CANON CAMERA COMPANY, INC.
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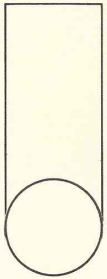
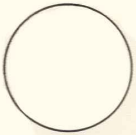




DEVELOPMENT OF CANON LENSES

for
35mm CAMERAS

Canon

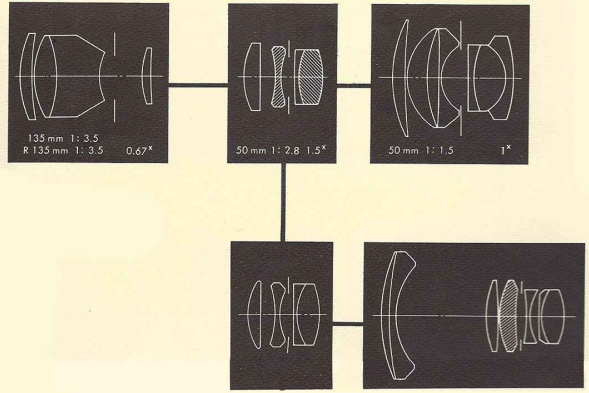
The secret of Canon's success in the photographic industry today owes much to its fine series of lenses for miniature cameras as well as photo-industrial equipment including lenses for television cameras . . . they are truly the back bone of the company whose name is world renowned as the manufacturer of quality cameras.

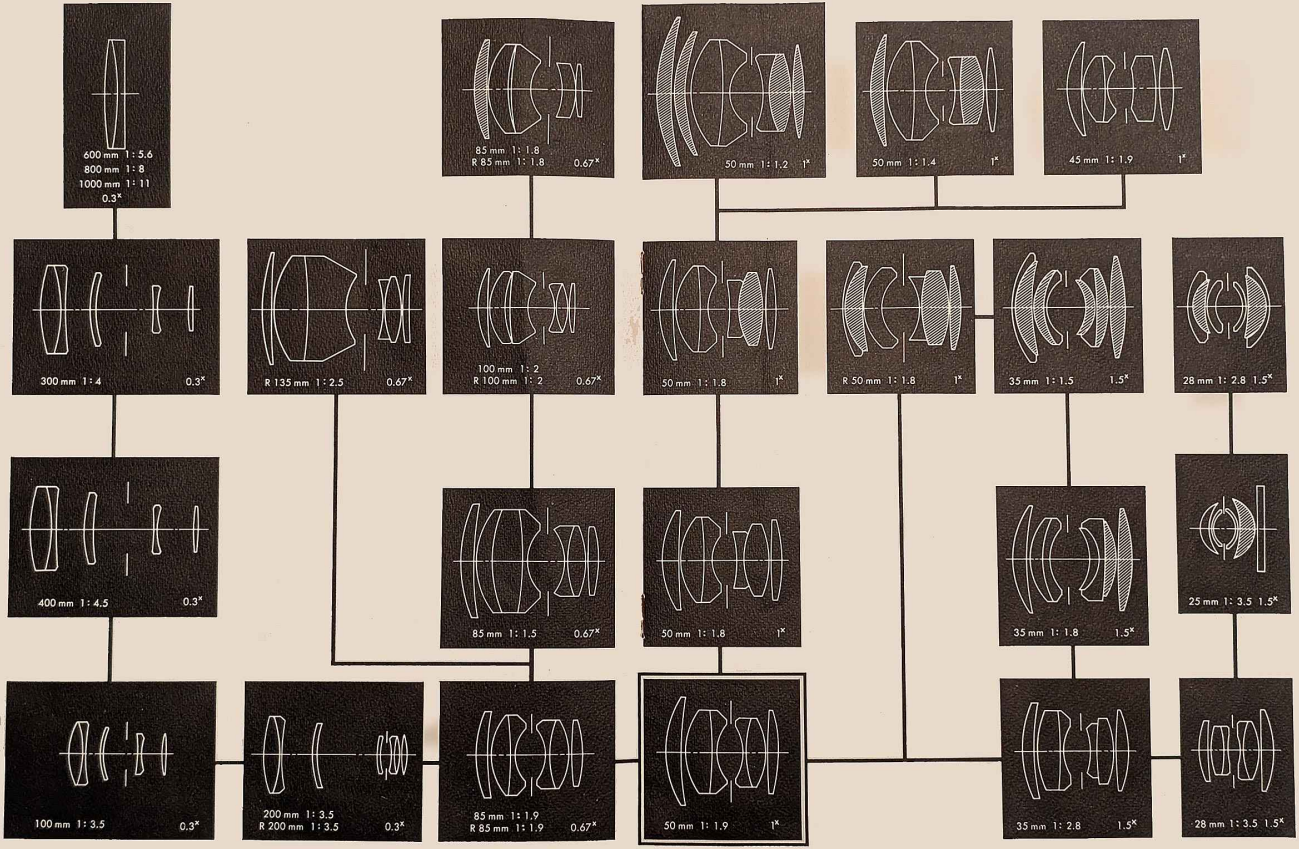
Today, Canon lenses are held in the highest esteem by professionals and amateurs the world over for their unsurpassed, unique optical design, and precision engineering. Canon pioneered development of high speed lenses, too—opening up new lanes of photographic versatility to the serious photographers. Canon provides for the oweners of Canon camera a complete range of interchangeable lenses from wide angle to super-telephoto in rangefinder-type cameras as well as in single-lens reflex.

Before leaving the factory, all Canon lenses must meet one of the most rigid tests to insure the highest quality, resolution, contrast, brilliance, and color fidelity. All lenses are Spectra-Coated (Trade Mark) internally and externally to assure you of the finest reproduction in both color and black and white photography at their colorful best.

The construction and the performance of a camera vary with its manufacturer, who endeavors to give its product some unique features. The same thing can be said of camera lenses. Two lenses made by different makers may look alike, but they will often differ in the combination of unit glass pieces and the shape of surface curves. In the design and manufacture of Canon lenses, primary importance is attached constructing them to give optimum performance : a high resolving power with least flare at the widest aperture. The achievement is exemplified by the introduction of the 50 mm 1 : 1.2 lens, the 35 mm 1 : 1.8 wide-angle lens, and both 28 mm and 25 mm extra-wide-angle lenses of 1 : 2.8 and 1 : 3.5, all of which are brighter than any other lenses made by other manufacturers. All Canon lenses have been designed with one principle in mind.

Just how this idea has been developed up till the present time can be traced in the following illustrations, which will serve to show the characteristics of each lens illustrated. Canon family of precision lenses have been developed into one of the largest groups of fine optics in the last 20 years. And, it will continue to grow in the world in the future. We hope that the chart showing Canon's achievement to this date will be revised soon to have bigger family of fine lenses for the photographers the world over.




600 mm 1 : 5.6
800 mm 1 : 8
1000 mm 1 : 11
0.3×
85 mm 1 : 1.8
R 85 mm 1 : 1.8 0.67×
50 mm 1 : 1.2 1×
50 mm 1 : 1.4 1×
45 mm 1 : 1.9 1×
300 mm 1 : 4 0.3×
R 135 mm 1 : 2.5 0.67×
100 mm 1 : 2
R 100 mm 1 : 2 0.67×
50 mm 1 : 1.8 1×
R 50 mm 1 : 1.8 1×
35 mm 1 : 1.5 1.5×
28 mm 1 : 2.8 1.5×
400 mm 1 : 4.5 0.3×
85 mm 1 : 1.5 0.67×
50 mm 1 : 1.8 1×
35 mm 1 : 1.8 1.5×
25 mm 1 : 3.5 1.5×
100 mm 1 : 3.5 0.3×
200 mm 1 : 3.5
R 200 mm 1 : 3.5 0.3×
85 mm 1 : 1.9
R 85 mm 1 : 1.9 0.67×
50 mm 1 : 1.9 1×
35 mm 1 : 2.8 1.5×
28 mm 1 : 3.5 1.5×

THE FIRST CANON LENS . . .

The pivot of the development is the Serenar 50 mm 1 : 1.9 lens, the manufacture of which has now been discontinued. Almost all Canon lenses currently available have been developed from the analytical research made into this lens. This Serenar, with six elements built into four sections, is of the Gauss-type, which has an established reputation of being a lens with excellent brightness. The lenses of this type, which having many good qualities, reveal one noticeable defect when they are made into a 35 mm standard lens. That is, in their making it is extremely difficult to correct coma aberration for the oblique rays with an angle of incidence of more than 10 degrees. As a consequence, the pictures taken with those lenses at full opening showed flares to an objectionable over all except the middle area.

Many lens designers attempt unsuccessfully to find some way to correct this aberration. The Canon lens designers were not able to overcome this difficulty when the Serenar 50 mm 1 : 1.9 was produced. However, they did not slacken in their efforts to find out just what causes this type of lens to have this coma aberration. Their tireless research was finally rewarded when they discovered the vital reason for coma aberration was that it was mostly due to the sixth surface of the lens having too small a radius in curvature. This curve was then made more gradual. However, this was no solution to the whole problem. Making the curve more gradual brings about an increase in spherical aberration. This was overcome by changing the forth surface which is in turn glued onto the fifth surface. Prior to this improvement, fourth surface was designed only for correcting chromatic aberration. It was a new departure that this surface was now used also to correct spherical aberration. To achieve this second objective it was necessary to provide the third unit glass with much higher refraction than the second unit glass. This provision of higher refraction inevitably increased the astigmatism of the glass. Then this was remedied by considerably lowering the refraction of the concave lens in the third unit. Mentioned thus in summary form, all these adjustments sound simple. Actually, however, with each step there was an increasing amount of mathematical calculation to establish the results both theoretical and practical of this intensive prolonged study of these computations. Every phase of this operation required a great deal of time and labor.

WORLD-FAMED 50 mm 1 : 1.8 . . .

The material alteration in the curvature radius refered to above, as well as in the lens construction materials, produced success in correcting the coma aberration. The condition, known as Rudolf's theory, which is of great help in correcting aberrations, was fortunately and unexpectedly satisfied by the changed curvature in which the two pieces of glass are joined together to form the third unit lens. These results produced a great forward stride in the progress of the Gauss-type lens. With all these improvements incorporated the Canon 50 mm 1 : 1.8 was produced, and in which in addition to the removal of the coma aberration, both spherical aberration and astigmatism were corrected more exactly than other lenses. As a result, with this world renowned lens, picture can be taken even at full aperture with practically no flare.

As mentioned above, when used as a standard lens, six element Gauss-type lenses display excellent qualities although they have the defect of coma aberration.

GROUP OF INTERCHANGEABLE LENSES . . .

The Canon engineers established, that, as a result of their research, this type of lens could possess excellent performance in its own field of use, if its astigmatism, spherical, chromatic and other aberration were perfected to a high degree of correction. After the introduction of the 50 mm 1 : 1.8 lens further study produced the Canon 85 mm 1 : 1.5, followed by a group of lenses including the 85 mm 1 : 1.9, 200 mm 1 : 3.5, all being provided with a superior central resolving power as a result of the ever greater improvement in correction of spherical and chromatic aberration. The method successfully adopted in the design of the above 200 mm 1 : 3.5 lens to lessen its weight made it possible to add to the Canon lens family the new distinguished members 100 mm 1 : 3.5 and 400 mm 1 : 4.5. Meanwhile, by further improvement in the correction of astigmatism a group of wide angle lenses with many new features was introduced, including the 35 mm 1 : 2.8, 28 mm 1 : 3.5 and others.

With emphasis on brightness and minimum coma aberration, high quality lenses of 35 mm 1 : 1.8 and 25 mm 1 : 3.5 were perfected also to occupy their places in the Gauss-type lens family. The 28 mm 1 : 2.8 was a product, an advanced step of the design of the 25 mm 1 : 3.5.

In addition to these described above, the Canon lens family has members of another type, which are also highly regarded, including the 50 mm 1 : 2.8, 50 mm 1 : 1.5 and 135 mm 1 : 3.5. They are designed as a development of the triplet type using new kinds of glass as materials. This will illustrate the step-by-step progress in the Canon lenses brought about by the Canon engineers, who worked, and continue to work tirelessly toward the single objective, that of making better camera lenses.

One of the latest achievement of Canon is the fast 50 mm 1 : 1.4 lens. This lens was developed by further improvement and study of the world-famed 50 mm 1 : 1.8, incorporating all its finest features. Unique lens design developed by Canon engineering staffs made possible the 6-element 1 : 1.4 of the highest quality. This will surpass the lenses of 7-elements in performance. At the widest aperture, 1 : 1.4 will assure you of the non-flare picture edge-to-edge sharpness. Including 2 elements of special rare glasses, 1 : 1.4 consists of only 6-elements in 4-components with the curvature of each lens element surface being extremely easy to complete.

Canon 35 mm 1 : 1.5 is the fastest wide-angle lens in its field. This lens was made in an attempt to correct the remaining minor aberration of 1 : 1.8 by employing the high-speed electronic computor. Canon attempted the daring design to include 5-elements made of special rare glass in the 8-element, 4-group lens. The success in lens design has resulted in the lens of the highest quality. 1 : 1.5 assures sharp and non-flare photograph at the maximum aperture. This is truly one of the finest wide-angle lens in the world.

LENSES FOR SINGLE-LENS REFLEX CAMERAS

As the completion of Canon single-lens reflex system, the new R 50 mm 1 : 1.8 lens was developed on the same theory as the original Canon wide-angle-type lens, incorporating the method for correcting aberration which made possible the design of 35 mm 1 : 1.5 lens.

It was named the "Super Canomatic" lens which incorporates fully-automatic springback diaphragm. All the lenses for the Canon single-lens reflex cameras have the same bayonet type mounts. The distance from the surface of the last lens element to the film plane is extremely long. It reproduces picture of highest resolution, unexcelled color correction in its entire photographing range from closest range to infinity at all aperture stops, while it indicates performance which is common with all wide-angle-type lenses.

The standard Super Canomatic Lens R 50 mm 1 : 1.8 was followed by a series of new Super Canomatic Lenses ; R 35 mm 1 : 2.5, R 85 mm 1 : 1.8, R 100 mm 1 : 2, and R 135 mm 1 : 2.5. From the optical theory point of view these lenses are the same as the group of lenses for range-finder type cameras introduced earlier ; however, they incorporate the Super Canomatic mechanism to allow the photographers to view and focus at full aperture brightness at all times which is an essential factor for single-lens reflex cameras. Along with the series of Super Canomatic Lenses, a lens with semi-automatic diaphragm—R 200 mm 1 : 3.5—was developed. This lens was named "Canomatic". It is designed so that charge mechanism of pre-set aperture be actuated within the lens barrel instead of at the lens mount to avoid mechanical defects. There are Canon Lenses R 85 mm 1 : 1.9 and R 135 mm 1 : 3.5 which have bayonet type mount. They are especially designed for Canonflex R 2000 and other Canon single-lens reflex cameras. The setting of aperture is done manually. Thus, as the completion of these interchangeable lenses, Canon provides a complete range of lenses from wide-angle to telephoto for the single-lens reflex Canon cameras.

NEW ELECTRIC-EYE CANON LENS SE 45 mm 1 : 1.9

With the introduction of fully-automatic camera "Canonet," Canon engineers have developed, for the first time, a built-in lens with shutter mechanism incorporated within the lens. The lens consists of 5 elements in 4 components. Although this was the first venture for Canon to design 45 mm semi-wide angle lens with an amazingly fast 1 : 1.9, Canon engineers had succeeded in correcting the coma aberration . . . eliminating flare completely at all aperture stops. The front part of the lens is surrounded by electric-eye photo cells and has a fully-automatic shutter mechanism.

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