E. BOOS.

DRUM FOR WINDING THREADS.

APPLICATION FILED FEB. 18, 1911.

1,052,125.

Patented Feb. 4, 1913.

4 SHEETS—SHEET 1.

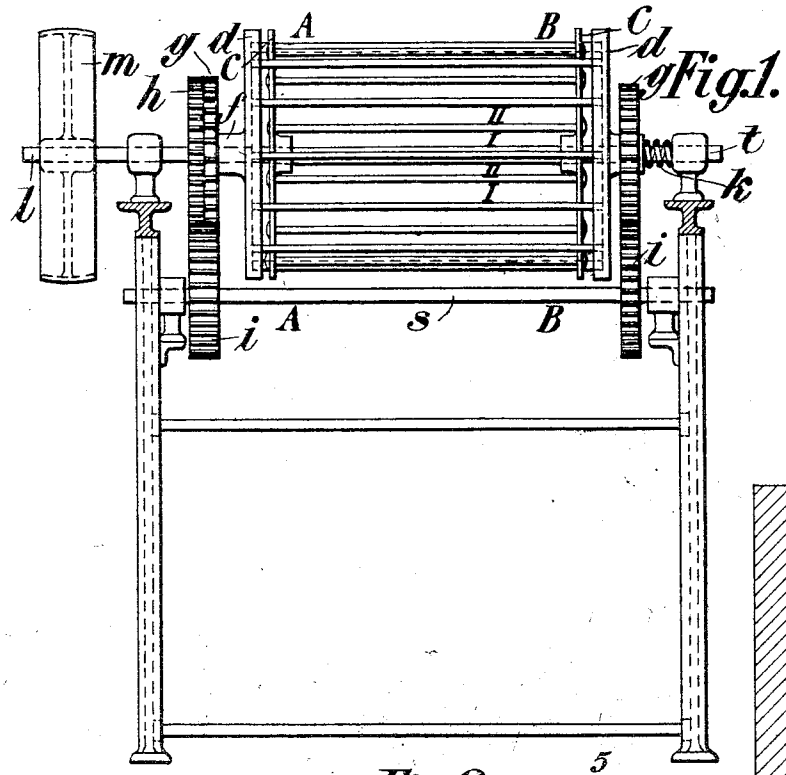

Fig. 1.

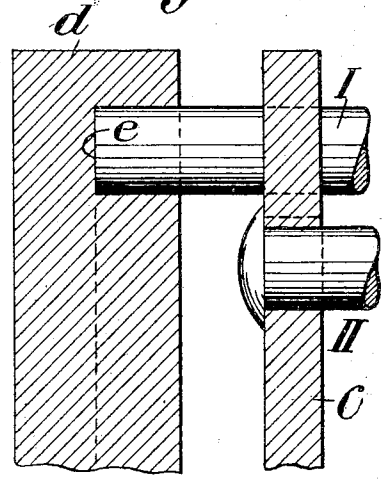

Fig. 4.

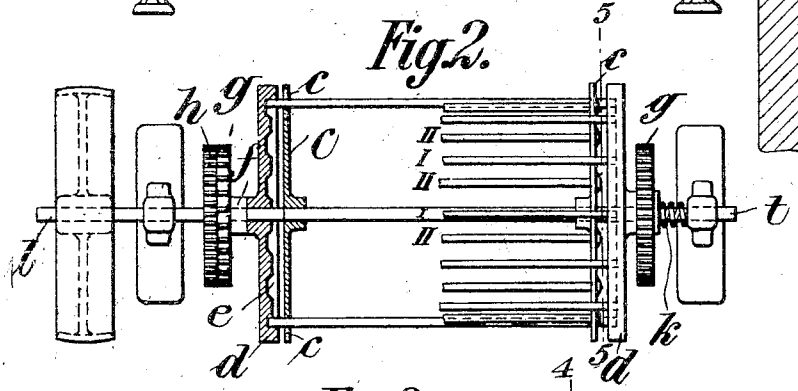

Fig. 2.

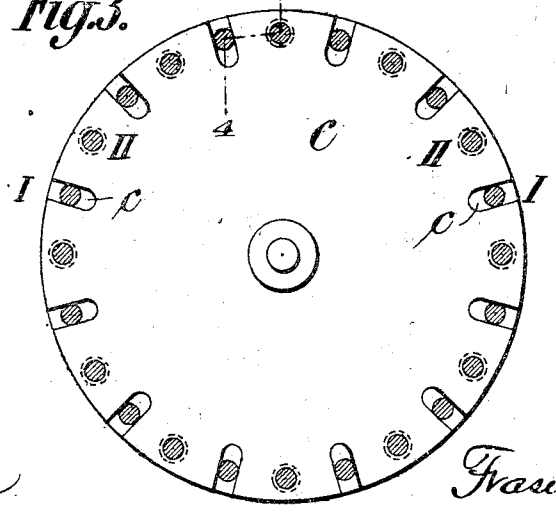

Fig. 3.

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4 SHEETS—SHEET 2.

Fig. 5

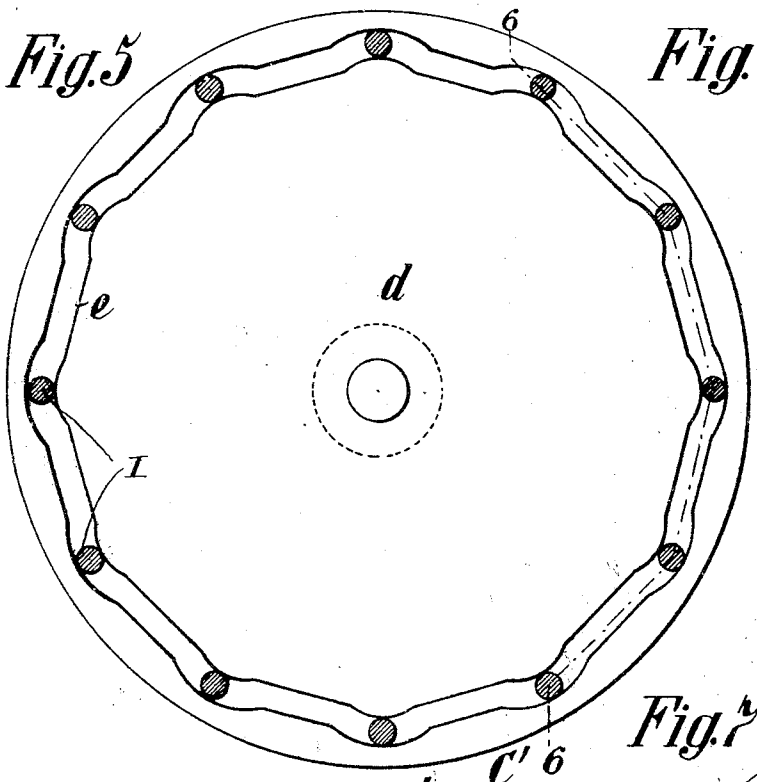


Fig. 6

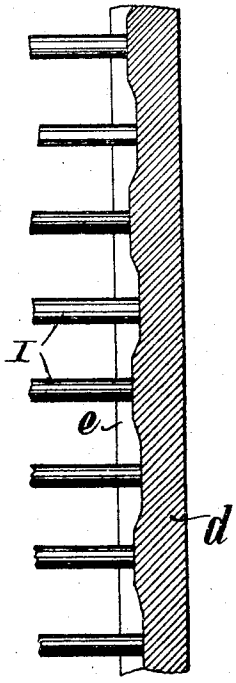


Fig. 7

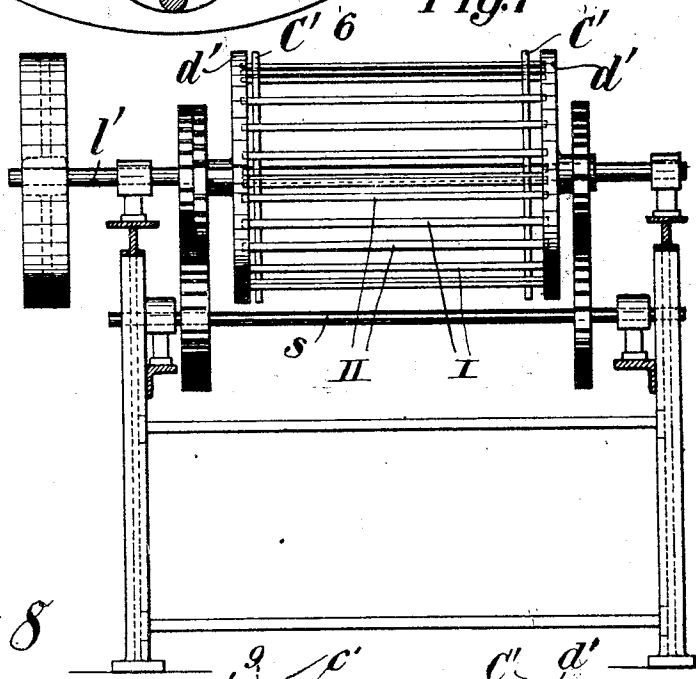
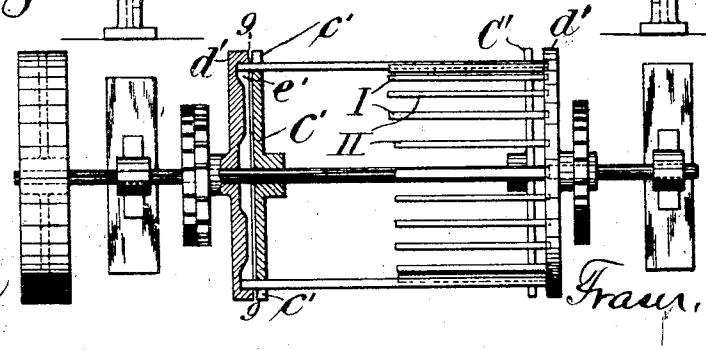


Fig. 8



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4 SHEETS—SHEET 3.

Fig. 9.

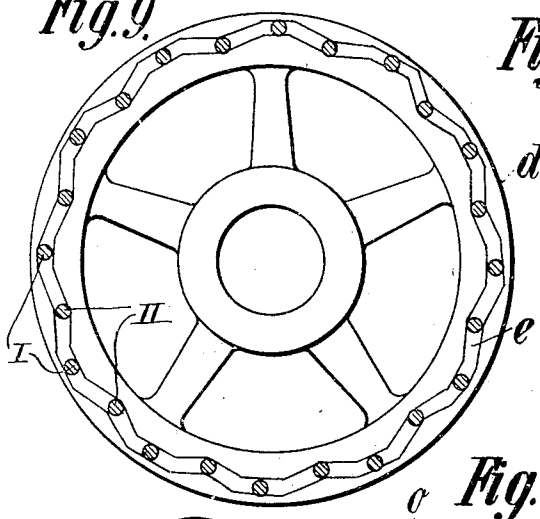


Fig. 10.

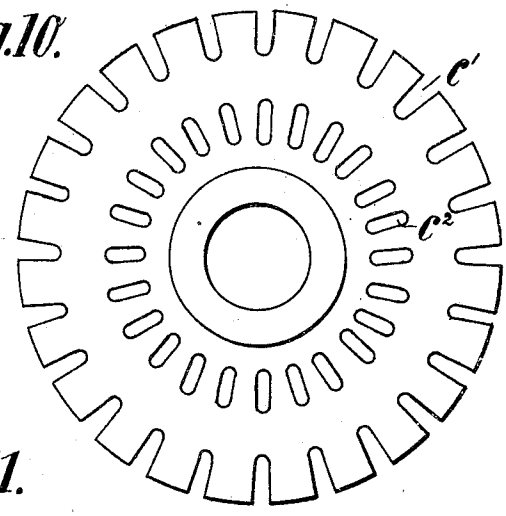


Fig. 11.

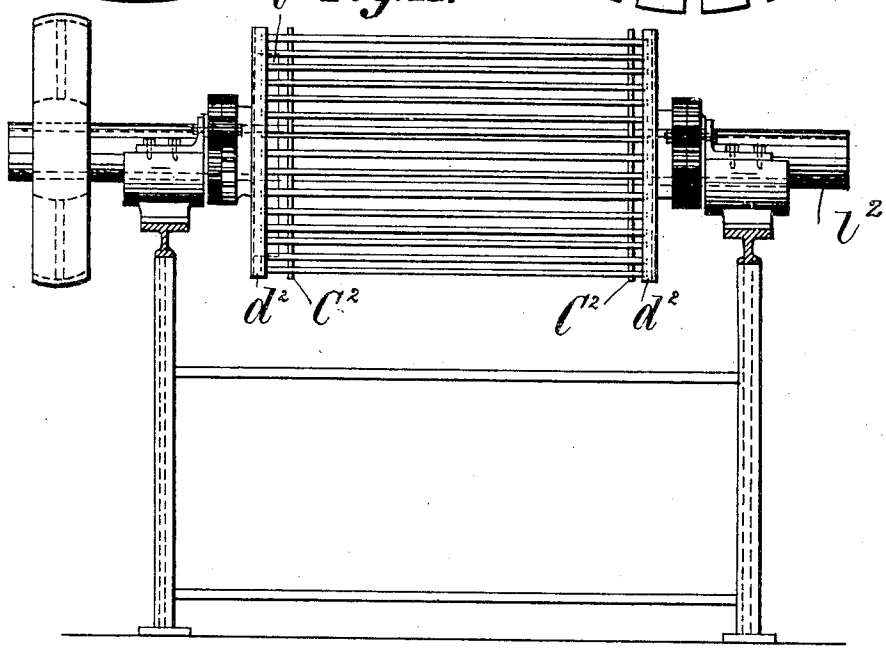
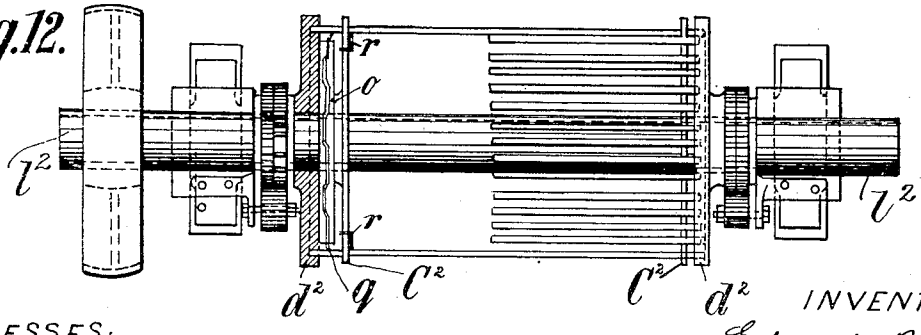


Fig. 12.



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4 SHEETS—SHEET 4.

Fig. 13

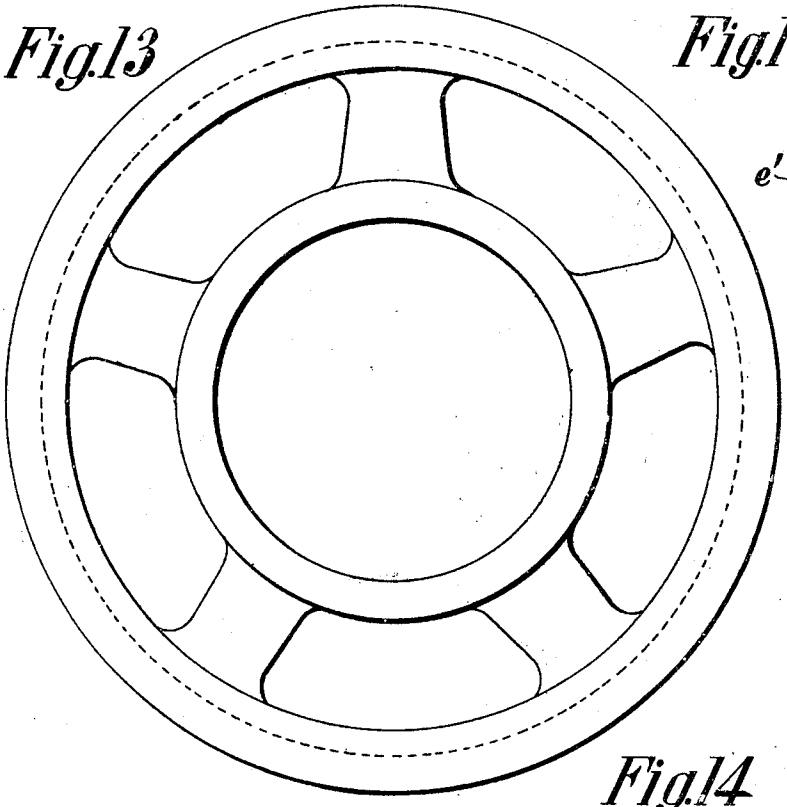


Fig. 15

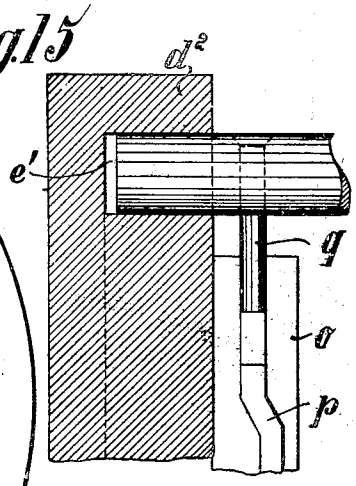


Fig. 14

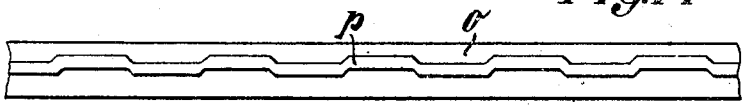


Fig. 17

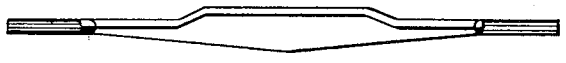
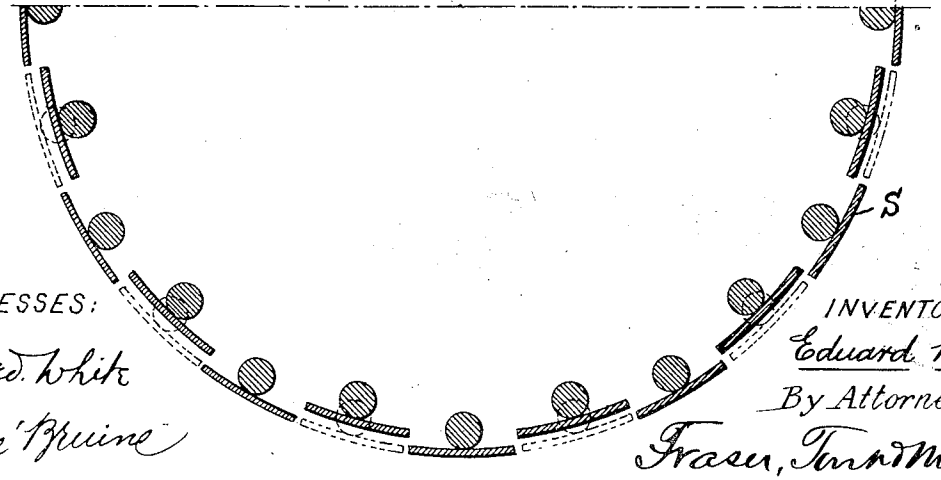


Fig. 18

Fig. 16



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UNITED STATES PATENT OFFICE.

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DRUM FOR WINDING THREADS.

1,052,125. Specification of Letters Patent. Patented Feb. 4, 1913.

Application filed February 18, 1911. Serial No. 609,310.

To all whom it may concern:

Be it known that I, EDUARD BOOS, a subject of the Grand Duke of Hesse, and resident of Oberbruch, Germany, have invented certain new and useful Improvements in Drums for Winding Threads, of which the following is a specification.

This invention relates to a drum for winding threads by means of which it is possible to feed the thread laterally in a continuous manner with an automatic operation. The thread travels around this drum in a spiral path, is seized at one end thereof, this point of entrance always remaining in the same plane, and then the thread is wound and at once moved laterally. During its progress it may be subjected to various treatments, for instance it may be treated with chemicals, washed or dried. At the end of the drum the thread is delivered continuously—here too always in the same plane—and may then, as a finished product, be fed to a reeling or yarn-twisting device.

In the textile industry, and particularly in the production of artificial textile threads in the shape of narrow glued straw-like ribbons, and also in the production of artificial sik according to any one of the well-known processes it is necessary to subject the thread, in the course of its manufacture, to a considerable number of treatments. Thus in the case of the narrow straw-like ribbon it is necessary to first glue together a series of threads and then to dry this glued bundle while keeping it of constant length. In a like manner, in the well-known processes for the production of artificial silk it is necessary to subject the threads successively to a large number of processes and to keep them constantly under tension during these treatments. All the processes known hitherto for the production of such threads involve a more or less discontinuous operation, the thread being delivered to reels or spools the material of which must be adapted to the particular chemicals with which the thread is to be treated, and this at times leads to serious inconveniences. Undoubtedly it is desirable to secure a continuous operation for these processes, that is to say, to conduct the thread successively through the several processes without resorting to new spooling or new reeling. In most cases attempts of this character fail because the action of the particular chemicals must be continued for too long a time and because the machine would be of a length not admissible in practice if it were to lead the thread in a continuous operation and in a straight line, through the several processes. The present invention enables the great length of the thread to be brought into the shape of a spiral and thus to render the entire apparatus exceedingly compact and accessible.

The principle of the operation to be performed by the device described hereinafter consists in winding the thread upon a drum-like rotating body and at the same time shifting it laterally in the direction of the drum's longitudinal axis in such a manner that the thread is always wound in a plane and unwound in a parallel plane located laterally thereof, without requiring a separate second drum with laterally shifting rods and without any crossing and tangling of the threads. In principle this is accomplished by constructing a winding drum with two sets of rods one within the other.

In the accompanying drawings, I have represented several examples of my invention.

Figure 1 is a side elevation of one form of my winding device, with parts in section; Fig. 2 is a top view thereof, with parts in section and other parts broken away; Fig. 3 is a vertical section through the two sets of rods, substantially in the plane indicated by A—A in Fig. 1; Fig. 4 is a vertical section on line 4—4 of Fig. 3, drawn upon an enlarged scale; Fig. 5 is a vertical section on line 5—5 of Fig. 2, drawn upon an enlarged scale; Fig. 6 is a developed view, in section on line 6—6 of Fig. 5; Fig. 7 is a side elevation, with parts in section, showing a second embodiment of my invention; Fig. 8 is a corresponding plan view, with some parts in section and others broken away; Fig. 9 is a cross section on line 9—9 of Fig. 8; Fig. 10 is a face view of one of the disks forming part of the structure shown in Figs. 7 to 9; Fig. 11 is a side elevation of a third form of my invention; Fig. 12 is a corresponding plan view; Figs. 13 and 14 are a face view and a partial edge view of one of the heads forming part of this third embodiment; Fig. 15 is a sectional view showing the same head in conjunction with a companion head and with one of the rods;

Fig. 16 is a cross section showing two sets of winding rods provided with curved attached strips; and Figs. 17 and 18 are a side elevation and a cross section respectively, of a peculiar T-shaped rod which may be used in my improved winding device.

In the form of my invention illustrated by Figs. 1 to 6, I employ two sets of parallel rods, the rods of the same set being at the same distance from a common center or axis, or in other words, the rods of each set are arranged upon a cylindrical surface, as it were. One of these sets is of constant diameter; its rods, designated by II, are secured to disks C. At points midway between the rods II, the disks C are provided with slots or notches *c* extending radially inward from the periphery. Through these notches extend at all times (see Fig. 3) the rods I of the movable set. The ends of these rods are received in cam grooves *e* of the heads *d*. These grooves vary not only as to distance from the center or axis (Fig. 5) but also in depth (Fig. 6) and are therefore adapted to move the rods I in or out radially, and also lengthwise, that is, parallel with the axis. In the position shown in Fig. 3, a thread wound on the drum formed by the rods I, II would be supported equally on the rods of both sets, but by moving the rods I in or out, the thread would be made to rest exclusively on the rods II or I respectively.

The disks C and the rods II connecting them are rotated in unison, by means of the shaft *l* to which they are secured rigidly. The rods II therefore have no movement toward and from the axis, and no movement parallel with the axis, such as mentioned above in connection with the rods I. The shaft *l* is driven in any suitable manner for instance by means of a pulley *m*. On the shaft *l* is also secured rigidly a gear wheel *h* meshing with a pinion *i* on a countershaft *s* which carries a like pinion at the other end. The two pinions *i* are in mesh with gear wheels *g* on bosses *f* which are integral or rigid with the cam heads *d*. One of these heads is mounted loosely on the shaft *l*, the other is provided with an axial pin or trunnion *t* journaled in a suitable bearing, and a coiled spring *k* presses this head toward the other head *d*. The rises and depressions in the cam groove *e* are so arranged that when one end of the rod is in a depression, the other end is at a rise. The heads *d* therefore have no axial movement under ordinary conditions of operation, the spring *k* being employed chiefly to obtain a greater certainty of movements, and to facilitate removal and renewal of the rods I.

The two pinions *i* are alike, as are the gear wheels *g*, so that both heads *d* will revolve at the same speed. The wheel *h* however has a number of teeth different from the wheels *g*, so that by the differential gearing the heads *d* are given a different number of revolutions from the shaft *l*, and disks C. With each set comprising twelve rods, as shown, I prefer to have the gearing so constructed that for a complete revolution of the drum, the disks *d* will lag behind the disks C just one-twelfth of the circumference in each rotation. This may be accomplished by providing the gears *g* with a less number of teeth than gears *h* whereby the gears *g* will be rotated at a faster rate than gears *h*. The differential movement of the disks *d* and C provides for a relative movement between the ends of the rods I and the bottoms and side of the cam-grooves *e* whereby the rods are operated, as hereinafter described.

In the operation of this device, the thread travels to the drum always in the same plane, say that indicated by A—A in Fig. 1, and always leaves in a plane parallel thereto, say the plane B—B. In detail, the operation is as follows: The thread arriving at A—A is received upon the rods II of the drum, and the rods I move outward in the notches *c* (owing to the action of the cam grooves *e*) until they are farther from the axis than the rods II. The thread therefore, at this moment, is supported exclusively by the rods I. While the latter are thus in their outer position, they are moved lengthwise, that is, axially (toward the right in Fig. 1) so as to shift the thread to the plane B—B. Then the rods I move inward to a position nearer the axis than the rods II, thereby transferring the thread from the rods I to the rods II. The rods I, while in their inner position and therefore out of contact with the thread, move lengthwise or axially in the opposite direction (to the left in Fig. 1) thus bringing them back to their original position. It will be understood that both sets of rods I and II rotate in unison, the rods I being always within the notches *c* and therefore carried along by the disks C so far as rotation about the axis of the drum is concerned. While the rods II have only this rotary movement, the rods I have two kinds of additional movements, viz: first, a contracting and expanding movement within the notches *c*, so that the diameter of the set I is at times larger than the invariable diameter of set II, and at other times smaller; second, a longitudinal movement, first in one direction and then in the other. The radial movement effects the transfer of the thread from one set of rods to the other, while the axial movement carries the thread laterally, say from A—A to B—B.

Instead of combining a set of constant diameter with a set of variable diameter, as in Figs. 1 to 6, I may employ two sets of variable diameter, as illustrated by Figs. 7 to 10. The shaft *l'* is shown as extending

through the entire drum, with both disks C′ secured to it. Each disk C′ (Fig. 10) has peripheral radial slots or notches c' for the rods I and II, that is to say, with twelve rods in each set (as before) there will be twenty-four notches instead of twelve. The rods of both sets are movable in and out in these notches, their position being controlled by cam grooves e' in the heads d'. Fig. 9 shows that when the rods I are in their outermost position the rods II are in their innermost position. The operation will be substantially the same as described above, so that a repetition of details will not be necessary. With this construction, if the cam grooves e' are given the proper shape, it becomes possible to avoid entirely any stretching of the thread during the operation. If it is desired to give the thread the same amount of lateral displacement as in the construction first described, the lag of the cam heads d' relatively to the notched disks C′, for one revolution of the drum, ought to be $\frac{2\pi}{24}$. The other parts of Figs. 7 and 8 are of the same construction as in Figs. 1 to 6 and are designated by the same reference letters. It will be noted that the spring k is not employed in Figs. 7 to 10.

In Figs. 1 to 10 the endwise movement of the rods is obtained by employing a cam groove of varying depth. According to Figs. 11 to 15, one of the heads d^2 is provided with an extension o having a cam groove p upon a cylindrical surface, said groove receiving the ends of pins q secured to the rods I. The lateral deviations of the groove p (shown best in Fig. 14) will give the rods the desired endwise movement. By this arrangement the wear at the ends of the rods is prevented, since they need not engage the bottom of the cam groove e^2 which controls the radial movement of the rods as before. Furthermore, the accuracy of the movement is increased, even without the use of a spring. With this construction, in order to prevent rotation of the rods about their own axes, they are guided by means of pins r, secured to the respective rods and fitted into radial slots c^2 (Fig. 10) of the disks C′. As indicated in Figs. 11 and 12, the main shaft l^2 is made hollow in order to convey hot air for drying or humid air for moistening purposes.

In the drawings described so far, the rods I and II are shown simply as round rods. This has been done for the sake of simplicity and of clearness. In practice, however, it is preferred to secure upon these rods, curved strips S of any suitable material such as rubber or metal (Fig. 16), so that the rod and strip together will constitute a rod having a T-shaped cross section, or instead of this, the body of the rod R itself may be given a T-shaped cross section, as shown in Figs. 17 and 18. If during the operation of the device as described above, it should be thought desirable to alter the tension of the thread, this may be accomplished by increasing or reducing the diameter of the drum. For this purpose, the rods may be bent (as indicated in Fig. 17) to give the drum a different diameter, or rods of different diameters may be used.

Various modifications may be made without departing from the nature of my invention as set forth in the appended claims.

The construction of Figs. 11 to 15 inclusive is claimed specifically in a divisional application filed by me March 25, 1912, Serial No. 685,905.

I claim:

1. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward so that either set may become the outer set temporarily, one set being also movable axially in relation to the other to carry the thread laterally, and means for effecting the radial and the axial movements of the rods.

2. A thread-winding drum, comprising two sets of rods one movable relatively to the other radially during winding so that either set may become the outer set temporarily, and means for effecting the radial movement of the rods during the winding operation.

3. A thread-winding drum, comprising two sets of rods one movable outwardly beyond the other so that the first-named set may become the exclusive carrier of the thread, temporarily, and means controlled by the rotation of the drum, for effecting the movement of the rods.

4. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward during winding so that one set may temporarily become the outer set and the exclusive carrier of the thread, and means for effecting the movement of the rods during the winding operation.

5. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward so that one set may temporarily become the outer set and the exclusive carrier of the thread, said set being also movable axially to carry the thread laterally, and means for effecting the movement of the rods.

6. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward during winding so that one set may temporarily become the outer set and the exclusive carrier of the thread, the rods of one set alternating with those of the other set, and means for effecting the movement of the rods during the winding operation.

7. A thread-winding drum, comprising

two sets of rods one movable relatively to the other inward and outward so that one set may temporarily become the outer set and the exclusive carrier of the thread, said set being also movable axially to carry the thread laterally, the rods of one set alternating with those of the other set, and means controlled by the rotation of the drum, for effecting the movement of the rods.

8. A winding drum comprising disks provided with guide slots, a set of rods secured to said disks at a constant distance from the axis, another set of rods extending loosely through said slots and movable toward and from the axis, and cam heads for controlling the motion of the last-named set of rods.

9. A winding drum comprising disks provided with guide slots, two sets of rods extending through said slots loosely and movable toward and from the axis of the drum, and cam heads for controlling the motion of both sets of rods.

10. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward so that one set may temporarily become the outer set and the exclusive carrier of the thread, the said rods being T-shaped in cross section, and means, controlled by the rotation of the drum, for effecting the movement of the rods.

11. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward so that one set may temporarily become the outer set and the exclusive carrier of the thread, each rod having secured thereto a curved strip to give it a T-shaped cross section, and means controlled by the rotation of the drum, for effecting the movement of the rods.

12. A thread-winding drum, comprising two sets of rods one movable relatively to the other inward and outward so that one set may temporarily become the outer set and the exclusive carrier of the thread, the diameter of the drum being susceptible of being increased or reduced during the operation, in order to alter the tension of the thread and means, controlled by the rotation of the drum, for effecting the movement of the rods.

13. A thread-winding drum, comprising two sets of rods, one set movable radially relatively to the other so that either set may become the outer set temporarily, one set being also movable axially, and means for imparting such axial movement, such means comprising a groove of varying depth.

14. A thread-winding drum, comprising two sets of rods, one set movable radially relatively to the other so that either set may become the outer set temporarily, one set being also movable axially, and means for imparting such axial movement, such means comprising corresponding grooves in the opposite heads of the drum, said grooves being reciprocally of varying depth and engaging the ends of said rods.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

EDUARD BOOS.

Witnesses:
HENRY CRADFLIEG,
MATHIEU GILLES.