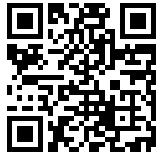

PRINTERS' ROLLERS

TYPOGRAPHIC TECHNICAL SERIES FOR APPRENTICES—PART I, NO. 11

PRINTERS' ROLLERS

A PRIMER OF INFORMATION ABOUT THE COMPOSITION, MANUFACTURE AND CARE OF INKING ROLLERS

BY

A. A. STEWART

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INTRODUCTORY

WITHOUT a proper inking apparatus for the printing surface the printer could not produce his work, even with an adequate supply of every other requisite. Inking rollers are an absolutely indispensable part of his equipment. A good printing form, a good press, good paper, good ink, and skilful makeready are of no advantage if the right rollers are lacking.

Considering their evident importance it is astonishing how little attention is often given to them. A large part of the troubles of the press room is due to poor or unfit rollers. Lack of knowledge and forethought and consequent improper care of rollers are costly matters. The first cost of rollers is relatively small, but the loss due to careless, ignorant management of them is very great.

On each printing machine the pressman must understand certain peculiar conditions and meet them intelligently and conscientiously. The whole story of modern inking rollers cannot be told in a short treatise; there is infinite detail in the subject — climate, temperature, time, mechanical operation, nature of printing surface, inks, etc., in no end of variations — each of these factors affecting in some degree the kind of service obtained from a set of inking rollers. Only those general phases can be considered here which will inform the young pressman about some essential facts upon which he may base his future special knowledge to be acquired from experience.

PRINTERS' ROLLERS

Inking Balls

THE early method of spreading ink on the printing form was with large pads or dabbers. These were cushions similar to boxing gloves, covered with untanned sheepskin or buckskin, evenly and firmly stuffed with wool or some similar substance. They were carefully built on strong handles or stocks and were used in pairs. A dab of ink was placed on them and by forcibly rocking the two faces together the ink was spread over their surfaces. The ink thus distributed was then dabbed on the face of the form. (Fig. 1.)

FIG. 1. Old-time Inking Balls, and Method of Use.

The making of the inking balls was a matter of more than ordinary care, as it was important that the leather surface should be soft and pliable and in a condition to work the ink. The soaking, currying, and stretching of the skin was a painstaking affair, to get it uniform and smooth, and the stuffing was done with some skill to get the desired shape.

Inking balls were used for nearly four hundred years with little change. Because of this long use their shape became a familiar symbol of the printer's work. The balls themselves, however, have long since been discarded for actual work except in places where primitive methods are still followed.

These leather-covered balls were the exclusive method of inking typographic forms up to the beginning of the

nineteenth century. After the discovery of the glue-and-molasses composition used for rollers, inking balls were made of this material too, and these, as well as the leather-covered balls, were used in hand-press work long after composition rollers were made a part of the newer style presses.

The First Rollers

The invention of inking rollers was contemporaneous with the invention of the cylinder printing press, about 1814. A machine so radically different from the old one made it necessary to use a different inking device — one that could be placed in a fixed position or in a frame which would carry the roller across the form automatically with the motion of the press. For this purpose the long, slender cylinder was peculiarly adapted.

The first rollers were covered with buckskin or a similar soft leather, like the inking balls, sometimes with a finely woven fabric. The leather covering on the roller, however, presented a disadvantage not present on the inking ball. The seam which was necessary made a break in the smooth surface. The nature of the material, furthermore, was not satisfactory for type forms, as in this shape it lacked the desirable pliability and it was difficult to make it "tacky" enough to take the ink readily from one place and carry it elsewhere to distribute again.

Leather-covered and cloth-covered inking rollers are still in common use for some purposes, as in lithographic, intaglio-plate, and gelatin-plate printing; but for typographic and relief-plate printing the modern "composition" roller is the article upon which reliance is placed for inking purposes.

NOTE. There was a strong prejudice in favor of ink balls for hand presses. In 1846 I worked in the office of William Burroughs of New York, with a very good hand-pressman of the old school, who always used buckskin balls for his fine work. He claimed that they were better than any roller ever made. — *Theo. L. De Vinne.*

Glue-and-Molasses Rollers

The original roller composition consisted of glue and molasses only. The use of this substance is said to have been suggested by its employment in the potteries of Staffordshire, England, where it was used to transfer uniform designs to the irregular surfaces of dishes — a process which required an elastic material that would conform to uneven surfaces and readily take up coloring matter and as readily deposit it again. It was immediately seen that these qualities especially adapted the substance for the printer's use.

Pressmen who have had experience with these old-fashioned glue-and-molasses rollers unite in the opinion that under favorable conditions no better rollers for printing have ever been used. They can be made of the right firmness and smoothness of surface, and they possess that peculiar "tackiness" which will take up printing ink, distribute it, and part with it on the form. The molasses used had much to do with the quality of this old-style roller. This was known as New Orleans molasses, a thick, dark sirup that has not been obtainable in commerce for many years. Molasses adulterated with glucose will quickly dry into a hard mass like gum; for this reason the glue-and-molasses roller of later days was inferior to the older kind.

The melting together of glue and molasses gave an elastic, gelatin-like mixture which possessed most of the essential qualities that were required, but it had a serious disadvantage. It was not durable and therefore it was expensive and unreliable. A few weeks at the most, under favorable conditions, was as long as the rollers would serve and they were very susceptible to changes in the weather and to variations in temperature. The composition hardened rapidly when exposed to dry air and a glassy skin formed on the surface in a short time, greatly

reducing the necessary suction and causing the roller to shrink in size. The suction of the face could be revived temporarily by sponging, but this only hastened the process of drying and shrinking when this little moisture was gone.

The Addition of Glycerin

The great difference between the original glue-and-molasses roller and the modern roller is in the use of glycerin. The introduction of this ingredient, which was a comparatively new article of commerce, gave the very desirable quality of durability to the composition.

Glycerin is a thick, oily, nearly colorless liquid compound, used in varying grades in the manufacture of confectionery, soaps, nitroglycerin, and in medicine. Glycerin is formed when natural fats are decomposed by treatment with alkalis or superheated steam. The peculiar properties of glycerin are: First, that it never freezes except at a very low temperature, and consequently heat or cold have but little effect upon its consistency; rollers in which it is used are therefore less affected by variations of temperature than are the glue-and-molasses rollers. Second, it will mix perfectly with water in any proportion but will not mix perfectly with oil. This is singular, as it is extracted from fats and oils. Third, and this is a very important quality, it never evaporates. Fourth, it has a powerful attraction for moisture, and will gain notably in weight if exposed to moist air. The last quality is rather a disadvantage and is the cause of many of the troubles attendant upon the use of glycerin in rollers. It is this property that makes rollers to some extent still dependent in working quality upon the variations of the weather. Glycerin, however, to a certain degree may be deprived of its moisture-absorbing quality by modification or admixture of other materials, thus giving a longer period of elasticity without excess of dampness, as well

as, on the other hand, preventing undue drying up and shrinking.

The addition of glycerin proved a great advantage to the glue-and-molasses composition and it will probably be retained in some proportion until another substance offering the same non-evaporating property is found.

The Modern Inking Roller

The chief ingredients of the rollers used for typographic printing are glue, sugar sirup, and glycerin. The proportions of each vary greatly according to the kind of roller wanted, the condition of the materials, etc.

The best rollers are made of glue and glycerin, without sirup. These are also the most expensive rollers, due to the difference in the cost of sugar sirup and of glycerin, as the absence of sirup must be made up by the more costly glycerin. Rollers of this kind are used on fast-running newspaper and magazine web presses and on high grade flat-bed cylinders.

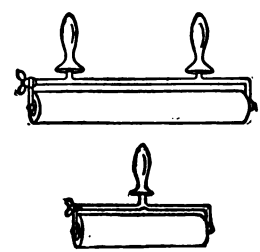

FIG. 2. Hand Composition Rollers.

A cheaper grade of roller is made of glue, glycerin, and sugar-house sirup. The greater the proportion of sirup used in the composition, the lower the cost and also the less durable the roller. Rollers of this kind are used on the common grades of work on small cylinder and job presses.

Glue is the real basis of all roller composition, other materials being added to give it the desired flexibility, consistency, and adhesiveness when cold, and to make it durable by preserving these qualities as long as possible. The grade suitable for rollers is that known as hide glue, extracted from cattle hides, in distinction from the glue

from horns, hoofs, small animal skins, etc. Hide glue is glutinous in a large degree and gives more resilience and less brittleness when cool. The flake form is preferred over the ground glue.

The glycerin used is commonly of a good grade, though not necessarily the purest. Chemically pure glycerin is of a lighter specific gravity, or weight, than the less refined grades. The greater weight of the latter is of more advantage in the composition than absolute purity, and as the greater cost in this case adds nothing to the quality of the roller the better commercial grades of glycerin serve the purpose fully.

The sirup used is that known as sugar-house sirup, extracted from cane. This is the modern substitute for old-fashioned molasses (or treacle, as it was formerly termed and is now called in England). This sirup is an article now standardized, though the roller maker must make a careful selection, when buying, to get the kind of sirup that serves his purpose best, namely that which contains the least proportion of water.

Some other ingredients are occasionally used in very small quantities in roller composition. One of these is zinc oxide. It is used in rollers as a sort of "drier" to reduce the excess of stickiness in the composition in warm weather. The quantity used is very small. Some English formulas mention "Paris white," or plaster-of-paris, as an ingredient, probably for the same purpose, but this is not used in America.

Borax, soap grease, varnish, and other substances are sometimes used, also in small proportions. These are for specific purposes, however, to make slight variations in the composition to meet unusual conditions: for toughness, for excessive heat or cold, dampness or dryness, etc.

Rollers are today made by formulas varying so widely that it would be useless (in some cases impossible) to detail them. The making of rollers is now carried on as a special

branch of business, except in instances constantly growing rarer, and every maker has his own methods and formulas for rollers for various purposes. Modifications of the ingredients are constantly going on. Now and then chemistry may produce a new combination or a new substance with which roller makers experiment and if it seems at all available it is added to their practice to meet specific needs. These methods and formulas are to a great extent each maker's stock in trade, based on his study of the materials obtainable in commerce, and still more upon his constant effort to meet the increasing demand made by new printing machine inventions and unusual conditions.

Formulas are changed or become obsolete in a short time. Yet for many staple uses the kind of roller that has proved its worth continues to be made. Often these are better made than formerly, in spite of the fact that the maker is constantly confronted with the problem of adulteration or variation of the material which he must buy in the market. Glue and sirup and glycerin are of many varying qualities; the maker must constantly watch for the kinds that enable him to produce satisfactory rollers and to guard against deterioration. Special knowledge and experience and also the exercise of good judgment are necessary.

Roller Making a Special Industry

It was not long after the invention of the composition roller before some regular means of supplying it became

NOTE. Many persons without experience in printing have supposed that india rubber would make an acceptable inking roller. A little consideration of the subject will show the impracticability of this substance. In the first place, an india rubber surface has not the necessary tackiness to take up a thin film of ink and leave most of it at another point; second, the oil used in printing ink would quickly rot a pliable rubber surface; and third, india rubber being relatively an expensive substance, the cost of such rollers would be prohibitive.

an object of special attention. The old hand-press required but one pair of leather-covered inking balls and these, when properly made, lasted for a long time, practically unaffected by weather or temperature. The new rollers presented new problems. The new printing machines needed many rollers and larger sizes, and these had to be renewed frequently. The expense was a considerable item. In many printing rooms there were presses of different sizes or different styles. This meant extra molds, and this duplication of molds, with the necessary melting kettles and other facilities, was an expense not advisable where there was only infrequent need for them.

The makers of the early cylinder presses usually supplied the first set of rollers with the new machine, a practice that has been followed to a great extent ever since. A record of a patent granted to Bacon & Donkin, in England, in 1813, for a printing machine, specified that the press was fitted with rollers made of glue and molasses, which they claimed to be a novelty for printing rollers.

Aside from the first set furnished by the press builders, rollers were, for many years, made mostly in the places where they were used. In cities where there were many users, particularly in England and America, roller-making shops were opened for the purpose of supplying this need of the printers. In this way rollers could be made cheaper and better, and also without interruption to the real work of the printing office. There is an advantage in obtaining them from a maker who possesses the special apparatus needed for their casting, and where they are made by persons experienced in this kind of work. Roller makers study the climatic and shop conditions of their neighborhoods and are specialists upon whom the modern printer depends to keep him supplied in this important part of his equipment. The printer merely explains to the roller maker the purpose for which he wants the roller and the maker furnishes it. The important part for the printer

is not so much to know how to make the roller he needs as to know the kind of a roller he has, and how to use it and care for it.

This service given by the roller-making firms has proved so advantageous and the means of transporting rollers from maker to printer have become so convenient and relatively economical that it may be said that the great bulk of the composition rollers used in this country is now supplied in this manner.

Home-made Rollers

There are, of course, some rollers made in the places where they are used, by printers who make them through preference or necessity. These are usually in towns and small places where access to the roller-making shop is not convenient. In these cases the pressman acquires the necessary knowledge and materials and supplies his own needs, in part at least. For small job-press rollers the task is not difficult.

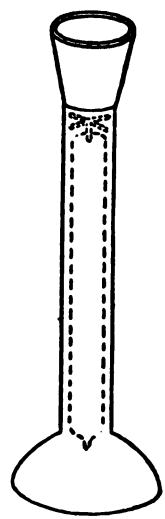

FIG. 3. Old-style Roller Mold.

Up to within the past ten or fifteen years it was the custom of the makers of printing presses to furnish as a part of the press outfit a mold suitable for the composition rollers needed, and this enabled the printer to supply his needs as necessity called for. The roller mold, however, is now furnished only in exceptional cases on special order.

It was also the custom for roller makers to furnish roller composition in bulk to printers who wished to cast their own rollers, and this is still done to a small extent. This prepared composition is of several kinds, made according to the maker's usual formulas, and supplied ready for

melting and casting. Careful directions are given for this process, which may be carried out with the aid of the mold and a few improvised or home-made utensils. The home-made roller of recent years is usually a re-cast roller. That is, the composition is cut off the old rollers and melted, the waste or scum cleaned off, and then some new material added to it, making a new roller whose quality depends on the condition of the material and the knowledge and skill of the maker.

How Rollers are Made

A printing roller is made, first, by providing a metal rod or core and placing this in the center of a cylindrical mold. The inside of this mold is polished smooth and well oiled. In order that the melted composition may hold firmly on the core and not slip or work loose, the iron rod is painted with a coarse, adhesive coating and is also wound with strong twine or tape. In the case of large rollers the iron rod was formerly also covered with a wooden sheath to enlarge the size of the core and lessen the thickness of the composition. The core of the modern roller of large size is made from a piece of steel tubing having the spindles fitted on the ends of the tube so as to make a single piece of the core. This gives a core of ample size, firm enough to preserve its true shape and of relatively light weight.

A roller mold is a perfectly smooth bore, or a hollow cylinder, like a gun barrel, the size of the bore corresponding to the circumference of the roller required. In length it covers the entire core from end to end. Early molds were naturally made singly and the rollers were cast one at a time. This process is still followed to a small extent for home-made rollers and for special rollers.

The modern roller maker who casts rollers in large numbers has his molds arranged in groups in a large metal

cylinder, similar to the arrangement of pipes in a tubular steam boiler, or like a huge gatling gun. The large cylinders are held in a strong frame on trunnions which allow the molds to be turned up vertically for pouring and delivering, or in a horizontal position to prepare the molds for the next casting.

The early molds were usually of cast iron, occasionally of brass. The modern mold is made of steel. The mold

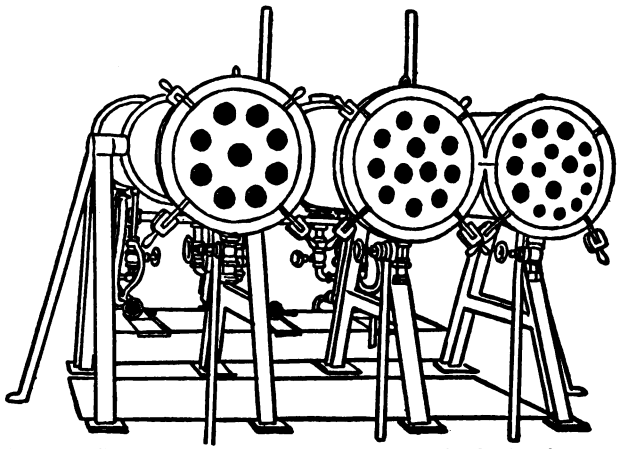

FIG. 4. Roller Casting Apparatus in horizontal position for cleaning after a cast, also for making ready for a casting. Under the machine are the steam and hot and cold water pipes and attachments. The opening in the floor is to allow the rollers to descend to the floor below as they come from the mold. See also Fig. 5.

must be straight and accurate from end to end, and it must be nicely polished and clean throughout the interior, to give a perfectly smooth face to the roller.

The oiling of the mold before each casting is important, as it is vital that the roller shall be extracted without injury to its surface. The oiling is done with a special kind of greasy oil — sometimes sperm or lard oil — carefully swabbed in a thin film over the whole interior surface. Too much oil is apt to cause oil streaks on the face of the roller.

The core being placed in the mold and held by end-pieces to keep it in the exact center of the bore, the mold and core are thoroughly warmed to blood heat or higher. In this condition the melted composition is forced in and the whole is allowed to cool. The warming of the mold is important, because if it were cold the hot composition would become chilled against the cold metal and this

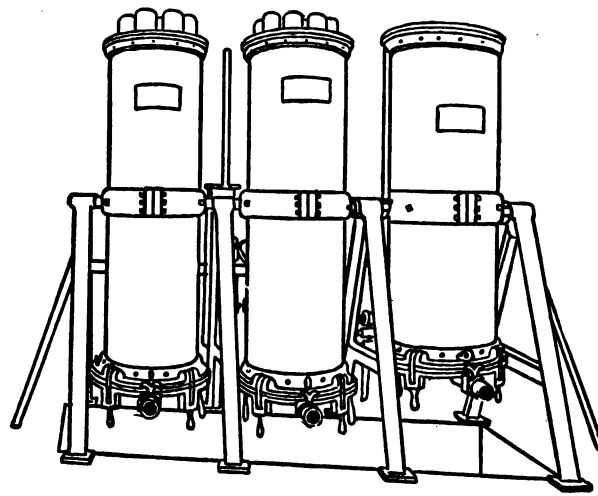

FIG. 5. Modern Roller Casting Apparatus in perpendicular position. The steel tubes within the large cylinders are protected from atmospheric action during the process of casting. The outer cylinder is filled with hot water which surrounds the roller molds within and heats them to the temperature of the composition, which is then forced into the bottom of the tubes under pressure, flowing upward to the desired height. After the casting is completed cold water is substituted for hot until the cast is cold, when the bottom plate is removed and the rollers descend by their own weight to the floor below. See Fig. 4.

would leave streaks on the face of the roller. It is necessary that the composition, the core, and the mold be kept at a uniform temperature until the composition completely fills the mold and settles into place compactly, without air holes, seams, or streaks.

The old method of making rollers is to cast them one at a time in single molds. The mold is held upright and the

composition poured in at the top. In pouring, the stream is directed down the sides of the core rather than beside the face of the mold. In this manner the composition flows down on the core outward in a steadier stream toward the face of the roller and does not wash off the oiled surface. It is desirable to pour the contents of a mold at one operation in a stream as uniform as possible, in order to get an evenly united covering on the core. A break or interruption, unless the composition is very hot, is liable to leave a rift or mark where one part of the mass ceases to run and the next wave flows in on it.

The modern method of filling a roller mold is to force the composition in at the bottom until the mold is full. This has several advantages. One of these is the prevention of the formation of air holes in the composition. When air gets caught in the fluid the space it occupies leaves a spot, which is quite liable to be on or near the surface. This means a spoiled roller and the imperfection cannot be discovered till the cast is taken from the mold. By forcing the composition in at the bottom the air is completely expelled by the rising fluid, whereas a stream poured in at the top is always liable to catch and confine particles of air, though poured ever so carefully.

Preparing the Composition

While the proportions of the chief ingredients of roller composition vary widely, it may be said that these average roughly, 1 part glue, 1 part glycerin, and 1 part sugar sirup, for glue-and-sirup rollers, and about 1 part glue and 2 parts glycerin for rollers in which the sirup is omitted.

The flake glue is softened by first immersing it in water for fifteen or twenty minutes, then letting the surplus water drain off and wrapping the mass in a thick blanket and letting it remain over night. The next day the

moisture will have absorbed uniformly, making the flakes soft and pliable.

The mixing of the composition starts with the melting of the glue. This is done in a double boiler or combination kettle, the larger kettle containing water in which a smaller kettle is placed, and heat applied till the water boils. The glue is put in and as it begins to melt it is stirred and allowed to heat until the greater part of the water used to soften it is evaporated in steam. The glycerin is then added and the stirring is continued until the ingredients are well combined. Next, the sirup is put in (when this is used) and the whole mass stirred for a half hour or more. The stirring must be done carefully, to release and not create any air bubbles in the mass. The melting process is not prolonged any longer than is necessary to mix the ingredients thoroughly, as any prolonged heating will tend to "candy" the sirup and to stiffen the glue, thus deteriorating the composition and rendering it unfit to make a pliable and durable roller. It is in these matters that the expert roller maker's experience and knowledge of the materials used are particularly essential.

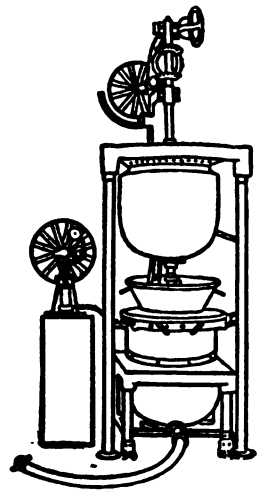

FIG. 6. Kettles for melting roller composition. The composition is drained into the lower kettle, which, when filled, is removed and covered tightly and is then run over to the casting apparatus. Here the hot composition is pumped into the bottom of the roller molds.

When the composition is thus prepared and allowed to settle to permit any remaining air bubbles to escape and to clear off any scum that may have formed, it is ready for casting.

For a home-made roller the kettle used for preparing the composition may be a relatively small, simple affair, with a narrow lip on the inside dish to permit pouring a small, uniform stream. The apparatus used in the large roller-making shop is, of course, somewhat elaborate. It is not always exactly the same in every shop, as there are many pieces of apparatus which each firm has made especially for its purposes. The illustrations given herewith show the general characteristics of the usual articles employed.

Re-casting Rollers

The composition of old glue-and-glycerin rollers may be melted and used again by the addition of some new composition. In this way there is a certain percentage saved by the roller maker and this reclaimed composition is usually taken into account in the cost of making new rollers. A first set of rollers for a press, made from entirely new materials, will cost more than a subsequent set, as the maker ordinarily expects to reclaim much of the material stripped from the old rollers.

There is a prevalent notion that *all* old rollers may be re-melted and the composition cast again. This is not practicable with composition in which there is sirup. Glue and glycerin will stand melting a number of times with slight deterioration under certain conditions; but sugar sirup melted the second time will crystallize to a point where it is of no use for rollers and will, of course, produce this effect in large degree in any composition of which it is a part.

Old composition of glue-glycerin-sugar has until lately been largely waste, but it is now disposed of to outside dealers who have discovered a method of separating and extracting the glycerin and other ingredients for other uses.

Seasoning Rollers

After a new roller is drawn from the mold the surplus composition is neatly trimmed from the ends so as to shape them as it is desired they should be when in use on the press. The composition is at first very soft and tender and the roller must be handled carefully by the spindles only and placed for a while where there will be no liability of injury to the face. It is not properly ready for use until it is seasoned. This is a process which the roller maker prefers to attend to if he is given the opportunity and the roller is not demanded for use as soon as it comes from the mold. Rollers should be ordered and made in advance of their use in order to allow this seasoning. One to two weeks should be allowed the roller maker for washing and seasoning.

Seasoning is done by exposing the roller to the air long enough to give the surface a certain toughness to withstand the pull and strain which it will undergo in distributing sticky ink. Upon the care and judgment used in seasoning a roller will depend a great deal of its working qualities and durability. Here again, only experience and close observation will teach one how to season a roller properly, but there are many important things on the subject which may be learned by reading the experience of others.

The time required to season a new roller may be from one day to two weeks. It depends on the weather or the conditions of the atmosphere in which the roller may be kept. Seasoning will, of course, occur quicker in dry weather than in damp weather. The cool air of winter will stiffen up the new composition more than the warmer air of summer, and this is in a way equivalent though not exactly the same as seasoning. A distinction should be made between the rigidity produced by cold and the toughness resulting from exposure to normal atmosphere. A firm-feeling roller in a cool place may be apparently

seasoned but it will quickly become soft and unworkable in a warm press room.

The kind of composition used has much to do with the seasoning required. Glue-and-sirup rollers dry up quicker than rollers made of glue and glycerin only, and the former are usually seasoned in a short time unless the air is very damp. If seasoned too much they quickly become hard and shrink, and may require frequent treatment, as explained elsewhere, to keep a tacky, good-working surface. On the other hand, the glycerin roller is usually made of a firmer composition which will not require much seasoning and it may be put at work in a short time.

The amount of seasoning will also depend on the kind of work for which the roller is to be used. If it is for stiff inks it should be tougher than may be necessary for soft inks. Slow presses may have softer rollers than can be used on presses running at a high speed. These and numerous other conditions will govern the seasoning process. When the roller arrives at the desirable condition it is well to put it into use at once, temporarily at least; or if this is not feasible to retard any further seasoning by covering it over with soft, non-drying ink, thick oil, or some chemically harmless substance which will keep its surface from the action of the air. Covering the rollers in this manner is usually better than placing them in a box with moist air, especially if they are to remain unused for a number of days.

NOTE. A roller, when in the best condition for taking up the ink freely and giving it off again, should be firmly elastic, and should feel tacky when the hand is pressed upon its surface; at the same time, if the hand is moved rapidly along its surface it should feel smooth and polished, as if it was not very tacky. A form roller should be nicely adjusted, so that it will be evenly pressed by the vibrator along its full length without flattening its surface; at the same time, it should firmly but evenly press the face of the form without depositing any ink below the actual face of the type, cuts, etc., contained in the form. — *J. F. Earhart, The Color Printer.*

Summer Rollers and Winter Rollers

Roller makers furnish two kinds of seasonal rollers, one for winter — approximately, September to May — and another kind for summer — May to September. Winter rollers are made softer than summer rollers, to provide for the natural hardening effect of cooler weather, which tendency is also increased by the dry artificial heat needed to keep the press room at a comfortable temperature. Summer rollers are quite different, being firmer to withstand warm air and of somewhat different composition to meet the humid conditions of the season. It is rare that any number of rollers will remain in good working condition the year round. Ordinarily a set of rollers will run through the winter if they are started right and intelligently cared for; but on the approach of the warm, humid weather of spring they may grow soft and become "green" with moisture and refuse to take up ink.

Summer rollers are usually made in early May; if later in the season, they are made a little stiffer. Winter rollers should not be put on until the weather is really cool. Local conditions, the particular rollers, and the kind of work to be done should govern this, not the calendar or mere book knowledge.

Washing and General Care

Rollers in use must be washed many times, the frequency depending upon the class of work done and the kind of ink used. Printing ink does not wash off readily. As it is composed to a great extent of boiled oil or varnish, water has no effect on it. Therefore, the washing requires the use of a substance which will loosen it on the roller surface and yet not injure the roller. The manner in which the washing is done is of vital importance. In earlier days one of the first duties of every printer's apprentice was to wash the rollers, and in this he was instructed by his

master. This custom is now too often neglected, and the consequence is that many printers grow up with little understanding of some rudimentary requirements, as well as an aversion for what they look upon as a disagreeable task.

There are many general rules which apply to the washing of composition rollers of all kinds and some special directions which relate to particular kinds of rollers.

The first rule to observe is never, if it can be avoided, to allow ink to dry on the roller so hard that it will require a strong washing solution and hard rubbing to take it off. This will require a knowledge of the ink and constant watchfulness, without which no end of trouble will ensue.

Another point is never to use a washing solution any stronger than is needed to loosen the ink so that it can be readily wiped off clean; and to learn where and where not to use a strong acid or alkali wash of any kind. It often happens that one improper washing will spoil a good roller.

The safest substance to use on rollers is oil of any common grade. If put on after the roller is used and before the ink gets a chance to dry, oil will keep the ink soft and allow it to be easily wiped off later when the roller is used again. A soft oil should be used for new rollers especially. Oil, however, will not always soften up some inks so that they can be washed clean, and it may leave a greasy residue that is not desirable to get into the ink next put on. For this reason some other washing substances are often necessary.

The other substances commonly used are kerosene, turpentine, benzine or naphtha, weak lye, and also some special preparations known by trade names. All these serve because of their more or less powerful biting or solvent effect on the ink. In using them, care must be exercised in order that while they dissolve and wash away the ink they may affect the roller face as little as possible.

Benzine is commonly used for washing rollers, but it is not always advisable. It quickly dissolves most kinds of printing inks and enables them to be washed off clean. It evaporates quickly and leaves the rollers dry in a short time. When used frequently and freely on fresh rollers, however, benzine will dry up, glaze over, contract, and in time crack their surface. A small quantity used occasionally on well-seasoned rollers may be quite safe and advantageous in cleaning rollers for a change in the color of the ink, or for ink that has dried hard.

Turpentine, or "turps" as it is termed, is used to a large extent in England for washing glycerin rollers. It is not used in America, and is not recommended. Turpentine will dissolve hard ink quickly, so that the washing may be done easily, but it evaporates rapidly and is a natural drier, producing an undesirable after effect.

Common kerosene is often the most desirable wash for rollers. It dissolves the ink fairly well and has no severe effect on the roller, evaporating slowly, though leaving a slight residue of oil which is objectionable when fresh ink is to be put on the rollers at once. This oily residue, however, may be easily removed by wiping carefully with a clean rag, or, if the rollers are on a job press, by laying a sheet of well sized (not coated) paper on the ink disk and running the rollers slowly over this. The paper will absorb the oil and leave the rollers clean.

Lye is not much used in America nowadays for washing rollers, although it was formerly common. It is too drastic for composition rollers, except in very occasional instances of old, tough rollers which need softening and reviving for temporary use. There are times when a weak lye may be used to take off ink that has hardened on a well-seasoned roller. Lye should never be used on new rollers. Nor should new rollers be washed or sponged with water after ink is taken off. When rollers become hard and lose their tackiness a careful sponging with water or a

weak potash-lye before putting on ink will revive this "tack" to some extent. The sponging must be done uniformly over the entire surface and care taken to leave no excess moisture to raise blisters on the surface.

Rollers that have been sufficiently seasoned should not be cleaned off dry and left exposed for a long time in any ordinarily dry atmosphere. It is not a good practice, for instance, to wash up at the end of the day and let the rollers stand until used next morning, as is customary in some places. Neither is it a good practice, on the other hand, to let the ink dry on the rollers over night and wash up in the morning, unless the ink is slow-drying and can be washed off easily.

A good time to wash rollers is just before they are to be used or before putting fresh ink on them. If the ink is stiff and will probably dry hard before the rollers are to be used next day, as is the case with most inks nowadays, pour some machine oil on them and work this into the ink thoroughly, letting the oily ink remain until the rollers are used again. When quick-drying or colored ink is used a covering of common oil may not be enough to prevent it from drying hard, especially over an idle day. In this case it is better to wash the ink off before leaving and then to cover the rollers with oil, or, if clean, to place them in a box or closet where they will be kept cool and not too dry. A good roller box or closet will keep rollers free from dirt. It is not necessary to keep a pan of water or wet sawdust in the box to keep the rollers in good condition, except in an abnormally dry atmosphere.

The suggestions in the two preceding paragraphs, about the unnecessary exposure of clean rollers to dry atmosphere, apply more especially to job presses and to cylinder machines doing miscellaneous work in short runs, where the pressman or his assistant washes the rollers as a part of his regular work. In common practice, however, in large press rooms where many presses are running regu-

larly, the washing of rollers is done at the end of the day's work and they are left ready to be placed in position for starting up in the morning. In these places the washing is done by some helper engaged to do this work after the regular working hours, in order that the running or productive time of the machines may not be curtailed by stopping before closing time or by waiting for rollers in the morning. The practice of washing rollers at night has, in such cases, quite obvious advantages in the economical management of a press room. A half-hour devoted to washing up each morning is an expense much greater than would be saved by trying to prolong the life of the rollers. This method also provides for the prompt washing up of colored and quick-drying inks and avoids the liability of surplus oil dripping on the machine while standing over night. A great deal of the advantage of this practice depends, as in other matters, on having it intelligently done.

Roller washing should be done carefully and thoroughly each time and no specks of old ink should be allowed to remain, especially if they do not come off easily. Specks which adhere to the surface of the roller mean that they are spots which stick firmer than the ink. If these specks are allowed to remain for a day or two under a fresh supply of ink they will soon adhere so strongly to the composition that they cannot be cleaned off without taking a spot out of the surface of the roller. This is always a serious defect and should be guarded against.

In this connection a word of caution is necessary. The less hard rubbing a roller receives in washing, the better. When ink dries hard there is a disposition to rub it severely to take the hard ink off, and in that way the smooth, delicate surface of a good roller may be so roughened that it is spoiled. This is liable to happen when trying to take off hard lumps of ink. In such cases, get at the particular spot and remove it, if possible, without spoiling the roller at that particular place.

Rollers used for colored inks require special care to keep their surfaces free from cuts, cracks, and pinholes, because in these small places the ink cannot be thoroughly cleaned out but will remain there to come out later when the next color is put on and thus spoil the new color. This is especially important for bright colors and tints. For this purpose rollers should have perfectly smooth, firm, unbroken surfaces.

Rollers and Inks

Several of the problems of modern presswork arise through the effect of some of the newer inks on composition rollers. The chemical and physical qualities of modern printing inks — both black and colors, but especially some of those known as process colors — are different from those of the older inks. Sometimes these unexpected effects cause vexatious delays in long runs of the press, often necessitating extra rollers, and generally shortening their life of usefulness.

While the oil used is practically the same now as it was in the older and standard inks, yet some of the color pigments now used are of a distinctly astringent nature and quickly affect the roller surface. Some of the scarlets, for instance, which are made into pulp colors require the use of lead acetate to precipitate them, and the coloring matter does not precipitate entirely unless there is a slight excess of this lead salt. This particular lead salt unites with glue to a certain extent and forms an insoluble compound. This tends to form a hard surface on the roller, producing a "lifeless" face, which does not carry the ink in proper quantity or in uniform distribution. This, however, is an evil which cannot be overcome by adding anything to the ink, but when rollers are used on inks of this kind it is necessary to give them a little more than the usual attention. This attention should consist

principally of sponging over the rollers with a little water or glycerin to soften up their surface and to put back into them the suction necessary for good inking. This explanation applies also to certain process red inks.

Most black inks are "toned" with a blue ingredient which intensifies the black. This toner is usually a dye or aniline color which will saturate the roller composition and tan or dry it up in a short time. There are two kinds of blues used for thus toning up black ink — the aniline or artificial dye and the so-called "Milori" blue. It is not the coloring matter in the dye which hardens the roller, but the chemicals which it is necessary to add to the dye to make it insoluble in water. The excess of these chemicals is washed out as far as possible, but some small quantity remains. In the case of the "Milori" blue it is necessary to use certain acids in oxidizing. If this acid is washed out entirely the color becomes soluble and therefore useless for printing ink. So it is necessary to retain some of the acid to preserve a proper condition of insolubility.

Other inks have traces of acid, or an ingredient which will deposit on the roller and in time destroy its tack. Inks which contain magnesia will usually leave a deposit of this ingredient on the roller as well as on the printing plate, this deposit producing a dead, clayey surface. If this deposit is left for some time a good washing may be required to clean it off.

In many cases these effects on the roller may be overcome by an application of glycerin and a cleaning with special washing solutions, provided the deteriorating tendencies are detected before too late to be remedied. Frequent examination of the rollers should be made, running the hand over the surface when the rollers are clean to find out whether the surface is becoming dried up. A little application of glycerin will usually prevent serious trouble. It remains with the pressman to be constantly on

the lookout until he has an understanding of the nature of the materials he is using, and to apply remedies promptly.

Copying ink has an injurious effect on roller composition. The strong aniline color penetrates quickly and deeply, so that it is difficult to clean it off; usually it never can be wholly cleaned out of the roller, but will continue to work out into any subsequent ink that may be put on, changing the tone if the new ink is of a different color. Copying ink also has a deadening effect on the roller surface, destroying the tackiness and rendering it unfit for regular inking use if the copying ink remains on the roller for some time. Copying ink is usually washed off with warm water or with a mild acid or alkali solution — not with benzine or the washes commonly employed for oil-mixed ink — and requires more saturating and washing than a roller gets in ordinary use. For this reason, also, new rollers or good-working rollers not exactly new very soon deteriorate. Old rollers which are tough and past their usefulness for ordinary printing may be sponged and will serve for the occasional job printed with copying ink. If there is much work of this kind a special set of rollers is advisable.

Other Kinds of Inking Rollers

Composition gelatin rollers are not the only kind used for inking purposes. All cylinder presses and many other printing machines employ steel or brass rollers for distributors, etc., in connection with the pliable rollers. These are usually long hollow tubes fitted with spindles and having polished surfaces. They are placed beside or between the composition rollers, sometimes receiving their rotating motion from contact and sometimes geared to the machine and used to rotate the composition form rollers. Occasionally composition rollers covered with fine canvas are used for distributors, especially where durability is required for long, heavy rollers on large machines.

Lithographic printers use leather-covered rollers for their adhesive, greasy printing inks, and their wet rollers are made with several layers of fine flannel or felt on a steel core, this flannel being covered with a strong cotton or linen fabric.

Inking rollers for plate and die-stamping presses and for intaglio plates and chemically treated surfaces are for the most part made of felt and covered with fine woven cloth; in some instances the covering is of leather.

Rollers used by copper and steel plate printers are composed of thin disks of woolen cloth tightly clamped together on a spindle to make a firm but pliant surface. Steel-die printers, who print from deeply cut plates, use rollers covered with a sort of plush.

As with early typographic and engraved block printing, the rudimentary dabber is still often used to ink flat surfaces for proofs and for some hand-work processes.

A roller made of any of these materials, it will be readily understood, cannot be used for inks of different colors. Once the roller becomes saturated with a color it must be used only for that color or some slight variation. It must, of course, be carefully cleaned of the surplus ink after each using, and kept soft and pliable when not in use, or the surface will dry up and harden.

SUGGESTIONS TO STUDENTS AND INSTRUCTORS

THE following questions, based on the contents of this pamphlet, are intended to serve (1) as a guide to the study of the text, (2) as an aid to the student in putting the information contained into definite statements without actually memorizing the text, (3) as a means of securing from the student a reproduction of the information in his own words.

A careful following of the questions by the reader will insure full acquaintance with every part of the text, avoiding the accidental omission of what might be of value. These primers are so condensed that nothing should be omitted.

In teaching from these books it is very important that these questions and such others as may occur to the teacher should be made the basis of frequent written work, and of final examinations.

The importance of written work cannot be overstated. It not only assures knowledge of material but the power to express that knowledge correctly and in good form.

If this written work can be submitted to the teacher in printed form it will be doubly useful.

QUESTIONS

1. What was the earliest method of spreading ink on the face of type?
2. Describe appliances used and tell how they were used.
3. When and why were rollers first used?
4. Describe the first rollers.
5. Of what were the first composition rollers made?
6. What were their advantages and disadvantages?
7. What is the great difference between the original composition rollers and the modern sort?
8. What are the characteristics of the added substance?
9. What are the chief ingredients of the rollers used for typographic printing?
10. Of what are the best rollers made?
11. Why are they expensive?
12. For what are they used?
13. Of what are cheaper rollers made, and what governs the cost?
14. For what are the cheaper rollers used?
15. What is the real basis of roller composition?

16. What grade of this material is used, from what is it obtained and in what form is it preferred?
17. What grade of the next important element in the composition is used, and why?
18. What grade of the third ingredient is used, and what care is needed in its selection?
19. What other ingredients are sometimes used, and for what purpose?
20. Is there much variation in the formulas for making roller composition, and why?
21. Does india rubber make a good roller, and why?
22. How did roller making become a special industry?
23. Do printers now ever make their own rollers, and why?
24. How are rollers made?
25. Describe the core and the mold.
26. Describe the arrangement of molds in a large roller factory.
27. Describe the mold.
28. What is done before the roller is cast?
29. Describe the old method of casting in single molds.
30. Describe the modern method of casting.
31. Describe in full the preparation of the composition.
32. What can be done with the composition when the rollers are worn out, and under what conditions?
33. What is done with the roller after it is cast?
34. How long does the process take?
35. How is this process affected by the weather; by the purpose for which the roller is intended?
36. How can one tell when the roller is in the best condition?
37. What should be done with a roller when it is completed?
38. What is the difference between summer and winter rollers?
39. How are rollers cleaned after a run or at the end of a day's work?

40. What two rules should be observed in cleaning rollers?
41. What is the safest substance to use on rollers?
42. What other substances are sometimes used, and what care must be taken in using them?
43. What are the advantages and dangers in the use of benzine, turpentine, kerosene, and lye, and how should each be used?
44. When should rollers be washed, and what precautions should be taken to keep them in good condition?
45. What is the practice in many large shops, and what are its advantages?
46. What happens if the cleaning is not thorough?
47. What caution should be observed in washing rollers?
48. What should be done when the ink dries, or when hard lumps of ink form on the roller?
49. What special care is required when rollers are used for colored inks, and why?
50. How do some of the newer inks affect rollers?
51. What should be done when these inks are used?
52. What is the effect of copying ink on rollers?
53. How is this difficulty usually met?
54. What other kinds of rollers are used on cylinder and some other presses?
55. What kind of rollers are used for lithographic work?
56. What kind of rollers are used for plate and die-stamping presses and for intaglio plates and chemically treated surfaces?
57. What use is still made of the dabber?
58. What kind of rollers are used by copper and steel plate printers?
59. What do steel die printers use?
60. What is done when inks of different colors are used in these processes?
61. How should rollers made of substances other than composition be cared for?

ANGLE ROLLER — A distributing roller placed diagonally across the inking plate of a flat-bed cylinder press.

BEATING — The old-time custom of distributing ink by means of inking balls, beating two balls together to spread the ink and then beating them on the form.

BENZINE — A colorless, inflammable liquid obtained from petroleum by partial distillation. It is volatile and a solvent of fats, being used as a cleanser for rollers, etc.

BRAYER — A small hand roller used to spread ink on a distributing disk or plate.

COMPOSITION — As used in this treatise, the mixture of glue, glycerin, and sirup used to make inking rollers.

CORE — The steel rod upon which composition rollers are cast. A roller stock.

DABBER — A soft leather or silk ball used for inking a printing form; smaller than the old-fashioned inking balls.

DISTRIBUTOR — An extra roller used on top or beside an inking roller; usually with a lateral as well as a rotary motion to give additional distribution of the ink.

DUCTOR ROLLER — A fountain roller; sometimes used to mean the drop roller which operates between the fountain and the distributing plate, as on a cylinder press. The "duck" roller.

DROP ROLLER — The roller which takes ink from the fountain and drops to the ink table to supply ink for the form rollers.

FOUNTAIN — The receptacle attached to a press in which the ink supply is placed.

GLUE-AND-MOLASSES ROLLER — In distinction from the roller in which glue and glycerin only are used.

GREEN — An inking roller is said to be green when it has not been sufficiently seasoned and becomes soft and moist when used in warm damp weather. In this condition it will not take up ink to distribute on the form.

HAND INKER — A roller to be held in the hand while inking a printing surface, in distinction from a machine roller.

INK UP — To distribute on the rollers and ink-plate a sufficient quantity for the work in hand.

LYE — A liquid of strong leach or alkali, used for washing, soap making, etc. Formerly common as a wash for inking rollers and type forms. See page 26. Lye is made by leaching ashes of wood and plants, or dissolving caustic soda or potash.

PATENT ROLLER — Originally a roller made by a patented formula, as when glycerin was first used in the composition. The term came to mean that kind of roller in which glycerin was used, in distinction from the old-fashioned glue-and-molasses roller.

PROOF ROLLER — Usually a hand roller for inking forms when taking proofs.

ROLLER STOCK — The steel or wooden rod upon which composition, cloth, or leather is placed to form the cylindrical shape of an inking roller. The core.

ROLLER CARRIAGE — The apparatus on a job press, with hooks, springs, etc., which carries the inking roller back and forth over the form.

ROLLER WHEELS — The small collars placed on the ends of form rollers on job presses, etc. Sometimes termed roller trucks.

SHEET THE ROLLER — To turn a roller over a sheet of hard paper for the purpose of taking off surplus ink.

SUCTION — A word used to describe the slightly sticky condition of a composition roller; same as tack.

TACK — The condition of an inking roller when it has a degree of stickiness to take up and carry ink.

VIBRATOR — A roller placed on top of an inking roller which has an endwise motion in addition to its rotary motion, vibrating back and forth to give additional distribution of ink. A distributor.

WAVER ROLLER — A roller which distributes ink by moving back and forth endwise as well as in a rotary manner.

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