

*The*  
**PHILCO**  
Retaining Wall

THE history of the automobile business is a record of continuous progress. From year to year car owners become more and more exacting in their demands for greater reliability and longer life.

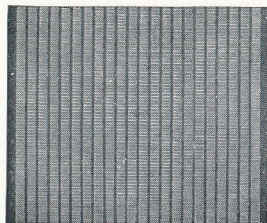
In the battery field, the Philadelphia Diamond Grid Battery has long been universally conceded to be a good battery. It has been guaranteed for the exceptionally long time of eighteen months, and the number which have failed to outlive eighteen months is negligible.

But, during the last five years, the Philadelphia Storage Battery Company engineers have been busy developing, testing and making ready for quantity production, a new device called the Philco Slotted Retainer, which adds at least one-third to the already long life of the Philadelphia Diamond Grid Battery. During the war, the Government absorbed practically

the whole output of Philco Slotted Retainer Batteries, but with the cancellation of war contracts it has become possible to offer the Philco Retainer to the motoring public.

The new Philadelphia Diamond Grid Battery with the Philco Slotted Retainer is *guaranteed for two years* and bears the same relation to the old battery that the cord tire bears to the fabric. Both are made in the same plant and largely of the same materials, but on account of different and more costly structure, one outlasts the other, and also provides greater insurance against interruption of service.

This booklet is intended to present, in non-technical fashion, the reasons why the Philco Retainer plus the Diamond Grid, the Quarter Sawed Hardwood Separators, and the various refinements of construction found in the Philadelphia Battery, make a *two-year guarantee* very conservative.



**T**HE Philadelphia Diamond Grid Battery *without* the Philco Slotted Retainer was, and is, a good battery. But the Philadelphia Diamond Grid Battery

*with* the Philco Retainer is even better. In gruelling tests it has out- lasted and out-performed any other battery we could buy or build. In actual war service it has demonstrated its supreme practical worth.

In service, the positive plates of any battery tend to shed their active material, and the faster this occurs the quicker a battery is worn out.

In the Philadelphia Diamond Grid Battery with Philco Slotted Retainers, a Retainer is placed against the active material on each side of each positive plate. The Retainer is a thin, tough sheet of slotted hard rubber. Although the slots are so numerous that they allow the free passage of acid and current, each slot is so narrow that the Retainer is, in effect, a solid wall which holds the active material firmly in place.

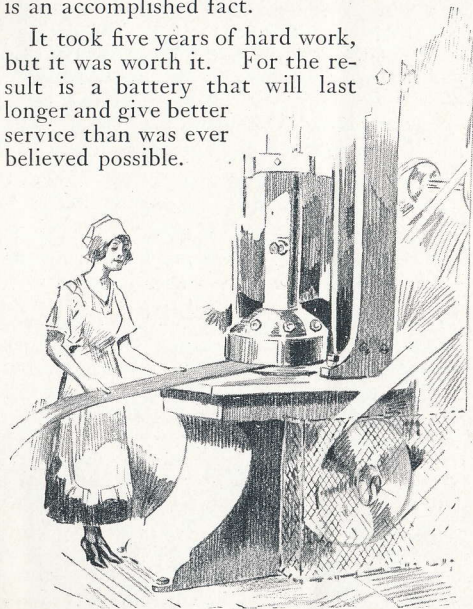
Five years ago the proposition of manufacturing Slotted Retainers was placed before the largest hard rubber manufacturers in the United States. Their opinion was that quantity production was impossible because of the great difficulty in making a machine which would last any length of time. Hard rubber is a very difficult substance to cut, and any tool used for this purpose tends to dull or break very quickly. But the engineers of the Philadelphia Storage Battery Company

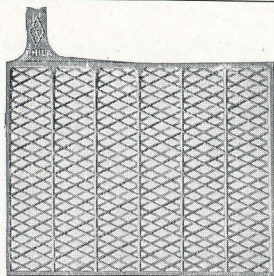
refused to be daunted by this opinion. They realized the enormous gain in battery life which the Slotted Retainer would make possible, and they determined to build their own machines for manufacturing it.

Within a year they had a machine in operation to produce small quantities. This machine is just about as similar to the perfected machines which are operating today as the original automobiles are like the 1920 models.

But just as in the development of the automobile, each model was the stepping stone to a better model until today the perfected machines are turning out Slotted Retainers day in and day out, and quantity production is an accomplished fact.

It took five years of hard work, but it was worth it. For the result is a battery that will last longer and give better service than was ever believed possible.





THE Diamond Grid is just as important a feature in the Two-Year Battery as the Philco Slotted Retainer. No buckled plates—no short circuits. That's what the

Diamond Grid means to you.

Everywhere, wherever strength is needed, you see this same kind of diamond construction—in bridges, in derricks, fighting masts, scaffolding, trestles and a hundred and one other familiar structures. You can hardly ride on a train without passing a score or more examples of this sturdy, dependable form of construction. Engineers the world over have recognized it as the strongest type. The Eiffel Tower of Paris is a splendid instance of its use.

In a storage battery its use is your protection against costly repair bills. It's a patented Philadelphia Diamond Grid Battery feature to be found in no other battery.

Why is such strength needed in a storage battery? Because every time you use your car, every time you go over a bump, every time you start, every plate in your storage battery is subjected to a strain that tends to buckle or bend it.

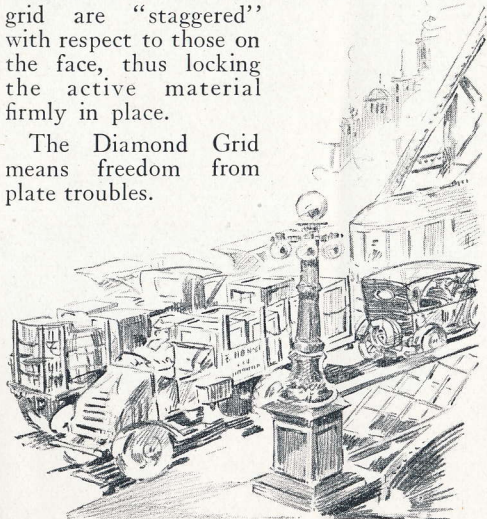
In ordinary battery plates the grids are made of perpendicular and horizontal members. They are braced in only two ways. A strain from any direction other than directly horizontal or vertical meets with practically no resistance. The plates will buckle and short

circuit with comparative ease. But in the Philadelphia Diamond Grid these members brace not only vertically and horizontally but diagonally as well. No matter from which direction a strain may come, there is a brace to withstand it.

Another point: After some months of service the plates in any battery tend to "shed" their active material. The "paste" of lead, or lead oxide, drops out of the ordinary horizontal bar grid very easily and sometimes breaks through the separators and short-circuits the cell. That is because in ordinary grids the members do not lock the active material in place.

A glance at the illustration will quickly show you that in the Philadelphia Diamond Grid the diamonds on the back of the grid are "staggered" with respect to those on the face, thus locking the active material firmly in place.

The Diamond Grid means freedom from plate troubles.



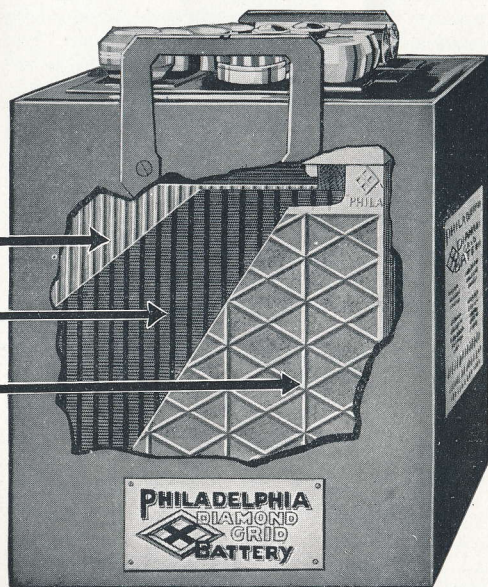
THE patented improvements that have made possible the longest and strongest guarantee ever placed on storage battery for starting, lighting and ignition.

*The Quarter Sawn  
Hardwood Separator*

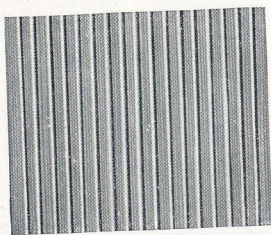
*The Philco Slotted Retainer*

*The Diamond Grid*

## THE CORD TIRE BATTERY



GUARANTEED TWO YEARS



**N**EARLY every motorist has had separator trouble—until he secured Philadelphia Quarter Sawed Hardwood Separators.

Probably no one point of battery construction is so susceptible to wear, nor causes so much trouble, as poor separators.

A good separator must do two things: It must keep the plates apart; it must allow the acid and current to circulate freely through it.

The logical material for a separator is wood; for the pores and cells made by nature offer just the right porosity and they never become clogged with gas.

Wood separators, generally, are of two classes: Those of soft, porous wood and those of harder, resinous wood, porous only in certain portions.

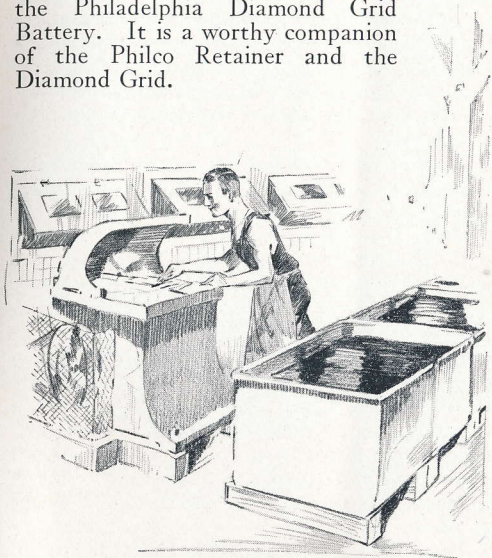
The soft wood separators are splendid from the standpoint of allowing acid and current to circulate. But unfortunately, they do not last. They quickly become "mushy," crack and allow the plates to short circuit.

On the other hand, the separators of hard, resinous wood, when cut in the ordinary flat-grain fashion, do not permit a free circulation of acid and current. They are "patchy"—a patch of soft, porous wood, then a patch of hard, resinous wood, through which the current cannot pass. The result is that the portions of the plates adjacent to the soft patches are overworked while the portions adjacent to the hard patches are underworked. A

plate subjected to this uneven stress is likely to buckle.

After much experimenting, Philadelphia Storage Battery Company engineers found that by quarter sawing hard, resinous wood they could produce a separator in which the hard and soft portions are not in irregular patches, but in regular alternating layers. The soft, porous layers conduct the current and acid perfectly—every part of the plate works evenly. The hard layers buttress the soft layers and protect them against disintegration, and in addition supply the needed hardness to withstand plate pressure and abrasion.

The quarter sawed separator is patented and is to be found only in the Philadelphia Diamond Grid Battery. It is a worthy companion of the Philco Retainer and the Diamond Grid.





WE believe that the little things about a battery are well worth a lot of thought. So, when we have found certain troubles common to batteries, we have worked until, in the Philadelphia Diamond

Grid Battery, they are overcome.

Ever have plate trouble? Have your plates ever buckled, or short-circuited, or shed their active material? The Diamond Grid or framework on which a Philadelphia Plate is made braces it against stress in every possible direction and locks the active material in place. And the Philco Slotted Retainer makes doubly certain that the active material stays where it belongs.

Ever have to get your separators renewed? Failure of separators is perhaps the most frequent of battery troubles. The Philadelphia Quarter Sawed Hardwood Separators provide perfect internal insulation, combined with perfect circulation of acid and current. They last as long as the battery. The guarantee assures you of that.

Ever rub the skin off your fingers trying to get a filler cap off? Philadelphia Bayonet Catch Filler Caps are removable with a quarter turn. Your fingers do the trick easily and quickly—no need to use pliers. And these filler caps are so designed that it is practically impossible for acid to splash out of them.

Ever fill your battery too full? There's a

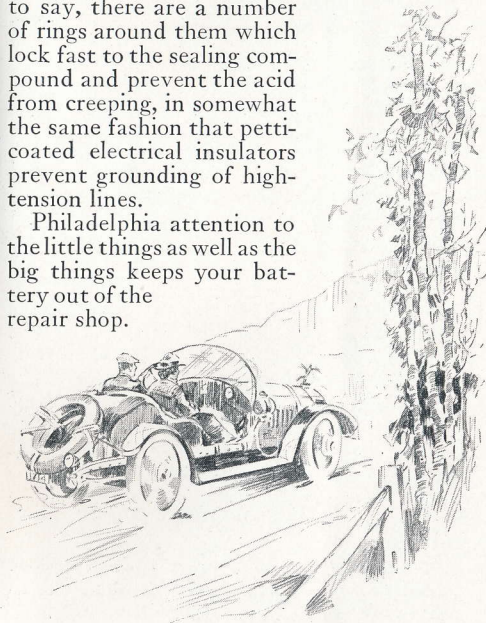
collar in the Philadelphia Covers that shows you just where to stop and prevents the acid from splashing into the filler cap. The covers are molded in one piece, with a big, hollow space beneath for the natural expansion of the electrolyte while the battery is charging.

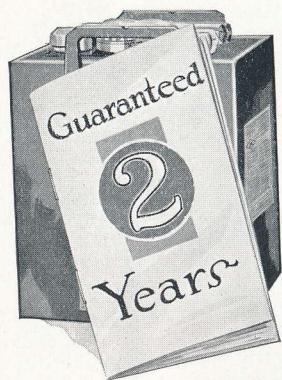
Ever have the wooden case of your battery disintegrate? Philadelphia cases are strongly built with lock corners, dowelled, and coated thickly with an acid-resisting preparation.

Ever have the acid creep out of the battery and corrode your terminals and wires? Acid tends to creep along the lead pillar posts and good sealing is necessary to prevent this. Philadelphia Pillar Posts are petticoated. That is to say, there are a number

of rings around them which lock fast to the sealing compound and prevent the acid from creeping, in somewhat the same fashion that petticoated electrical insulators prevent grounding of high-tension lines.

Philadelphia attention to the little things as well as the big things keeps your battery out of the repair shop.





**T**HE Philadelphia Diamond Grid Battery *without* the Philco Retainer is guaranteed for eighteen months. Almost without exception it has outlived this long guarantee.

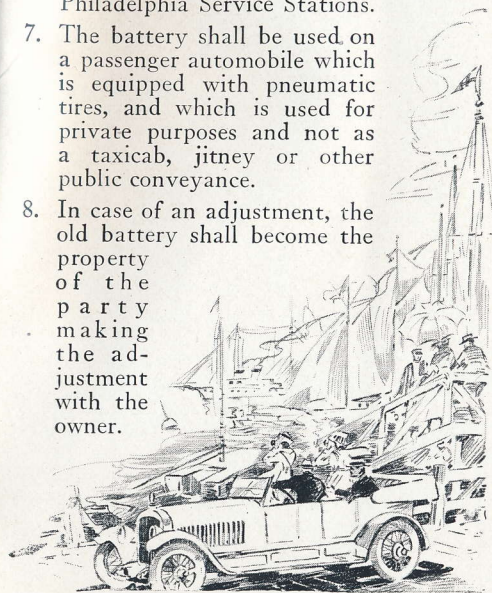
But just as the cord tire outlasts and out-performs the best fabric

tires, so does the new Philadelphia Diamond Grid Battery *with* Philco Slotted Retainers outlast the Philadelphia Diamond Grid Battery *without* these retainers.

And just as every motorist prefers the cord tire because of its greater service, so will every motorist find greatest battery satisfaction in the Philco Retainer Battery guaranteed for two years, subject only to the following conditions:

1. In case of failure, the Philadelphia Service Station which sold the battery, or the Philadelphia Storage Battery Company itself, will fulfill the guarantee by allowing to the owner, on the purchase of a Philadelphia replacement battery of the same type, a reduction from the regular consumer price proportional to the number of months by which the original battery failed to give two years' service.
2. The guarantee covers all ordinary wear and tear, but does not cover failure due to accident, neglect or abuse.

3. The battery shall be subject to adjustment when it is unable to deliver 80 per cent of its rated capacity.
4. The battery shall be considered to have given service up to within ten days previous to receipt of request for adjustment by the Philadelphia Storage Battery Company.
5. The owner shall keep the battery properly charged and properly supplied with distilled water, and shall keep the electrical system on the car in correct operating condition.
6. The owner is urged to avail himself of the regular free inspection service and of the excellent facilities for recharging and repairing offered by authorized Philadelphia Service Stations.
7. The battery shall be used on a passenger automobile which is equipped with pneumatic tires, and which is used for private purposes and not as a taxicab, jitney or other public conveyance.
8. In case of an adjustment, the old battery shall become the property of the party making the adjustment with the owner.





# Instructions for the Care of Starting, Lighting and Ignition Batteries

## Keep Your Battery Filled With Pure Water Only

ONCE every two weeks in cool weather and once every week in hot weather is good practice. Do not fill with acid. Fill with pure water only.

### *Read the Specific Gravity Regularly*

The best way to determine the condition of the battery is to test the specific gravity (density) of the solution in each cell with a hydrometer.

A convenient time is when adding water, but the reading should be taken *before*, not after, adding the water.

### *Keep the Battery Fully Charged*

When all cells are in good order the specific gravity test will be within 25 points (0.025) in all cells. The gravity varies with the state of charge, as follows:

1.290—Fully charged.

1.215—Half discharged.

1.150 or below—Completely discharged.

It is important to keep the battery fully charged in order to prevent freezing in cold weather.



WITH THE PHILCO SLOTTED RETAINER

PHILA. STORAGE BATTERY CO.

37 Spear Street  
San Francisco, Cal.