

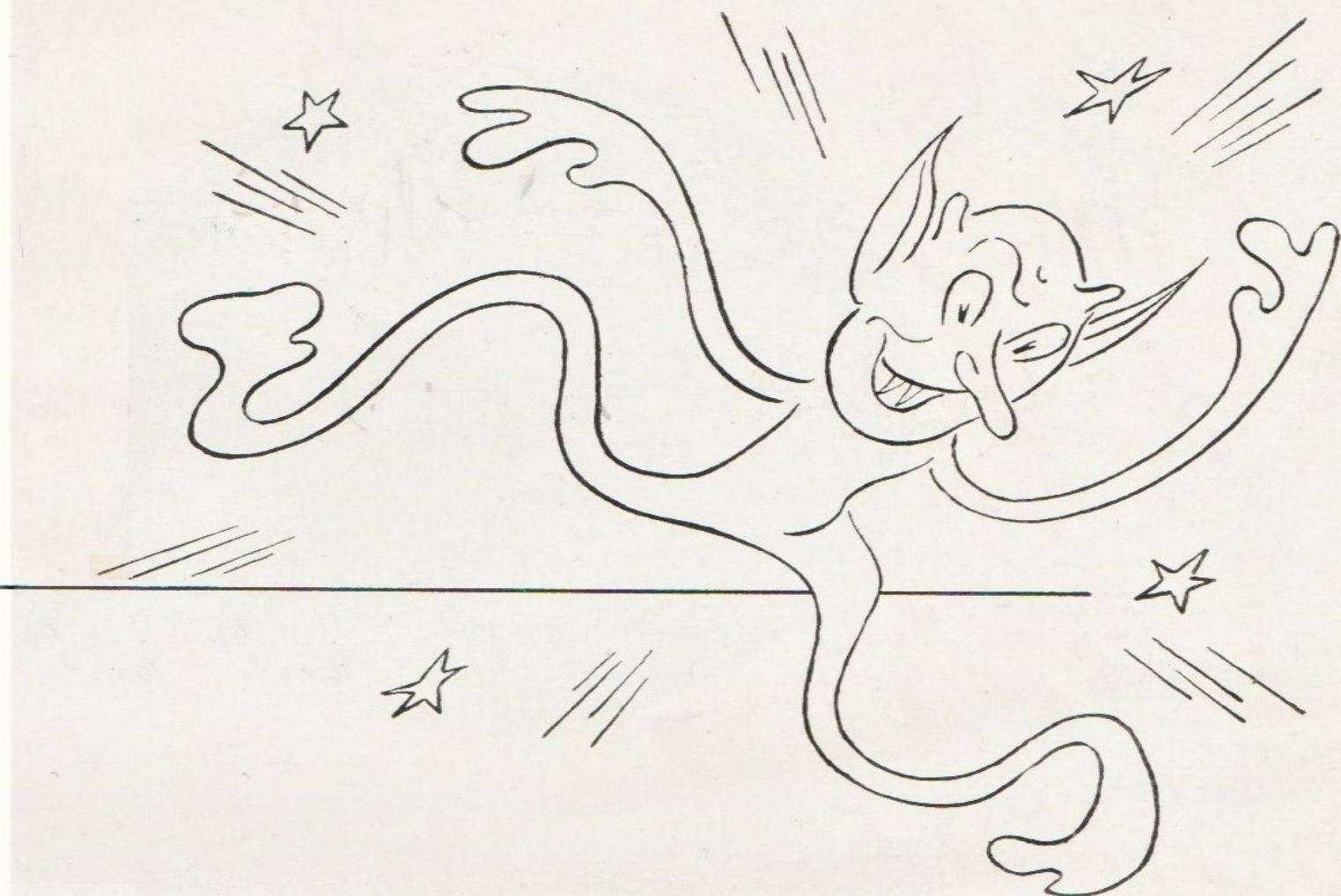
The Care and Nurture of Coated Lenses



The Care and Nurture of Coated Lenses*

THERE seems to be an elfish, mischievous, almost malicious spirit about modern technology,—we no sooner adapt ourselves to an innovation, learning its idiosyncracies, its own peculiar little laws, the better to pay it its due respect and to gather from it all it can give, than another comes along with its own set of eccentricities, which on the basis of chance cannot be identical with those already painfully learned, and the whole wasteful process of learning by error must be started afresh. Just such apparently has happened in the field of optics within the past ten years by the introduction of coated lenses. The care of high grade

*By Allen E. Murray
Bausch & Lomb Optical Co.
Originally published in
The International Projectionist, February 1949



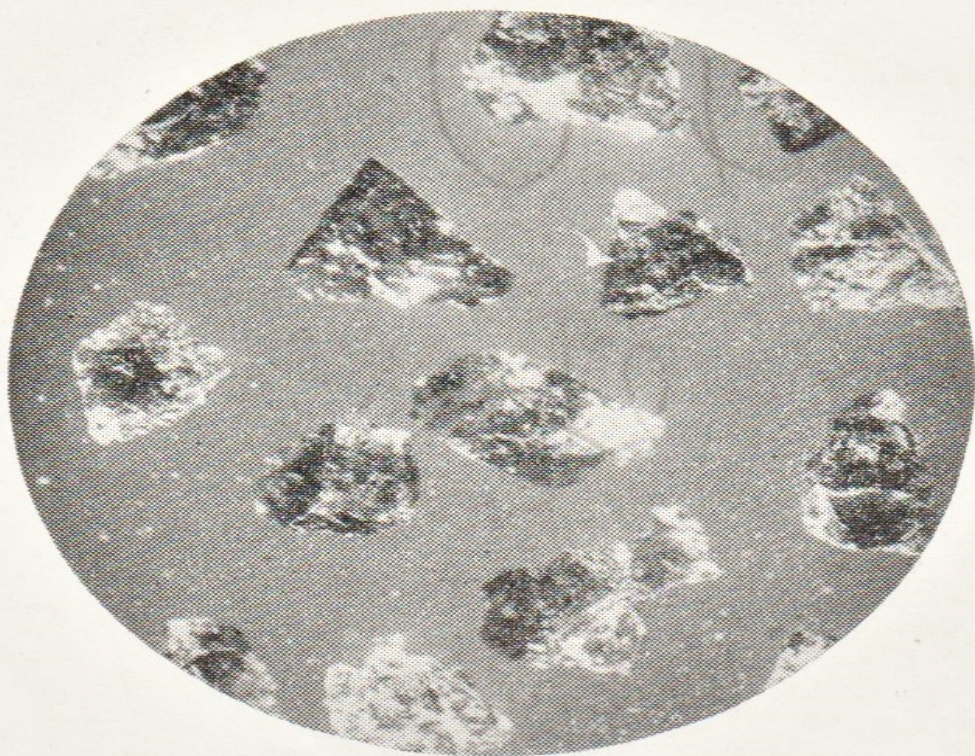
lenses was learned through countless mistakes and was fairly well understood, to judge from the repairs received by the manufacturers, until the whole field was turned topsy-turvy by the development on a commercial scale of the techniques of applying anti-reflection films.

LENS

MISTREATMENT WIDESPREAD

The manufacturer now receives lenses showing indisputable evidence of mistreatment from an ignorance or sheer carelessness which for the most part seems in-





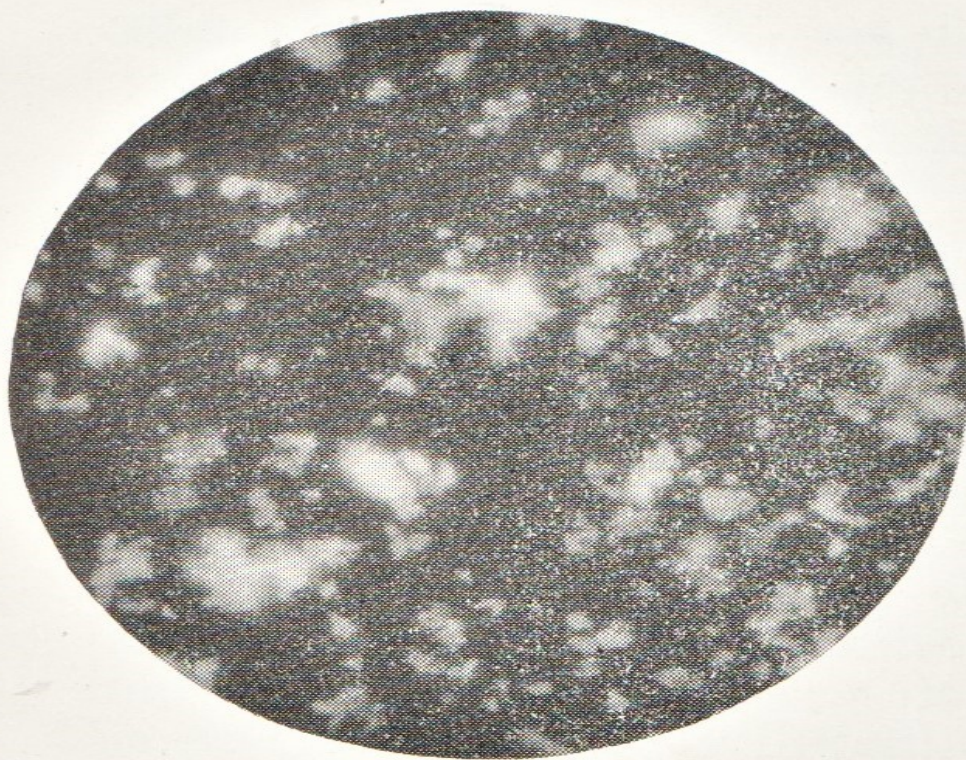
*Coarse emery used
in lens grinding.
Mag. 12×*

excusable. He is somewhat more than mildly incensed to see these lenses in such a condition, for aside from his natural pride in a well made product, repairs cannot in the long run be profitable, for at best they are stop-gap, and the manufacturer's reputation inevitably suffers.

It is to alleviate some of these troubles that this is being published. It is our hope that those who must handle the excellent, well made lenses of today will read this and gather from it a better understanding of the physical nature of that extremely thin boundary between air and glass which has such a profound effect on the optical properties of the objectives.



*Dust "scratches
for a living".*



*Common dust
can scratch a
lens. Mag. 100×*

In the first place, the extent to which most optical glass is actually delicate and subject to scratching, by an astonishing array of things we have learned to think of as truly soft, is not realized except by those who have seen the effect of common dust rubbed over a polished optical glass surface. Once having been seen, this demonstration cannot be forgotten.

*Rx . . . a routine
of constant care*

The two pictures accompanying this are photomicrographs of emery grains and common dust, not however, to the same scale. The first substance is used to grind curves on lenses; its abrasive qualities are familiar to everyone. The second is commonly used to produce scratches in fine optics, its multitude of sharp edges being



hint enough of the hazard in indiscriminate rubbing over a dust-laden polished surface.

BLANDEST SUBSTANCES UNSAFE

Even such bland stuff as face powder is capable of producing scratches sufficient to destroy the fine polish laboriously applied at the factory. In their effect, a few such scratches are negligible, but multiplied many times over so as to cover the entire surface, they can be disastrous to good imagery and contrast on the screen. All cleaning powders contain such abrasive matter, despite their claim to never having scratched, and are thus *never* to be used to clean a lens, coated or uncoated,—a homely little principle which seems to be well enough understood by the bulk of projectionists and photographers.

The introduction of filmed optics has not changed substantially the recommended cleaning practices, but it has brought with it a new factor in the increased sensibility of the filmed surface to contamination of any kind.

The surface reflectances of most substances likely to find themselves spread on a lens approach

*Coated lenses
easily cleaned*



that of the glass itself, and thus would not be expected to be seen easily against the lens surfaces. A thin uniform layer of water is totally unrecognizable against glass until it loses its uniformity, i.e., begins to evaporate or to flow off, when the varying thickness betrays it.

KEEP

COATED SURFACES SPOTLESS

The story is totally different with coated surfaces. The reflectance here is so low that a drop of liquid of any kind, oil or water, is instantly manifest as a grossly different area, a horrid spot quite out of keeping with the rest of the surface, a disfiguring area that demands removal because of its heretical reflectance.

Coated surfaces are no harder to clean than the unfilmed,—the penalty of incomplete or careless cleaning is simply more evident. Exactly the same amount of elbow grease, properly applied, is required to make an unfilmed surface clean as to perform the same duty for a coated one,—the only difference being that in the latter the residue likely to be overlooked in the uncoated lenses just cannot be,—it will obtrude itself painfully.



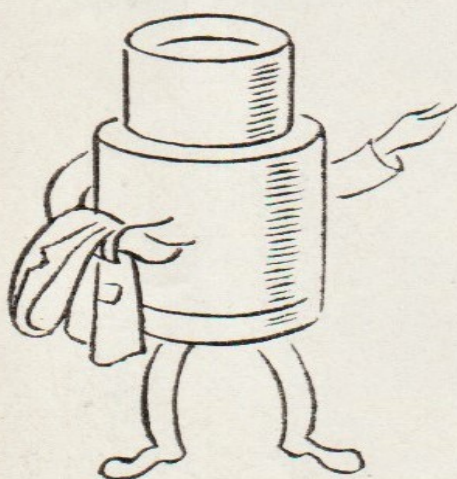
*They must be
clean—or else.*



*It's a thin,
hard coat*

Moreover, the filmed surface, or the substance applied to produce the anti-reflection properties, demands the same treatment as does the original glass surface. In fact, the magnesium fluoride commonly applied has a chemical inertness exceeding that of many of the optical glasses. It thus can stand attack by stronger chemical cleaning agents than, in many cases, the glass itself. But this is slight consolation, for no strong agents can be used in the cleaning on account of other substances used in making lenses, metal mounts, optical cements, and even the lacquer used to cut down reflections.

Likewise in their mechanical properties, the hard coatings are as scratch resistant as most optical glasses. This statement, however, is cruelly misleading. The coating may be as hard, but it cannot be as thick, and as we have already seen that glass itself is soft, the coating can be destroyed surprisingly easily by abrasion, and such destruction is particularly irritating because of the loss of anti-reflecting properties. The net consequence of all this is that practically coated surfaces can be treated with a roughness only slightly less than that endurable by glass, which is quite small indeed. Under no circumstances are abrasives to come into

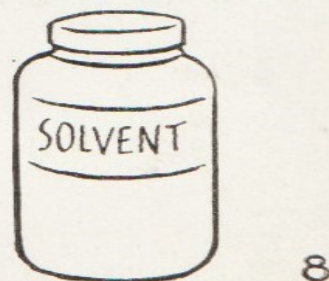
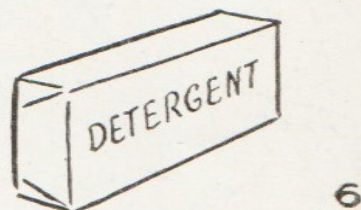
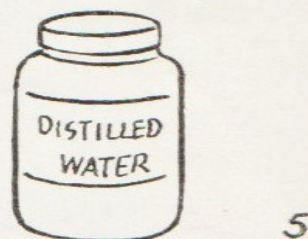
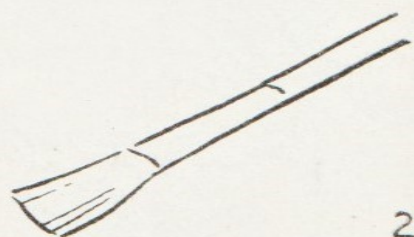


*Don't take
it off—ever.*

contact with lenses, coated or uncoated; their effect is no greater on the one than on the other, but simply more quickly recognized in the filmed surfaces.

Investigation at Bausch & Lomb has shown that the best cleaning agents for lens surfaces of both species, filmed and unfilmed, are in order: 1) A gentle blast of air; 2) a camel's hair brush; 3) a soft cloth properly used; 4) the film of moisture from the breath together with a soft cloth; 5) warm pure or distilled water; 6) most of the common detergents (the commercial "soapless soaps") such as women use for sheer lingerie; 7) warm water suds of the mildest soaps which are suitable for babies: all these agents to be followed by rinsing in clean pure warm water, and finally 8) the very, *very* sparing use of solvents such as alcohol.

This latter is the most drastic treatment to which lenses can be subjected, and is always attended by considerable danger. The manufacturer just cannot recommend solvents for the cleaning of his lenses; they are too dangerous and harmful, even in the most skillful hands; he is fully justified in refusing responsibility for any damage resulting from their use by anyone but himself.





*First, get rid
of loose dust*



*Dust—the lusty
scratcher*

Briefly described, because they are familiar in their broad outlines to the reader, the techniques discussed in the remainder of this article will have their emphasis on the reason why, rather than the what.

The surpassingly important primary step, the very first thing to do, without which all to follow is unavailing, is the removal of every particle of dust from the lens surfaces. It cannot be emphasized too strongly that before anything else is undertaken in the way of cleaning a lens the accumulated dust must be removed, for if it is not at this point, it is likely to remain around with results described as somewhat disastrous. Then, too, in a large number of cases this is all the treatment necessary to restore a dirty lens to its original efficiency.

The danger of dust is its lust for making scratches in any surface it might happen to light on, be that surface glass or coating material. The danger being scratches, and there being no way to dissuade it from fulfilling its appointed function, the only thing remaining is to banish the dust. But the removal requires some cunning if it itself is not to produce marks and thus defeat our good intentions.

EFFICIENT CLEANING PROCEDURE

The most efficient manner of accomplishing this end is to blow the dust off, using a syringe, or even the breath. If it still lingers, and some is likely to, particularly if one attempts to blow it away, a soft camel's hair brush will pick up what remains. The brush should be tapped on the edge of the table after each pass in order to shake out the grit and dust particles picked up from the lens surface.

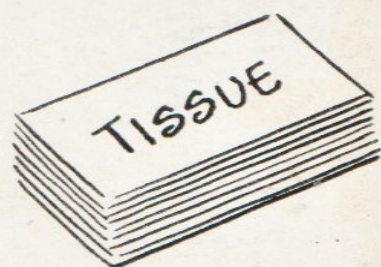
It is also possible to remove this dust by the use of a *soft* cloth wrapped about the finger. The cloth must be soft, recently laundered, and scrupulously clean if it is not to introduce its own dust, and what is more annoying, lint. An alternative choice is lens tissue, available in camera stores. The trick is to wipe across the surface gently and at the same time to rotate the finger and the cloth so as to pick *up* the dust and remove it from the contact point. If the motion is across the glass surface from right-to-left, the cloth-wrapped finger should be rotated in the clockwise direction, thus picking up the dust and removing it from the contact area. For left-to-right motion, which left handed people would naturally use, the counter-



Blow it off



*Wipe it off
with cloth . . .*



. . . or with tissue

clockwise direction of rotation is obviously indicated.

The dust removed, the remainder of the cleaning is straightforward. It will be found that usually the film of moisture deposited by breathing gently on the lens, when removed by careful rubbing, will take with it the remainder of the scum and dirt.

If this does not suffice, it may be necessary to try heavier doses of water, applied to the affected areas, by a cloth wrung nearly dry, or by small pieces of surgical cotton wrapped on a toothpick or suitable stick, followed by a piece of dry cotton or cloth to remove the excess water and dry the surface.

USE OF DETERGENTS

If water itself will not do the trick, resort to stronger agents is indicated. The very best of these is some common detergent dissolved in warm, clean water in the proportions of one tablespoonful to the gallon. If this fails, the next strongest agent, and the last that can be recommended by the lens manufacturer, is a copious suds of a gentle soap. This and the former are always to be followed by a thorough rinse with clean water, preferably lukewarm, and drying



*Use detergent ..
but sparingly.*



*You might call
it "rinse stick".*



*Copious suds
of gentle soap*

as above. By "rinse" is understood the application of clean water on a nearly dry cloth or cotton wrapped stick or toothpick.

DRASTIC CLEANING MEASURES

There may be especially obstinate cases, as when a lens has fallen into a barrel of oil, been painted during redecoration, or been splashed with tar or some other equally stubborn and improbable substance, when more vigorous methods are required. When these come up, and they should be once-in-a-lifetime events, such solvents as alcohol, carbon tetrachloride, lighter fluid, or the finest laboratory petroleum distillates may be used with the understanding that they entail considerable potentiality of damage to both the lens and its mount.

These solvents must be used extremely sparingly, never with enough to wet the cotton or cloth applicator, for otherwise the excess is likely to find its way into the interior of the lens, there to attack the cement and lead to rapid deterioration. Another danger in the excessive use of solvents is the imminent possibility of irreparable damage to the seal. Of course, such liquids cannot be kept from the



*Accidents
will happen.*



*The risk must
be yours.*

mount, where they attack the lacquer and reveal the bare metal to increase the contrast-robbing light scatter.

Always after using these solvents the lens should be carefully cleaned with mild soap and water to remove the last trace of scum which they all leave after drying, and which is particularly obnoxious on coated surfaces. It must be said again that these heroic measures cannot have the sanction of the manufacturer, and he will assume no responsibility when the evidence of their use appears on a given lens.



*And—Heed
the danger!*

SAFEST TREATMENT IS BEST

The cleaning methods herein described are the safest ones, and are calculated to provide the user with the best techniques in the care of his lenses. No distinction need be made between the present-day coated lenses and the few still in service without anti-reflection films. Some of the very early lenses had an extremely soft coating which would bear no cleaning, rubbing off easily with a handkerchief:—these were coated principally on the interior surfaces which were safe from damage. The coatings now applied are sturdier

stuff, and except for their thinness, can be handled in much the same manner as the underlying glass surface. Both require finesse for maximum performance, and deserve the best in the way of treatment.

With these few notes may your lenses keep their brilliance, toward which the manufacturer has struggled long and hard, for the life of the equipment on which they are used. Potentially, they can: treated properly, they will.



LENS CLEANING RULES

1. Remove dust. (Blow, brush, or wipe off.)
2. Clean with water, detergent solution, or mild soap. Rinse scum-free.
3. Always use dust-free cloths, cotton, or lens tissues.
4. *Never use cleaning powders.*



