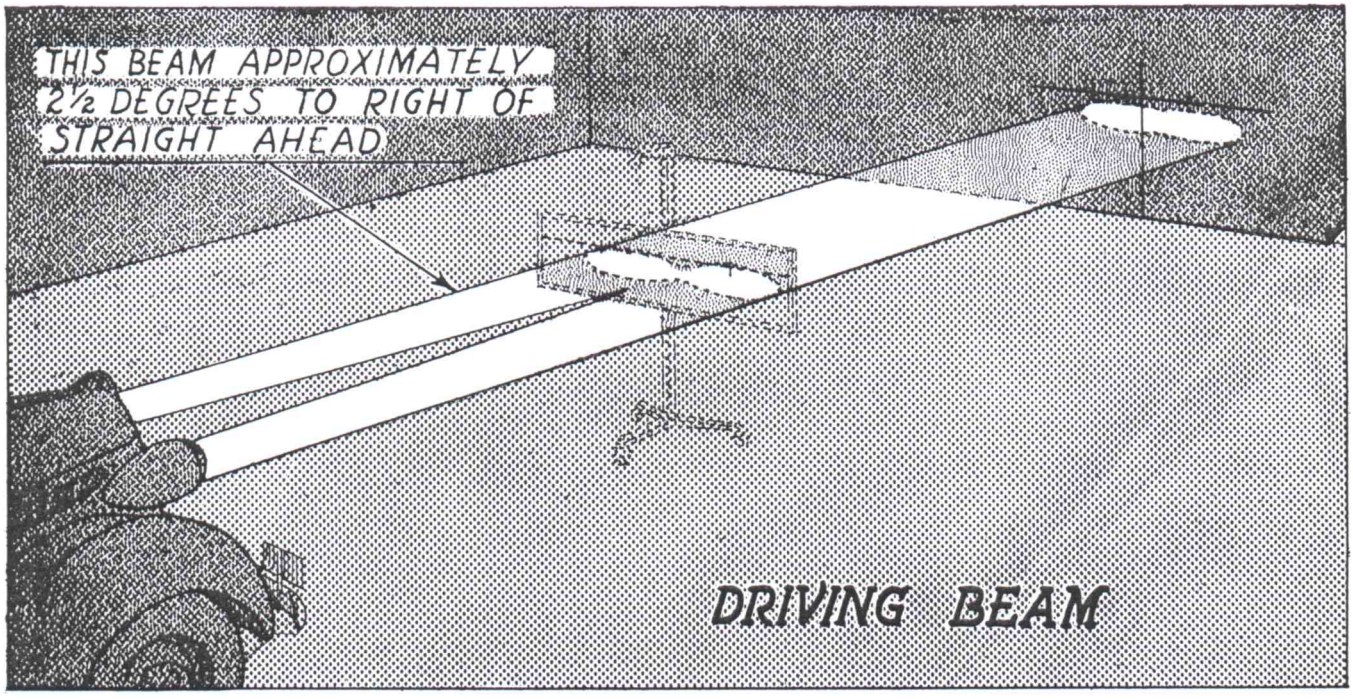
(n) You will not fail to recognize the merchandising possibilities of the Weaver Electric Eye Headlight Tester. Show your customer the pattern his headlight beams make on the screen, and call his attention to the readings of the meter. After each successive adjustment show how much you have increased his road illumination - how polishing the reflectors and lenses, changing the bulbs, and each other operation has resulted in better lights. With this equipment you can SELL your headlight service in a manner possible with no other equipment on the market. Capitalize this fact to sell more service, better please your customers, and make more profit for yourself.

9. "HEADLIGHT SERVICE — How to Sell It"

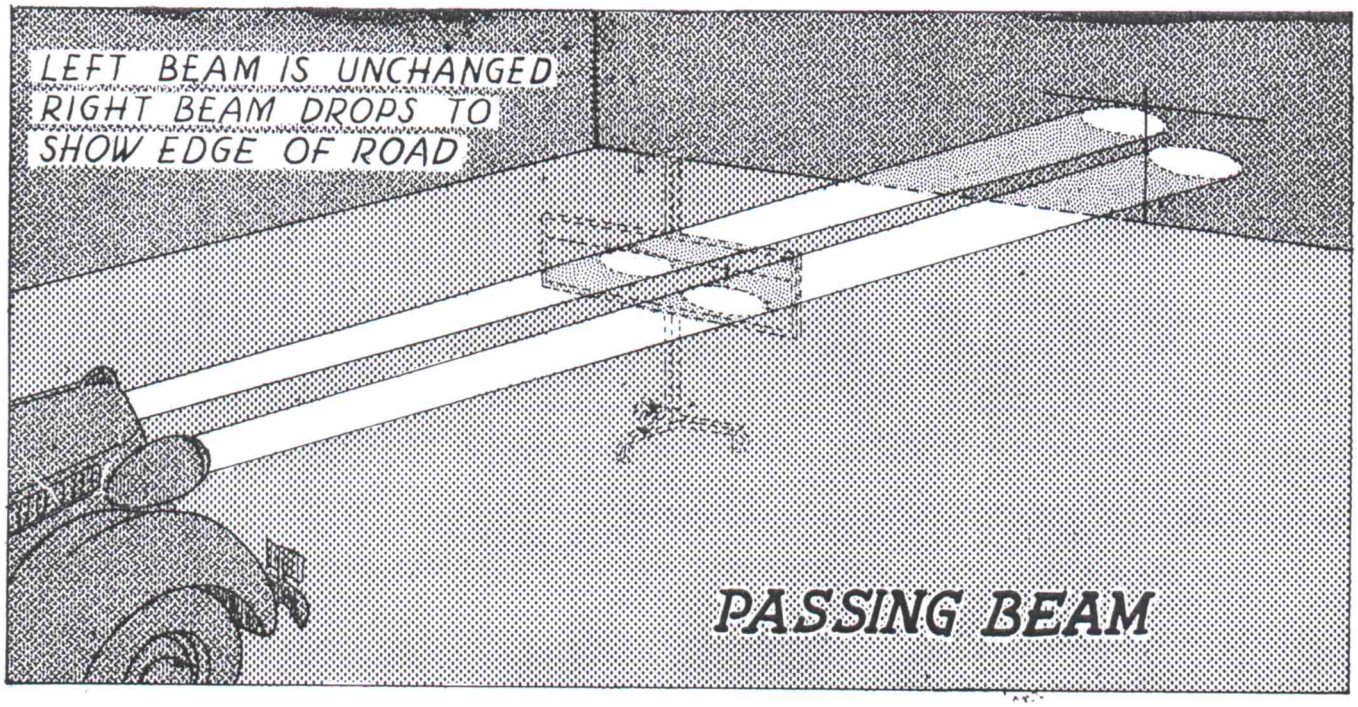
With your Weaver Electric Eye Headlight Tester comes a book bearing the above title. We urge you to read it carefully, because it contains not only sales helps, but additional valuable service information.

We call your particular attention to the Weaver Manual of Headlight Service which is furnished with your Tester, and which we believe will prove of inestimable value to service men who are interested to build a profitable Headlight Service Department.

ASYMMETRIC BEAMS AS THEY APPEAR ON A WALL 25 FEET AWAY — AND ON THE TESTER SCREEN AT CUSTOMARY 10 FOOT WORKING DISTANCE



These illustrations show operation of the driving and passing beams of the type shown in Fig. 8 — used on most General Motors cars and others. Note that Weaver Electric Eye Tester checks beams individually, before they fuse. Photo-electric cell locates "hot spot" or beam centers.



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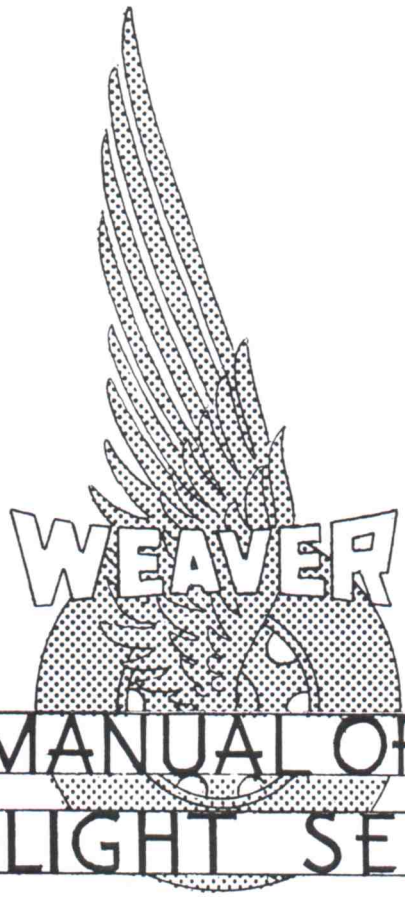
WEAVER INDUSTRIES, LTD., Chatham, Ontario, Canada
Printed In U. S. A.

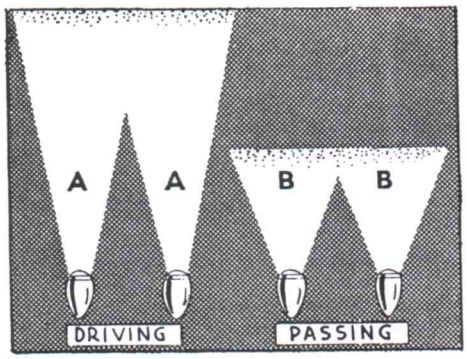


MANUAL OF HEADLIGHT SERVICE

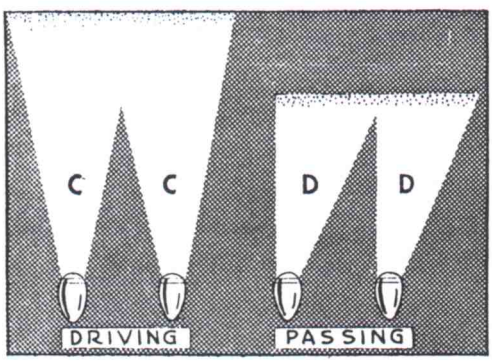
For PROVIDING ADEQUATE, WELL AIMED ROAD LIGHT

HEADLIGHTS IN GENERAL USE

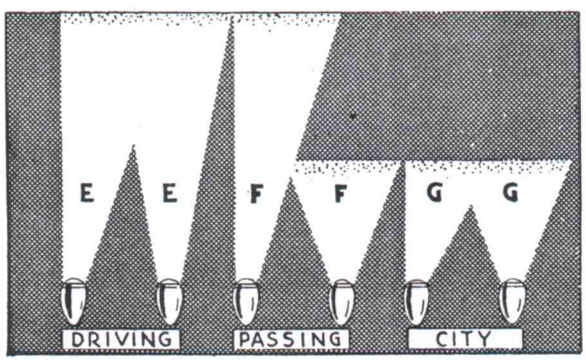
There are four principal types of headlights in general use today. Each has its own individual means of changing to a passing beam. In the illustrations of these four types which are shown on page 3, we have designated each separate beam by letter. On page 4 are shown how these various beams should appear on the screen of the Weaver Photoelectric Headlight Tester when the headlights are properly aimed. Work of testing the headlights should be performed with beams A, C, E or H. After correct aim of these beams has been secured, operate the switch to show the passing and city beams, and compare with illustrations showing how they should look on the screen. This will definitely show if lead wires have been crossed, as sometimes happens.



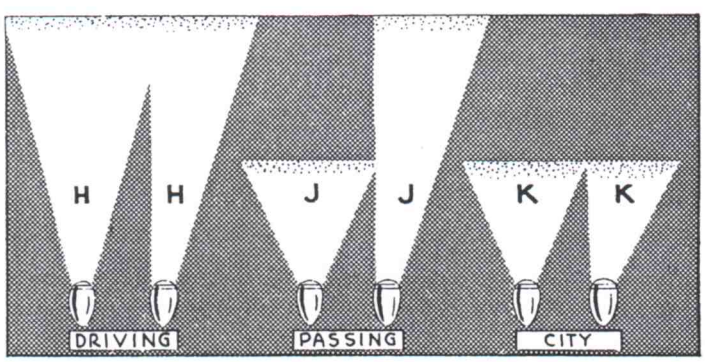
Older style dual beam headlights merely drop for passing. The passing beam is customarily used for city driving.



Newer style dual beam headlights drop slightly and shift to the right for passing. The passing beam is used for city driving. These are used on Hudson, Terreplane, Nash, LaFayette, Studebaker, etc.



This type of light will be found on many of the newer General Motors cars. The left beam is aimed slightly to the right. For passing, this beam remains unchanged, while the right beam drops. Change from driving to passing beam is made with a foot control. A third pair of beams (controlled by dash switch) is used for city driving.



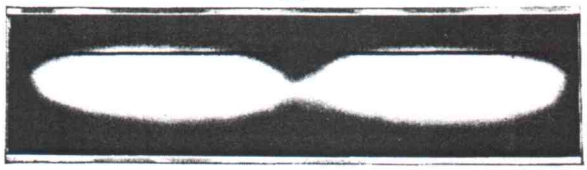
This type of light was used on most Chrysler products (up to and including 1935 models), as well as on Packards (1935 and later). The right headlight beam is aimed slightly to the right. For passing, this beam remains unchanged, while the left beam drops. Change from driving to passing beam is made with a foot control. A third pair of beams (controlled by dash switch) is used for city driving.

BEAM PATTERNS ON THE PHOTOELECTRIC HEADLIGHT TESTER SCREEN

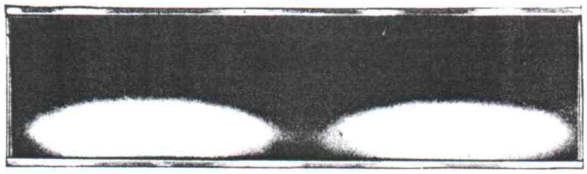
A Headlight reflector is so curved as to reflect about 2/3 of the light rays that emanate from the bulb, and re-direct them into a definite path which is called the headlight beam. At a distance ten feet ahead of the car the beams from the two headlights have not merged — hence the two beam patterns on the screen of the Weaver Photoelectric Headlight Tester are separate and distinct, the Tester being used at a standard distance of ten feet from the headlights.

The following illustrations show how the beams should appear on the Tester screen. Refer to the beams shown on page 3, and compare with the pattern below indicated by the corresponding letter of the alphabet.

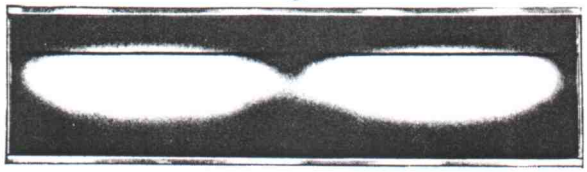
A



B



C



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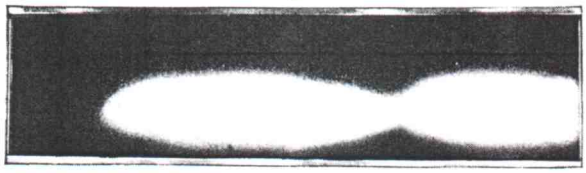

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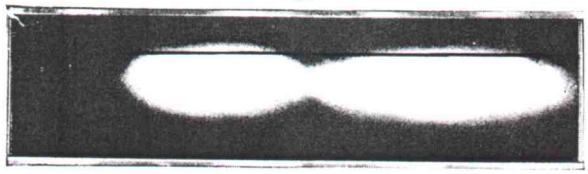

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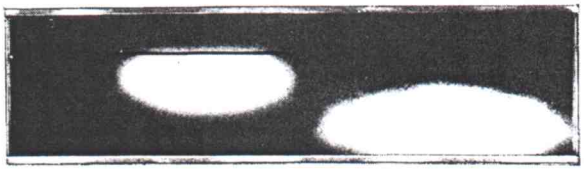

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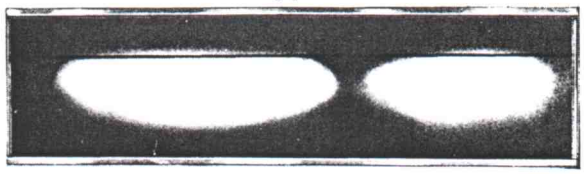

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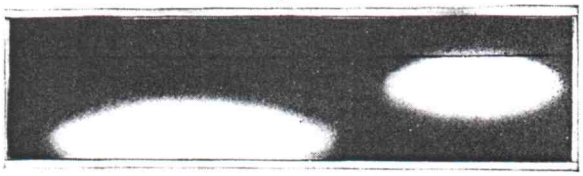

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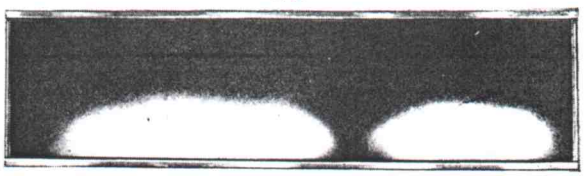


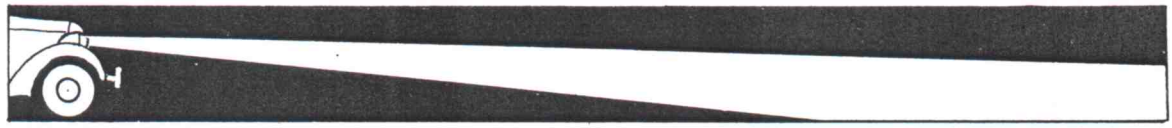
LOADING ALLOWANCE WHEN ADJUSTING HEADLIGHT AIM

Since most headlight service is rendered with the vehicle empty, a certain "loading allowance" is necessary when aiming the headlights to compensate for the change in the angle of the vehicle when weight of passengers(or load) compresses the rear springs.

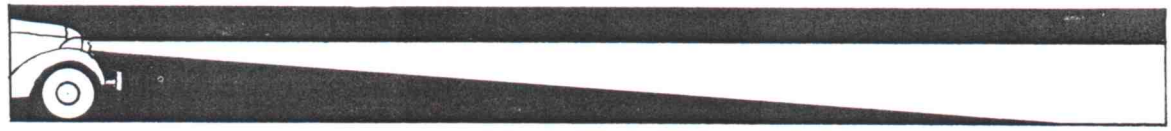
In many States the Headlight Code specifies loading allowance for making headlight adjustments. We urgently recommend that State or local ordinances be followed accurately in all cases. For those communities where local statutes do NOT govern, the following general practice will give satisfactory results.

The "hot spot" or high intensity part of the headlight beam has a noticeable depth. As the photoelectric cell on the Optoscope is moved up and down through the beam, you will notice there is a range or band about 1/2 to 1 inch high at which the pointer on the candlepower meter remains at approximately the same high reading, while the photoelectric cell moves through it. Above this band or below it, the pointer drops off sharply. This band marks the visual "hot spot" of the beam. At a distance of 100 yards from the car this "hot spot" is usually about 10 feet deep.

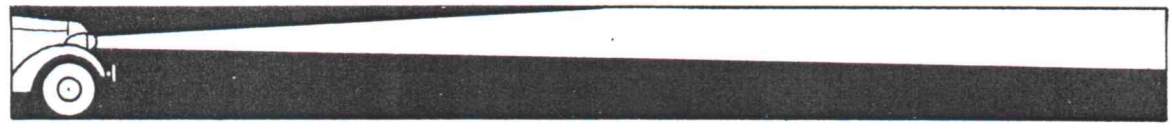
When aiming headlights with the vehicle empty, the upper edge of this "hot spot" should be aimed to give about 500 feet of road illumination, as shown by the pointer on the Optoscope. This gives the beam an aim something like this:



With one or two passengers in the front seat of the car, the compression of the soft rear springs usually tilts the beam very slightly upward, bringing the top of the "hot spot" about level, like this.



Then when passengers are added in the rear seat, further compression of the rear springs still further raises the beam, but the bottom of the "hot spot" still strikes the road and gives adequate road illumination. With the car heavily loaded, the headlights may throw a beam like this:



All of the above instructions as to aim, of course, apply to the country driving beam, or highest beam. Drivers must depress their beams when passing, to avoid glare. On most cars the lights are changed to a passing beam by pressure on a foot switch. This passing beam is sufficiently lower so that with high beam aimed as above, there will be no glare even with rear seat fully loaded.

In those States having specific requirements regarding the drop of the beam a mark may be made on the face of the Optoscope designating the desired or legal aim. When no specific laws govern headlight aim, we believe aiming the top of the beam for 500 feet road illumination will give the most desirable headlight adjustment.

WHAT TO DO WHEN CANDLEPOWER IS LOW

1. ADJUST FOCUS

Older cars with focussing headlights can sometimes be greatly increased in candlepower. Set the Optoscope and Electric Eye at point of highest reading; then turn the focus adjusting screw in or out to attain point of highest possible beam intensity. This places lights in exact focus. Newer model cars are for the most part equipped with fixed focus headlights on which no such adjustment is possible or necessary.

2. POLISH LENSES AND REFLECTORS

Use NEW, clean cotton and a non-abrasive polish on reflectors. If in bad condition reflectors may have to be re-silvered or replaced.

Check lenses to see that they are of same make as headlights; also to see that lens marked "RIGHT" is on right headlight; "LEFT" on left headlight. It is important that lenses be of the same manufacture as the headlight since prisms are formed to give correct direction to rays coming from reflector of a given shape.

3. CHECK THE BULBS

Imported and "pirate" bulbs should be replaced. Also bulbs that have become blackened or lost efficiency. Compare candlepower with that of a new bulb to determine if replacement is necessary or advisable.

4. TEST THE BATTERY

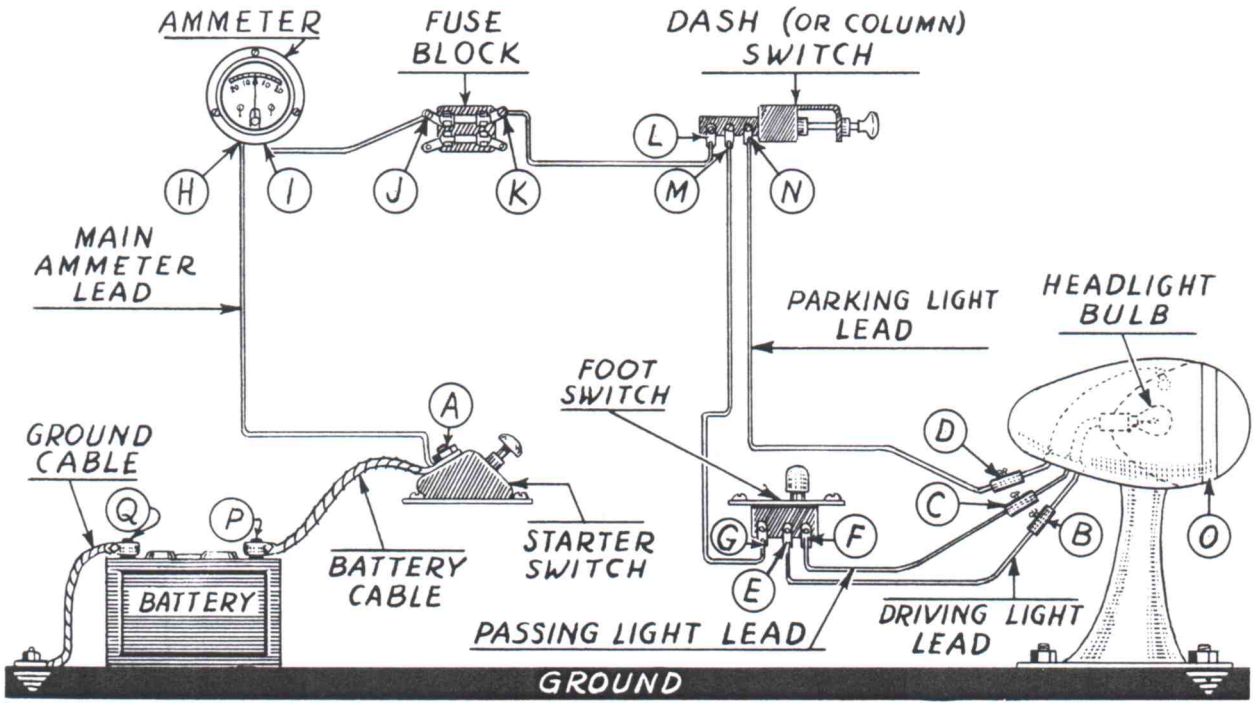
The battery may be strong enough for easy cold weather starting, and still be too weak for effective illumination. Make sure battery is fully charged and in good condition — otherwise recharging or replacement should be recommended.

5. LOCATE RESISTANCE IN THE CIRCUIT

If all of the above service fails to bring headlight candlepower up to normal, resistance in the lighting circuit is usually indicated. Such resistance causes a loss of voltage, with a proportionately GREATER loss in candlepower. Thus if 6 volts will produce 10,000 candlepower from a headlight, reduction of the current to 5 volts reduces the candlepower to 5,600 — a loss of 44%. Resistances are frequently discovered which are greater than this!

You may frequently notice when lights are first turned on, and you set the red hand on your candlepower meter to maximum illumination, that after a few minutes burning the candlepower falls off noticeably. This is NOT usually due to battery depreciation as is commonly supposed, since tests show that a normally charged battery will not suffer noticeable reduction in voltage for 60 to 90 minutes after lights are turned on. What does occur is a gradual heating up of bad connections, which increase the resistance to the electric current and drop the voltage delivered at the headlight. This resistance will usually be found in the ammeter, dash switch, fuse block or foot switch, and is located by following the procedure outlined below.

For this work you will need a "jumper" made of insulated #10 stranded wire (the soft, pliable kind such as is used for brush leads), on one end of which is a spring clip connector, and the other is a pointed rod with wood handle. Any mechanic



can make up such a jumper for himself, which should be about 8 feet long, and the pointer or prod may be of brass or copper, with a sharp point to enable him to prod through the wiring insulation whenever the connectors or terminals are not easily accessible.

1. Turn on the headlights and press the foot switch (if necessary) to make sure the high or driving beam is on. Adjust Headlight Tester and Optoscope to obtain maximum candlepower reading, and set the red hand on the meter to this position.

2. Attach spring clip of jumper to starter switch (A in diagram on page 7) and with the prod, contact the connector of the high beam wiring (B), at the set screw or spring clip. This makes a direct connection between points (A) and (B) with a resistance-free jumper, and in most cars will cause an immediate flare-up of the lights to approximately normal candlepower.

CAUTION: If you touch the connector to the passing beam filament (C) it will cause both filaments to burn simultaneously. This can do no damage, but it WILL cause the candlepower to jump. Similarly touching the connector (D) to parking light will cause parking lights and driving lights to burn simultaneously. This is easy to identify because the parking light is a separate bulb. Identifying connectors (B) and (C) is more difficult, but can be done usually by watching the screen pattern of the headlight beam on the Tester.

If the jumper contact at (A) and (B) causes lights to flare up, proceed with steps 3, 4, 5, etc. in order. If these contacts do NOT raise candlepower of headlights appreciably, then proceed at once with steps 11, 12, 13 etc. to locate bad ground connections or battery cable.

In all of these tests we are assuming that battery is up, lenses are clean, reflectors polished, focus adjusted, and bulbs new.

3. In some cars it is inconvenient to get at the headlight connectors (B). Similar tests may be made by touching the prod to the output side of the foot switch at (E), and a flare-up will indicate resistance in the line between (A) and (E). Similar caution must be observed about touching the passing beam output connection at (F), which will cause both filaments to burn simultaneously and candlepower to

jump. This is very deceptive, since it cannot usually be detected by looking at the lamp — watch the pattern on the Tester screen.

THERE IS NO DANGER in these tests of burning out a headlight bulb or otherwise injuring the electric system. Six volts is all you can possibly deliver to the headlight, and bulbs are made to carry this. The amount that lights will flare up will sometimes amaze you. Your only care needs to be not to overload the candlepower meter and bang the indicator needle against the stop. If necessary put up the 50% shutter before the photoelectric cell, and readjust red hand accordingly.

In some cars some of the various points indicated by letter in the accompanying diagram may be inaccessible or difficult to get at. In such cases the insulated wire may be punctured at the nearest point with the sharp-pointed prod. Hence the desirability of the sharp point, and avoiding touching this point to the ground; which shorts the battery, causes a hot spark, and burns off the prod point.

4. While you are at the foot switch, touch the prod to the input lead (G). The candlepower reading made by shorting (A) to (F) having demonstrated the light volume we ought to be able to get, any falling off of this candlepower by the connection (A) to (G) shows resistance in the foot switch. This is very common, and may be corrected by putting in a new switch (which on some cars may be just as bad, because cheaply made) or by flowing solder over the rivet connections to make a good bond and electric connection.

5. Having demonstrated by the flare-up of lights in Steps 2 and 3 that resistance is causing a drop in voltage between battery and headlights, you should now proceed to locate what part or parts are responsible.

Touch the prod to the input lead of the ammeter (H), shorting out the main ammeter lead. If Tester meter jumps a few hundred candlepower, it indicates the lead-in wire is too small for the load it is expected to carry. It is amazing the number of these that are found overloaded by extras that are added to the car — heaters, radios, and what-have-you.

The simplest, least expensive correction is to run a supplementary, additional wire from starter switch to ammeter, paralleling the one already there. Use #10 or #12 wire, with terminals soldered at the ends, which may be attached to the same connecting posts. The parallel wires may be bound together here and there with tape. This procedure saves tearing out the wiring already installed, and is just as effective. Candlepower will thus be permanently raised to the point secured by shorting from (A) to (H). This having been corrected, readjust the red hand on the candlepower meter to the new level, and do the same after making each permanent repair.

6. Now touch the prod to the output side of the ammeter, at (I). If candlepower increases substantially (say 1000 c. p. or more) it may be sufficient to warrant replacement of the ammeter. This will have to be judged in relation to age and value of car, proportionate share of candlepower that can be so gained, and willingness of customer to spend the amount necessary.

7. Next touch the jumper point to the input side of the fuse block, at (J). If this shows an increase in candlepower as compared to shorting (A) to (I), the lead-wire to the fuse block is probably overloaded. Here or any other place that wires are overloaded, install a supplementary #12 or #14 wire as described in Step 5.

8. The output side of the fuse block should now be tested by touching the prod at (K). Corroded contacts should be cleaned with sandpaper. Check the fuse itself, which may be causing resistance. Cheap, imported fuses are the principal source of trouble, and "pirate" makes are frequently a cause. Test the comparative candlepower reading with a new standard make fuse installed.

9. The main light switch may be on the dash, or at the base of the steering column, depending on make and model of car. Wherever it is, a test at the input side (L) is next in order.

If contact at (L) shows greater candlepower than at (K), supplementary wire may be installed.

10. Next the output side of the main light switch should be tested by contact at (M). If this indicates resistance in the switch, it may be necessary to replace it. Constant and long-continued heating of these switches (due to corrosion, etc.) causes the copper to lose its "temper" or become "burned", and cause a resistance that cannot be overcome except by replacement. Switches in use a year or two will often cause a drop of a volt or more, which would reduce candlepower by 40% to 50%.

11. If headlights still lack candlepower, and lights seem to burn off-color instead of with the white light they should have, test the main battery cable by touching the prod to the center of the battery terminal at (P). If this causes lights to flare up, make sure there is a good contact between the cable and battery terminal, free from corrosion. If this fails to correct the trouble, the battery cable will probably have to be replaced.

12. Disconnect the jumper clip from the starter switch and hook onto the frame or any other good ground. Be sure clip bears against clean, shiny metal. Then touch the prod to center of battery terminal at (Q). A flare up of the lights by this test indicates a bad battery ground connection or defective ground cable.

13. With clip still attached to the ground, touch the prod to the headlight rim. Quite often this discloses a defective ground at the headlight itself, which may be due to rust between reflector and headlight shell, or between headlight column and fender, or perhaps in the socket (on older cars) which permits headlight aiming. If there is a ground wire, check the contacts to make sure they are clean and bright. In many cases headlight ground can be immeasurably improved by soldering a pigtail of copper wire to inside of headlight shell, and to back of reflector.

* * *

By following the procedure outlined above, safer headlights can be provided almost any car that comes into your shop. The amount of this work there is to be done will amaze you once you get into it. It is good, profitable business of the kind that satisfies customers, builds a valuable reputation for your shop, and adds to the safety and comfort of every driver who patronizes you.

SELLING AND SERVICE TIPS

Last year (1936) there were 21,670 killed in night accidents, as compared with 15,130 in daytime. This despite the fact that night traffic is only about half of day traffic (by actual count). Thus night driving is about 5 times as hazardous as daytime driving!

Constant vibration of the car body gradually changes the aim of the headlights. They should be serviced at least twice a year - oftener is desirable.

A headlight mis-aimed just 3° sideways throws the center of the beam clear off the road at 160 ft. Tilted upward just 3° too high, even the passing beam will be above level, and glare will blind the oncoming driver.

A light object can be seen at night about three times as far away as a dark object.

The pupil of the eye shrinks as we grow older, thus requiring more light. Tired eyes need more light than rested ones - and most of our night driving comes at the end of the day when eyes are fatigued.

PASSING BEAMS

Normally the passing beam is $2\frac{1}{2}^{o}$ lower than the driving beam, completely eliminating glare. Drivers must be educated to use this passing beam whenever another car approaches, not only for courtesy but for safety.

Most cars produced in recent years have multiple beam headlights. Changing from driving lights to passing lights deflects one light downward $2\frac{1}{2}^{o}$; the other light (already aimed slightly to the right) remains unchanged.

On the newest Flex-Beam and Corcoran-Brown headlights, a change to the passing beam deflects both lights 1 degree downward and $2\frac{1}{2}$ degrees to the right.

LENSES

Lenses must carry the same manufacturer's name as is shown on the lamp body.

The headlight lens marked "LEFT" should be on the left hand headlight as viewed from the driver's seat. Be sure the top of the lens is truly at the top of the headlight, so that seams in the glass are exactly vertical and horizontal.

HOT - SPOT

The "hot spot" of a headlight beam is about 8 feet deep at 350 feet ahead. The top of this hot spot should be aimed to strike the road about 500 to 600 feet ahead with the car empty. Then when the car is loaded, the bottom of the hot spot of the beam will still aim no higher than level.

With the Weaver Photoelectric Headlight Tester, you are adjusting headlight aim within 1/5 of a degree - much closer tolerances than are possible in wheel alignment.

A correctly aimed driving beam strikes the road 500 to 600 feet ahead of the car. This means a drop of 2 inches in 25 feet (about 1/3 degree).

SPRING - SET

In stopping a car quickly with the brakes, the radiator dips downward, and the springs have a tendency to set with the car nosed downward. Relief of this spring set is important if headlight service is to be accurate.

"Spring set" may cause a variation of as much as 1^{o} ($5\frac{1}{2}$ inches in 25 feet) in the elevation of the headlight beam. For this reason always bounce the front end of the car up and down to bring the springs to rest in their normal position before measuring or adjusting aim.

TIRES

Soft rear tires (with properly inflated front ones) will elevate the headlight beam about $2\frac{1}{2}$ inches in 25 feet; so that with headlights properly aimed, soft rear tires will lift the beam center clear off the road.

When you find one headlight higher than the other, look for a soft tire on the low side. Also check the springs and shackles on both sides. Stiff springs (that need lubrication), weak and sagged springs, frozen shackles - these are but a few of the jobs you will uncover.

REFLECTORS

Headlight reflectors should be polished with NEW cotton and a non-abrasive polish. A dirty rag, or a dusty one, will scratch the high polish of the reflector. Use the cotton only once, and throw it away; a small tuft is sufficient.

New Headlight gaskets should replace old and worn ones, to prevent dust and discoloration of reflectors.

Replacing reflectors (or re-silvering them when feasible) is a constant source of extra income for headlight departments.

BULBS

Bulbs lose about 1/3 of their brilliance before finally burning out. Dim, weak or blackened bulbs should be discarded, even though the filament still glows.

CONNECTIONS

A poor contact or connection creates resistance, cutting down the voltage delivered to the headlights, and hence decreasing illumination. Jiggling the switch, wiring, battery connection, or lamp contact where the poor connection occurs will jiggle the needle on the Optoscope dial, making it easy to locate the source of trouble.

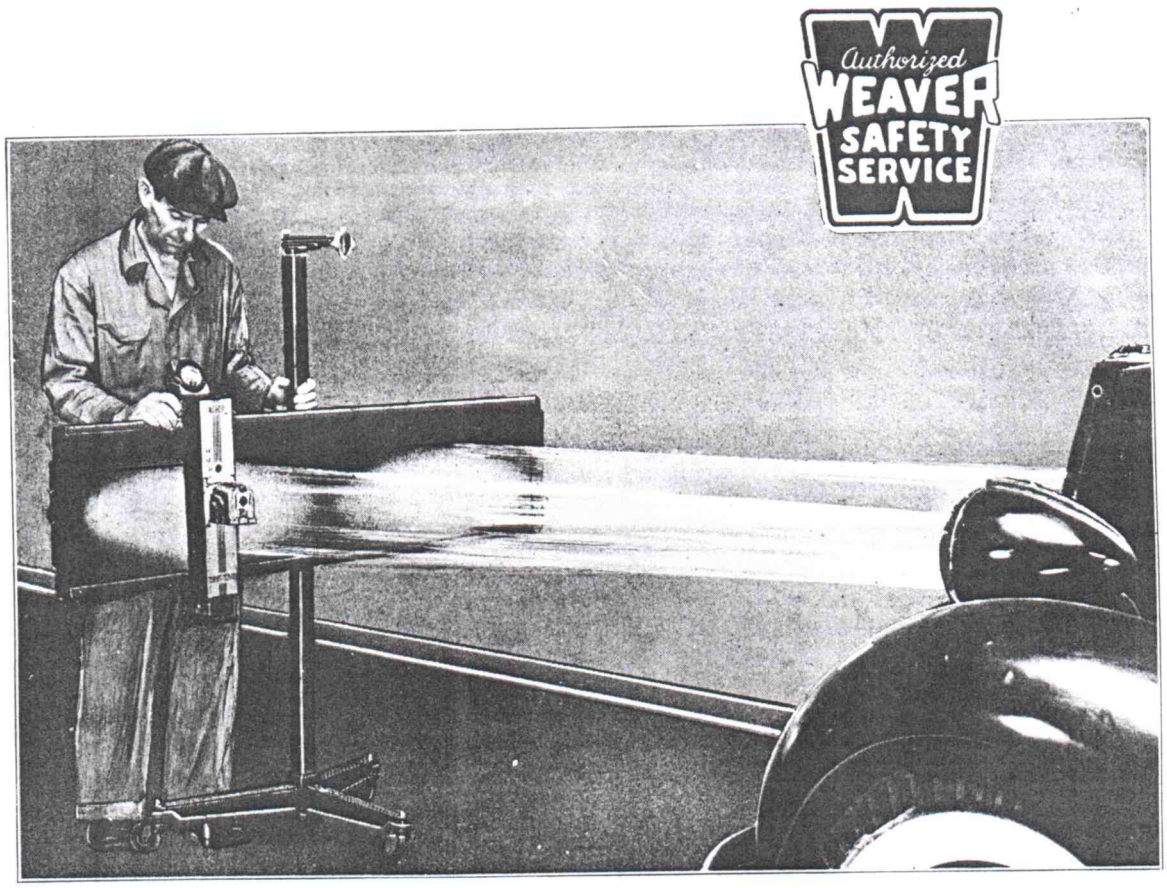
A defective ground can be quickly detected by shorting with a test wire from the polished headlight rim to any other bright surface on the body of the car. This makes a good ground connection which will immediately show increased illumination on the meter if the regular ground is defective.

A defective headlight ground is often due to a rusty ball and socket mounting. Or new or freshly repainted cars, paint will have the same effect. Correction consists in cleaning and brightening both ball and socket with emery cloth.

BATTERIES

A defective battery cell often causes the Optoscope needle to drop spasmodically, as for instance when a separator is shorting through. One dealer sold nine batteries this way during the first month he had his Photoelectric Headlight Tester.

If lights are dim, try starting the engine. If this causes the lights to flare up, the battery is probably weak, or connections from generator to battery are poor.



WEAVER

WEAVER MANUFACTURING COMPANY, Springfield, Ill., U. S. A.
WEAVER INDUSTRIES, LTD., Chatham, Ontario, Canada

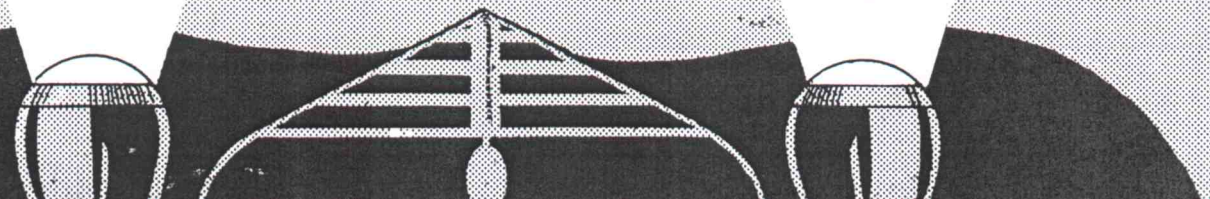
Printed in U. S. A.

HEADLIGHT SERVICE

and how to sell it

the WEAVER way

Authorized WEAVER SAFETY SERVICE



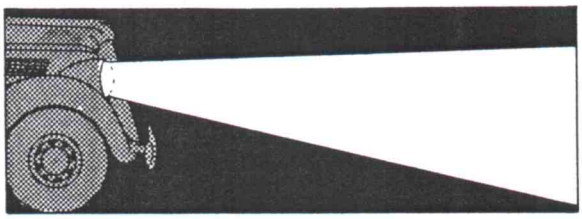
FEW DRIVERS KNOW WHAT A YEAR'S DRIVING DOES TO THEIR HEADLIGHTS

When Sam bought his brand new car, each headlight sent 15,000 candlepower squarely down the road. Two such headlights gave him 30,000 candlepower providing safe vision for about 275 feet ahead - which meant he could drive at 50 miles an hour and still be able to stop within the range of vision.

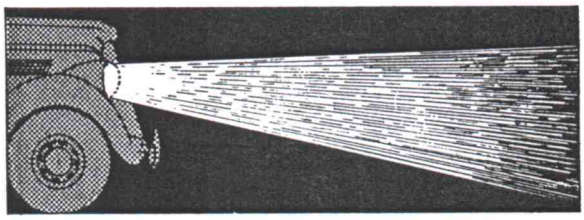
But that was a year ago; and although Sam has had his car washed and polished, his brakes and steering adjusted, those two headlights have been completely neglected.

In time, the bright reflectors began to tarnish, and the bulbs grew blackened and dull. The gaskets loosened and a thin layer of dust filtered in and spread over reflectors, bulbs and lenses. Backing his car into its garage stall by pushing against a headlight had cocked one of them upward. These changes for the most part came - so little at a time he never noticed them; just as failing eyesight creeps stealthily over an aging man and he doesn't realize until one day he must have a magnifying glass to read. So it was with Sam and those gradually dimming headlights.

Fortunately Sam was not what you'd call a reckless driver - at night he never traveled over fifty miles an hour, and usually only forty. But after a year had gone by, forty miles an hour was really a dangerous



"Because 30,000 candlepower---



gradually dimmed to 10,000."

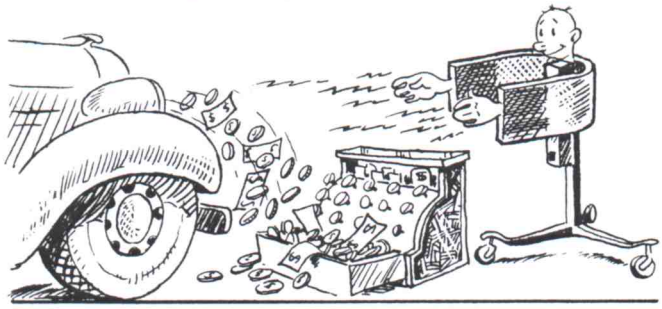
night speed! Because the 30,000 candlepower (both headlights) had gradually dimmed to 10,000; with lights only one-third as bright, the object that he could see a year ago at 275 feet became scarcely visible now at 40 feet; and even with brakes like new, to be safe he ought to travel not more than 20 miles an hour.

Sam doesn't know all that (few drivers do) and the garage that has serviced his car for a year never told him. As a matter of fact, too few garages have ever tried to merchandise headlight service, even though servicing headlights is a necessary and profitable safety service. The first garage man that shows Sam the chance he takes driving 40 miles an hour with 20 mile headlights, is not only going to get the job of cleaning and adjusting those lights, but will earn real gratitude and good will and future patronage from Sam.

A New Source of Revenue

Perhaps the garage that serviced Sam's car should not be blamed, because in the past headlight service has often given rather uncertain results, has been hard to sell, and never proved profitable enought to warrant serious attention. Until the advent of the Weaver Photoelectric Headlight Tester, precise adjustments could be made only for focus and aim, with focussing rapidly fading out of the picture as more and more cars came through with tixed focus headlights.

With the new Weaver Photoelectric Headlight Tester available at a price within reach of the average garage, and at a price commensurate with the volume of business which it will develop, a whole new safety field is opened to garagemen, and many are welcoming headlight service as a new and profitable department capable of earning dividends on a par with those from wheel alignment, brake service, lubrication, or any other major service.



Headlight service brings in dividends

Beginning a New Era in Safety Service

Ten years ago wheel alignment was comparatively unknown; today it represents 15% of the money spent for automotive maintenance. The shops that equipped themselves early and sold wheel alignment service to the motoring public cashed in, in a big way.

Drivers have taken their headlights for granted for years (just as they formerly did their wheel alignment) and the garage equipped with this new method of testing headlights and merchandising headlight service, who sells headlight service to the motoring public is going to make the big money from this important safety service that is just now coming into its own.

The important thing for YOU as the owner of this new Headlight Tester is to realize its possibilities and start immediately to explain to your customers just what you now can do toward promoting the safety (and comfort) of their night driving.

Don't overlook the importance of night driving COMFORT as a sales appeal. Nothing fatigues a driver more quickly than constant eye strain and the mental concerntration necessary when trying to pierce the gloom ahead to pick out dimly lighted objects. An hour or so of such driving will tire the freshest driver, who dares not let his attention waver for an instant lest danger and disaster overtake him and all his passengers. Good lights will convert that night driving strain into placid ease and complacency, since they will show up possible dangers ahead in plenty of time to stop from comfortable night driving speeds.

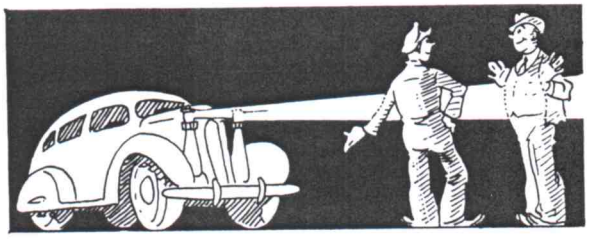
Car Owners Are Eager For This Service

There are millions of drivers just like "Sam" driving around these United States, willing and eager to spend their service dollar for comfort and safety any time someone shows them a legitimate safety service they can buy. Some of their cars are three or four or more years old, some are only a few months old. "Sams" are driving by your door every day, and some of them drive right into your shop! Are YOU selling them?

"Sams are driving....into your shop"

Sam came into our shop the other day (only his name happened to be Bill) and we set our Neaver Photoelectric Headlight Tester before his car and measured his lights. The first one had just 4,200 candlepower.

"Bill" I said, "that isn't a very bright headlight is it? Better let me polish the reflector." Bill agreed, so I took the silver polish and a wad of cotton, and in three minutes it shone like a new dollar. Then when I measured the beam it showed 7,100 candlepower! Bill said, "Gee, that sure makes a difference, doesn't it?



"I'll give you a pair of Lindberg Beacons."

"That's only a start," says I, "just spend a dollar and a half with me and I'll give you a pair of Lindberg Beacons! And here's what happened.

I polished the lens, and the candlepower jumped to 8,500. Then I aimed and focused the light and got a new bulb (same size as the old one) and it jumped the candlepower up to 11,000!

"Bill," I said, "that old bulb's still got a few hours left, but they're DULL ones. If I were you I'd say it's done its work and leave in the new one." Bill was no fool. He said, "All right, but give me that old one for a spare, just in case I get caught on the road some night". So into the tool compartment it went.

That was what happened with Bill. We boosted his headlights from 8,500 candlepower (the two combined) to 22,500 - that's an increase of over 150% - and his bill looked like this:

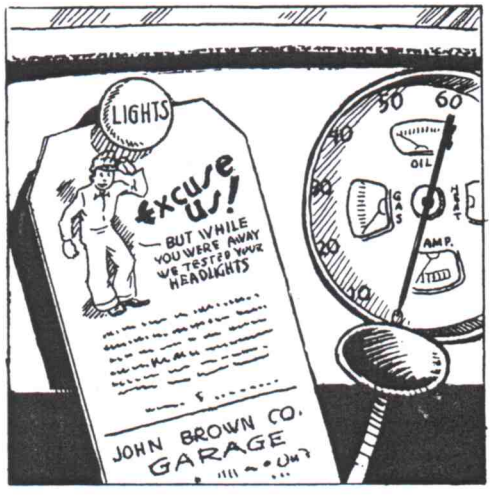
Polishing and adjusting headlights - - - - - - -	$1.25
2 headlight bulbs @ .24 - - - - - - - - - - - -	.48
2 headlight gaskets @ .10 - - - - - - - - - - - -	.20
	$1.93

Less than two dollars had pushed up Bill's safe night driving speed from 17 miles an hour to more than 40! My profit? Well, it took just 40 minutes from first to last for the labor involved. That's about 35 cents at the average mechanic's wage. Profit on the bulbs and gaskets amounted to 22 cents. So I cleared on the job $1.12 and a satisfied customer. Bill will want that job done again in six months or so, and I won't have to sell it to him. In the meantime he'll be in for a lot of other work, because now I stand ace-high in his estimation.

Of course, I know it's hard to get these motor-minded mechanics to get out a headlight tester and sell headlight service with it. Put one in your shop and if you yourself don't push it, the Tester may just sit and gather dust until someone comes in and asks for headlight work. And that happens all too seldom!

Let Headlights Be Someone's Special Job

I know a man that found the answer by getting a boy from the trade school and putting him to work on nothing but lights; paid him a third of the gross "take" on labor. Ever time a car came into the shop (there were fifty or sixty a day) he'd line up the tester in front of it and then try to sell the owner on a polishing and adjusting job. Or if the owner wasn't there he'd hang one of these little tags on the light switch showing in what condition he'd found the lights. Do you know, after three or four weeks that lad was earning $15 to $20 a week, just with his one-third percentage?



Hang one of these tags on the light switch

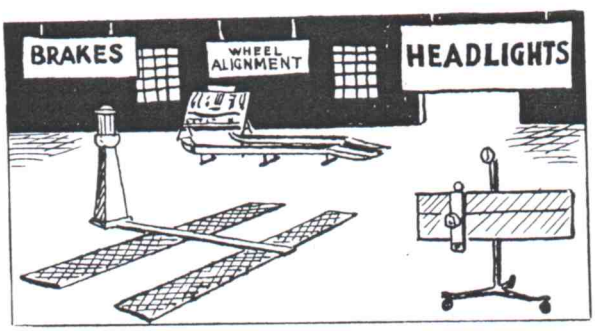
He got all he could out of headlights, and then began to check tail lights, stop lights, and stop light switches. You can figure for yourself what the "house" made if he was getting $15 or $20 a week.

Those little tags have worked out to good advantage, too, in garages that have over-night storage. The night man sets the headlight tester in front of each car, fills out a tag if the lights aren't up to standard, and hangs it on the light button. You'd be surprised how many jobs are sold that way, and how pleased customers are to feel that mechanics take a personal interest in their cars.

Headlights are mighty important to safety, and just a little properly directed effort will pay worth-while returns. Many of the jobs are small, amounting to only a dollar or two each. But add them to your regular run of business and they certainly make a soft cushion of "velvet" on the week's profits.

Then, too, there are a lot of bigger sales that come from this effort. Like some of these:

A's car had dim lights. We traced it to a poor battery ground connection. He had us install a new ground wire.
B's headlights were both dim. A few minutes testing with the Photoelectric Tester (watching the candlepower pointer) showed that the connections were good, that the grounds were okey, but that the trouble was in the switch - a dirty contact. So he had us overhaul the switch.
C's headlights were both dimm - you could see they were burning dull. Checking over his electrical equipment we found a spot light, car heater and radio all loaded onto a regular size battery. The charging rate on his generator was stepped up slightly, and the customer decided to put in an oversize battery. So we got a battery sale.



A real headlight department in your shop

Yes, there are real possibilities in this headlight service, and now with your Photoelectric Headlight Tester you can really show your customers just exactly what they need, and then show them the improvement your service has made. With a device of this kind, selling headlight service is easy, and makes possible the development of a real Headlight Department in your shop. Give it the same attention you do some of your other departments (such as greasing, brakes, wheel alignment, or motor analysis) and you'll be surprised what profits it can make for you.

Safe Night Driving Speeds

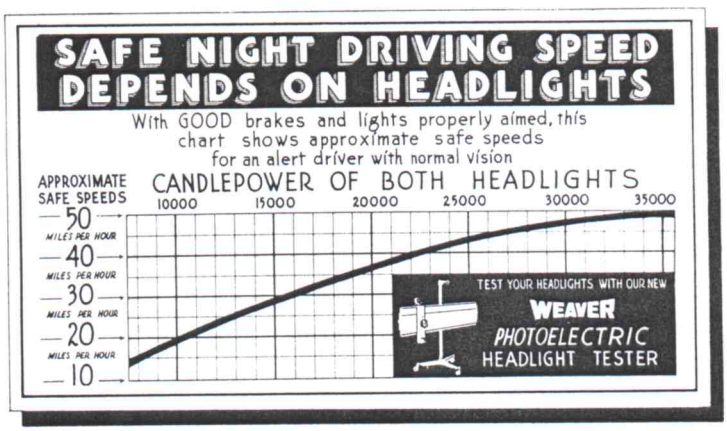
The ability to stop in time when danger looms up ahead depends on not "over-driving" headlights. Even with the best brakes, there is a definite distance necessary for stopping the car. That distance increases as the square of the speed - that is to say, a car traveling 30 miles an hour would require four times the stopping distance necessary to stop from 15 miles an hour. From 45 miles an hour it requires nine times the stopping distance from 15 miles an hour.

On the other hand, illumination of the road diminishes in proportion to the square of the distance from the headlights. The light that shines on an object at 20 feet is only 1/4 what it is at 10 feet; at 50 feet, 1/25th; at 100 feet, 1/1000th; etc. Thus with stopping distance rapidly increasing and illumination rapidly diminishing, even the

brightest possible headlights cannot give safety at speeds which are common in daylight; but the brightest possible headlights are necessary if comfortable night speeds are to be maintained with safety.

The Safe Night Speed Chart

Based on these well-established principles, Weaver has prepared a Chart for use in your Headlight Department which should help you to sell headlight service. Assuming that the driver is alert, of normal mature mentality, has good eyesight, that weather, road and visibility conditions are favorable, and that the light coming from his headlights is properly aimed down the road, then the chart shows the approximate maximum safe night driving speed in proportion to the candlepower of the headlights.



Read the candlepower of each headlight with your Weaver Photoelectric Headlight Tester, add the two figures together and consult the chart. Find where the corresponding candlepower intersects the red diagonal line, and then follow horizontally to the left to find the approximate safe speed.

Nine drivers out of ten are over-driving their headlights. With this chart you can do two things for them - sell them a service that will increase their maximum safe speed; and make them more "safety-conscious" so that they will slow down within that maximum during their night driving.

Note that as candlepower increases from the legal minimum (7500 c.p.) to 30,000 c.p. the safe night driving speed increases rapidly. Note too, that at the right side of the chart the parabolic curve has perceptibly flattened, so that beyond this point an increase in illumination does not bring a proportionate increase in safe night speed.

A Service You Can Demonstrate

Car owners are daily becoming more and more ready to be "shown" the service they need. Success of the motor analyzers and similar merchandising equipment demonstrates that fact, as does the use of such visible testing equipment as the Weaver Automatic Wheel Alignment Indicator and the Weaver Brake Tester.

With this Photoelectric Headlight Tester you can show your customers the actual pattern of their headlight beams on the screen, and show them the candlepower of each beam by means of the photoelectric cell and meter in the Optoscope.

Thus it is possible to show the need of adjustment and sell the job. If the customer waits to see the work done, you can show him definite results in the form of higher candlepower as a result of each step in your service. In any event, when he calls for his car you can show him exactly the amount his road illumination has been increased.

You will build good will and satisfied customers at the same time you make a handsome profit for yourself.

Don't overlook these possibilities in headlight service. It's the coming safety service.

Illustrating a compact, efficient headlight department.

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