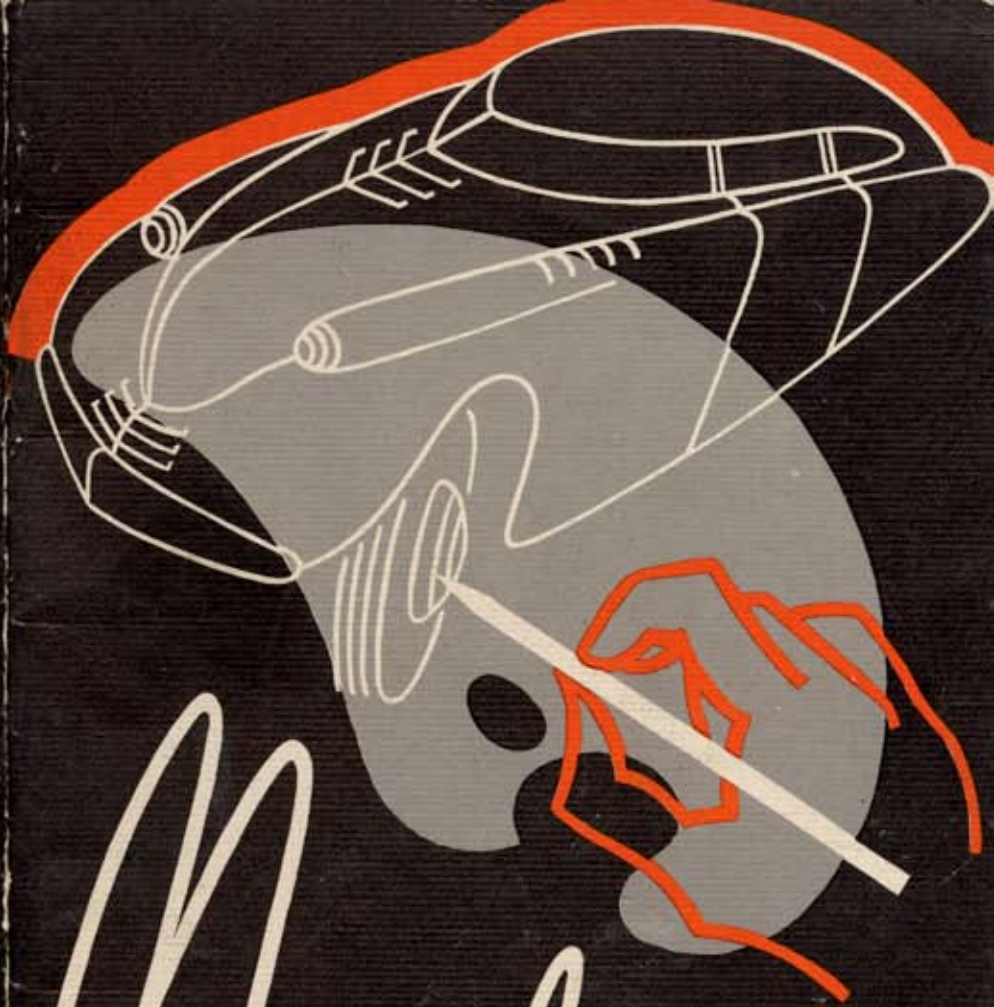

Modes AND MOTORS

"Out of the merger of art, science and industry have come new techniques that have within themselves the ability to create an entirely new pattern and setting for the life of the world."

MODES *and* MOTORS

by
Styling Section
General Motors Corporation

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Mention the word "art" to a roomful of people and most of them will think of a great painting. Some will think of sculpture or architecture—a few, of music or literature.

But hardly anyone will think of industry.

For art in industry is comparatively new. Only in recent years has the interest of manufacturer and user alike been expanded from the mere question of "Does it work?" to include "How should it look?" and "Why should it look that way?" Appearance and style have assumed equal importance with utility, price and operation. The artist and the engineer have joined hands to the end that articles of every day use may be beautiful as well as useful.

Every civilization has contributed something of importance to man's understanding of the principles of beauty. It remained for our own times, through new forms of skill, to provide the means by which artistic creations are made available to everyone.

Probably in no field have the results of the application of art to the products of industry been more apparent than in that of the automobile. In this book is told the story of this new partnership, together with a description of the methods used in designing style and beauty into a modern motor car.

ART IS AS OLD AS MAN

More than fifty thousand years ago a primitive man, living in what is now Spain, drew a picture of a bull on the wall of his cave home. Although to our eyes it may appear to be the work of an amateur, it remains one of the most famous paintings of all history. The painter's name was Ab—and Ab was the first master artist of whom we have record.

This simple drawing is important to us because in it Ab demonstrated, all unconsciously, certain principles of beauty and design that have governed artistic creation ever since. For example, he used bold sweeping lines. He painted in color. Later artists found that color adds naturalness to any composition. He pictured the bull in motion—it is now an accepted principle that motion increases realism and interest. Again, although he made his picture smaller than life size, he kept the various parts in rough proportion (experts call this "scalar reduction"). Finally, and doubtless without being aware of what he was doing, Ab utilized effectively most of the seven

elementary shapes we know today.●

Thus, right at the very beginning certain definite principles of design were laid down that have been followed from that day to this.

But it is not for technical reasons alone that the bull drawn by Ab enjoys world fame. It holds a place high among the masterpieces of all time as our earliest known example of man's striving to improve his surroundings and make them more pleasing and beautiful.

MAN'S FIRST TEACHER

The desire to be surrounded by beautiful things is an elemental human urge. From the time man first learned to mold the raw materials of nature into useful forms he has never been content with usefulness alone. No sooner had he learned to make stone axes and earthen vessels than he turned to decorating them with crude geometrical patterns and representations of animals and plants.

Nature herself was his first teacher, for all around him—in every tree, every blade of grass, every animal—the perfection and beauty of nature was expressed. It was man's ambition, then as now, to capture this beauty of line and form and apply it to objects of his own making.

Art and nature, then, are so closely related that appreciation of beauty is not limited to the artist or the art student. We all know when we like a pattern or design. You often hear a person say, when looking at a new design, "It doesn't look right." You probably have said it yourself, without exactly knowing why you felt that way. Usually it is because objects designed naturally, in accordance with such natural laws as balance and unity, are pleasing to the eye—they "look right."● At the same time, whatever violates the laws of nature "looks wrong."

ART AND CIVILIZATION

Efforts to add beauty to man-made objects can be traced through every period of the world's history. In some periods, as during the Dark Ages, little or no progress was made; in others, as in the days of ancient Greece or when the Renaissance was at its peak, artistic creations by master artists dominated the life of that day. In spite of brief excursions off the main road in pursuit

● *Most authorities agree that these seven elementary shapes are the straight line, the semi-circle, the circle, the spiral, the wave line, the broken line and the letter S.*

● *Incidentally, things that follow natural forms usually work better, too. Airplanes are coming to look more and more like birds, while submarines follow the general outline of a fish.*

of ideas and theories that failed to stand the test of time, each civilization has contributed something of its own to our present-day knowledge of artistic principles—the rules and laws of design used by modern craftsmen to beautify the objects of our daily lives.

IN EARLIEST TIMES

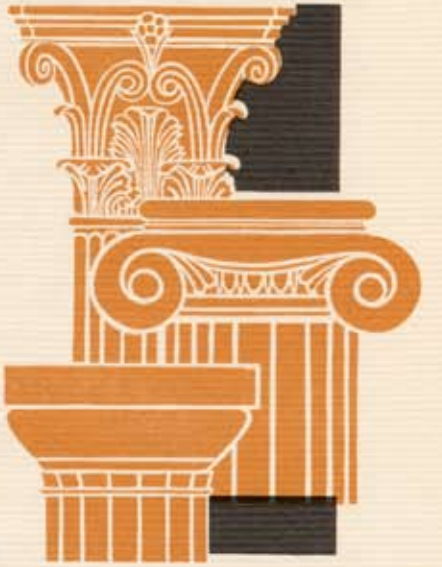
Among the more outstanding of ancient contributions are those of the Egyptians, who gave us the beauty of the triangle and demonstrated the pleasing simplicity of mathematical symmetry• when they built the Pyramids as tombs for their kings. The Babylonians devised that triumph of engineering and art, the dome, and extended the idea into the principle of the tunnel vault. Likewise, they brought the art of glazing to a high stage of perfection and produced some of the finest and most artistic colored brick that the world has ever seen.

A neighboring people, the Assyrians, excelled in the use of color and discovered that borders make a structure appear stronger. Sculpture was made more life-like, more "natural," by an unknown Assyrian about

• *Simplicity, for example, is the keynote of modern architectural design. Skyscrapers and suburban bungalows alike are characterized by straight lines and smooth surfaces.*

2,000 years ago when he conceived the idea of modelling the surface of statues to represent muscles.

IN GREECE AND ROME



More than any other people, the ancient Greeks were interested in art for art's sake. In no other period of the world's history has there been a time when the skill and thought of a whole nation were so concentrated upon the pursuit of beauty and knowledge. Through sculpture, architecture and literature the Greeks left their indelible imprint on all civilizations to come.

The Romans followed in the footsteps of the Greeks, but rarely, if ever, equalled the work that had already been done in the realm of pure artistic creation. The Romans were practical men, faced with practical problems and driven by the desire to build a great empire. So it was chiefly in the field of architecture and public works that the Romans showed themselves to be highly

skilled and able artists, men with the vision and the ability to translate into stone the beauty that every truly useful thing must have.

ORIENTAL ART

On the other side of the world, long before the Occident was aware of their existence, the Chinese were producing fine pottery and porcelains, and weaving exquisite textiles. In India, delicate designs were being wrought in silver, gold and precious stones, while the countries of Islam were developing a distinctive style of architecture, characterized by the graceful Moorish arch.

Every civilization has thus helped to teach us the principles by which things are made beautiful. Wherever artistic geniuses lived and dreamed, they left behind them evidences of their hopes and ambitions and desires —evidences that have come down to us in the form of artistic creations.

BEAUTY FOR EVERYONE

On the whole, however, the art of the ancient and medieval world was very limited in its usefulness so far as the majority of the people were concerned. Expressed in the form of scattered structures, or decorations for the palaces of kings, only comparatively few people could ever see and enjoy it.

Widespread dissemination of art was impossible because a means or method for duplication of artistic objects was lacking. Even small, movable works of art were scarce and costly. The artists of long ago were creators of beauty by their own hands—and by their own hands alone. The master painter of the Renaissance could produce only a few great pictures during his entire lifetime. A master silversmith, such as Cellini who lived in the 16th century, made relatively few pieces, spent months and even years in the creation of a single cup or bowl. Duplicates were rare—the pleasure and benefit derived from a single work of art were restricted to the few.

Let us suppose, for a minute, that Cellini had lived and worked today.

His designs would be used as master ***patterns.*** Expert craftsmen using modern methods would reproduce his work in finest detail, quickly and surely. Millions of these reproductions would be made and distributed all over the world. Everyone would have an opportunity, if he so desired, to see and purchase the product of this great master's brain and skill.

In recent years, through such joint efforts of artists and engineers, sound artistic principles have been applied to hundreds of things in everyday use—from the package of perfume we buy at the store to the motor car we ride in. Not only has the influence of the artist been multiplied by science and industry, but modern research has provided the artist with a much more exact knowledge of artistic principles. No longer is it necessary to depend entirely upon "impressions" and that vague faculty known as "taste" in arriving at critical standards of comparison in artistic fields.● It is true, of course, that art cannot be produced with pure mathematics and applied science alone—there must always be the added ingredients of human feeling, inspiration and imagination that are the mark of the truly great artist.

● *For instance, research into the functions of nerve endings, or "buds," in the eye has thrown new light on the effect of color combinations.*

THE COMMON GOAL

In the last analysis, art, science and industry have a mutual objective—the betterment of mankind and man's life. The means are different, but the goal is the same.

Knowledge itself became widespread only when invention made it possible to reproduce in quantities at low cost the work of the world's writers and thinkers. When manuscripts had to be written by hand, only a few people ever learned to read. The printing press made information and learning available to everyone.

Radio and motion pictures, through the application of research and modern industrial methods, bring the finest artistic productions in the field of music and drama into the lives of us all. Tomorrow, television may still further widen our opportunities to enjoy the beauties of the world in which we live.

By thus bringing together the best artistic thinking from all fields, it is entirely possible that within the span of our own times the products of our factories will come to represent one of

our most noteworthy contributions in the realm of art.

INDUSTRIAL ART

In the early days of our country the emphasis was mainly on "getting things done." The demand for manufactured articles so far exceeded the supply that such things as appearance and style were of little importance to either the manufacturer or the consumer—with the result that most products were strictly utilitarian and not always good looking. Americans took a great deal of pride in being practical people and anything that was frankly artistic was looked upon with considerable suspicion as being either a weakness or an indulgence in extravagance.

During this period the artist regarded manufacturers

with thinly-concealed contempt—to him they were rough, coarse men whose sole purpose in life was to make money. In turn, manufacturers considered most artists to be dreamy, impractical fellows, notoriously unsuccessful by the accepted business standards of the day. Few of them felt the need of an artist to tell them how to design their products.

So, for more than a century we, in this country, were busy thinking out and learning how to make the things we wanted. Even with the development of "mass production"—that is, the technique of making goods in large enough quantities so that many people can have them—it was quite generally assumed that machine-made products necessarily would lack artistic qualities. Gradually, however, as purely mechanical problems began to be solved, there came a growing realization that useful things need not be ugly, that in fact the most useful shape is the most beautiful—that good engineering and good design were closely related.

It was not by chance that makers of automobiles were among the first to devote serious study to appearance engineering. The automobile had grown out of the carriage business. In many respects it still carried the earmarks of the family buggy it supplanted. But in reality the automobile was a new form of mechanical transportation—it served ***the individual,*** taking him where and when he wanted to go. To serve this purpose

well, it must fulfill a number of very definite requirements.

In the first place, the owner wanted to move about at a rapid rate. He wanted to do so comfortably. He required a vehicle that could be operated with ease and confidence. And, because the motor car was a personal possession often second only to the home in which he lived, it was essential that it express individuality, style and good taste.

The job of the designer, then, is to combine the mechanical requirements with the human requirements—to bring together the science of the engineer and the skill of the artist in order that the automobile might be as beautiful as it is useful.

Quietly, in the drafting room and in the industrial studio, this work has gone forward. Because the automobile utilizes materials of every sort—metals, plastics, glass, rubber, fabrics, lacquers—artists in many fields have been recruited from the style centers of the world.

In the following pages is described in some detail the actual procedure employed in designing the modern motor car. We hope you will find it interesting, as an example of the new industrial techniques by which our surroundings in this mechanical age are being made more attractive.

MOTOR CAR DESIGNING

Engineers and designers, assembled around a conference table, take the first steps toward designing the new model. From an engineering viewpoint, mechanical specifications are studied, changes are explained. A new type rear axle may permit lowering the body—an increase in wheelbase may mean changes in seat location. As Leonardo da Vinci showed, the designer must know what is underneath before he can design the covering, or envelope, known as the "body."

From the viewpoint of the customer, the problem involves what might be called human mechanics. In other words, the car, in a sense, must be built around the human form—must be so proportioned as to provide the greatest possible convenience, comfort and safety for the average occupant.

The artist is interested in what the car will look like—in what it *should* look like. Because it is a swiftly moving vehicle, its exterior must express fleetness and movement; because it carries passengers, its interior must express comfort and repose.

Leonardo da Vinci, the great Florentine artist, demonstrated that in order to arrive at a satisfactory portrayal of the human form the artist must possess a knowledge of anatomy—especially of the bones and muscles that make up the structure of the body.

DESIGN RUNS RIOT

Now comes what might be called a "creative field day." Design runs riot. A group of designers• give free play to their creative instincts, working out all the new ideas that happen to come to mind. Files of drawings made in the past are consulted for whatever material of value they may contain. (Incidentally, an average of 1500 separate sketches are prepared in the process of arriving at one finished design.)

Along with the actual sketching, fashion trends in other fields—women's costumes, architecture, interior decorating—are studied, for the motor car must reflect in its design the style tempo of our times. Reports on special features and details of appointments are compiled from surveys made among "Motor Enthusiasts"—practical motorists who have more than a passing interest in motor cars.

Then comes a period of appraisal in which these various conceptions are weighed one against the other. Out of it all emerge a few ideas that have definite possibilities of application—the rest are filed away against a time when, under different conditions, something that is not quite acceptable today may become the mode of tomorrow.

• *We call these men "designers," when perhaps a more accurate name would be "artists"—except that so many people still think of artists as men wearing smocks and painting in oils.*

MODELS IN CLAY

While finished designs are being created on the drawing board these artists develop their ideas in miniature, quarter size clay models. They spend hours and days molding contours with their hands, scraping and smoothing lines with tiny instruments, adding a curve here, taking away a curve there. It is careful, painstaking work, requiring patience and craftsmanship of the highest order. The clay is very much like that sold for children's use and is kept at proper working temperature in special electric ovens.

Clay models have two main advantages over drawings and sketches—they are in three dimensions and therefore show more nearly how a design will finally look, and the soft clay permits easy experimentation with different contours.

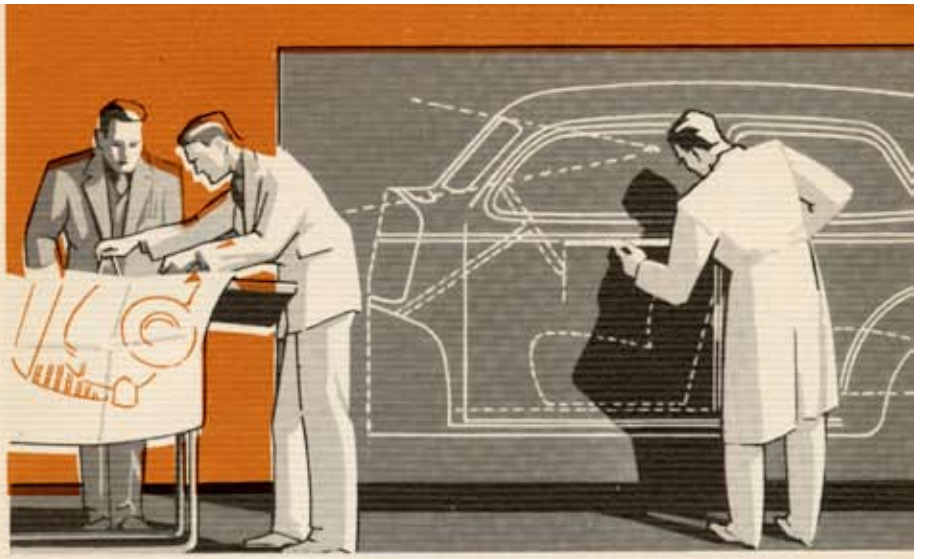
From these models other characteristics besides appearance can be studied. For example, by placing the scale model in a wind tunnel and generating gales up to fifty miles per hour, the effect of wind resistance can be measured. Incidentally, through such tests it is sometimes found that some minor projection or curve creates an unusual wind noise, in which case the contours are changed to eliminate the objectionable sound.

CHALK DRAWING

Every artist and designer is limited by the materials in which his design is to be reproduced. Some designs that look good on paper have to be discarded because there is no machine yet available that can produce the parts, or no materials that can be processed in the way called for by the plans. Every step in designing an automobile is really a compromise between human imagination and human ingenuity—between what ***might*** be done and what ***can*** be done now.

For example, take the recent development of all-steel tops. The idea was in men's minds and on their drafting boards long before it could be put into production, simply because no one knew how to make steel sheets of the required size and quality, nor had any press been developed capable of stamping them into shape.

So right here at the beginning, production men and engineers step into the picture to check the efforts of the artists and make sure that the design selected can be produced with the present knowledge of materials and methods. When the necessary alterations have been completed, a full size drawing of the new model is made in chalk on a blackboard. Here every curve and every dimension is accurately plotted and drawn in outline; end views as well as side views are shown.



COMFORT

You probably have noticed frequent references to the extremely fine measurements used in the manufacture of a motor car. Connecting rods and pistons are balanced within a small fraction of an ounce; clearances held to 2/1000 of an inch are common. This is fine work, requiring precision instruments and skilled workers, and the automobile industry is justly proud of the accuracy with which these operations are performed.

But these men you see in the illustration are not interested in decimals and fractions—they are designing for ***comfort***, making the automobile body fit the human body. People vary so greatly in size and stature that tiny fractions make little difference, but an inch or half an inch ***is*** important in the angle of a seat cushion or the height of an arm rest.

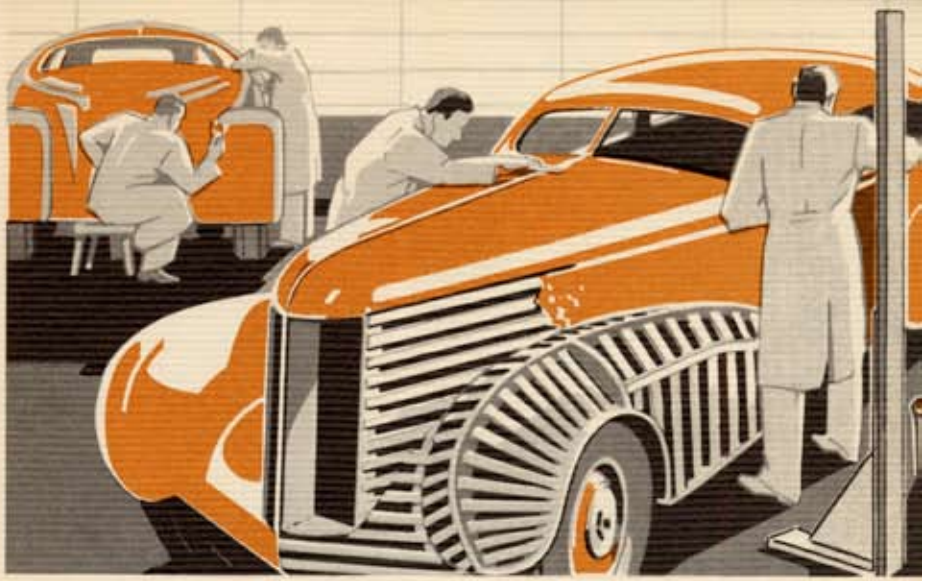
The designers carefully check the full-size drawing to determine proper door width, correct seat spacing and to establish ample head and leg room. Is vision clear and unobstructed? Where should the instruments and controls be placed so as to respond easily to the normal movements of the driver? Their decisions are based upon carefully computed averages, but, whenever possible, adjustments are provided to make the final product even more suited to the user.

WORKING DRAWINGS

As a final check on the interior plan, a "trim buck" is constructed—a skeleton framework built in accordance with the proposed interior measurements and arrangement. It serves an important purpose by providing an actual reproduction of the head room, seat width, seat depth, leg room and other dimensions that will be present in the finished body.

If changes seem necessary they are indicated on the full size chalk drawings. Then, with the external outlines of the car established, tracings of the blackboard drawings are made on vellum paper and turned over to the drafting room staff.

Here the work is divided between two groups. One group prepares full-size working drawings of the contours of the car, using the vellum tracings. Another group concentrates on working drawings of details such as bumpers, emblems and headlights. Both activities are carried on simultaneously by skilled and experienced draftsmen. As time goes on and the design progresses through the various stages of full-size clay model, wood model and finished body, these men will revise and keep up-to-date the early working drawings they are making here. On their accuracy and care depends the success of the final design in production.



FULL-SIZE MODELS

Through the preliminary stages of design development miniature scale models provide a ready means of translating the idea and sketches of the artist into three-dimensional form. But later, when the new design approaches its final stages, full-size models must be made in order to be certain that the design is entirely harmonious.

Using the working drawings prepared in the drafting room, a full-size model is carefully built up out of clay, over a wooden form. Some parts of the work go rapidly; others, such as details of the louvers, radiator and rear contours require endless hours of experimentation. On the same body shape innumerable combinations of louvers, lights, fenders and grilles may be tried out before arriving at the one combination that is satisfactory in all respects.

No door or window glass is installed in this model, and the interior is rough and unfinished. But every detail of the exterior surfaces is carefully and accurately worked out, so that from the standpoint of size and exterior design this clay model is an exact replica of a finished car.

With the last minute changes made, templates• and patterns are taken of every curve and contour for use in the construction of the hand-made wood model described on the following page.

• *Pieces of wood cut out to fit over a section of the body, reproducing its curves exactly.*

MODELS IN WOOD

When the design has been accurately reproduced in clay, the activity shifts to the wood and metal shops. Here, as shown in the illustration, a new full-size model is built up out of mahogany and poplar. Metal parts, such as bumpers, grilles and body hardware are made by hand by skilled workers, and are finished complete down to the smallest detail and even plated with chromium where required.

Next the inside of the car is trimmed. Seats are installed, glass placed in the windows, instruments in the instrument panel. Tires are mounted in position, doors hung, head and tail lights put in place. The exterior surfaces are then covered with cloth and painted. The cloth is used to give an extra smooth surface to the body, so that the painted areas will have all the gloss of a new car. As a result, this finished model—lacking an engine, frame and all the rest of the chassis—so closely resembles a real car that most people can't tell the difference from a distance of six feet.

From this finished model a complete set of master drawings are made and turned over to the engineers and designers. They in turn make the shop drawings, dies and patterns from which the design will be produced in steel.

INTERIORS

As already pointed out, the exterior of a car should be suggestive of motion and fleetness—an effect achieved, in the main, by the use of dominant horizontal lines. The interior of an automobile must give a different feeling—a sensation of restfulness and repose for maximum passenger comfort. This is accomplished by using about the same technique as in designing a living room "cozy corner."

The details of interior treatment are worked out simultaneously with the development of the exterior design. Hardware and moldings in many different styles are prepared. Customer preferences bearing on types of fabrics and styles of trimming are consulted. Harmonious color schemes in floor coverings, head-linings and upholsteries are developed.

Of special importance is the design of the instrument panel. For maximum safety, relaxation and comfort the instruments must be within easy ***vision,*** the controls within easy ***reach.*** Moreover, the color must be neutral and the instruments adequately illuminated.

The proper design and location of gear shift levers, door handles and window controls, the position of rear vision mirrors—all are of importance from the standpoint of safety and comfort.•

• *Incidentally, it was found that when such things as door handles were designed to be better functionally—that is, so they would not catch the coat sleeves—they became more attractive in appearance.*

FASHIONS IN COLOR

As every woman knows, there are fashions in color as well as in design. One season blue strikes the popular fancy, another sees maroon or green or yellow in the ascendant. Fortunately for the manufacturer, fashions in automobile colors do not change rapidly, but there are noticeable differences over a period of time and between different sections of the country. And so color fashion trends must be studied by a special group of color experts.

These color experts do not guess at what colors should be used—they ***find out*** by conducting field surveys at regular intervals among new car buyers everywhere, tabulating exactly what colors people like.

On the large map you see illustrated above, the color "vote" in each state is recorded and kept up-to-date. In passing, some interesting variations might be mentioned. For example, in the colder sections of the country, black and blue are favored; in southern areas light colors such as tan take preference. Automobile colors are even a fairly good index of economic conditions. During periods of reduced business activity people seem to prefer dark colors and swing to lighter hues with the return of good times.

COLOR TESTS

With so many colors already available, it would seem that there could be no possible need for more. But fashion dictates—milady's car must match her mood; people are always demanding something "new." So every month a number of new colors are developed. Some are for automobiles—while others are used for accessories, streamlined trains or displays at expositions.

New colors, especially those destined for automotive use, must be tested carefully before being used in production. This work is carried on in part at an extensive testing station in Florida, where sample color panels are exposed for long periods to the action of the hot tropical sun and the salt air. At regular intervals these panels are checked for signs of deterioration, or "weathering" as engineers call it. No finish can be adopted for automotive use until it passes these tests.

At any given time upwards of sixty colors stand approved by the color experts, including special forms of lacquer such as the recently developed metallic colors—made by adding a small quantity of fine aluminum powder to the pigment. From these approved colors selections are made for the various types of cars and body styles.

ACHIEVEMENT

Many months have passed since the first conference of engineers and designers. Much work has been done—plans have been made and thrown away—ideas tested and rejected—designs perfected. The long weeks of study and research are drawing to an end. Engineers, designers and draftsmen gather to see the final result of their joint efforts.•

The curtains roll back, the lights flash on. A new car is born!

In the factories, production soon will start. Then a different kind of craftsmanship comes into play—the craftsmanship of skilled production workers who execute the designs of the artists and engineers. Materials begin to flow into the factories, wheels begin to turn, and soon replicas of this master model will be sent to thousands of customers all over the country. But for the designers the job is finished—it is time to start another. Like the artist who draws Christmas cards in June, the automotive designer works far ahead of the actual appearance of the product on the market.

• *Incidentally, you might be interested in knowing that the best way to judge the appearance of an automobile is to look at it from a point diagonally off the front fender. This gives you a three-quarter view of the whole car, taking in both front and side.*

DESIGN IN OTHER FIELDS

So far most of our story has been devoted to the designing of automobiles. It is the most important part of the work of the Department of Styling—but it is only a part.

Because the principles of sound industrial design are equally applicable to any field, extensive development work in design is carried on with a number of diverse products, ranging from radios to streamlined trains, from batteries to buses.

No matter what the product may be, the problem of its design is approached in the same way. To follow the progress of, say, a truck design, would be largely repetition.

However, you may be interested in glancing through the following pages to see some of the ***results*** of this design activity in other fields.

TRUCKS AND BUSES

The appearance of trucks and buses used to be even more neglected than the appearance of passenger cars—all the attention was given to power and capacity. In fact, only within the past few years has any real progress been made towards making commercial vehicles pleasing to the eye.

While passenger and driver comfort, ease of control and adequate visibility are of the same importance as in passenger cars, a distinctive commercial body design *in itself* possesses value from the standpoint of serving as a sort of moving billboard advertising the owner and his products.

Buses present their own peculiar problems of design—maximum passenger capacity, comfort, safety and ease of handling must be provided. But designers say that, strangely enough, one of the most difficult things to develop is a satisfactory plan or scheme for painting the body. The bus body is a massive object and it is the task of the designer to handle these large areas of external color so as to portray gracefulness and fleetness. The sweeping lines and pleasing color harmonies you see on the latest transcontinental buses were worked out mathematically to create this effect.•

• *As in the case of the automobile, mechanical improvements, too, have contributed to improved appearance. In fact, it is rather an accepted principle that as a product is improved functionally, it tends to become better artistically.*

STREAMLINE TRAINS

In automobiles the principal benefit of streamlining is in improved appearance. Since an automobile is usually operated at relatively low speeds except on rare occasions, the factor of wind resistance does not affect economy or performance to any great degree, practically speaking.

Trains are a different matter. They are often run at high speeds over long distances. They have a large frontal area. By following the best streamline practice, combined with the utilization of new, lightweight materials now available, it is possible to effect great savings in weight and operating costs, and at the same time increase passenger comfort.

With the development of Diesel powered trains the whole problem of locomotive design could be approached from a new angle. Not only were designs developed for many of the streamlined locomotives now in use, but the work was extended to include the interiors of the cars, the color scheme, seating arrangement and, in some cases, even the china, the silverware and the porters' uniforms.

PRODUCTS

The ability and experience of these "industrial artists" have found expression in many of the products that surround our everyday lives.

For example, car radios and heaters were redesigned from the standpoint of style and utility, resulting in products that harmonize with the interior treatment of the car. Such little refinements as proper blending of colors, smoother contours and accessible controls are the result of long testing of preliminary designs before the final one is selected.

Storage batteries likewise were given a "face lifting" treatment. Simply because batteries are usually out of sight was no reason why they should not be better looking, reasoned the engineers. The application of the principles of design to this particular problem resulted in a battery that was not only more pleasing to the eye, but much easier to keep clean—which incidentally seems to bear out the theory that just as mechanical advances promote better appearance, so design based on sound artistic principles frequently results in improved function.

WHAT OF TOMORROW?

A great many people frequently ask: "Why didn't you do that two years ago?" or "Why don't you do this or that now?" The answer lies in the nature of progress itself.

Progress in artistic design, as in most other things, is evolutionary. Advancement comes in logical sequence—it would not have been possible to jump, for example, from a 1934 design to the current one without benefit of the experience that came in between. Each year new knowledge and new skills are added to what was known before. In the constant striving for better products there can be neither hurrying nor holding back.

Always there is a race between our ideals of what a thing should be like and our ability to make it that way. Design frequently waits upon technological advancement before the product can be made as the artist pictures it in his mind —upon new materials and new methods and machinery to work these materials, and upon mechanical improvements in the car itself. Finally, every improvement in design must

always be measured in terms of the cost of this benefit to the user. Modern industry by constantly devising new methods and perfecting new processes has brought a multitude of former luxuries within the reach of the average person.

There is much speculation about what the car of the future will look like—and many people have ideas about how it should look. As a matter of fact, no one really knows. We can look back over what has been done in the past and discover certain trends. We can even hazard a guess as to how long these trends may be continued. Further than that no one can, with accuracy, speak. But there is no reason to suppose that ten years from now the automobile will look any more like the car of today than today's car looks like the product of ten years ago.

Certain it is that out of the merger of art, science and industry, fostered and made effective by modern industrial processes, have come new techniques that have within themselves the ability to create an entirely new pattern and setting for the life of the world.

★ ★ ★

OTHER BOOKLETS OF A SIMILAR NATURE

"WHEN THE WHEELS REVOLVE"

A description of the operation of the automobile from the pistons to the rear wheels, using familiar objects from the home and office to illustrate the principles involved.

"CHEMISTRY AND WHEELS"

The fascinating story of the combustion of gasoline in an automobile engine, treated from the standpoint that the motor car is a chemical factory on wheels.

"DIESEL—THE MODERN POWER"

Issued by the General Motors Research Laboratories, this profusely illustrated booklet discusses the past, present and future of the Diesel engine.

"METALLURGY AND WHEELS"

The story of iron and steel from prehistoric times, with special attention to the part these metals play in the automobile industry.

ADDRESS
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