International Correspondence Schools
Scranton, Pa.

Spoolers

PREPARED ESPECIALLY FOR HOME STUDY

By
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482

EDITION 1

REVIEW NOTICE

This instruction text was prepared to describe the construction and explain the operation of the ordinary type of spooler. It has been revised several times since it was first published.

In 1941 the text was reviewed by H. E. Reed, Principal of the School of Textiles of the International Correspondence Schools, and was found to treat with the mechanisms and the calculations incident thereto, in a fundamentally sound manner.

482 Printed in U. S. A.

1941 Edition

SPOOLERS

Serial 482 Edition 1

INTRODUCTION

1. Unlike almost every other machine through which the cotton passes during its process of manufacture into cloth, the **spooler** cannot be said to have any effect on the condition of the stock passing through it, since its only object is to assemble a greater length of yarn and put it in a suitable shape to be unwound at the next process. The yarn comes to the spooler, in most cases, from the spinning frame, although in a few instances, from the mule. The treatment of the cotton in these two machines constitutes the final process of yarn preparation; namely, spinning. This statement refers to single yarn; ply yarn is usually supplied to the spooler on twister bobbins.

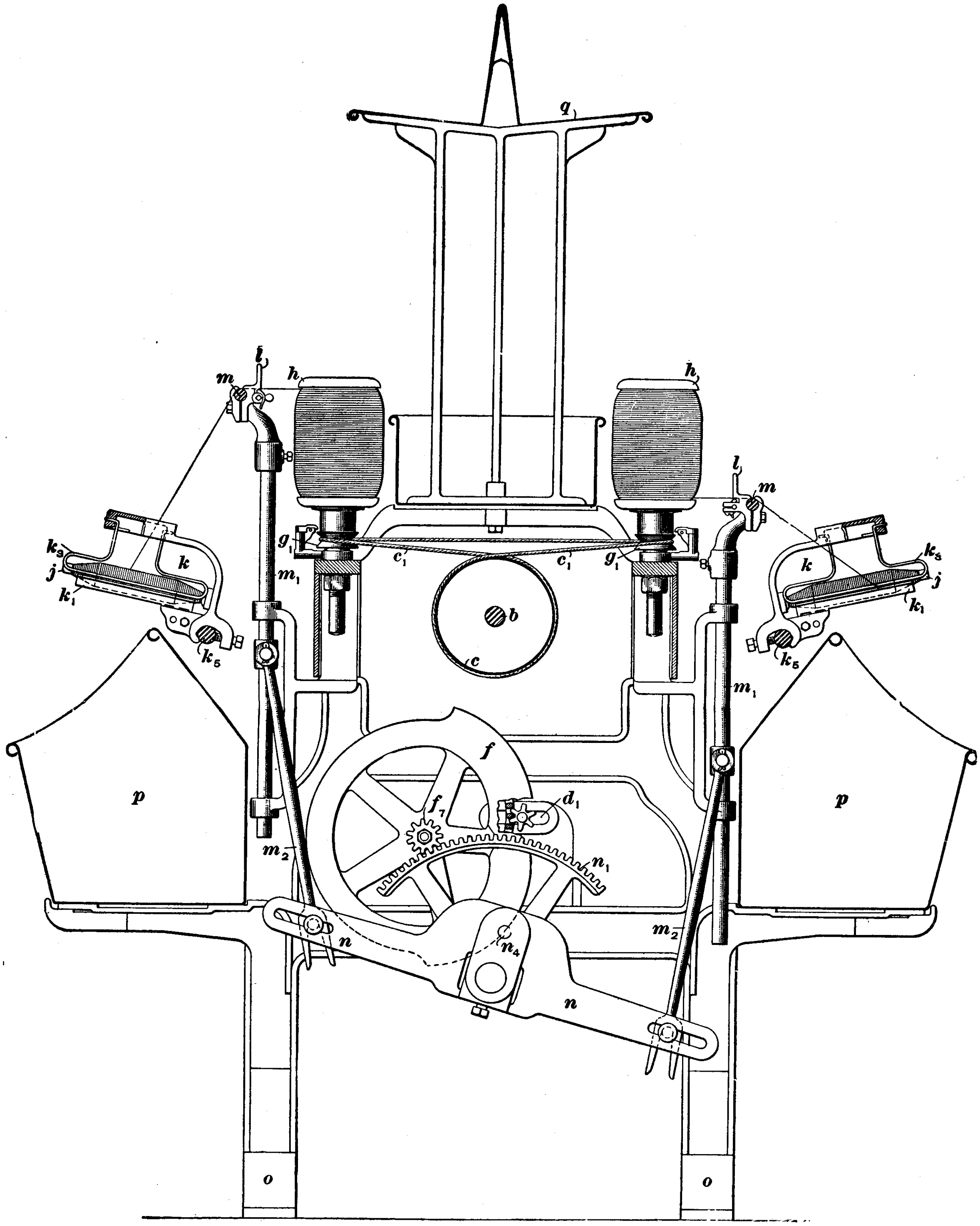
If yarn is *frame-spun*, that is, if it has been spun on the spinning frame, it is in almost every case on a wooden bobbin and may be wound in two ways, one being known as a *warp-wind* build of bobbin and the other as a *filling-wind*. Figs. 1 and 2 show warp-wind and filling-wind frame bobbins as they appear when empty and when filled.

2. Fig. 1 (*a*) shows an empty bobbin such as would be used for warp yarn with a **warp wind**; Fig. 1 (*b*) shows the manner in which the yarn is placed on such a bobbin. The yarn is built up in successive layers, the traverse of each succeeding layer being slightly shorter than the one just before it. Thus, as shown in Fig. 1 (*b*), the traverse of the first layer of yarn on this bobbin extends from j_1 to j_2, while the traverse of the last layer extends from j_3 to j_4.

CONSTRUCTION AND OPERATION

3. Fig. 4 shows a view of part of a spooler, while Fig. 5 shows a section of the machine. The machine carries the usual tight-and-loose pulleys a, a_1 through which it receives power from the main driving shaft. The tight pulley is fastened to the cylinder shaft b, which carries the cylinder, or drum, c. The cylinder extends the entire length of the spooler, and drives by means of bands c_1 the whorls g_1 which form a part of the spindles on which the spools h rest. The spindles support the spools h on which the yarn is wound.

4. Passage of the Yarn.—As shown in Fig. 5, spoolers are so made that many of the parts on one side are duplicated on the other, thus permitting the yarn to be spooled on both sides of the machine. The bobbins j, Fig. 5, as they come from the spinning frame are placed in the bobbin holder k, the end of yarn being passed under a swinging arm similar to k_3 and then carried to the thread guide l, from which it passes to the spool h. As the spool revolves, the yarn is wound on it. The traverse of the yarn on the spool is obtained by imparting an up-and-down motion to the rail m on which the thread guides l are secured. This motion is given to the traverse rail by means of the rods m_1, motion being imparted to these rods by the rods m_2, which are connected to the arms n; these arms are acted on by a mangle gear f and quadrant n_1, shown in Fig. 5. The bobbin boxes, in which the bobbins are kept, are shown at p, while q shows the creels on which the spools are placed as they become full. With the make of spooler illustrated in Figs. 4 and 5, the stands o, on which the machine rests, are made adjustable, so that the height of the spooler may be readily changed to meet requirements.



ILT 7—482 Fig. 5 83560

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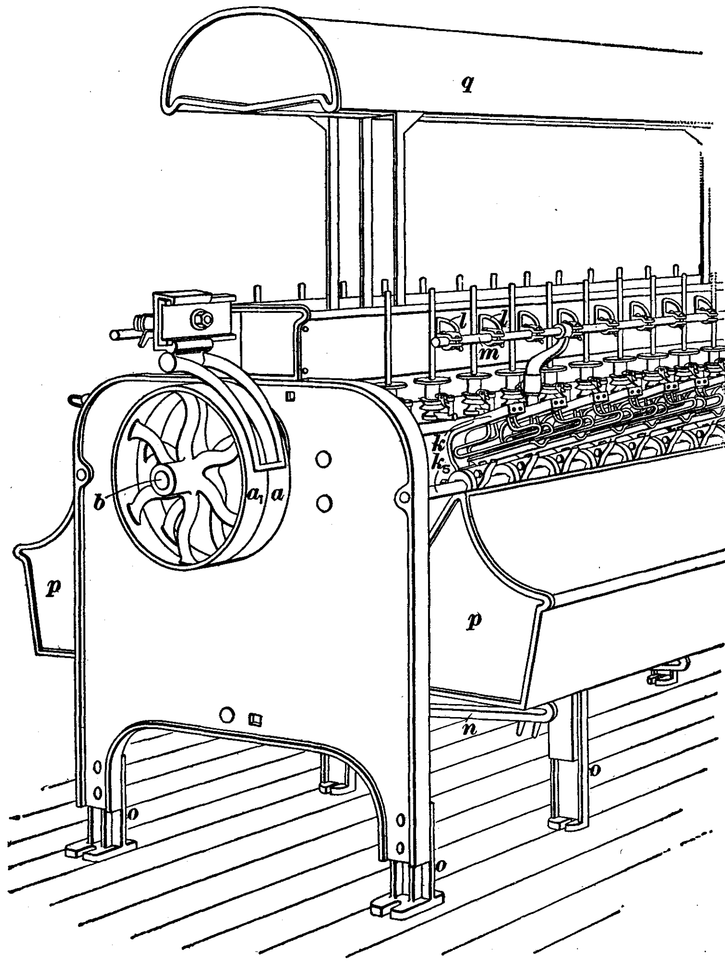

FIG. 4

DETAILS OF CONSTRUCTION

5. Having pointed out the principal parts of a spooler and indicated the passage of the yarn from the bobbin to the spool, the more essential parts will be given a fuller description. A spooler, however, cannot be said to be a very complicated machine, and since it does not have any direct effect on the stock passing through it, there are no complicated settings to be made, as are met with in the majority of the other machines.

6. Bobbin Holder.—A common type of **bobbin holder** is shown in Fig. 6. It consists of a curved plate k_1 on which the bobbin rests. Above this plate projects an iron bracket k_2 carrying two curved wires k_3, k_4 that rest loosely in sockets and are thus allowed to move outwards or inwards. It is under one of these wires that the thread passes in going from the bobbin to the spool. The weight of the bobbin, resting on the curved plate, produces sufficient friction to keep the ends reasonably tight. As the bobbins decrease in

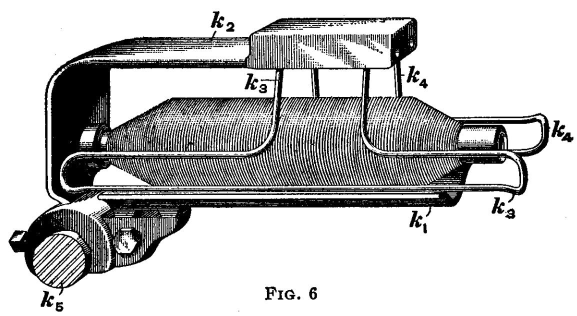

FIG. 6

weight, owing to the yarn being unwound from them, this friction will be lessened, but as more strain is put on the yarn when unwinding from a bobbin of small diameter, this is beneficial. The swinging wires also adjust themselves to give the proper angle for unwinding the thread, as required by the reduction of the diameter of the bobbin. The holders are attached by means of setscrews to a rod k_5 that extends along the sides of the machine. On most spoolers there are, in addition to the bobbin holders, spindles situated either at each end of the frame or at intervals along the frame, on which bobbins containing yarn too weak to stand the strain when unwinding from a bobbin holder may be placed and thus have the yarn taken from them.

7. Thread Guide.—Fig. 7 shows one type of **thread guide** found on spoolers. It consists of an upper plate l, and lower plate l_2. The opening between these two plates can be made larger or smaller, according to the size of the yarn being run. The primary object of all thread guides is to guide the yarn from the bobbin to the spool, and yet they are used in a great many cases as a means of accomplishing other purposes. For instance, it is found in actual practice that a thread guide removes from the yarn a fractional percentage of refuse, such as leaf, dirt, and other foreign matter. Again, the thread guide, if the plates are set sufficiently close, will prevent large knots or bunches from passing on to the spool. As large knots and bunches in the yarn are a great drawback to good weaving, their removal at the spooler is to be recommended, but the practice, or rather the necessity, of performing such work at the spooler should not be encouraged, since this is something that should have been attended to at one of the earlier processes.

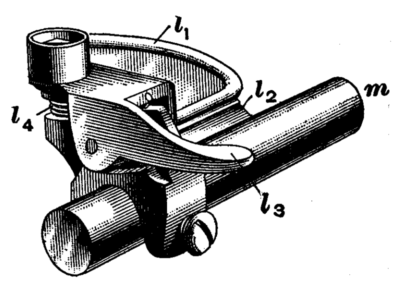

FIG. 7

By referring to Fig. 7 there will be noticed a thumb lever l_3. By pressing down on this lever the upper plate l_1 will be raised, thus giving sufficient space for cleaning any refuse that may have been collected by the guide during the passage of the yarn. The spring l_4 will return the plate to its position when the pressure is removed from the lever. The thread guide is setscrewed to the traverse rail m and is thus capable of being given any desired position in order to guide the yarn to the exact position it should occupy on the spool.

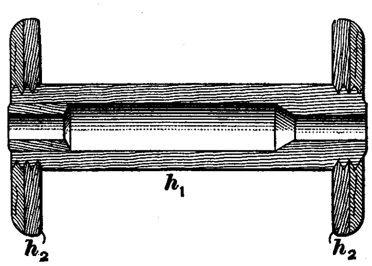

FIG. 8

8. The **spool,** as shown in Fig. 8, consists of a barrel h_1 with flanges, or heads, h_2 at each end. The heads of the spools are made of two pieces firmly glued together. By this means the tendency toward splitting is greatly reduced. The inner part of the barrel is hollowed out as much as possible without weakening the spool and thus a larger spool is obtained without bringing too great a weight on the yarn as it unwinds at the next process. The larger the spool can be made, the more yarn it will hold, and consequently the greater will be the production of the spooler; but there is a limit to the size of the spool, due to the fact that at the next process the yarn is obliged to turn the spool, and if too much tension is brought on it, it will break frequently and thus defeat the object of having a large spool. From this it will readily be apparent that the coarser the yarn, the larger will be the spool that can be used. Good sizes of spools for different counts of yarn are as follows:

TABLE I

Counts	Length of Traverse Inches	Diameter of Head Inches
8s to 16s	6	5
18s to 34s	5	4
36s to 54s	4½	3½
56s to 80s	3½	3¼
90s to 100s	3	2¾

9. The **spindle** used on a spooler consists of the blade g_2, Fig. 9 (*a*) and (*b*), supported by the base g_3, in which it revolves. The blade carries the whorl g_1, around which the band from the cylinder passes, and by this means the spindle is driven. The bottom of the spool rests on g_4 and is revolved by the spindle by means of its own weight, there being nothing to attach the spool to the spindle. The spindle shown in this illustration is known as the **single-rail spindle;** that is, it is supported by only one rail, to which it is attached by means of the set nut g_5, the rail coming between the set nut and the part g_6 of the base g_3. The oil tube for oiling the spindle is shown at g_7. The cap g_8 prevents dirt and dust from entering the tube, and

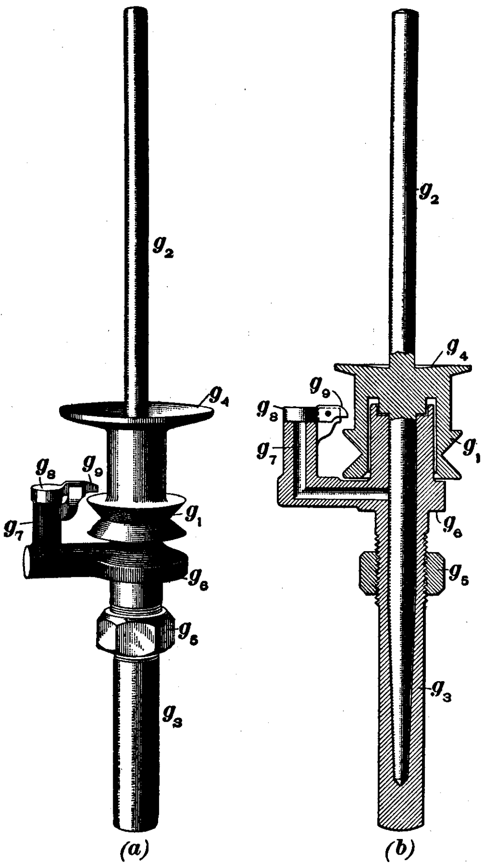

FIG. 9

also, by means of the projection g_9, holds the blade of the spindle in place.

10. Banding the Spindles. — Spooler spindles are banded in several ways, but the most popular method is to have one band for two spindles, one on each side of the frame but not opposite to each other. For example, the band driving the first spindle on one side drives the second on the other side, and the band driving the second on one side drives the third on the other side, and so on. The bands are arranged in this manner in order that no two parts of one band shall be continually rubbing together.

After banding the spindles as just described, it will be found that the first spindle on one side and the last spindle on the other side are not provided for. To overcome this difficulty, one spindle on each side of the frame carries a

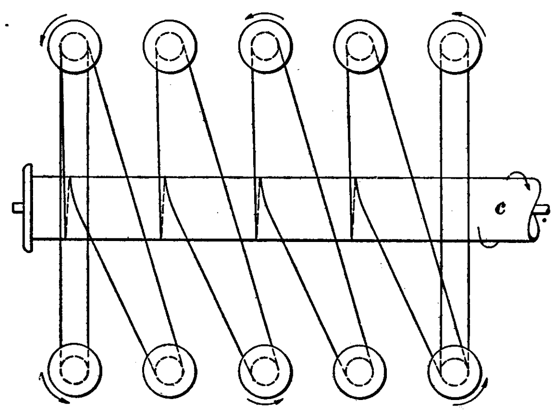

FIG. 10

double whorl, and consequently two bands. This method of banding is clearly shown in Fig. 10, where five spindles on each side of the frame are shown; *c* shows the cylinder of the spooler, around which the bands pass and thus receive their power. In some cases when spindles are banded in the manner just described, instead of providing spindles with a double whorl, the last band at each end of the frame will drive three spindles instead of two.

11. Another arrangement of banding the spindles is shown in Fig. 11. In this case one band is made to drive twelve spindles, and on this account is not so frequently used, since every time a band breaks it necessitates the stopping of twelve spindles. Another defect of this method is that on some spindles the band is in contact with only about one-quarter of the circumference of the whorl, while on others it is in contact with one-half of the circumference, thus tending toward irregular speeds of the spindles.

The arrangement of banding the spindles that is illustrated in Fig. 11 can, of course, be extended to cover any even number of spindles within reason. Almost all, however, are arranged to drive either four, six, eight, ten, or twelve spindles.

Spooler spindles should be banded in such a manner that

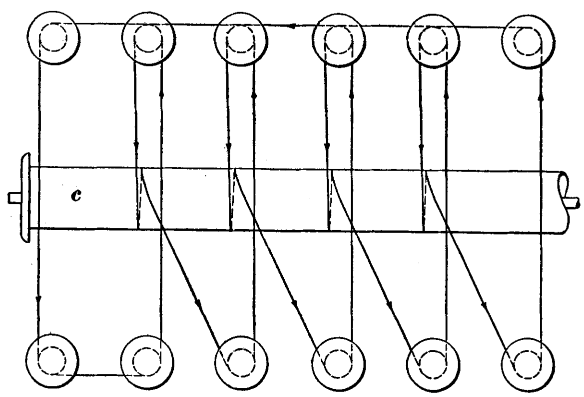

FIG. 11

they will revolve in the direction opposite to that of the hands of a watch, thus causing the ends when being wound to pass to the right-hand side of the spool.

BUILDER MOTIONS

12. Mangle Gears.—The yarn in being wound on the spool is given a traverse by means of the thread guide being attached to the traverse rail, this rail receiving an up-and-down motion while the spool revolves continually in the same plane. In winding the yarn from the bobbin to the spool there are two objects that must be attained: (1) The yarn must be wound from the bottom to the top of the spool, where it reverses and is wound from top to bottom, reversing again at this point, and so on, each layer covering the preceding one; (2) the yarn should be wound on the spool in such a manner that the full spool will be larger at its center than at either of its ends, since a spool with the yarn wound in this manner not only holds more but also unwinds better at the next process. Both of these objects are attained by means of what is known as the **mangle**

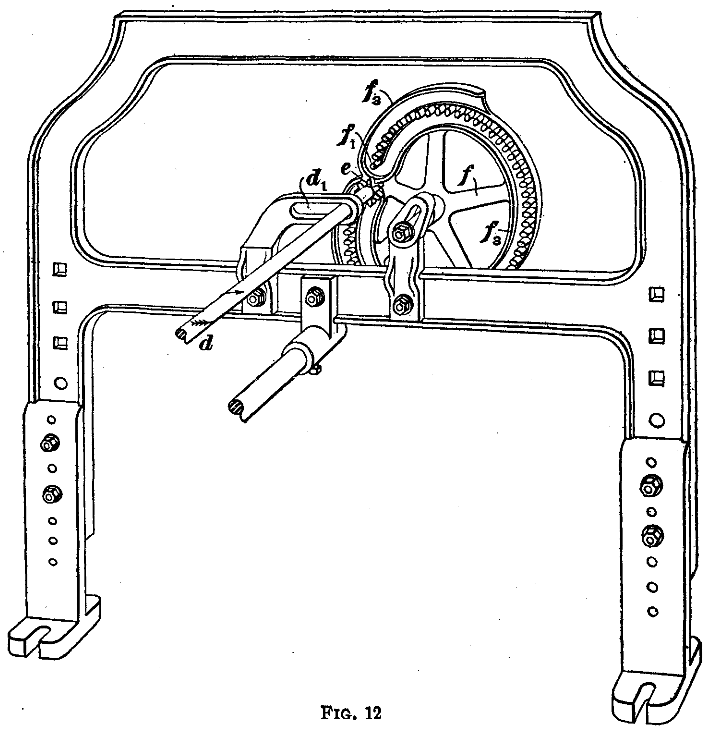

FIG. 12

gear and its connections. Fig. 12 is a view of these parts, an end view of the same being shown in Fig. 14, while Fig. 13 shows the mangle gear alone.

Rods m_1, Figs. 5 and 14, known as the lifting rods, are situated at regular intervals on each side of the frame. These rods slide up and down in brackets, and, being connected to the traverse rail, which carries the thread guides, the latter move simultaneously up or down. Attached at the middle of each lifting rod is a rod m_2 that is connected to adjustable studs n_2 in the lever n. Extending along the center of the frame and directly under the cylinder is the shaft d, Fig. 12, which is driven from the cylinder shaft by means of a belt. At the end of this shaft, opposite to the driving end, is the gear e that drives the mangle gear f.

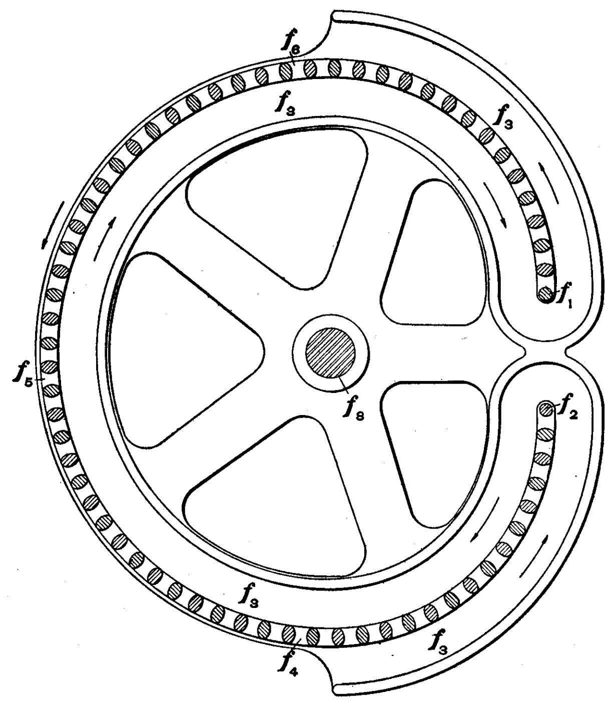

FIG. 13

13. Reference is now made to Fig. 13, which shows the mangle gear alone in cross-section. This gear is composed of two rings joined together by pins that form teeth. By this means, the pinion gear engaging with the mangle wheel can drive it either from the outside or the inside of the teeth. It will be noticed that the teeth of the mangle gear end at the points f_1 and f_2. This is to allow the pinion gear engaging with the teeth to pass from the outside to the inside, and vice versa. Supposing the pinion to be on the outside of the mangle gear, it drives this gear around until the small opening at f_1 is reached, when it slips to the inside of the mangle gear and continues to turn it, but in the opposite direction. This continues until the opening at f_2 is reached, when the pinion passes to the outside and again reverses the direction of motion of the mangle gear.

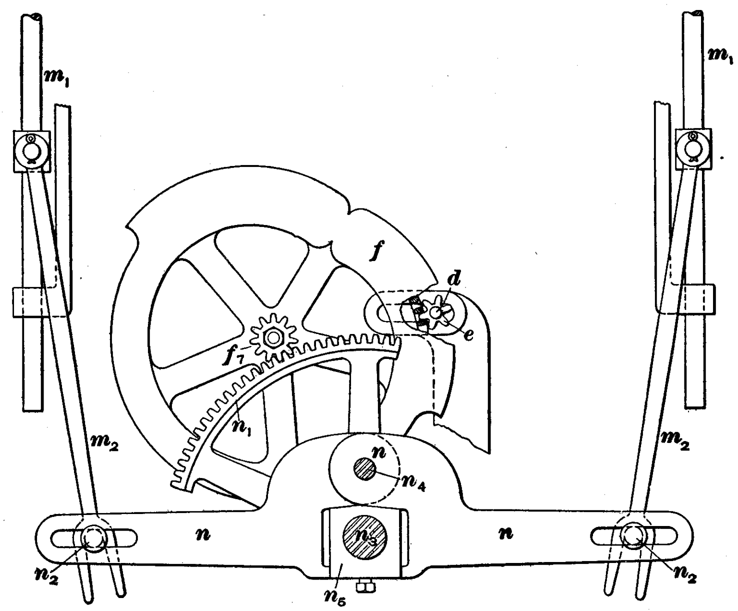

FIG. 14

Two points should be noted here: (1) As the mangle gear simply revolves without having any vertical or lateral movement, then the pinion must be provided with some such motion in order to allow it to pass from one side of the mangle gear to the other, since one of the two gears must change its relative position. It is made possible for the pinion gear to move back and forth by means of the shaft on which it is placed being held in a bearing d_1, Fig. 12, sufficiently wide to allow the required lateral movement.

(2) Since the pinion gear is not held firmly in one position by the shaft on which it is placed, some other provision must be made by means of which it will be held in contact with the teeth of the mangle gear at all times. This is accomplished as follows: When the pinion is engaging with the outside of the teeth from the point f_4 through f_5 to f_6, the shaft has been moved until it is being pressed against the extreme side of its bearing, and since it cannot be moved any farther in that direction, the teeth of the pinion must remain in gear with the mangle wheel. After the pinion has passed the point f_6, on the outside of the teeth, and until it again reaches the point f_4, on the outside of the teeth, it is held in gear with the mangle wheel by means of the end of the shaft projecting beyond the gear and thereby coming in contact with outer and inner guides f_3 with which the mangle gear is provided.

14. Reference is now made to Fig. 14, which gives an end view of these different parts. On the hub of the mangle gear is the gear f_7, which engages with the teeth in a quadrant n_1. The quadrant is fast to the shaft n_3, on which are also situated the levers n. The shaft n_3 extends the whole length of the spooler, and has at intervals other levers corresponding with n and other rods corresponding with m_2, m_1. As the mangle gear is having its direction of motion continually reversed, the quadrant also keeps reversing and gives an alternating up-and-down motion to the arms of the lever n and the other levers corresponding with it, this motion being also imparted to the lifting rods m_1 by means of the rods m_2. The lifting rods are so adjusted that when the rods are up on one side of the frame they are down on the other, so that one side tends to balance the other and thereby lessens the amount of power necessary to move the traverse rail.

15. Build of the Spool.—As previously referred to, it is desirable to give a barrel shape to the spools in order that more yarn may be put on each spool. In order to give this barrel shape to the spool, the traverse rail, and consequently the thread guides, move more slowly along the central parts of the spool than at the ends. At the latter points a quick approach to and return from the head of the spool is desired. If the mangle gear were circular and the speed of the pinion gear remained constant, the speed of the traverse rail would be constant on both the upward and downward traverse and at every part of each traverse, thus producing a spool no larger in diameter at one place than at another. The manner in which the desired result is attained is to have the mangle gear eccentric, as shown in Fig. 13, the center of the stud f_8, on which the mangle is mounted, being nearer to the points f_1 and f_2 than it is to any one of the points f_4, f_5, or f_6. In fact, the distance from the center to the points f_1 and f_2 is only 4 inches, while the distance from f_8 to f_4, f_5, or f_6 is 6 inches. Consequently, when the pinion gear is in gear with the mangle wheel at the points f_1 or f_2, it may be said to be driving a gear 8 inches in diameter, while on the other hand, when it is in gear at the points f_4, f_5, or f_6, it is the same as driving a gear 12 inches in diameter, and consequently at a reduced speed. The mangle gear is so set that the traverse rail on one side will just reach the top of its traverse when the pinion is at the point f_1, and the bottom of the traverse when the pinion is at the point f_2. The conditions on the other side of the frame will, of course, be the exact reverse of this; consequently, the thread guides start quickly at the top of the spool and gradually slacken their speed as they approach the center, increasing their speed again just before reaching the bottom of the spool. After they have reversed and traveled a short distance upwards, the speed is again slackened until they have passed the center, when it is increased for the approach to the top of the spool.

16. Another arrangement for obtaining the traverse of the thread guides and the desired build of the spool is shown in Fig. 15. In this arrangement the mangle gear and lifting rods are employed, as in the motion previously described. The method, however, of driving the mangle gear and raising and lowering the lifting rod differs slightly. Referring to

Fig. 15, the pinion shaft r is driven by a chain r_1 from the cylinder shaft. The bearing r_2 of the shaft r is so arranged that the shaft is allowed a vertical movement instead of a lateral movement, as in the previous case. The mangle gear f is driven by a pinion gear on the end of the shaft r, and being fast to the shaft s, it in turn drives the gear t by means of another gear on this end of the shaft. Fast to the shaft carrying the gear t is the segment arm t_1 carrying the

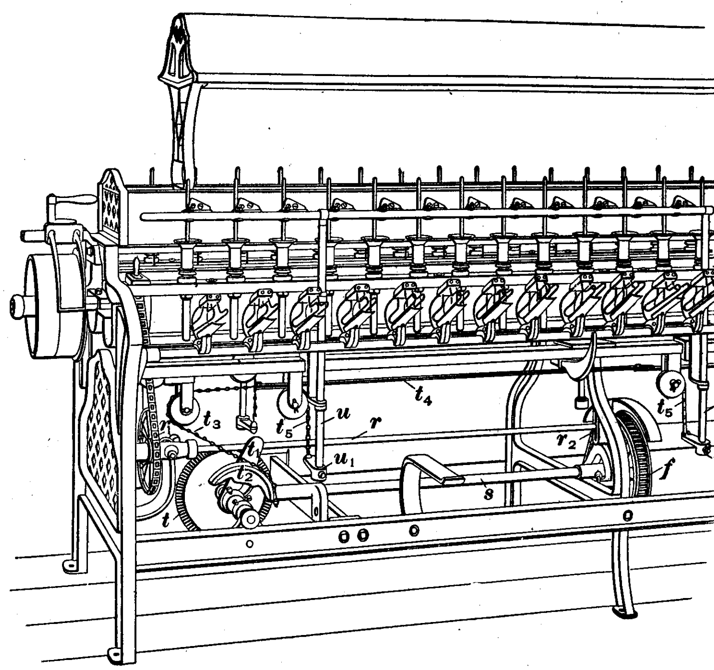

Fig. 15

segment t_2. Connected to the segment is the chain t_3 that operates the rod t_4 and chains t_5, the chains t_5 being connected to the lifting-rod dogs u_1 attached to the lifting rods u. Since the mangle gear is driven first in one direction and then in the other by the pinion gear, the gear t will also reverse its direction of motion at regular intervals. This will impart a swinging motion to the segment arm t_1 and also to the segment t_2, resulting in the chain t_3 being alternately brought down and let out. As this chain is brought down by the action of the segment it will raise the traverse rail through connections referred to, while on the other hand, when the chain is let out, the rail, due to its own weight, will drop. Since the mangle gear is constructed on the same principle as the one previously described, the desired results will be obtained.

17. Winding From Cops or Bobbins Having a Filling Wind.—In cases where the yarn is to be wound on to

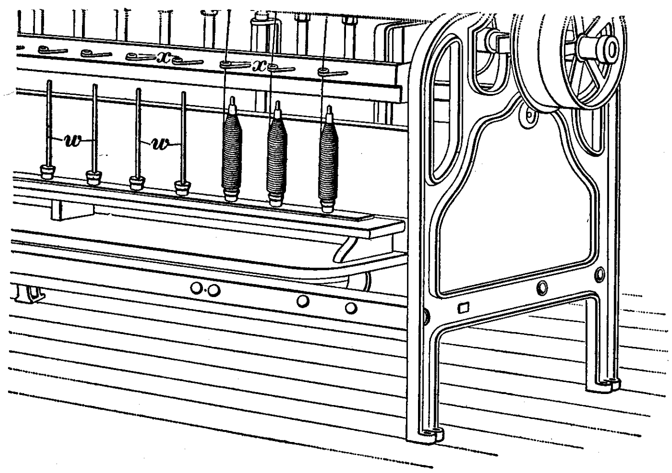

FIG. 16

spools from cops or from bobbins with a filling wind, an arrangement differing from any previously shown must be adopted for holding the cops or bobbins, since a filling wind differs entirely from the ordinary warp wind, the yarn in the former case being built up from the bottom, while in the latter case it is placed on the bobbin in layers one above the other. Thus, in one case, the yarn must be pulled off at the nose, while in the other the yarn is unwound from the side. Fig. 16 shows an arrangement suitable for holding the cops or filling-wind bobbins when the yarn is being spooled. The cops or bobbins are placed on the spindles *w* and the yarn carried through the guides x to the thread guide on the traverse rail and then to the spool. In this manner the yarn is pulled directly from the nose of the cop or bobbin, which method must always be adopted in order to run the yarn at all successfully. In most cases when spooling yarn that has a filling wind, the yarn has to be run over a friction flannel situated between the cops and spools, in order to give the yarn sufficient tension to be wound on the spool in a compact form.

18. Safety Device.—With the motion shown in Fig. 14, the levers n are so constructed that, should any obstruction prevent their lowering, they will simply be held in one position and the yarn will be wound on the spool at one place. Referring to this figure, it will be seen that the arms swing on the stud n_4. Fastened to the shaft n_3, on which is placed the quadrant, is the casting n_5, so shaped that its lower edge, pressing against the lever, will lift it when the quadrant is turned. For example, suppose the quadrant is turning to the left; then the lower right-hand corner of the casting n_5 will press against the arm n on the right-hand side and raise the lifting rods on that side of the frame. When the quadrant swings in the other direction, the lever will drop on account of its own weight and the weight of the lifting rods and traverse rail resting on it; but the casting n_5 is not acting on it in any manner, excepting to allow the lever to fall gradually; consequently, it is capable of being held up by any obstruction. The stud n_2, Fig. 14, also works loosely in the slot in the rod m_2 and is a further precaution against the breaking of any parts should the traverse rail or the rod m_1 be prevented from dropping. With the motion shown in Fig. 15, the quadrant does not, of course, have any positive action on the rods when they are dropping, since it simply allows the chain to run out and thus permits the rods to drop by means of their own weight.

19. Dimensions of Spoolers. — Spoolers are constructed in various sizes, containing usually not less than 30 and not more than 80 spindles on each side. Spoolers are spoken of not only by their length and by the size of the spool they use, but also by the gauge, that is, the distance from the center of one spindle to the center of the next. A common gauge is $4\frac{3}{4}$ inches, this of course being reduced for small spools used for spooling fine yarns and increased for large spools in the case of running coarse yarns. The length of a spooler containing 100 spindles with $4\frac{3}{4}$-inch gauge is 21 feet, 3 inches; its width is 4 feet.

SETTINGS

20. Setting the Parts of the Builder Motion.—To set the mangle-gear arrangement, shown in Figs. 5 and 14, have the pinion gear just at the point of reversing the mangle gear; then find the difference between the number of teeth on the segment and on the stud gear and set the stud gear so that it will be half this number of teeth away from the end of the segment. For example, if the segment contains 28 teeth and the gear meshing with it has 20 teeth, then when the mangle gear is at the point of reversing, have the gear on the stud 4 teeth from the end of the segment. $28 - 20 = 8$. $8 \div 2 = 4$. At this point the top of the traverse rail on one side of the spooler should be about $\frac{1}{16}$ inch below the top heads of the spools, while the top of the traverse rail on the other side should be the same distance above the bottom heads of the spools on that side of the machine.

21. Regulating the Traverse.—The gear meshing with the segment is known as the **change gear,** and it is this gear that is altered when a change in the traverse is desired. As previously stated, different counts of yarn require different sizes of spools; consequently, whenever a different class of work is started, this gear must be changed in order to obtain the required traverse. A larger gear drives the quadrant more quickly, and consequently makes it travel a greater distance while the mangle gear is making one revolution. This gives a longer traverse of the traverse rail. A smaller gear has, of course, the opposite effect. In case the change gear does not give the exact traverse required, any slight change may be obtained by moving the studs n_2, Fig. 14, inwards or outwards. Moving them inwards gives the lever n less leverage and consequently shortens the traverse. By this method of changing the traverse, the traverse on one side may be altered independently of that on the other, which cannot be done by changing the change gear.

22. Regulating the Point at Which the Traverse Rail Reverses.—Another adjustment, but one that alters only the point at which the rail reverses without altering the traverse, can be made by dropping or raising the lifting rods. If, for example, the traverse rail is a little too high at both the top and bottom points at which it reverses, then the rods may be dropped until the traverse rail assumes its correct position. Care should be taken, however, to have the traverse rails perfectly horizontal and the studs in the slots of the lever n all set at the same point on one side of the frame.

23. To set the builder motion shown in Fig. 15, turn the gears until the pinion gear is at the central part of the mangle gear. When in this position, the top of the traverse rail should be in the exact center of the spool and the chain attached to the segment should leave the segment at exactly its central position. At the points of reversing, the top of the traverse rail on one side should have the same relative position to the top heads of the spools that the top of the traverse rail on the other side has to the bottom heads of the spools. With this motion the gear driving the gear t is the change gear; the larger the gear, the longer will be the traverse.

Another adjustment of the traverse may be made by means of the segment t_2, which is attached to the segment arm t_1 by a bolt in such a manner that it may be moved either toward or away from the shaft carrying the segment arm. By moving the segment toward the shaft, the traverse is shortened. By moving the segment away from the shaft, the traverse is lengthened. If the length of the traverse is correct but the rail does not reverse at exactly the right point, this may be adjusted by altering the point at which the dog u_1 is setscrewed to the lifting rod u. Care should be taken, however, to have the traverse rail perfectly level. The thread guides are adjustable on the traverse rail, and in some cases their position is changed in order that the yarn may be wound correctly on the spool. Sometimes the spools at one end of the frame are correctly wound while those at the other end are wrong. In such cases the lifting rods that support the traverse rail are not sufficiently well lubricated or are sticking for some other reasons.

The upper and lower plates of each thread guide should be set at such a distance apart that the yarn will just pass through without chafing. It is a good plan to use No. 7 or No. 9 card gauge to set these on fine yarns and No. 11 on coarse yarns, or even No. 7 and No. 9 together, equaling No. 16, on very coarse yarns. The settings of these plates should be looked over frequently.

MANAGEMENT

24. Properly Shaped Spools.—The faults caused at the spooler are generally in connection with the shape of the spool. If the traverse given to the thread guides is not sufficiently great, soft places at both the top and bottom of the spools will result. If the length of the traverse is correct but so set that it runs up too high, a hard place is formed at the top of the spool and a soft place at the bottom. If the length of traverse is correct but runs down too far, then the opposite effect is produced. Care should always be taken to have the bearings of the lifting rods well lubricated, since if these are sticking, the spools will not be filled correctly.

25. Speed.—It is not desirable to run spoolers too fast, since slower speeds tend to maintain the strength of the yarn, leaving it more elastic and causing fewer knots in the warp. It is much better to have a few extra spoolers whorl of the spindle is $1\frac{1}{2}$ inches in diameter. What is the speed of the spindle?

SOLUTION.— $\frac{200 \times 11 \times 6}{10 \times 1.5} = 880$ rev. per min. Ans.

One point should be noted in this connection—that the true diameter of the whorl cannot correctly be considered the actual diameter on which the band runs, since the band, being round, is of a measurable diameter, and therefore its diameter should be added to that of both the drum and whorl in order that more accurate results may be obtained.

EXAMPLE 2.—Suppose that in the example just stated the band is $\frac{3}{16}$ inch in diameter; then add this thickness to the diameters of the drum and whorl.

SOLUTION.— $\frac{200 \times 11 \times 6\frac{3}{16}}{10 \times 1\frac{11}{16}} = 806.66$ rev. per min. Ans.

A still more accurate method would be to turn the drum around once by hand and count the number of revolutions that the spindles make during this time. Then, by figuring the speed of the drum, the speed of the spindles may be readily ascertained.

CHANGE GEAR

33. In figuring the change gear for a spooler, the length of the traverse is in direct proportion to the size of the gear; consequently, if the size of the gear and the length of traverse it gives are known, the desired gear for any traverse, or the traverse that any size gear will give, may be easily found.

To find the gear required to give a desired length of traverse when the gear being run and the length of traverse it gives are known:

Rule I.—*Multiply the traverse gear being used by the length of traverse desired and divide the result by the length of traverse being run.*

EXAMPLE 1.—An 11-tooth gear is being used and gives a $5\frac{1}{2}$-inch traverse. What gear will be required for a $4\frac{1}{2}$-inch traverse?

SOLUTION.— $\frac{11 \times 4\frac{1}{2}}{5\frac{1}{2}} = 9$-tooth gear. Ans.

To find the length of traverse that a certain gear will give when the gear being used and the length of traverse it gives are known:

Rule II.—*Multiply the length of traverse being run by the gear to be used and divide this result by the gear being used.*

EXAMPLE 2.—An 11-tooth gear gives a $5\frac{1}{2}$-inch traverse. What traverse will a 9-tooth gear give?

SOLUTION.— $\frac{5\frac{1}{2} \times 9}{11} = 4\frac{1}{2}''$ traverse. Ans

PRODUCTION

34. When figuring the production of a spooler, the following will prove of advantage: The production of a spooler with a spindle speed of 750 revolutions per minute has been found from actual practice to be 90 hanks per spindle in 10 hours. From this the number of pounds or ounces per spindle may be figured, since hanks divided by counts equals pounds. For example, suppose the spooler is running 30s, then the production per spindle will be $90 \div 30$, or 3 pounds.

In case the spindle speed differs from that stated above, the production may be figured by proportion.

EXAMPLE.—What would be the production per spindle in 10 hours of a spooler with a spindle speed of 900 revolutions per minute spooling 80s?

SOLUTION.—

$$750 : 900 = 90 : x$$
$$900 \times 90 = 81{,}000$$
$$81{,}000 \div 750 = 108 \text{ hanks}$$
$$108 \div 80 = 1.35 \text{ lb. Ans.}$$

SPOOLERS

Serial 482 Edition 1

EXAMINATION QUESTIONS

Notice to Students.—*Study the Instruction Paper thoroughly before you attempt to answer these questions.* **Read each question carefully and be sure you understand it;** *then write the best answer you can. When your answers are completed, examine them closely, correct all the errors you can find, and* **see that every question is answered;** *then mail your work to us.*

(1) What is the object of the spooler?

(2) Describe the setting of the quadrant and gear f_7 on a spooler similar to the one illustrated in Fig. 5.

(3) What would result if the stud gear f_7, Fig. 14, were made 1 tooth smaller?

(4) Suppose a spool should catch under the traverse rail on the left-hand side of the frame when the rail was at the top of its traverse, what would result?

(5) Name and describe two forms in which yarn may be delivered to the spooler.

(6) (*a*) Explain the difference that exists between a spooler adapted to unwinding yarn from a warp-wind bobbin and one adapted to unwinding the yarn from a cop. (*b*) Give the reasons for this difference of construction.

(7) Describe different methods adopted to keep the different counts of yarn from becoming mixed at the spoolers.

(8) In what manner is the tension of the yarn regulated as it is being unwound at the spooler?

(9) Explain what evils knot tiers are intended to overcome.

(10) What objections would there be to spooling 80s yarn on a spool with a 6-inch traverse and a 5-inch head?

(11) Describe the method of setting the builder motion illustrated in Fig. 15.

(12) Explain the reason for the shape of the full spool and describe the arrangement in any one make of machine by which a spool of this shape is built up.

(13) Describe the following parts of a spooler, stating their objects: (*a*) bobbin holder; (*b*) thread guide.

(14) Describe the passage of the yarn through the spooler, stating the different parts with which it comes in contact.

(15) Explain, fully, how you would remedy the following defects on a spooler: (*a*) traverse too short for the size of spool being run; (*b*) traverse of the right length but running up too high on one side and down too low on the other.

(16) Describe any one method of banding the spindles on a spooler.

(17) Find the speed of the spindles on a spooler with the following particulars: Main shaft of room 200 revolutions per minute, carrying a 12-inch pulley that drives a 10-inch pulley on spooler; diameter of cylinder 6 inches, and diameter of whorl $1\frac{1}{2}$ inches. Do not consider the diameter of the band. Ans. 960 rev. per min.

(18) If an 11-tooth traverse gear is being used to give a $5\frac{1}{2}$-inch traverse, what length of traverse will a 10-tooth gear give? Ans. 5 in.

(19) What will be the pounds per spindle produced in 10 hours on a spooler with a spindle speed of 750 revolutions per minute and spooling 40s? Ans. 2.25 lb.

(20) If the spindles on a spooler make 4 revolutions to every revolution of the cylinder, how many revolutions per minute do the spindles make if the main shaft of the room makes 200 revolutions per minute and carries an $11\frac{1}{4}$-inch pulley driving a 10-inch pulley on the spooler?

Ans. 900 rev. per min.

Mail your work on this lesson as soon as you have finished it and looked it over carefully. DO NOT HOLD IT until another lesson is ready.

SCIENCE INSTRUCTING INDUSTRY

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