

WOOL OILING

LUBRICATION OF WOOL

I. Object of Oiling Wool.—Owing to the removal of the natural, preservative, greasy matter, or yolk, by the scouring, it is necessary to lubricate the fibers of wool with oil before carding and spinning, in order to preserve the serrations of the fiber from injury during the carding process. At the same time, oiling wool enables it to be worked with the least waste possible in the carding and to be spun into the finest yarn possible consistent with the quality of the stock. Also, the natural elasticity and softness of the fiber are uninjured if the stock is lubricated and the oil used is suitable for applying to wool. The oiling of wool before carding and spinning, therefore, is an important process and should be carefully done, not only with regard to the kind of oil used, but also with regard to the quantity used and method of application. Imperfect oiling results in gummed-up cards, uneven work, and also in the destruction to a greater or less extent of the elasticity of the resultant yarn.

Especial care should be taken with the wool for cloth that is to be heavily milled; the oil used for such stock should be pure and one that easily saponifies, thus aiding in the fulling and scouring of the cloth. Impure oil or oil that will not saponify easily will make the dyeing streaky and uneven. If oil is not applied in suitable proportions to wool that, when made into cloth, must be fulled, there is danger of impairing the felting properties of the fiber by injuring the serrations of the fiber. The oiling of wool also lessens the amount of flyings from the cards, and consequently the percentage of waste.

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LUBRICANTS

2. Among the oils used for lubricating wool may be mentioned *olive oil*, *lard oil*, *oleine*, and *red oil*.

3. **Olive Oil.**—Although universally acknowledged to be the most suitable for applying to the wool fiber, **olive oil** is only used on the finer and more expensive grades of stock, owing solely to its cost. The olives, which grow in warm countries, chiefly in California and in Southern Europe, are collected when ripe, and ground into a pasty mass and pressed. The oil obtained from the first pressing is called *virgin oil*, and is colorless; it is principally used for table purposes. The material, however, is not exhausted by the first pressing, but is treated with hot water and further pressed. The oil obtained by the second pressing is of a fine yellow color and is the olive oil commonly used for lubricating wool before carding and spinning. By a third pressing of the ground olives, an inferior oil is obtained, which is used in making soap. The specific gravity of hot-pressed olive oil is about .92.

The best olive oil for wool is that known as *Gallipoli*, but many other olive oils are used, the only precaution necessary being to obtain an oil that is free from impurities. Olive oil is often adulterated with cottonseed oil, and the difference between the pure and impure article can be detected only by an expert.

For the finer grades of woolen goods, olive oil is often used, since it enables the stock to be carded with the least waste and spun to the finest counts. Olive oil softens the stock and preserves the natural serrations of the fiber from injury during the carding process, and even after lying in an oiled state for a long time, the fiber will not become hard and stiff nor the oil rancid or stale, provided that the oil used is pure.

When using olive oil on wool, a good proportion is 6 quarts per 100 pounds of wool; this, of course, may be varied to suit different cases. As a rule, dyed wools require more oil

than white wools, especially those dyed dark shades. The oil should be mixed with enough hot water to form an emulsion of sufficient quantity to be applied to the entire lot of wool. All kinds of oils are usually applied in the form of an emulsion, which is merely a mechanical mixture of oil and water in which the oil exists in a state of the finest division and is particularly well absorbed by the wool fiber. In order to make this emulsion, it is necessary to add some substance that will enable the oil and water to unite, or, to use a common expression, *cut* the oil. There are two substances used for this purpose—ammonia and borax. The former is preferable on account of its volatile nature, but the latter, also, is quite extensively used.

In making emulsions the best method is first to add the substance that aids the water and oil to unite (either ammonia or borax) to the heated water and then gradually add the oil, stirring well until a milky solution is formed. By dipping the fingers into this solution and rubbing them together, it is easily determined whether the emulsion contains sufficient oil and is therefore greasy enough.

An emulsion of olive oil for fine wools that has been found to give excellent results is made as follows: To 10 quarts of hot water add a cupful of ammonia, and to this add 6 quarts of pure olive oil. This will be sufficient for lubricating 100 pounds of wool.

For fine wools, and in cases where the yarn is going to lie for a considerable time before being woven, it is always well to use olive oil, as this will keep better in the yarn than any of the cheaper oils, being less liable to grow rancid or gummy.

4. Lard Oil.—The most common lubricant used in connection with wool is **lard oil**, which is applied in varying proportions according to the condition of the wool that is being worked. If the stock is very dry or harsh, more oil is required than if the scouring and drying had been properly performed and the wool were soft and contained just enough natural lubricating matter. When of good quality, lard oil

is all that can be desired for an ordinary quality of wool. While not so desirable as olive oil for the finest classes of wools, it meets all the requirements of a good lubricating agent for medium wool without being so expensive as olive oil. In regard to the quality of the lard oil to be used, it may be stated that it varies according to the stock in hand. For wool well scoured and dried about 5 quarts of oil and 5 quarts of water are used to 100 pounds. This may be reduced to 4 quarts of oil if the wool is quite moist and soft, or increased to 6 quarts if the stock is harsh and brittle.

In making the emulsion, take the boiling water and add to it about 1 ounce of borax or a cupful of ammonia; the latter is to be preferred on account of its being volatile and not remaining on the wool. To the solution of water the oil should be added slowly, with constant stirring, until a milky emulsion free from bubbles is formed.

Another recipe for a lard-oil emulsion is as follows: Best lard oil, 4 gallons; water, 5 gallons; borax, 4 ounces. Dissolve the borax in a little warm water and then add the solution to the boiling water; agitate, and then gradually pour in the oil, constantly stirring. Boil a few minutes and the emulsion is ready for use.

For ordinary stock, 16 per cent., by weight, of this solution will be found to be about right, but it must be remembered that no hard and fast rule regarding the amount of lubricating matter to be used on wool can be given. Much depends on the condition of the wool, either naturally or as a result of the scouring or drying, which may injure the wool so that it will require much more oil than would otherwise be sufficient.

5. Oleine.—Another substance that is used quite extensively for lubricating wool is known as **oleine**. It occurs as a by-product in the manufacture of stearine candles, and when free from impurities, is an excellent substance for the purpose. In the process of making stearine candles, stearine and oleic acid are produced, and the stearine is afterwards freed from the oleic acid by means of sulphuric acid. Oleine is a product obtained from the oleic acid, but the sulphuric

acid that was used to free the stearine from the oleic acid should be removed by distillation, as if present it injures the card clothing.

Oleine, when employed for lubricating wool, is used in varying proportions according to the stock in hand, a good proportion being 4 parts of oleine, free from acid, to 6 parts of water. Add a little ammonia or borax to aid the oil and water in uniting and use from 20 to 25 per cent. of the weight of the wool. If the stock is dyed dark colors or heavily weighted with any dye stuffs, it is a good plan to use less water and more oil.

Another good emulsion may be made with 10 per cent. oleine and 15 per cent. water of the weight of wool to be oiled. The water should be hot and the borax or ammonia added to it, in order that the oil and water may unite. For wools that are dyed dark colors and heavily weighted with dye stuff, 10 per cent. of water will be sufficient.

6. Red oil is practically the same as oleine and, like it, is liable to contain free acid. There are two kinds of red oil in the market—the saponified, or ordinary red oil, and the distilled, or oleine, oil. The former is not generally considered as suitable for oiling wool as the latter.

In the preparation of the saponified oil, the tallow or grease is treated to a jet of live steam, and after a certain period breaks up into stearine and oleic acid. The material is now placed in bags and the oil pressed out. Red oil obtains its red color from the iron in the presses, which becomes rusted and stains the oil.

7. Mineral oils are frequently used for oiling wools and are preferred by some manufacturers; but they are more difficult to remove from the yarn or cloth by scouring, as they do not easily emulsify. In the presence of some saponifiable oil, such as lard oil or olive oil, mineral oil appears to emulsify more easily and for this reason is often used mixed with lard oil, with which it is easily scoured from the cloth or yarn.

TESTS FOR OIL

8. Oleine is sometimes sold under the name of *elaine oil*, both oils having the same composition and both being liable to contain sulphuric acid; in fact, they are rarely free from acid, the commercial oil containing usually at least .5 per cent. of acid and sometimes a great deal more than this. If acid is present in any great quantity it will attack the card clothing during the carding of the stock, and if the oil is regularly used, will in time destroy the wire. The acid also burns the hands of the operatives if much is present.

A good test for the presence of acid in oil is to place a drop of the suspected oil on blue litmus paper; if a red color is immediately developed, acid is present. This test, however, does not give any idea of the amount of acid present, since the least amount will turn the litmus paper red. A better way to test the acid in oleine is by means of the hydrometer. The specific gravity of pure oleine is about .91, but if it contains acid, the oil is heavier in proportion to the amount that it contains.

Another test for a good oil for wool is as follows: Take two parts of a solution of sodium carbonate 3° Baumé and add to it three parts of oil. If, on stirring, a milky solution free from bubbles is formed, without oily drops on the surface, it is an indication of good lubricating qualities.

It is of the greatest importance that a suitable oil should be selected for oiling wool. The use of cheap oil is false economy, owing to the increased amount of waste in the carding and spinning and the decreased production and quality. The price of the oil used is cheap compared with the cost of the wool, and the amount used should not be stinted any more than the quality.

The following characteristics should be possessed by an oil that is suitable for lubricating wool: It should be readily emulsified by an alkali, in order to be easily removed from the yarn or cloth by scouring; it must not be oxidized by exposure to the air nor become rancid; and

it should be free from mineral acid, sulphuric acid being present in low grades of oleine. An oil for oiling wool should also be devoid of color and smell, as far as possible, and must not stain the wool.

METHODS OF OILING

OILING BY HAND

9. There are many methods and means of applying the oil to wool, the oldest, the most used, and the one considered by the majority as the best being the method of oiling by hand. If oil is unevenly distributed over the stock, the result will be noticed in the carding and spinning. Some fibers of the stock will be barely touched by the oil, while others will receive more than their due proportion, which, with the refuse material often found on dyed wools, will form a coating completely covering them. This will harden gradually and affect the pliability of the fiber. The poorly oiled fibers exert a controlling influence and the result will be a general deterioration (as when shoddy is mixed with wool); thus, the more even the distribution of the oil, the more nearly perfect will be the resulting yarn.

In former times, the oiling of the wool was usually attended to by the boss carder himself. He removed his shoes and stockings and taking a pail of warm oil walked from right to left over the thin layers of wool on the floor, distributing the oil by dipping his hand into it and then shaking it from his fingers as he passed slowly along. Each layer of wool was whipped with poles, after the application of the oil, to mix thoroughly the oil with the wool. This is the method employed in many mills today, with the exception that, instead of sprinkling the oil with the fingers, a can resembling a garden sprinkler is used. This can is provided with a T-shaped nozzle pierced with several rows of holes.

Suppose that 10 quarts of emulsion is to be applied to 100 pounds of wool. The emulsion should be prepared first;

then 10 pounds of wool should be spread evenly on the floor in a thin layer and 1 quart of oil sprinkled over it as evenly as possible. This layer of wool should be whipped, or beaten, with a long pole in order to distribute the oil as evenly as possible throughout the layer of wool. This operation is repeated ten times, each layer of wool being placed on top of the preceding one, oiled, and beaten until the 100 pounds of wool are used up and the 10 quarts of emulsion applied.

When using the sprinkling can in oiling a lot of wool, the oil should be distributed as evenly as possible and care should be taken not to apply a double supply to any one portion of the stock. The whipping, or beating, of the layers of wool should be thorough, as on this depends, to a great extent, the equalizing of the distribution of oil.

The stock is run through the mixing picker once or twice and is then ready for the cards, but it is well to let oiled stock lie for a short time, say over night, in order to allow the oil to penetrate the fibers. Stock oiled with lard oil, however, should not remain more than 48 hours between oiling and carding, or the carding properties of the wool will be impaired owing to the stiffening of the fiber and oxidizing of the oil.

In oiling all-wool mixes, each layer of material is sprinkled as it is laid down and is then beaten with poles. In cotton and wool mixes, however, the wool is oiled separately and the stock is carded as soon as possible after mixing, so that the cotton will not absorb the oil from the wool, in which case the cotton is much more difficult to card, having a tendency to become stringy and bunch up.

The same plan is followed with wool and silk waste mixes as with wool and cotton. The silk, being especially hard to work, needs extra carding and should be run through a card previous to mixing. In order to get rid of the electricity, which is troublesome in carding, silk may be dampened by lying under wet burlap over night, being mixed with the oiled wool and carded in the morning.

When shoddy has been lying around for some time and is very greasy and gummed up, it is well to use a large proportion of water and a small proportion of oil in the emulsion that is used for lubricating.

AUTOMATIC OILERS

10. Although in many mills the old method of hand oiling prevails, there are some mills that use automatic oilers, of which there are several makes designed to oil the stock at various points in the process of manufacture. The work of any of these devices is not absolutely what could be desired, but they furnish a means of oiling a maximum quantity of stock with a minimum amount of trouble and at the least expense.

11. Spencer Oiler.—This machine is designed to lubricate the wool, noils, or other stock as it passes into the mixing or burr picker, being attached to the mixing picker in most cases. The object of the oiler is to do away with the manual labor of lubricating wool and perform this operation in connection with the picking. At the same time it is designed to apply the oil evenly and uniformly to the stock and to effect a saving in oil, which is often wasted in large amounts when the oiling is performed by hand.

The principle on which this device is based is that of applying the oil to a rotating brush into the bristles of which a stationary blade or knife is set. The rotating brush striking against this knife throws the oil in a fine spray on the wool, which is evenly spread on the feed-apron of the picker.

The partly assembled parts of the Spencer oiler are shown in Fig. 1. It is practically impossible to show this machine set up as in operation, because the connections, etc. of such a machine as an oiler must necessarily vary to suit different circumstances and the needs of different mills. The large tank *a* that contains the supply of oil or emulsion is often located some distance from the picker where the wool is oiled, or it may be placed on the floor beside it.

As shown in Fig. 1, the oiler consists of an arch-like frame that, when attached to the frame of the picker, spans the feed-apron and carries the various parts of the machine, with the exception of the oil tank and pump, which are usually placed on the floor. The essential features of the machine

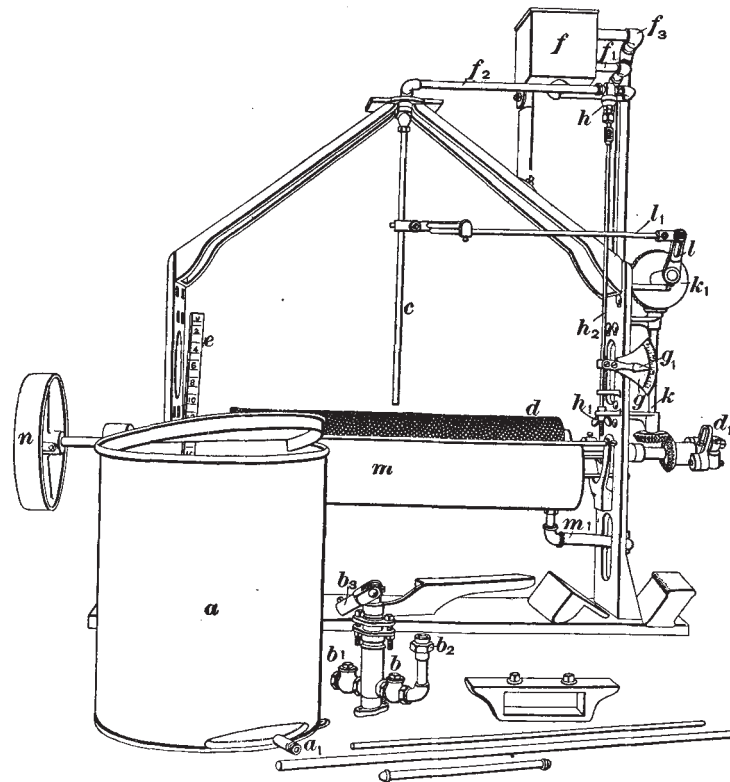


FIG. 1

are the supply tank *a* for holding the oil, the pump *b* and oscillating pipe *c* for supplying the oil to the brush *d*. The knife blade working in connection with the brush is hidden from view in the figure.

The supply tank is of sufficient size to hold the oil for a large batch of wool. It is provided with a float to which the

gauge e is attached and by means of which the amount of oil or emulsion that the tank contains can readily be ascertained at any time.

12. When the various parts of the oiler are set up for operation, the feedpipe b_1 of the pump is connected to the delivery pipe a_1 of the supply tank. The delivery pipe b_2 of the pump is connected with the pipe f_1 that opens into the reservoir f . The pump is driven by means of the crank d_1 on the shaft of the rotating brush, which by means of a suitable rod is connected with the plunger of the pump at b_2 . In operation, the pump takes the oil from the supply tank and forces it to the reservoir f through the pipe f_1 . The oil flows by gravity from this reservoir through a stationary pipe f_2 , and by means of an oscillating pipe c is applied evenly to the rotating brush that extends across the feed-apron of the picker, 2 or 3 inches above the wool spread thereon. The brush rotates rapidly, and, being charged with oil from the pipe c , throws the same on the wool on the feed-apron of the picker when the bristles strike the knife blade that is set into them. The oil is thrown on the wool in a fine spray, and as the stock passes through the picker, the oil is thoroughly mixed with the fibers. A trough m collects the oil that does not fall directly on the stock, and through suitable connections with the pipe m_1 returns the same to the supply tank. The oscillating motion of the pipe c is obtained by means of a crank l , which is connected to it by means of a rod l_1 . Motion is imparted to the crank by means of a gear k_1 , which is driven from the brush shaft through bevel gears and an upright shaft k . The oscillating pipe should not swing quite the entire length of the brush, for if it does, there is a liability of the ends of the brush receiving more oil than the central portion, and consequently of the wool on the sides of the picker being more heavily lubricated. The amount of oscillation may be regulated by moving the connecting-rod l_1 in the slot of the crank l . The reservoir on the top of the machine is supplied with an overflow pipe f_3 .

that connects with the supply tank on the floor. Thus there is no danger of an overflow if the delivery of oil is shut off and the pump left running.

The amount of oil supplied to the brush is regulated by means of the supply valve h , which may be set to deliver any desired amount by means of a pointer g , that operates the rod h_1 connecting with the valve. This rod may be locked in the desired position by means of a thumbscrew h_2 . The amount of oil supplied to the brush is indicated by the pointer g on a dial g .

The pump may be set for a different length of stroke by means of a slot in the crank-arm that drives the same. The stroke of the pump should be so adjusted that there will be a very small stream running down the overflow pipe f , when the oiler is spraying the largest amount of oil that will ever be required. This keeps the oil in constant motion, which is an important point when applying emulsions, since they are liable to become separated into their component parts if allowed to stand.

To regulate the amount of oil per hundred pounds of wool, place in the tank only the amount of oil required for the batch of stock that is to be run through; set the valve so that when one-fourth of the batch is run through, the tank gauge will show that one-fourth of the oil or the emulsion (as the case may be) is applied, and when one-half of the lot has passed through the picker, one-half of the oil is used, and so on, until by experience the exact place to set the pointer on the dial to use a given amount of oil for a given amount of stock is found.

The rotating brush and knife blade should be as level as possible each with the other, so that the oil will not run off to the side of the knife blade, which should be set at an angle of about 45° into the brush to throw a fine spray of oil. The knife blade should be set into the brush about $\frac{1}{4}$ inch. In order to attain the most perfect results, the oil or emulsion in the tank should be heated with steam pipes, as better results in oiling are always attained when warm oil is applied.

The power is applied to the machine by means of a pulley *n* on the shaft of the brush, which may be driven either from the main shaft of the picker or from the shaft of the beater on the self-feed. To attain the best results, the brush should make about 60 revolutions per minute.

13. Sargent Oiler.—Another machine for automatically oiling wool is shown in Figs. 2 and 3, its object being to lubricate the stock as it passes into the feed-rolls of the first breaker card. The oil is broken into finely divided particles, as is the case with the oiler previously described, and precipitated on the wool, which is evenly spread on the feed-apron of the card. The principle on which this machine depends is that of an oscillating, instead of a rotating, brush that extends across the feed-apron and, being moistened with oil, throws the same on the stock.

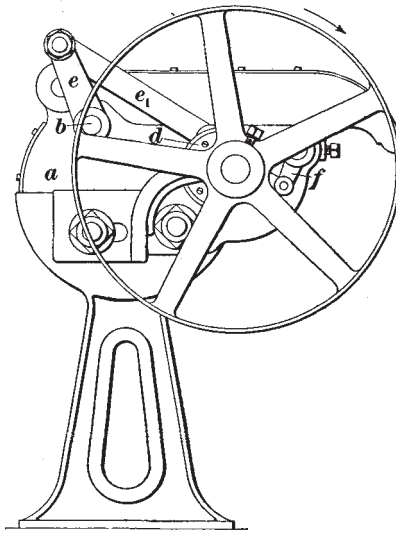


FIG. 2

The machine consists of two stands that carry an oil tank *a* stretching across the feed-apron of the card, and also carry the driving parts of the machine. The tank has a capacity of about 4 gallons of oil or emulsion, and contains a dipper shaft *b*, which carries a dipper *b*₁; this brings the oil from the tank to the vibrating brush *c*.

The driving pulley of the machine is fastened to a short shaft, which carries an eccentric *d* on its opposite end. A lever arm *e* on the dipper shaft is connected to a crankpin on the side of the eccentric by a connecting arm *e*₁, by means of which the dipper is given an oscillating motion, bringing

the oil from the tank and depositing it on the oscillating brush, which is driven by the eccentric through the arm *f*.

The amount of oil deposited on the stock depends on the speed of the machine. The driving pulley should make about 30 revolutions per minute for coarse stock, which passes through the cards rapidly. For fine stock, which goes

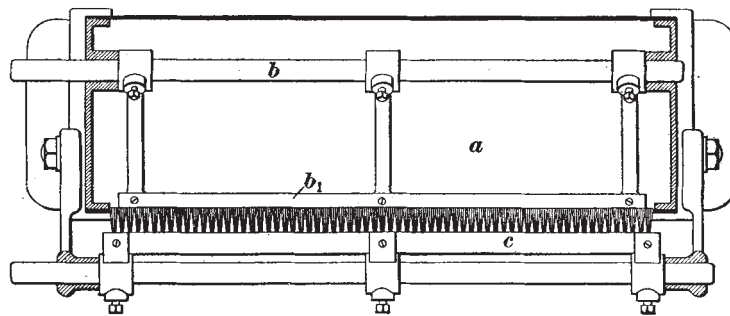


FIG. 3

more slowly, about 20 revolutions per minute is sufficient. The amount of oil used per hundred pounds of stock with a certain speed can only be determined by experiment. The machine is driven from the first worker shaft of the card.

The advantage of oiling the stock at the first breaker card is that there is but little chance for evaporation, as the wool is only exposed to the air after lubrication in passing through the cards. This is especially advantageous if emulsion is used, as an emulsion evaporates faster than pure oil. Another advantage of lubricating the stock at the first carding process is that large lots of wool or mixes can be picked beforehand and kept in reserve for the cards, there being no danger of injury by rancid or gummy oil.

The great disadvantage of this oiler is that as the oil tank gets empty, the amount of oil deposited on the stock is reduced because the dipper will not bring up as much oil to the vibrating brush. If more oil is required than is being supplied to the stock, the machine must be speeded up by increasing the size of the driving pulley on the worker shaft.

14. Goddard Oiler.—By referring to Fig. 8, *Burr Picking*, it will be noticed that there is located over the outlet spout of the burr picker a square box-like device, which is a form of automatic oiler, called the **Goddard oiler**. This consists of a case with a revolving brush inside and an oil tank that rests on the top of the case, in which oil or emulsion is placed and fed through a faucet and tube into the oiler case containing the revolving brush. The oil is brushed across an oscillating bar and thrown as a fine spray over the wool as it leaves the burr picker.

The amount of oil is easily regulated by the faucet; still there is some difficulty in knowing just how much oil is being used per hundred pounds of wool. Another fault with this method of oiling is that the stock can be picked only as it is needed by the cards, because it will not do to let oiled stock lie around, owing to the fiber becoming stiff and the oil gummy.