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POPULAR SCIENCE

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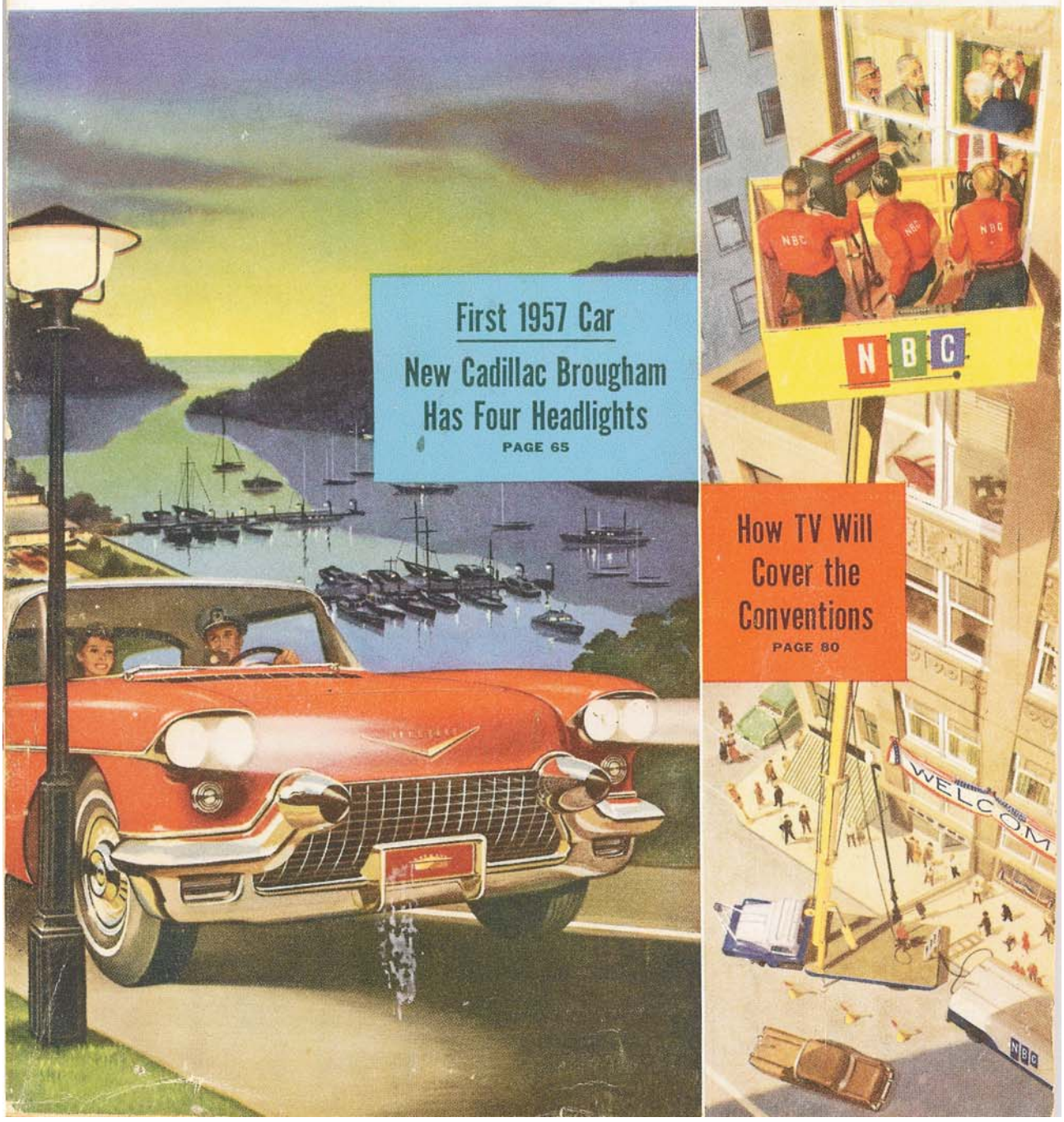
MONTHLY



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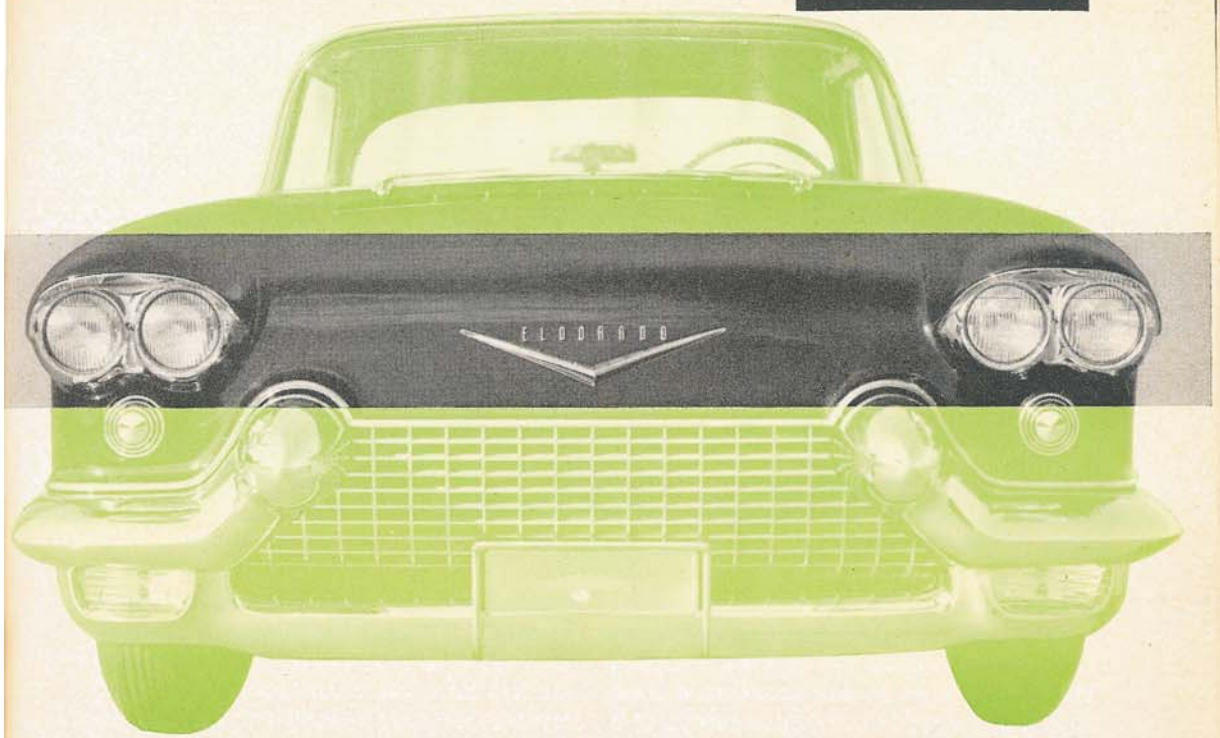


Why Cars Are Going to Four Headlights

Cadillac's flossy Eldorado Brougham, first of the '57 models, shows an exciting lighting system that's coming for all U.S. cars.

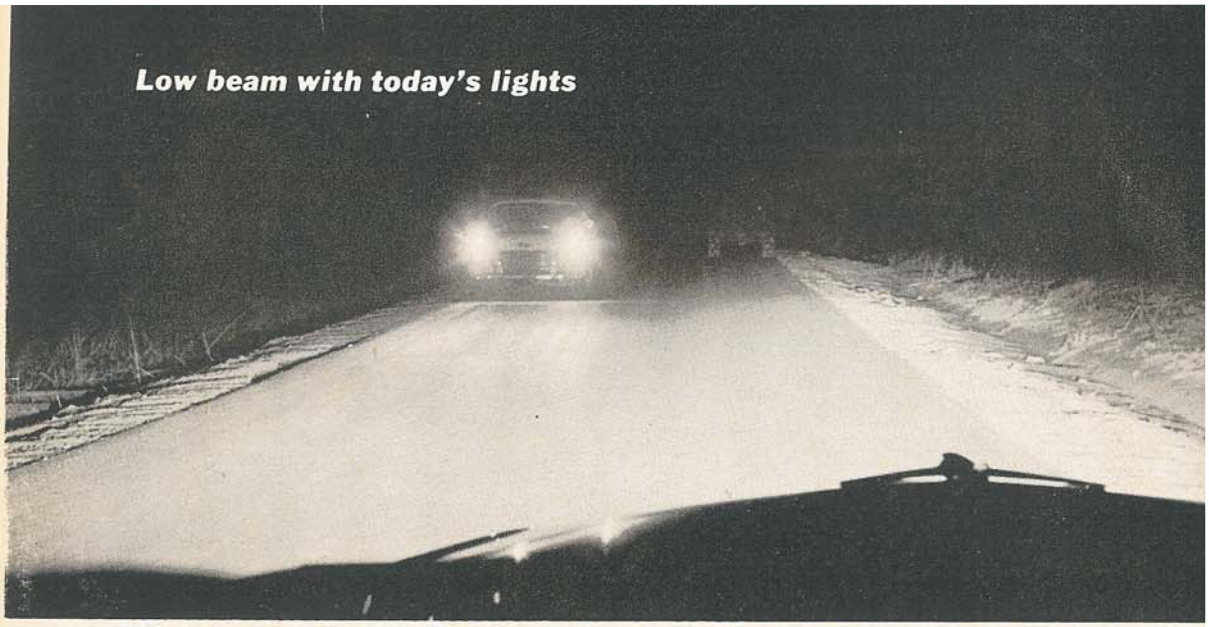
By Frank Rowsome Jr.

IN A FEW weeks, persons whose pockets are disfigured by the unsightly bulge of a spare $9,000—give or take a grand—can queue up to buy an Eldorado Brougham. This is a horseless carriage of quality, liberally fitted with such aids to gracious motoring as mouton carpets, electrically released doors and a manually operated Kleenex dispenser. Surveying the delights to which he has just taken title, a Brougham buyer may well overlook the fact that his new dreamboat has four headlights.

That would be a pity. The four-eyed feature is something that should not be mislaid in a cloud of hydraulically operated perfume sprayers and custom-tailored armrests. It is instead a solidly engineered development that promises:

- To appear on several competitive luxury cars in coming months;
- To come out on most (perhaps even all) American cars a year from this fall, including those sold in large volume to Hoi and his pal Polloi; and
- To deliver low-beam illumination of such conspicuous excellence as to discontent the owners of cars having only a measly two headlights.

Night and day. Driving behind the new headlamps is a pleasure, even if you are accustomed to the improved sealed-



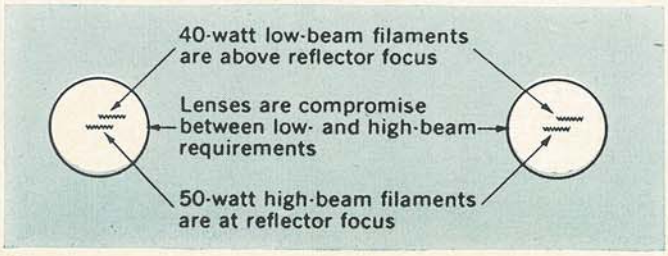
Even when the oncoming lights aren't glaring, down-the-road illumination is often marginal.

beam units brought out a little more than a year ago. (If the older sealed-beams are your standard, the new rig supplies the same sense of wondrous revelation that a first pair of eyeglasses brings to a nearsighted person.)

This writer tried out an engineering car, cobbled up by GM's Guide Lamp Division, on which it was possible to change at the flick of a switch from two units to the four-lamp system. On narrow Indiana and Michigan roads, the differences on high beam between the present and the new lighting were subtle but in favor of the new. The four-lamp high beams reach down the road toward the next county. On a clear night, you would need a fast car and a well-developed psychosis to "outdrive" the headlights. Two-lamp high beams, in comparison, do a similar job just a little less well.

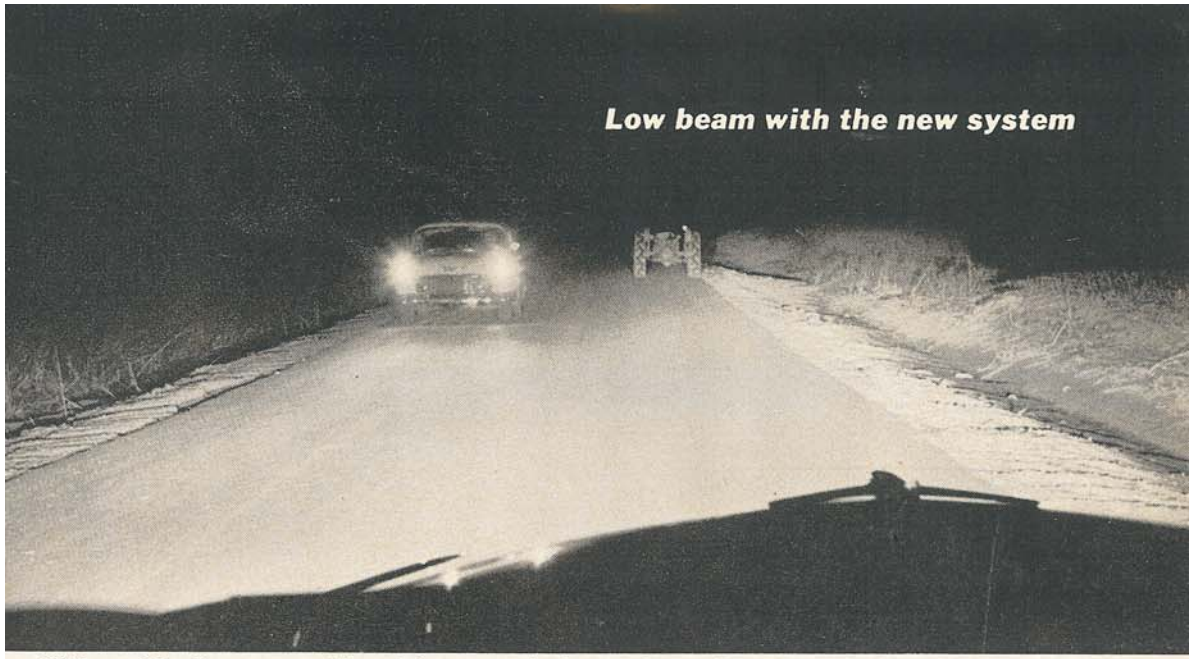
On low beam the difference is spectacular. Light is poured precisely where you need it, down the danger area along the right-hand margin of the road. At the times when low-beam lighting is most critical—meeting a glarey car on a narrow blacktop road—the new lights show off best, sneaking out about 275 feet, a gain of perhaps 100 feet of illumination alongside of and beyond an oncoming car. The new low beams give you adequate seeing for speeds up to 45 or 50 m.p.h. on an unlighted road. In contrast, many a present autoist going 30 m.p.h. on low beam is "outdriving" his headlights.

They're civil, too. The new system makes you feel inconsiderate at first; such juicy low-beam lighting, you feel, must annoy drivers of approaching vehicles. To your surprise, they go rolling past with neither irritable beam-flicking nor recourse to punitive high beams. The explanation, as you can see on care-



TWO-LAMP HEADLIGHT SYSTEM

Today's headlights are shown in the diagram at left. Wattages specified are for the improved sealed-beam units introduced in mid-1955; earlier units were different. Compromises between ideal low- and high-beam characteristics have to be made.



Without blinding approaching driver, new lights reach out along the right-hand danger area.

ful study of the light pattern, lies in precise asymmetric aiming. In nontechnical terms, the lights spare the other guy by providing a notch of relative darkness in which he can slip past.

Other side of the coin. Engineers who have developed the new system concede that these improvements exact their price. If you press them, the engineers will tick off these drawbacks:

• The cost is a bit higher. Two extra units, with mounts, hardware and wire are needed. Balancing the frown that this brings to Detroit's cost accountants is the contented smile that it brings to stylists, now given a new "appearance area" to toy with.

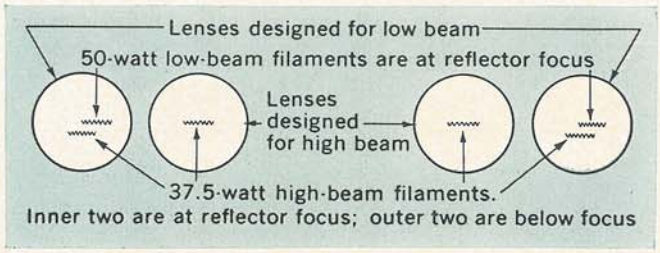
• More juice is drawn. A car with two sealed-beam units expends 80 watts on low beam and 100 on high; with the four-lamp installation the wattage goes to 100 and 150 respectively. These increases of 25 and 50 percent can be absorbed by most 12-volt electrical systems—providing they aren't already staggering under a load of miscellaneous electrical gadgetry. Though the new lamps won't strictly demand it, generator capacity may be raised a bit on four-lamp cars.

• Precise aiming is vital. Badly aimed, the new headlights could be vicious glarers. Headlight engineers refuse to concede that this is a real drawback: Present sealed-beam units can also be brutal if not set right.

Mechanical aimers. The engineers argue further that the general accuracy of aim on newer cars is increasing with the widespread garage use of mechanical aimers. These are ingenious gadgets; without them, four-lamp systems would almost certainly not be practical. Using three reference points on the face of each

FOUR-LAMP HEADLIGHT SYSTEM

In the new setup, all four lamps are used on high beam, and outer pair only are used on low. But compromises of the present system are avoided; off-focus filaments of the outer lamps are employed only for "body light" on the high beam.



SIX-EYED MONSTERS were used by engineers in demonstrating the new system to state motor-vehicle officials. A flick of a switch changes lights from the present to the new system.

lamp unit, aimers work by measuring the relationship of the points to each other and to the horizontal. (The reference points, when the lamps are manufactured, are held within a few thousandths of an inch of established relationships to the filaments and reflector.)

This means that the lamps can be precisely aimed just by setting them to suit the aimer jig; they don't even have to be turned on. In most garages such an aimer gives better results than the classic method of reading hot spots on a measured wall. Lighting engineers suspect that, under the older method, hurried or careless mechanics often confused hot-spot reading with tea-leaf reading.

Why make the change? The four-headlight idea is not new. Discussed by automobile lighting experts since the late Thirties, it came strongly alive in the engineering back rooms about three years ago. The pressure came in part from three basic weaknesses of two-lamp sealed-beam lighting:

1. In the present sealed-beam lamp, both filaments can't be ideally located. If one filament is placed at the focus of the reflector, the other one can't be.

2. One lens can't be designed that meets the ideal requirements for both upper- and lower-beam duty.

3. The design compromises forced by these two problems have mainly favored the upper beam, in order to provide a well-defined hot spot needed for conventional aiming techniques. But that led to a third difficulty: It is the lower beam that is the more critical one, and that is normally used more.

Four lamps were clearly a way around these difficulties. But not just four identical sealed-beam units, because they'd still be compromises. One attractive possibility discussed by a number of the engineering committees was two separate pairs of single-filament lamps, designed individually for high- and low-beam service. But so many other permutations were possible, too—reflectors of 5¾ or seven inches in diameter, combinations of one- and two-filament units, and various changes in filament wattages—that the technical men debated and experimented for months before the new system was agreed upon.

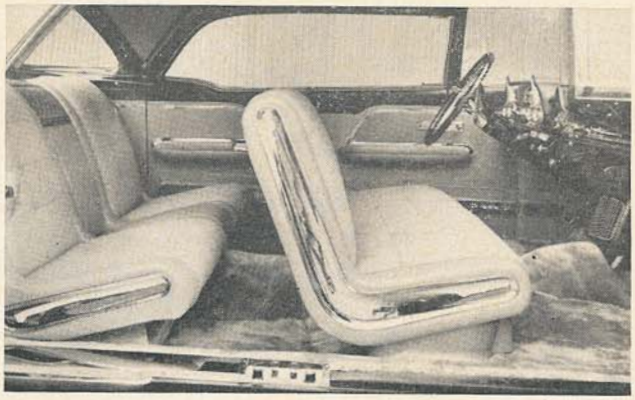
Not two and two. Although tempting, the notion of two entirely separate pairs of lamps was finally discarded. It was felt to be inferior to the system finally chosen (two double-filament lamps on the outside, two single-filament ones inside) on two counts. One was that single filaments of the wattages desired for high-beam duty got to be a trifle bulky, in respect to the reflector focus point. The other was a safety point: In icing weather, a lit headlight usually generates enough heat to keep its lens clear. On a two-and-two system, a driver switching beams in a freezing rain might find himself with nothing but Braille to guide him.

How it's done. In the four-lamp system that has ultimately been adopted, only the outer two lamps are used for low beam. The filaments used then are at focus and the lenses are designed specifically for low-beam service. The result is much better lighting, especially in a higher-intensity hot spot that reaches down the road on the right side.

On high beam, all four lamps are lit. In the outer pair, the not-at-focus filaments are used to give general "body" to the upper beam. The inner lamps, with filaments at focus and lenses designed for the job, do the down-the-highway work. This arrangement avoids excessive foreground lighting.

Amateur experts. Contrary to com-

Next month you, too, can buy a dream car, the Eldorado Brougham, for about $8,500 list



BESIDES HEADLIGHTS TO BURN, the new luxury car has other unusual features. A four-door hardtop, its rear doors are hinged at the back. But possible safety hazards of this are countered by an elaborate electrical door-latch system, which is interlocked with the car's transmission and with a button under the driver's seat. Doors are electrically locked when selector is in Drive. At his destination a driver can raise all windows and lock all doors by a key turn in either rear door. At right, one of many interior upholstery combinations. Note mouton carpeting and door-latch recesses that are set into the pillarless sill.

mon opinion, the bright splash of light on the road ahead of the car isn't technically desirable. What you really need is illumination of anything *on* the road, plus lighting of the shoulders and some allowance for the effects of rises and dips in the road. "One problem of headlight designers," Bob Falge, Guide Lamp's chief engineer told me, "is whether to give drivers the kind of lighting they want, or the kind they can see best by. I don't suppose there's a driver alive who hasn't decided that he could improve on headlight design."

Aside from providing excellent illumination, the new four-lamp system gives a measure of protection against icing. It is conceivable that the high-beam lenses could ice up during a period of low-beam driving; but a driver suddenly switching to high-beam won't be in a jam—the outer lamps, which have been on all the time, will still give him fair lighting from the off-focus filaments, behind their already-warmed lenses.

There's another quirk to the system, soon to be noted by cops everywhere. This is the fact that any car that goes by with four headlights lit is on high beam, and any with just the outer two lit is on low. This should simplify the problem of policing the slant-brow who keeps high beam on all the time.

The legal side. Pure chaos could develop from the combination of competitive auto makers building cars to be driven in 48 states having conflicting laws. It could, that is, but it doesn't. One reason is that in lighting, auto and lamp makers agree on technical standards; and many state legislatures are moving toward the goal of a reasonably uniform motor-vehicle code. Endless committee-work goes to the dovetailing of legal, technical and manufacturing problems.

At this writing, it seems highly probable that a four-lamp system will be legal everywhere by the time it's available. It also seems highly probable that you'll like it fine. END