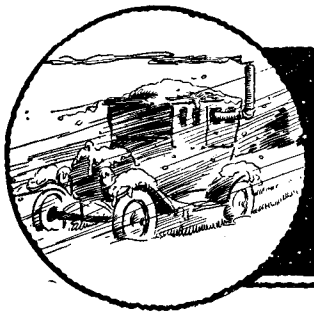


Anti-Freeze Solutions

Many Varieties That Protect Both Radiator and Engine

The easiest solution, of the anti-freeze problem, is to drain the radiator, and put the car away for the winter. But, this is running away from life, and the car owner who does this, deprives himself of some of the best pleasures of owning a real automobile.

Other owners, of Ford cars, believe that they can drain the radiator, every time that the car is left standing long enough for the radiator to freeze. They can do it—if they have nothing else to do—or if they live in Florida, or Southern California.

But, we all know the fable of the pitcher that went to the well "just once too often." And the owner, who attempts to drain the radiator each time, usually forgets it "just once—too often." And then he has a nice bill for repairs and all the time and trouble is wasted.

Now a freeze-up may cost a radiator overhaul of $7.50 for labor—plus the cost of the new parts installed. But, there is worse—and more of it! If the water freezes in the water jackets of the engine, and breaks the cylinder casting—then, Wowee! what a bill!

Of course, the freezing of the water, in the water jackets of the engine, does not always destroy the cylinder casting—it may just split open the water jacket, and such a leak can sometimes be soldered or welded. However, this makes necessary the taking the of the engine out of the car—so a frozen water jacket may cost from $10.00 up to $50.00 or more, if it is necessary to replace the cylinder block.

COST OF ANTI-FREEZE.

Supposing that it does cost from $2.00 to $5.00, for enough anti-freezing solution for an entire season's use. Isn't it worth this much and more, to insure against such repair bills—and these repair bills may not only occur once, but many times, in the course of a single winter, if an adequate anti-freeze solution is not used.

Fortunately, the war is over, and anti-freeze is now cheaper than ever before! It is one of the few things beside the FORDOWNER magazine—that is.

While it is true, that the anti-freeze solutions, that formerly sold for $1.50 a package, still sell for the same price of $1.50, the dollar that buys them now, has much less purchasing power when it comes to buying other commodities. So the anti-freeze solution is relatively much cheaper, in the proportion that the buying power of the dollar has decreased.

Draining the water from the radiator is a messy job—at the best. At the worst—one gets chapped hands and wet feet, and splattered with muddy water from the sediment bulb of the radiator. Also, the sediment bulb of the radiaor is almost invariably clogged up, and one has to clean out the pet cock one or more times, whenever the radiator is drained.

In draining out the radiator, there is always the danger that one or more of the tubes may be clogged, or that the water may not drain completely from the water jacket of the engine, if the car is not standing or on a perfectly level road.

Many a split-busted cylinder casting has resulted from trying to drain an engine, when the right-hand wheels were lower than the left, thus keeping some of the water in the cylinder block.

If one or more of the radiator tubes are clogged, then the water in them will freeze and burst the tubes, this leak revealing itself promptly, when the radiator is again filled.

Also, if one runs out of gasoline, has a puncture, or other trouble; it may be necessary to drain the radiator where once one cannot obtain the water to refill the cooling system—thus causing great trouble and delay.

PREVENTING LEAKS.

Since all anti-freeze solutions have one property in common—that of costing money, it stands to reason that, to use an anti-freezing solution economically, the anti-freeze that we put into the radiator must "stay put" and that leaks must be abolished.

While in summer the leakage of water from the radiator, or around the hose connections, may be only a darned nuisance in winter, this may cost considerable money.

Also, if the radiator is refilled with pure water, to replace the leakage, then the anti-freeze may be so diluted that it may fail to function adequately as a freeze-preventer, and damage may result.

A very small leak may sprinkle the roads with a lot of valuable anti-freeze, in the course of from 4 to 6 months of winter. Also, it should be remembered that the vibration of the car and engine, when the car is in motion, may cause more leakage than when the car is at rest.

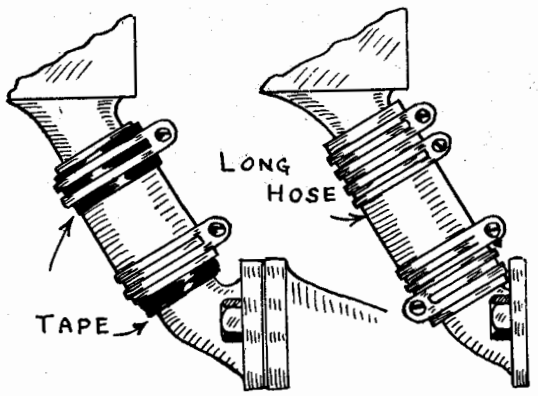
It is a good plan to start one's preparations, for making the cooling system leak-proof, about a week before the anti-freezing solution is to be put in. Replace all hose connections that are in the "doubtful" class. Save the old ones for next summer's use—if you must be economical.

In replacing the top hose connection, between the radiator and the engine, be sure to have a piece of hose that is **long** enough. Often the hose is cut a little short and skimpy, and then one has endless trouble in keeping a tight joint at this place.

The difference in the vibration, between the radiator and the engine, tends to pull the top hose connection loose. Less trouble is usually experienced at the other two hose connections.

Sometimes the stunt of using two hose clamps at each end of the top hose connection, is used to advantage.

Other owners of Ford cars use double nuts on the screws of the top hose clamps. The second nuts are used as lock nuts, to keep the clamping screws from working loose, under the influence of engine vibration.



PREVENTS LEAKS.

But, these methods are bothersome, and are hardly ever necessary, if the hose itself is sufficiently long, and if the hose is properly clamped over the **ridges**, or ribs, which run around the top hose connection of the cylinder head and the water inlet of the radiator.

Some owners use shellac, ordinary shellac, to fasten the rubber hose to the cast iron hose connections. However, such special cements as Holdfast gasket cements, which are sufficiently **elastic** to maintain a tight joint, in spite of vibration, are preferable.

White lead is sometimes used between the rubber hose, and the cast iron hose connections, and usually makes an effective, stays-tight joint.

To remove a rubber hose from a hose connection to which it has been cemented by the use of white lead, it is usually necessary to cut off the rubber, or to remove the loose rubber from the outside, and then peel off the fabric of the hose, by unwrapping it.

MAKING GASKETS TIGHT.

Another place where leakage is apt to occur is at the gaskets between the top hose connection and the cylinder heads, and between the side hose connection and the cylinder block. Also between the cylinder block and the cylinder head.

Sometimes merely tightening the bolts, which hold the hose connections to the cylinder block and cylinder head, is sufficient. Be careful to tighten the bolts evenly, and equally on both sides, as pulling one bolt up tighter than the other is apt to cause leakage, and may break the cast iron parts.

Installing new gaskets may be necessary, if the gaskets have been bent out of shape, or if they have been pressed down so hard that they have lost their elasticity.

Careful cleaning, of the adjoining faces of the cylinder block and the hose connections, often makes it easy for even old gaskets to form a tight joint. The gaskets cannot make a tight joint, if dirt is allowed between the parts.

If the radiator leaks badly, it may be necessary to have the radiator overhauled, or repaired by a competent repairman. Soldering radiator tubes is no job for the amateur to tackle—and there are only too many so-called "auto mechanics" who make a botch job of it.

RADIATOR CEMENTS.

Sometimes the radiator has only small leaks, hardly worthy of the time and trouble involved in soldering them. In such cases, the use of one of the many radiator cements, now on the market, may prove an effective remedy for the trouble. By remaining in the solution, these radiator cements remain ready to seal any small leaks as they occur, and thus tend to eliminate trouble, and to conserve the anti-freeze solution.

Do not, except in cases of dire emergency, use flax-seed or other home-made radiator compounds. The flax-seed will only clog the tubes, preventing the water from circulating. Then, these clogged tubes will freeze and burst, making it necessary to completely dismantle the entire radiator, in order to clean it out and repair the damage.

As the Ford car is not equipped with a water-circulating pump, owners of Fords do not have trouble with the water leaking out around the shaft of the water circulating pump.

One of the peculiarities of some of the anti-freeze solutions, particularly those of the calcium chloride type, is that they tend to "find" leaks, by dissolving the dirt and grease which may have previously sealed these leaks.

Tightening the cylinder head bolts **evenly** is an important factor in securing a tight joint between the cylinder head and the cylinder block—with either a new or an old gasket. Tightening cylinder head bolts is almost an art in itself.

One should begin with the bolts near the middle of the cylinder head, and then zig-zag around, tightening the bolts on each side and towards each end, alternately, until they have all been tightened.

Do not tighten the bolts down **hard** at first, but only give them a general tightening, and then go over them again and again. Give the final tightening a half-turn or so at a time, until they are all equally tight. Use great care not to break off any of the cylinder head bolts, by the use of undue force.

Sometimes, if the rubber hose is of rather thin and skimpy material, the hose clamps will fit rather loosely on the hose. In such cases, it is well to wrap tire tape around the hose, and then tighten the clamp on over the tape.

The method, of wrapping the tape around the cast iron hose connection, and then forcing the hose on over the tape, is rather difficult and is not so apt to secure as satisfactory results.

CLEANING THE COOLING SYSTEM.

The muddy water, which comes out when the radiator is drained, should be sufficient evidence to anyone that the cooling system of the average Ford contains much mud and sediment. Often this rust and scale is clogging small leaks which should be fixed.

If this dirt is not cleaned out, the coating that it forms, in the water jackets of the cylinder block and inside of the radiator tubes, interferes with the radiation of the heat and cuts down the cooling efficiency of the radiator—resulting in boiling and loss of the anti-freeze solution.

To clean the radiator, dissolve a pound of ordinary washing soda in water, and pour into the radiator. Run the car a day, with this mixture in the radiator. Bring the cooling system up to the boiling point by retarding the spark, if necessary, or by using an over-rich mixture.

But, don't let the solution boil over, as it will injure the paint of the car, or one's clothes, if allowed to get on them. Then drain the solution, and flush out the cooling system thoroughly, using plenty of clear water.

RADIATOR CAP CONDENSER.

Where alcohol, or other volatile, anti-freeze is used, a steam condenser is sometimes fitted on the top of the radiator cap. This condenses the steam, and allows the condensed moisture to run back into the radiator rather than to pass out of the overflow pipe as steam, and be wasted.

Other condensers are fitted to the end of the overflow pipe, and condense and collect the liquid in a settling chamber.

REQUIREMENTS OF GOOD ANTI-FREEZE SOLUTIONS.

By deciding on the requirements of the perfect anti-freeze solutions, we can then decide which solution most nearly meets these requirments, in a practical manner.

1. The perfect anti-freeze should not be too expensive—either in first cost, or in the cost to maintain all winter at normal strength. That is, it should not be subejct to too rapid change when in use.

2. The solution should not have a corrosive, or dissolving effect on the iron of the cylinder water jackets, on the copper, brass, and solder of the radiator, or on the rubber of the radiator hose. As the rubber hose is easily and cheaply replaced—destruction of the rubber does not necessarily rule out a compound, if this destruction is not too rapid.

3. The chemical used should not deposit dirt, scale, or sediment—to clog the radiator tubes. As a rule, a compound which does not cause corrosion, will not cause much sediment. as the sediment is really metal corroded from the parts of the cooling system.

4. The solution should be reasonably free from fire risk, so that any leak, in the cooling system, will not necessarily cause a fire if it comes in contact with the hot exhaust pipe or electric wiring system. This objection is urged against the use of kerosene.

5. The anti-freeze should not waste away by evaporation too readily. Alcohol evaporates and boils away very easily, causing a constant expense all winter for replenishment. Preferably, it should have a higher boiling point than water.

6. The chemicals should be easily dissolved in water, or combined with it. Kerosene will not mix with water, and a combined solution cannot be used. Water and alcohol mix very nicely, and can be used together in any proportion.

7. Another requisite is good heat conductivity. Water is admirable in this respect, and so are the metallic salts. Oil is a very poor conductor of heat, and this is a serious objection to the use of kerosene.

PREPARED ANTI-FREEZE.

Prepared anti-freeze solutions have come into quite general use, as most car owners would rather purchase a solution that has the endorsement of a reputable manufacturer, rather than take chances by experimenting on their own cars.

A 6-pound package of one of these prepared anti-freeze compounds sells for about a dollar and a half. And a single package will protect the Ford cooling system to 5 degrees below Zero. For colder weather than this more of the compound can be used.

These compounds do not evaporate, and it is only necessary to add water, to replace the loss due to evaporation. Of course, if the solution is allowed to boil, some of the solution will slop over and out of the overflow pipe of the radiator. This loss must be replaced by adding a small amount of fresh anti-freeze from time to time.

In order to test the strength of the anti-freeze solution, a Freeze-proof meter can be used. This instrument being a weighted glass tube, which sinks into the solution to an extent indicated by the scale, and so shows the density of the solution. The less anti-freeze in the solution the less dense the solution is, and the farther the glass bulb sinks down into the solution.

Another make of anti-freeze solution is called the Twelve-Twenty, because an ordinary storage battery hydrometer will indicate 1220 when the solution is of the correct strength to adequately protect the cooling system.

USING PREPARED SOLUTIONS.

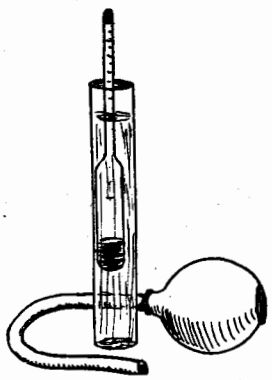
A few simple precautions are advisable when using these anti-freeze compounds. The radiator and cooling system should be well washed out, before adding the new anti-freeze. If the anti-freeze is added to water, which has been in the cooling system for a long time, the dirt and sediment in the water may tend to neutralize part of the anti-freeze, or combine with it, to form chemical reactions, which may have a deleterious chemical effect.

The anti-freeze should be thoroughly mixed with hot water, as hot water dissolves the chemicals much better. And not less than two gallons of hot water should be used for each 6-pound package of anti-freeze.

After the crystals have been completely dissolved, pour into the radiator and fill up with water, to within about 3 inches of the top. And always keep the water level in the radiator at about this point.

If the anti-freeze is not thoroughly dissolved, the crystals may settle in the lower hose connection, and interfere with the circulation of the water, and cause steaming, thus making the car owner think that the radiator is frozen, when the trouble is really only due to undissolved crystals.

After pouring in the anti-freeze solution run the motor immediately to thoroughly and evenly distribute the anti-freeze through the cooling system. This stirs up the cooling



FREEZE-PROOF METER.

system, and the heat of the motor tends to dissolve any particles of anti-freeze that have not been completely dissolved.

If any anti-freeze has gotton on the spark plug porcelains, or the wiring of the car, wash it off with hot water for this compound carries the electric current, and will cause short-circuits and misfiring, if allowed to remain on the wires or on the insulators of the spark plugs.

Most of these anti-freeze compounds are deliquescent—nice word that! We got it out of a book, and the dictionary told us that it means "gathers moisture from the air."

Any overflow from the radiator or cooling system, leaving a deposit of this anti-freeze, will always look moist and will give the impression that there is a water leak. But, the anti-freeze should be washed off with hot water, and dried.

As the weather becomes colder, and one wishes to strengthen the anti-freeze solution, a gallon or two of the solution should be drained from the radiator. This should be heated, and the additional anti-freeze dissolved in it. Then poured back into the radiator.

If the solution seems to be dirty and contains sediment, it can be strained or filtered through a cotton cloth.

In very cold weather, when a strong anti-freeze solution is used, it is advisable to cover up the radiator and run the engine idle for a few minutes, to take the chill off the water, and be sure that it is circulating, before starting out on the road. This will dissolve any crystals of anti-freeze, which may exist, due to the cold and the strength of the solution.

In bitterly cold weather, it is advisable to keep the bottom of the radiator covered up, to prevent crystallization of the anti-freeze at this point, and the over-cooling of the engine.

CALCIUM CHLORIDE.

Few car owners take the trouble to make their own anti-freeze solutions of calcium chloride, as care must be used to obtain the chemically pure chloride. And this costs about 25 cents a pund, or as much or more, than the ready-prepared compounds.

About 6 pounds of calcium chloride, mixed with 3½ gallons of water, will form enough anti-freeze solution to protect the Ford cooling system down to about Zero. Do not use chloride of lime.

To test for acid, in this home-made solution, use blue litmus paper. Add ammonia, to neutralize the acid, until the blue litmus paper no longer turns red, when immersed in the solution.

As to corrosive effect, on the iron of the water jackets of the cylinder head and cylinder block, this is not so apt to cause trouble. The metal at these points is made so heavy, for mechanical strength and for easy casting, that there is ample metal to withstand all the corrosion that is liable to occur.

The effect, on the soldered joints of the radiator, and on the steel hose connections of the radiator, should be watched. The electrolytic acid action, due to the copper of the radiator being in direct metallic connection with the iron or steel of the hose connections, makes electrolysis particularly apt to occur at these points.

ALCOHOL PREVENTS FREEZING.

Much of the utility of alcohol depends upon the price at which it can be purchased. And this price varies widely in different parts of the country. During the war, alcohol sold for $1.50 and upwards. Now, the retail price seems to be around $1.00, and the wholesale price is about 75 cents a gallon, when bought in 10-gallon lots.

During one "warm-and-cold" winter, the writer used over 10 gallons of alcohol, in one little Ford car. This is an unusual amount, but was made necessary by the fact that the patient Ford was left shivering outside the office all day long. During the comparatively warm days, the alcohol would evaporate rapidly—then it would be necessary to add a half gallon of alcohol or so to protect the radiator the next day when the weather changed to colder.

This "in-and-gone" process, with the alcohol, was repeated all winter, and the radiator froze twice—though without bursting, in spite of the $15.00 worth of alcohol that was used.

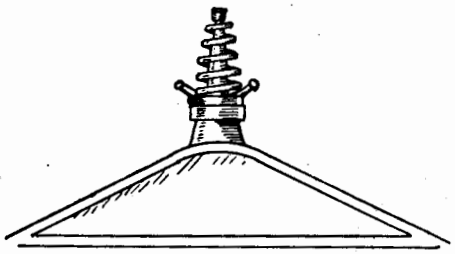
While large cars, like the Packard and the Cadillac, can use alcohol successfully, this is due to the fact that these cars have a pump to keep the water in circulation. This keeps the water much cooler than the thermo-syphon, or heat-circulating system of the

Ford, in which the water does not really begin to circulate effectively, until the boiling point is almost reached, in the water above the cylinder heads. That is why the Ford is so much more extravagant of alcohol as an anti-freeze, than the larger, pump-circulation cars.

About 5 quarts of alcohol will protect the cooling system down to about 5 degrees above Zero. And about a gallon and a half will protect the Ford engine in Zero weather. But, some owners feel serene in the knowledge that they have put so much alcohol in the radiator. But, it isn't what was in the radiator, it is rather what is in the radiator, that keeps the radiator from feeling frozen.

One of the reasons that alcohol is so costly in actual use is that there is no easy way of testing the strength of the unstable, ever-changing, alcohol-and-water mixture.

While it is true that the specific gravity of the mixture can be tested, by means of a special hydrometer—used for measuring liquids lighter than water—such hydrometers are not in general use. The storage battery hydrometers are for use with liquids heavier than



RADIATOR CAP CONDENSER.

water, and are hence not suitable for this purpose.

As a result of the difficulty of measuring the strength of the alcohol-water mixture, the cautious car owner usually keeps so much alcohol to the solution that the alcohol evaporates rather rapidly, and much of it is wasted.

If this is not done, then on some real cold day, when there is a "little too little" alcohol, the radiator will freeze. However, when some anti-freeze has been used in the water, the water seems to freeze in a sort of slush, and does not seem to have the hard, bursting effect of clear, cold water.

Among the advantages of alcohol is that it does not seem to have any corrosive effect on the metals, or the rubber of the cooling system any more than plain, clear water. Also, it does not have the dissolving and "leak-finding" ability of some solutions. As to fire risk, the fact that the alcohol is so thoroughly dissolved in several times its bulk of water, makes it practically fire-proof, though we would prefer not to hold a match over a steaming radiator, in the case of a strong, alcohol solution.

While wood alcohol has a lower freezing point, it costs more and evaporates more rapidly and so the use of denatured alcohol is generally preferable and more economical.

GLYCERINE.

Theoretically, glycerine is an admirable anti-freeze. In the same way, gold would be a good metal for stew pans—but they both cost too much.

The Ford Manual states that a solution of 60% water, 10% glycerine and 30% alcohol, is commonly used, and that its freezing point is about 8 degrees below Zero. But,as the glycerine would cost about $5.00 and the alcohol about $2.00, or a total of $7.00, for filling the cooling system—no charge being made for the water—this solution is so uncommon that we have not seen it in a Ford radiator for several years.

At present prices, of about $10.00 a gallon, the use of a mixture of glycerine and water alone is out of the question. Also, glycerine circulates rather sluggishly, wihch is a disadvantage in the Ford thermo-syphon cooling system. And the glycerine tends to attack and rot the rubber of the hose connections.

KEROSENE OIL.

In October, 1918, the writer filled the cooling system of a light Ford roadster with kerosene, using about 3½ gallons of oil, at 20 cents a gallon, or a total of 70 cents. This roadster had a light enclosed winter top attachment weighing only 10 pounds more than the regular Ford top.

No cover could be used over the hood or radiator, and every possible means had to be used to keep the engine cool, as the engine was constantly overheating. The first half-mile of every trip was all right. But, after a mile or two, the engine began to overheat and knock, causing unnecessary strains on the engine bearings and other parts, in spite of the fact that the engine was in first-class condition and free from carbon.

In March, when the kerosene was drained out, it looked more like engine oil, the lighter portion seeming to have been boiled away. Part of this heavy liquid was dumped into the gasoline of the fuel tank, but this made the engine run very rotten indeed, and the rest of the kerosene was used for cleaning the engine.

With sufficiently cold weather, there is no question that kerosene can be used as an anti-freeze—provided that the engine is humored in every possible way, and not worked hard, and not used for drives of more than a couple of miles at a time.

About 15 miles was the greatest distance we ever used the kerosene on a single drive—and the engine pounded like a trip-hammer, on that drive over fairly hilly roads.

When first placed in the radiator, the kerosene boiled very easily. After using the car for about a week, the lighter products seemed to have boiled away, and the remaining kerosene did not boil nearly so easily.

The constant knocking of the engine was due to the low heat conductivity of the kerosene, which did not conduct the heat away from the cylinder walls with sufficient rapidity, even though the front of the radiator was comparatively cool.

The writer is not going to use kerosene again this winter, as he believes that the constant knocking to be very injurious to the bearings and other parts, and might cause a broken crank shaft or other serious trouble. Also, the constantly overheated, had-to-behumored engine took all the joy and pleasure out of driving.

After the lighter products had been boiled off, the remaining oil did not seem very inflammable, and the fire risk did not seem very serious. Though this fire risk was always present to a certain extent.

As to injuring the rubber hose connections, new ones were installed at the beginning of the winter, and were taken off at the end of the winter—no leakage troubles having developed. But perhaps these hose connections should really be replaced more often when kerosene is used, especially the top hose connection.

COMMON SALT SOLUTION.

The kind of salt, used in ice cream freezers, has been suggested for making an anti-freeze solution. But we do not consider this plan of any value. Even a saturated salt solution will not protect the radiator, in really cold weather, and a strong salt solution has an intencely corrosive action.

The reason that the strong salt solution is so corrosive is that the iron, of the cylinder block—together with the copper, and the zinc-containing brass of the radiator, form electric couples. The electrolytic action of these dissimiliar metals, causes the rapid corrosion of the metals in the same way that the zinc of a door-bell battery is rapidly wasted away.

ARMY ANTI-FREEZE.

One of our readers, Mr. C. E. Lewis of Jackson, Michigan, has asked us about an anti-freeze, said to have been used in the Army trucks. This consisting of: water, 5 gallons; common salt, 10 pounds, and Arm & Hammer Soda, one pound. If convenient, boil for 20 minutes.

No doubt the soda is intended to prevent rusting, but we have no data available as to its effectiveness for this work. Soda is, however, quite frequently used for cleaning dirty radiators. Perhaps some of our readers have had experience with this solution, and can tell us about it.

EASIER COLD WEATHER STARTING

What has this caption to do with the picture above—or vice versa?

Why, friends, this is a psychic test. On cold, winter mornings when the 'bus stubbornly refuses to start out into the snow, just produce this picture. Show it to the car; let "Henry" dwell for a moment on this vision of sylvan, summer scenery. Or study it yourself for a while. Through the power of suggestion it should warm up both of you.

This picture is a reproduction from a photograph sent to us by Mr. Thomas F. Butler of San Francisco, who recently was fortunate enough to make an extensive Ford tour of the great Southwest. Many such scenes were encountered and of this particular one Mr. Butler says:

"The view of the Sierra Nevada Mountains from this part of the Owens River Valley is grand beyond description. Nothing I have ever seen on the Western slope of these mountains can approach this view in wonderful grandeur and magnificance. In ceaseless wonderment I gaze, and, well, I simply gaze again."

You say you would like to make such a trip right now? Well, that makes it unanimous.