

# Suitable Soaps For Silk Mills

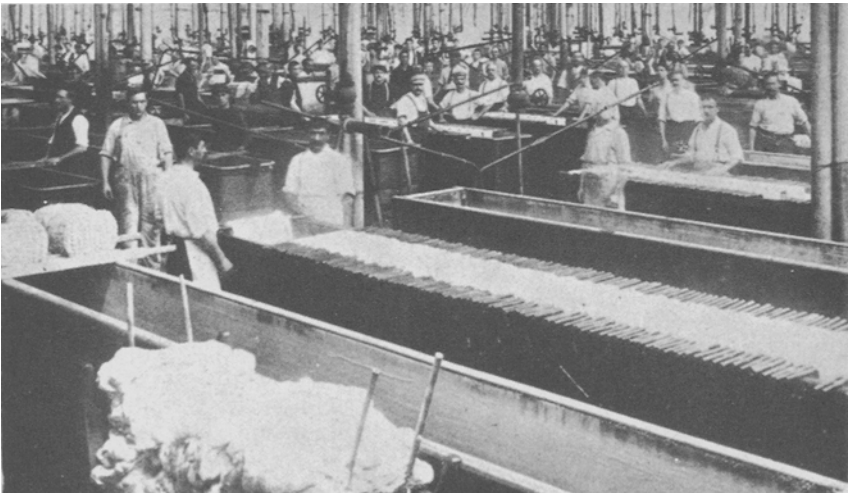
By FRED. GROVE-PALMER, A. I. C.

**D**URING the course of many years' experience in the laboratories of silk mills, the writer has been called upon to examine a great number of samples that have been offered for sale for the various purposes that entail the employment of soap in the treatment and finishing of the "Queen of Fibers." Soaps of all kinds have been tested and analyzed and the great majority have been found to be totally unsuited for the purpose.

It has been ascertained that no soap which has a hard fat for its base may safely be used for the "boiling-off" of silk, and the same remark applies to a soap which is of such a constitution that a solution of one per cent in water will set to a jelly when it cools. In addition, the use of any soap that contains rosin or colophony in its make-up is absolutely prohibited.

The presence of rosin is injurious to silk because it produces a yellowing of the fiber and that coloration is exceedingly difficult to remove; in many cases it has proved to be impossible to get it out without risking damage to the luster of the silk and so spoiling its commercial value entirely.

As regards the two other prohibitions, it may be wondered why so much stress has been laid on the necessity for choosing only soaps to which they do not apply. The reason is this: silk is covered with a coating of a substance known as sericin or silk-gum, and this must be removed before the fiber can assume that soft, crisp feeling with which we associate the word "silkeness." The best and cheapest method of removing the sericin is by boiling-off or degumming in a hot solution of soap; when that has been accomplished the silk



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Stripping and Dyeing Silk*

must be washed quite free from soap before it is dyed or weighted, otherwise there is danger of getting irregular white patches called "soap-marks." Now, although the washing of the boiled-off silk is usually conducted with extreme care and in thoroughly well-softened water, in the ordinary rush and worry of a busy mill there is the danger of an occasional slip-up in this respect and there may be times when the silk is not properly rinsed free from soap. If this should occur and a soap is being used that will set to jelly or has

presented as being free from rosin when it was obvious to the trained eye that rosin was present, and there are many other cases when it was not visible but was found by analysis. After all there is no need for it, as rosin is added merely as an adulterant to cheapen the commodity. There is not so much need for that in the silk industry as there may be in others; the finest fiber requires the finest materials for working it.

Extended research has shown three different kinds of soap that have proved themselves to be ex-



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Finishing skeins of silk after weighing and dyeing

been made from a hard fat, once it has become fixed in the fiber it is extremely difficult to get it out and it might give rise to trouble in the subsequent operations. Therefore the soap that is used must be free from such chances.

Experience has taught the sad knowledge that a silk factory should not buy a soap on the word of the salesman; either through a wish to deceive or through sheer ignorance soaps often have been

cellent for the purpose of boiling-off silk and also in the various other processes that the silk must pass through in the finishing departments. The first of these, and one of which many hundreds of tons have been used is a pure oil soap; the analysis of it is approximately:—

Fatty anhydrides	.....65%
Combined alkali	.....8%
Free alkali	.....0.3% or less
Water	.....23%

The low figure of the free alkali is an important matter in choosing a soap for use in this connection, because the presence of any great quantity of alkali is detrimental to the luster of the silk, and in excess at the temperature demanded by the boiling-off process it may actually lead to the tendering of the fiber by dissolving the silk-substance (fibroin) itself. The fat in this particular variety of soap is of semi-solid order, but a solution of one per cent shows no signs of jellying up when it is cooled. It is therefore very easy to wash it out, and even in cases where the rinsing has been scamped either because of lack of time or because the supply of softened water has been running low, there was no risk of leaving soap settled in the interstices of the fibers. In a factory run by supermen this could never happen, but with the average human beings most frequently employed in silk mills, it does, and therefore all precautions must be taken to nip such errors in the bud before they are perpetrated.

### Monopol Successful

A soap that has been used with great success is Monopol soap; this is possibly a proprietary article or a patented name for soaps made of sulphonated castor or linseed oil. Whether the brand that was used was the product of the patentees or whether it was some other make was never really known, as the merchant who supplies it was somewhat reticent on the subject for a number of reasons. The analysis of this showed the following:—

Fatty anhydrides	..... 65-70%
Combined alkali	..... 3%
Free alkali	..... nil
Water	..... 12-15%

At the time we were not able

to get extensive supplies of this soap and as the price was very high the use of it was eventually dropped, though the dyers were very loud in its praises. There was no free alkali, as will be seen from the figures quoted, and the small quantity of water made less of the soap requisite; it needed less rinsing and was altogether desirable.

### Marseilles Best

Without doubt the best of all soaps for the use of the silk dyer and finisher is Marseilles soap, or as it is often called, "Green Olive Oil soap," and it is interesting to remember in this respect that from earliest times when silk was being degummed in Europe the people always used olive oil soap for the purpose. This is just another instance of the exceeding wisdom of the ancient people in choosing the best thing for a particular purpose, and of our scientific knowledge proving the correctness of their views.

The main bulk of the Marseilles soap that comes into the markets of the world is shipped from the French port that has given it its name; but it may be purchased from both Spanish and Italian makers. It is produced in the olive growing countries on the borders of the Mediterranean Sea, but some is made in our own country, and if it were better known to the modern silk industry the call for it would be considerably greater.

The following figures show an approximation of its constitution:

Fatty anhydrides	..... 60-63%
Combined alkali	..... 7%
Free alkali	..... not over 0.3%
Water	..... 26-30%

Marseilles soap is excellent in every way for the purposes of the

silk mill, and the price is generally low enough to make it a pleasing proposition; the fat is always liquid because manufactured from the final extractions of oil from the olives after the qualities that are required for food and similar purposes have been extracted. It was quickly found that this soap had another reason for its popularity in the factory and that was that the girls employed there soon discovered its value in preserving "that schoolgirl complexion." It is a fine green color, which is derived from the chlorophyll present in the fruit, and it appears to be good enough to eat, which is a fact that the soap-maker should always keep in his mind when turning out a product. The saying that "an article is sold the first time on its appearance and the second time on its quality" is very true of soap.

Marseilles soap is generally boiled from the olive oil foots that have been extracted from the presscake and crushed kernels by means of such volatile solvents as carbon disulphide and ligroin (a very light gasoline). The solvent is then distilled off and used again

for a fresh lot. There are grades of olive oil soap that have not this same green color and that have been tested out in the same way as the others; they are equally suitable, but the less pleasing appearance renders them unpopular with the dyers, and there is always a need to retain the liking of the dyer for the material he is using as otherwise he is apt to lay the blame for everything that goes wrong on the substance of which he does not quite approve. While the superintendent does not pander to this recklessly, at the same time for the sake of a peaceful life he pays considerable attention to it.

These brown olive oil soaps are manufactured from a mixture of the green olive oil foots and "red oil"; this latter is the substance that is known to the chemical technologist as "crude oleic acid." It is made in the course of the manufacture of stearin; the fat, most frequently palm oil, is boiled up with lime, and the "rock," that is, the solid salts of calcium formed in this way, is cooked with dilute sulphuric acid. By this reaction calcium sulphate is precipitated, and



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*Reeling Machines in a Silk Mill*

the fatty acids are set free; they are run off and on cooling set into cakes of suitable size. The cakes are subjected to hydraulic pressure by means of which a certain amount of liquid is squeezed out, which is the "red oil" and that is of considerable value to the soap-maker.

McQuillin has described what is perhaps one of the best processes for the production of a brown olive oil soap for silk, which may be summarized here for the benefit of those who may not have read it before:

#### Heating with Steam

The soda lye of 30 deg. Bé, is put into a clean kettle and heated with open steam to near boiling; the red oil is baled in or run in from a barrel through a pipe of one-and-a-half-inch diameter. It should not be allowed to go in too quickly, for it may lower the temperature so much that there will be a bunching, which should be avoided; the open steam will keep up a continual agitation of the mixture in the kettle. Always there must be sufficient lye present to keep it open throughout the whole of the early stages of the operation. As soon as the whole of the red oil is in and has been well saponified the olive oil foots may be put in together with some weaker lye of 20 deg. Bé. During the whole of this part of the work the soap should be tested by its bite. A small portion of the mixture is taken between the thumb and finger and when it has cooled it is tasted by the tongue; so long as the business is proceeding properly there will be a sharp taste, and if this is the case there is no longer a need to keep it open.

When about ninety per cent of the olive oil foots is in, the open

steam is shut off and closed steam continues the heating for fifteen minutes or so, and if there is still a bite the remainder of the oil is added together with a quantity of salt sufficient to open the soap. If it is properly relarged a clean paddle dipped into it and held at an angle will show grains of soap and the clear lye running down its surface.

The open steam boil is then turned on again until such time as the volume of the liquid has increased to the extent that the kettle is full, when it is shut off and the soap allowed to settle for three hours; the soap rises to the top and the salty lye sinks, to be run off into the settling tank from which a small quantity of soap is subsequently collected. The main bulk of soap is boiled up again with water to clear out the salt and a fresh small lot of the weaker lye is added to make quite sure that any last traces of oil are completely saponified. This strengthening change opens the soap and it is once more boiled to the top of the kettle to be allowed to settle again overnight. The second lye must then be run off and the soap gets a cleansing boil with plain water, after which it must stand for at least twenty-four hours, and when the water has been run off, the soap is pumped through the swing-pipe to the frames. It is particularly emphasized that as the pipe gets close to the surface of the nigre the lowering should be done carefully and slowly.

#### Olive Oil Foots Added

The strengthening lye and nigre have added to them a small quantity of olive oil foots and the whole is boiled up so as to make sure of losing no soap that way. This soap is left in the kettle when the next

batch is started, allowance being made for the space it will occupy. The figures given run as follows:

For a kettle of 2000 gals. the first charge would be 4500 lbs. of mixed oils which will give enough soap to fill six one-thousand pound frames. The formula is:—

Lye of 30 deg. Bé.....	1500 lb.
Red oil .....	2250 lb.
Olive oil foots.....	2250 lb.
Lye of 20 deg. Bé.....	2300 lb.

That is stated to be sufficient to saponify all the oil completely.

For the boil on Nigre:—

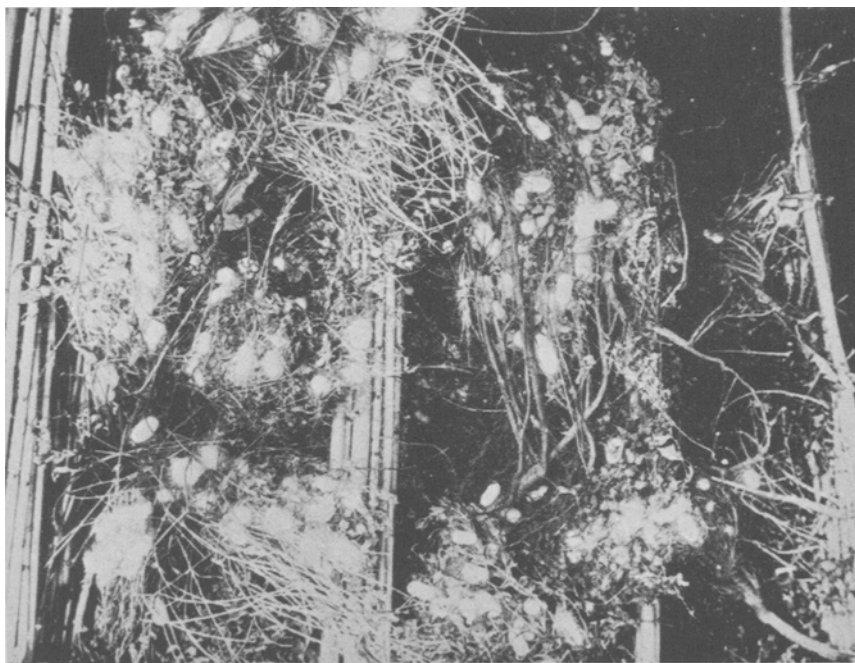
First lye .....	1325 lb.
Red oil .....	2000 lb.
Olive oil foots.....	2000 lb.
Second lye .....	2100 lb.

This is specifically for making a soap with fifty-fifty of the two oils,

but when the olive oil foots is in the majority the procedure is slightly altered. In such a case it is advisable to boil the foots first with the weaker lye in the proportion of 1000 lbs. of oil to 1100 lbs. of lye, and when that has been properly saponified the red oil may be put in, always keeping the lye in excess to preclude the possibility of the mixture bunching. An addition of salt assists in this. Apart from these details the procedure is as already noted.

It is pointed out that the ordinary kettle with only open steam coils will not do, there must be closed ones as well.

There is another stage in the life of silk in the silk mill when soap is required, and so far from this having anything to do with the finishing, it may be regarded as



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Cocoons of the Silkworm, Syria

the starting of all the operations, other than purely financial ones, that take place when the hanks of raw silk come into the hands of the manufacturer; this is the preliminary soaking.

Experiments had shown that the green olive oil soap was as good as any other for the first soaking of the skeins, but we were always up against tradition. Although no faults were to be found with the green soap, from time immemorial it had been customary to use a curd soap; the people were used to it; nothing ever went wrong; the same firm had been supplying it since grandfather's day and the ancestors of the operatives had bred it into the blood of their children, and so on. There was no use fighting it; the only thing to do was to watch closely, for, of course, owing to the fashion in which a curd soap is made, there is always a larger amount of alkali present than in other soaps and it only needed a small slip-up to make things really serious.

#### Silk Broke

As a matter of fact there was such a happening. A lot of silk recently soaked was giving trouble in the works by constantly breaking; previous batches from the same shipment had been good, there had been no fresh lot of soap received and the present lot had been passed as fit for use by the chemists. It looked like being one of those mysteries that the operatives thoroughly enjoy; everything perfectly normal and yet the result absolutely wrong. The matter was far too important to be passed over lightly, and eventually it was found that a fresh case of soap had been opened for this particular lot of silk. By good luck some of the bars in the case still

remained. On examining these they were found to be coated with a layer of crystals of soda and on looking at some more boxes others were found in the same condition. Those cases which had been tested by the laboratory had been quite satisfactory; the shipment was a mixed one. Naturally the soap-maker heard something of the matter and gave a totally unsatisfactory explanation of the occurrence. The loss was really serious to the silk people, for it meant not only scrapping very valuable material but a most annoying delay in output; silk is not merely silk, it is generally a particular sort of silk and is not always waiting on the doorstep to be purchased.

#### Curd Soap Analysis

A typical analysis of curd soap may be taken as being:

Fatty anhydrides	66.6%
Combined alkali	7.5%
Free alkali	0.5%
Water	23.8%

It will be seen that with so much free alkali, there need not be a very great error in the making to throw the figure out of bounds altogether.

It will perhaps be suggested that curd soap, in view of the foregoing remarks about liquid fat and low alkali, is not a satisfactory one to use with silk; it would not be possible to use it for degumming, where the solution containing the silk is kept at the boil for a long time, but in the preliminary soaking the object is entirely different and the process is also. Instead of softening the sericin and dissolving it off the fiber, as in boiling-off, it is only required to soften it slightly so that the hard places which have arisen in the course of reeling it off the cocoons may be softened sufficiently to en-

able the skeins to be unwound easily. Instead of having to wash out the soap so as to permit of such operations as weighting and dyeing, the soap does not have to be removed, indeed a certain amount of it, together with other greases that are put in the soaking bath, are purposely left on in order to act as lubricants to the silk in its passage through the various machines for throwing, winding, warping, weaving, etc. And finally, instead of boiling in

it, the silk is merely allowed to lie in the bath at a very low temperature.

It will be gathered from the details here collected together that the soap-maker has a very important part to play in the manufacture of silk, and it calls upon him for the exercise of continuous care and judgment in seeing that his products are always up to the very high standard that must, perforce, be set in dealing with such a valuable commodity.

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**KLEEN-KURE.** No. 265,280. George W. Marsh, St. Louis, Mo., for soaps.

**SERVICE BOY.** No. 264,703. Service Grocer Co., Detroit, Mich., for soaps.

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**SUN-RISE.** No. 263,478. Krich Products Co., Vineland, N. J., for automobile and hand soap.

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**MENTHOLATUM.** No. 257,808. The Mentholatum Co., Wichita, Kans., for shaving cream and soap shampoo.

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**CERES.** No. 258,592. Georg Schicht, A. G. Aussig, Czechoslovakia, for margarine.

**SUNCRISP.** No. 266,840. Texas Vegetable Oil Co., San Antonio, Texas, for vegetable shortening.

**SABA.** No. 265,840. Musher and Company, Washington, D. C., for shortening.

**CARBONELL Y CIA.** No. 259,842. Carbonelly y Ca., Cordoba, Spain, for olive oil.