Packard's "Predictor" may not thrill the styling purist, but its chassis has a unit differential and transmission with independent rear suspension.

Some down-to-earth predictions by the Editor

THE automobile industry is now 50 years old, a span which has seen such rapid and startling advances in the field of self-propelled transportation that only a fool would attempt to predict what the next half-century will bring forth. However, we can predict with some accuracy what will happen in the next 10 or 20 years.

The first 50 years can be divided into two halves, the period of "elimination," and the period of "development." From 1900 to about 1925 we saw the elimination of impractical ideas (as well as makes of cars) and the gradual evolution of a rather standard type of automobile. The second 25 years was the period of development, an era in which great attention was paid to the refinement of an existing product.

We are now well launched into the third phase, the era of "stylist rule", let us say beginning in 1950. At this juncture the cries of the classicists, the calamity howlers and the die-hards are heard—but they are futile. The reign of the stylist is here, and so long as "beauty" is kept functional the future can be faced with confidence, in spite of some mistakes which perhaps should be blamed on management, not the stylist.

The Powerplant

In the early days, three types of motive power appeared to have near-equal possibilities: steam, electric and the internal combustion engine. Steam had the advantage, for by 1900 it was, of course, a well known method of creating power for other uses. Many erroneous reasons have been advanced as to why steam powered automobiles did not succeed. Mr. Abner Doble, who should know the answer as well as any man you can name, says (in our words) that the primary difficulty lies in transferring the power of a high-efficiency boiler to the wheels. A multi-stage steam turbine will transfer high temperature/pressure steam into power efficiently, but has no low speed torque (whereas a gas-turbine with floating power-wheel develops very good low speed torque). Consequently a reciprocating piston type steam engine is indicated, but to date, and in spite of the best that modern technology can provide, no one has yet developed a piston type steam engine which can utilize steam at 1500 to 1800 degrees Fahrenheit and at similar pressures in lbs per sq. in. At lower temperatures and pressures the fuel consumption in mpg is not competitive with the modern gasoline engine and, at least equally important, the weight of a complete steam powerplant becomes unmanageable. I might mention that the cost and complication of a fully automatic steam powerplant also gets out-of-hand.

Electric power is still dependent on batteries. The size, weight and capacity of storage batteries has improved very slowly in the past 50 years. Recent developments in light, more efficient batteries may force a re-evaluation of the possibilities of electric power, but in any case it appears that even under accelerated development this form of power will have limited usage for some time to come.

What do we have left? The internal combustion engine, sometimes pronounced infernal! I am sure that none of the early pioneers, in his wildest dreams, ever believed that his noisy, unreliable internal combustion engine would, in 50 years, become the smooth, quiet and reliable powerplant that we enjoy today. Not only that, but look at the engine horsepower averages. In 1900 the output was about 3 bhp, but in 10 years the average bhp was 10 times greater. By 1920 a figure of 50 bhp was typical. Outputs doubled again in the next 10 years and then remained steady at around 110 until 1948 (American car averages). Today the great majority of new car purchasers are apparently demanding and getting at least 150 bhp—with a top of nearly 350 bhp for the Chrysler C-300-B model.

What lies ahead? Diesel power? Gas

Chrysler designed, Ghia built Plymouth "Plainsman" is new experimental station wagon with rearward-facing 'observation car' back seat.

turbines? Atomic power? I think none of these at least for the foreseeable future, 10 or 20 years hence. Diesel development has been slow, but steady. The fuel cost saving of a Diesel is partially a fallacy, due to the law of supply and demand, but the part throttle fuel economy could conceivably reduce fuel consumption rate by half. However, the Diesel is far from being housebroken, and it is very doubtful if any large segment of motorists would accept the noise and roughness, or the added first cost and weight.

Much has been written about the gas turbine powered car—far too much, when all the known facts have been weighed. It does appear to be the most likely prospect for displacing our present type of automobile engine, but not within 10 years as some irresponsible writers would have you believe. R & T covered this subject very thoroughly in "Pistons or Windmills" (April, 1951). Aside from the knotty problem of 4 to 7 miles per gallon, which is far from being solved, we have the dilemma of scarce materials. Present supplies of rare metals required for turbine blades are barely sufficient to supply the Military demands. Ceramic blades may be the answer, but the price of a 200 bhp gas turbine is currently around $25,000. Let's drop that one now, at least for 10 or 15 years.

Atomic power may be utilized for automobiles within the next 50 years. All we know today is that the necessary shielding indicates a vehicle weight of about 20 tons! Let's drop that one, too.

The powerplant of the forseeable future, and I mean the next two decades, will be evolutionary and not revolutionary. The fuel will be gasoline with an octane rating of about 100 for regular grades. Dual fuels may be required, as on the experimental G. M. supercharged V-8 of 1951 (the XP 300). Fuel injection is very doubtful, at least in popular-priced cars. It has advantages, of course, but the cost of a complete Bosch injection system is roughly the same as an average complete engine tooled for high production. Would you pay $300 extra for a new car, to get 5-10% better fuel economy, about the same % torque increase? It would take, roughly, 150,000 miles to pay for the device.

The overwhelmingly popular V-8 arrangement of cylinders will continue as the predominate type but the in-line six will be retained as an economy-option in lower priced cars. Someone may offer a V-6 but, as a type, it is not likely to become widely used because it is inherently rougher in operation. When an engine displacement of around 300 cubic inches is required, offering 200 plus bhp, the 50 cubic inches per cylinder in a six can never equal the smoothness of eight 37.5 cubic inch cylinders. Furthermore the V-6 is definitely more expensive than an in-line 6, and it saves very little in overall length required for the engine compartment.

Much more likely than the V-6 engine is the probable widespread conversion to aluminum castings for cylinder blocks where new developments in casting techniques will offset the higher raw material cost. Although aluminum weighs only one-third as much as cast-iron the need for heavier wall sections (for equal rigidity) will keep the possible weight saving to one-half. A typical 180 pound iron block will save only 90 lbs in the light alloy engine, but this is an important saving. Cylinder heads will still be cast-iron since the loss in structural rigidity by using aluminum cannot be overcome as easily in a head as in a cylinder block and, of course, the valve seat inserts are costly. As compression ratios approach 12-to-1, the general design of the engine tends to become similar to that of a Diesel—where every part must be beefed-up tremendously to withstand the high peak cylinder pressures.

Supercharging is a favorite topic of conversation, but not among automobile engineers. They must face the hard economic fact that the extra horsepower demanded by the sales department for next year can be obtained much more cheaply by increasing the bore and/or stroke, than by adding a blower.

If smaller cars, of the type now being imported, continue to rise in popularity (as I believe they will), we shall see other companies announce cars for the "economy market." This should revive the four-cylinder engine, but I do not expect them to be air-cooled, as desirable and sensible as this may be.

The Chassis

In 1927, one company announced that their famous Super Six principle could now be released to its full capacity. They went on to say that improved chassis design allowed them to utilize "new peaks of speed, power and endurance." It is perhaps unfair to say that modern chassis design has not kept up with engine horsepower. But a lot of people are saying it, and they have a point.

It is no secret that the next 5 years will see concentrated and intense activity on chassis design, with special emphasis on safer and better roadability. Riding qualities will improve too, for one is, to some extent, dependent on the other.

Vibration problems incident to the use of independent front suspensions demand an extremely rigid structure and the combined frame and body offers the best combination of rigidity and low weight. This form of structure, though widely used in Europe, has one important disadvantage for our economy. The cost of adopting it is extremely high and even more important, once put in production it is almost impossible to make annual model changes. The total number of body types is also limited and so far, no really large production car manufacturer has felt the engineering advantages worth the sales risk. However, the soaring cost of body re-tooling has already unleashed the oft-unhappy practice of face-lifting to save money, and when chassisless construction becomes standard practice we may see fewer model changes.

Suspension design, as practiced today is an admitted compromise. In the first place the roll axis is all wrong—it slants upwards from the ground in front to about the center

of the differential in the rear. It should be near the ground at the rear, high at the front, assuming we retain the conventional front mounted engine and rear-wheel drive (which I am sure will be popular for many years to come). High roll center front suspensions have been developed which are successful, the Allard and Ford Zephyr being notable examples. Ball joint front suspensions are now prominent, and pending the adoption of independent rear suspension, they will continue to expand in popularity.

Independent rear suspension is more or less inevitable, once the manufacturers decide to take the step. It is expensive, but once introduced others will be forced to follow suit. The cheaper swinging type of arrangement may be used at first, but once the heavy automatic transmission moves back to its logical place in unit with the differential, the less bow-legged forms of i.r.s. will be used.

Springs will continue to be made of steel and wound as coils, at least in the front end of the popular priced cars, for another 10 to 15 years. Many other forms of springs are under development which appear to offer certain advantages. All seem to be more costly although the fluid compression type may eventually be competitive. I personally do not think that torsion bars will become much more common than now. In fact, since predictions are in order, my statement would be that we shall see fewer, not more makes of cars using such bars, in the next 10 years (cars throughout the world, not just in the U.S.A.)

Summarizing the suspension part of the chassis picture, the trend will be towards even softer suspensions, with more stability (less roll), a difficult problem to achieve without increasing costs. It will be done however, even at some increase in price.

When aluminum takes its rightful place in engine castings and when the transmission goes aft, we shall see the end of power steering except on the heaviest cars. While sports car people like to talk of steering which requires only 2 turns lock to lock, the average American motorist would probably be happier with 3 or 3½ turns. Such a ratio reduces the feeling of walking a tight wire and is not too quick if the driver is startled. However, even if cars get somewhat smaller and lighter a "3 turn steering" will still require power-assist if the weaker sex continue to get weaker.

On brakes, I cannot agree with those who say that they are the weakest link in the modern chassis. Certainly there is ample scope and even need for improved brakes. But stopping distance is governed by well known laws which cannot be altered, and short of anchors, I see no hope of improvement in stopping distances. What is needed is either more reliable and longer lived brakes, or an automatic switch that will lock the ignition in the off-position when the brakes are unsafe or need attention.

Brake fade needs and is receiving attention. Since non-servo brakes are less prone to fade, the use of brake boosters will continue, so as to keep pedal pressures down even when present high-servo brakes fall into disfavor. There is more than a little evidence pointing to widespread use of 13 inch wheels. This will not help at all, but brake engineers have the answers, if they can spend a little money. The disc type of brake once used by Chrysler on the Crown Imperial is one answer, but don't discount the old reliable (and simple) drum brake. Note that no successful Grand Prix car has yet used disc brakes—and if they were half as good as some people think they are, both Ferrari and Mercedes would have had them three years ago.

Brakes lead to wheels, and there is little hope of much change here. The ultimate design usually employs a combined light alloy wheel and drum with some special means for positive air flow. The cost is of course prohibitive, and brake heat transfer to the tire carcass is a pitfall. It is worth noting here that when G. M. built a near-racing car (the Firebird) it had *forged* aluminum wheels, not magnesium castings. Pressed aluminum wheels may be used within 10 years, but only if the cost is competitive with steel and if fatigue strength can be made equal to steel. A standard 15 inch steel wheel weighs 17 lbs, a presently available cast-magnesium wheel, 14 lbs. The weight saving possibilities are small.

The Body

Already mentioned is the imminence of unit frame and body structures. This will limit body styles to as few as two choices in some makes, a two-door sedan-coupe and a 4 door sedan. Some of the external sheet metal will be made non-load carrying, thus facilitating fairly extensive face-lifting for "new model" sales appeal. The true convertible coupe (the "rag-top") will fall behind and be replaced by hard top convertibles with disappearing metal or fiberglass roof sections. However this type of body will demand further exploitation of an old idea—using the doors as structural members to retain rigidity in a frameless structure. Station wagons will continue to increase in popularity, for we Americans have never ceased to buy the biggest and roomiest package possible, for the money. It may be that the wagon could even replace the 4-door sedan, and certainly the stylists are working with great vigor to make something beautiful out of what once was described as "a piano-box on wheels."

What about sports cars? Taking a close look at the growth in the number of two-car families, at the popularity of station wagons, at the influx of small family cars and at the tremendous impact of sports cars, the future for the latter looks very encouraging. The impecunious enthusiast with a family needs a suitably priced 4-passenger sports car with adequate comfort during winter operation. Today, there is nothing available to supply this need. Many two-car families of moderate means will save enough by driving a small imported family car to enable ownership of a sports car. The more affluent can substitute a station wagon for the small import.

The struggle between the "stark" sports car and the "comfortable" types will continue. The real enthusiasts will still claim that a genuine sports car must sacrifice some comforts to obtain performance—and they are right. But, luxury-loving Americans will buy even more of what have been called "spectator sports cars." Roll-up windows and a heater are rather nice—at times! ●

Mercury's new show car, the "XM-Turnpike Cruiser," has automatic "butterfly" door inserts in the roof, stands 52.8" high.