

(No Model.)

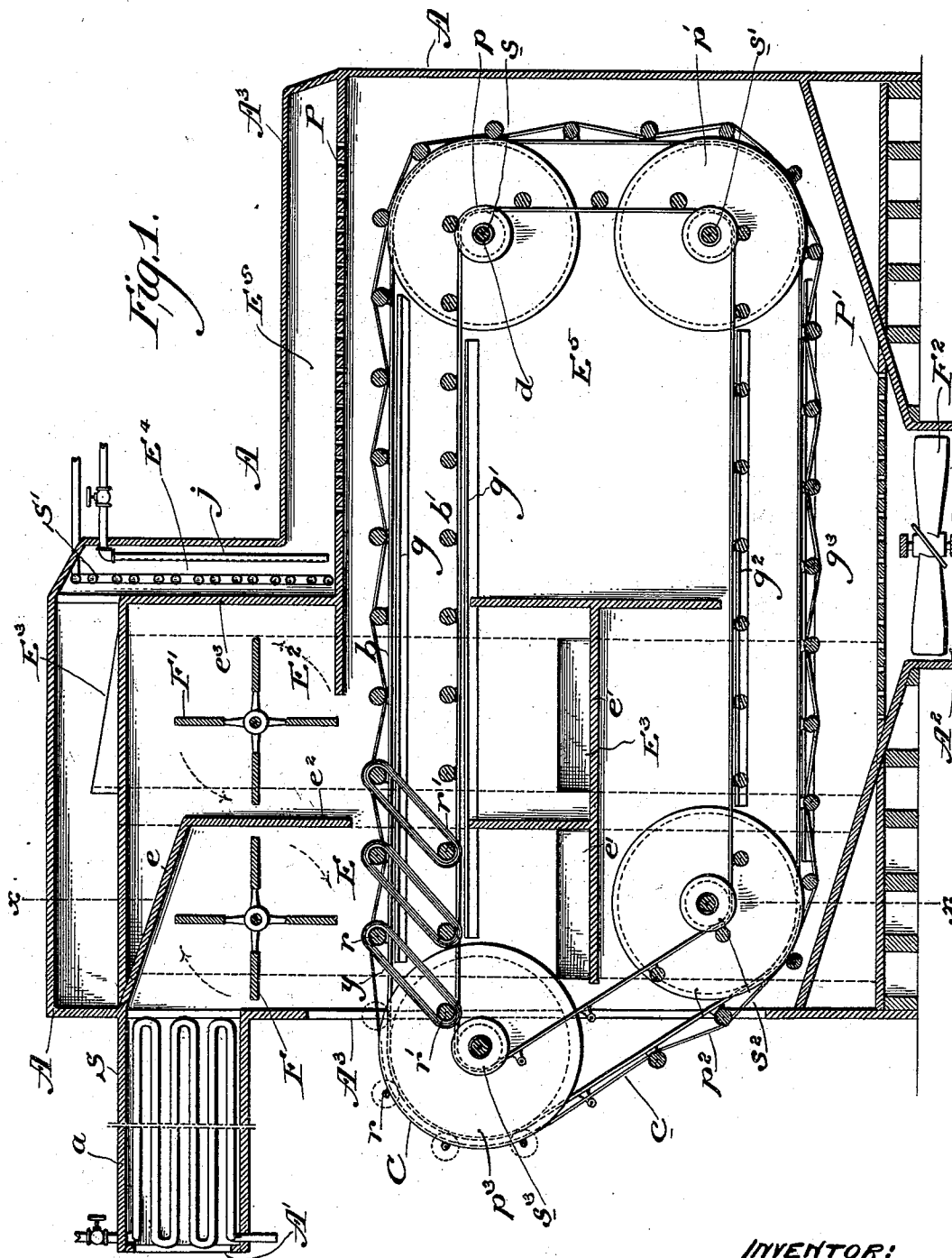
2 Sheets—Sheet 1.

O. DUCKWORTH.

PROCESS OF AND APPARATUS FOR OXIDIZING YARN.

No. 508,094.

Patented Nov. 7, 1893.



WITNESSES:
John S. Smith
W. A. Van Dusen

INVENTOR:
Ormerod Duckworth,
By his Attorneys,
Horace Pettit.

(No Model.)

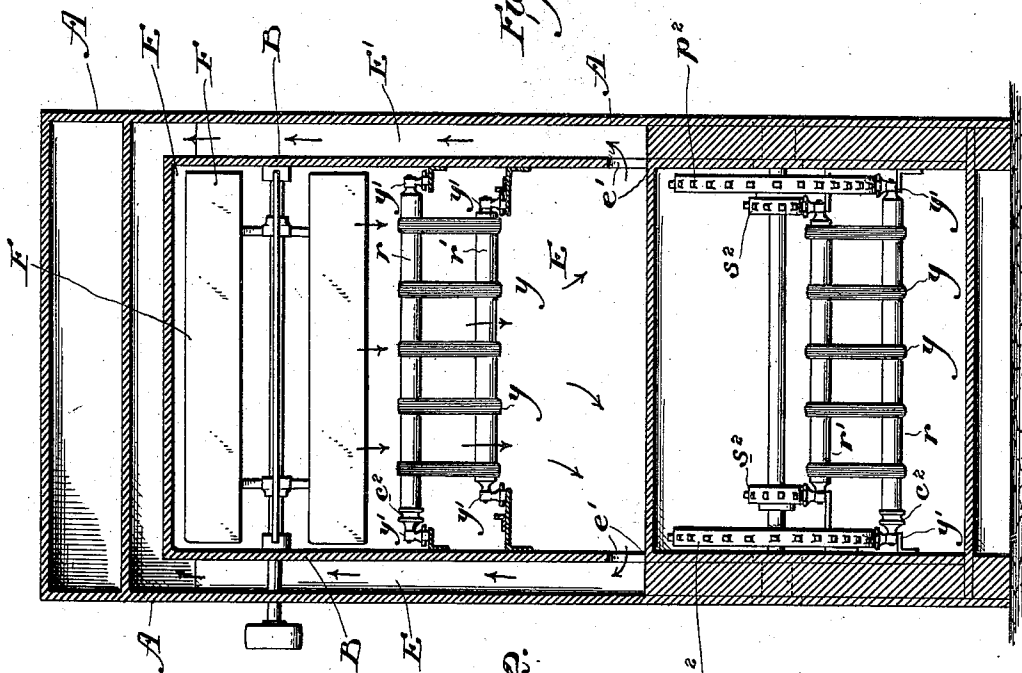
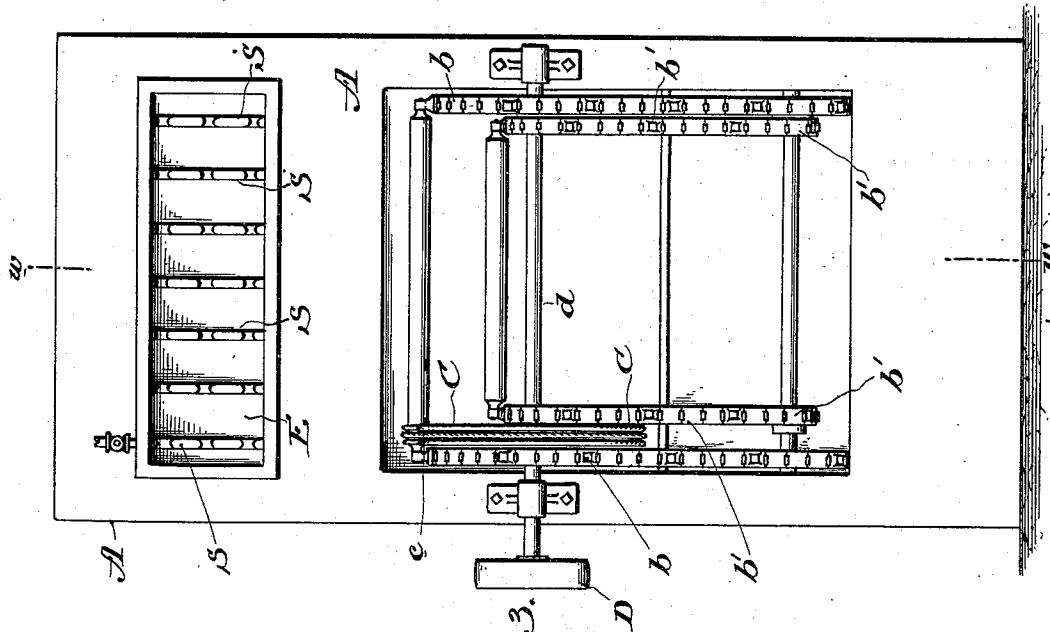
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WITNESSES:

James Scott & Co.
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Fig. 2.

INVENTOR:

Ormelord Duckworth,
By his Attorney
Thomas Pettit.

UNITED STATES PATENT OFFICE.

ORMEROD DUCKWORTH, OF NORRISTOWN, PENNSYLVANIA.

PROCESS OF AND APPARATUS FOR OXIDIZING YARN.

SPECIFICATION forming part of Letters Patent No. 508,094, dated November 7, 1893.

Application filed May 13, 1892. Serial No. 432,839. (No model.)

To all whom it may concern:

Be it known that I, ORMEROD DUCKWORTH, of the borough of Norristown, county of Montgomery, and State of Pennsylvania, have invented a certain new and useful Improvement in Yarn Drying and Oxidizing Processes and Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

My invention has relation to yarn drying and oxidizing processes and apparatus and consists in the method or process and device as hereinafter particularly described.

The object of my invention is to provide for the effective and rapid drying and oxidizing of yarns after they have been dyed before woven or manufactured into fabrics by exposing the threads in the skeins freely to currents of air which are directed through the skeins as the yarn passes in its course through the machine. A further object is to effect both the drying and oxidizing of the yarn in the skeins without rehandling.

In the apparatus heretofore invented for drying yarns dyed with aniline colors the drying and oxidizing, or either, is slow, and generally requires a rehandling of the material before the drying and oxidizing processes are complete. As before stated the object of my invention is, as nearly as possible, to direct one or more currents of air through all parts of each skein so that each thread, as nearly as possible, may be exposed to the drying or oxidizing current, and to accomplish this to so carry the yarns in the skeins through the apparatus that free access can be had to the skeins by the air current or currents.

In the accompanying drawings:—Figure 1 is a longitudinal sectional view on the line $w-w$ of Fig. 3 of a machine for drying and oxidizing yarns so constructed in accordance with my invention. Fig. 2 is a sectional view on the line $x-x$ of Fig. 1. Fig. 3 is a front view of the machine.

In the construction shown the drying and oxidizing of the yarn occur without rehandling in the same machine, but my invention is not limited to both drying and oxidizing,

but applies also to either of these operations separately performed, though the form illustrated is the preferable construction.

A represents the outer casing of the machine provided with two openings, A' , and, A^2 , for the induction and eduction of the air current respectively, and also open at, A^3 , in the front of the machine to allow of access to the traveling reels, r, r' , which carry the skeins of yarn, y , so that the dry and oxidized yarn may be removed at that point after having passed through the machine and newly dyed undried skeins may be inserted in their places on the rollers, r, r' , at that point, by the attendant.

I will first describe the air flues and the direction of the current of the air as it passes through the apparatus before describing the construction shown in the drawings for carrying the yarn. Three fans, F, F', F^2 , are preferably employed, though other means for the same purpose or other numbers of fans may be adapted for inducing, controlling and exhausting the current of air. The fan, F , is located within the chamber, E , which chamber occupies a central space between the outer sides of the casing, A ; and partially inclosed by the inner vertical walls, B , top, bottom and rear walls, e, e', e^2 . As the fan, F , is revolved in the direction indicated by the arrows, Fig. 1 and air current is induced through the external flue, a , and by the co-operation of the other fans also operating in the indicated directions the current is directed through the chamber, E , in the direction indicated by the arrows, Figs. 1 and 2, into and up through the flues, E' , situated on either side of the chamber, E , constructed between the sides of the outer casing, A , and vertical walls, B , of the inner chamber, E ; by the co-operation of the fan, F' , revolving in the direction indicated by the arrows in Fig. 1, the current of air is thence directed from the top of the flue, E' , which is open down through the central chamber or flue, E^2 , situated similarly but to the rear of the central flue, E , thence to the bottom of said flue, at e' , to the entrance to the flue, E^3 , thence up the flue, E^3 , situated on either side of the centrally located flue, E^2 , constructed similarly to the flues, E' , between the sides of the outer casing, A , and the inner vertical

wall partially forming the central chamber, E^2 ; the said flue, E^3 , is divided from said flue, E' , by the transverse partition, e^2 . The current of air is thence directed through the coaction
 5 of the respective fans, now largely influenced by the eduction fan, F^2 , from the top of the flue E^3 , through the flue, E^4 , formed between the outer casing, A , and the rear wall, e^3 , of the flue, E^2 , and thence preferably through perforated partitions, P , P' , placed horizontally
 10 within the main casing near the top and bottom respectively of the chamber E^5 , thence in the direction indicated by the arrows, Fig. 1, through the said chamber or flue, E^5 , and
 15 out the egress flue, A^2 , provided in the lower part of the casing, A , in which flue, A^2 the exhaust fan, F^2 is provided; the current of air through the machine is thus given a direction indicated by the arrows. The construction
 20 of the flues may be changed and the direction of the air current altered without deviating from my invention. The yarn to be dried and oxidized travels through the central and main portion of the casing, A , passing in its course
 25 through the respective currents of air provided in such manner as to allow of the greatest exposure of the threads of each skein of yarn to the drying and oxidizing currents as they pass through the machine in the course
 30 indicated. In the construction shown a set of two yarn rollers, r , r' , is provided to pass through and carry each skein of yarn, y , each roller being journaled in suitable journal bearings, y' , provided on a belt, b , preferably
 35 a chain belt, for the outer series of rollers, r , and upon another like belt, b' , for the inner series of rollers, r' , the outer belt, b , being provided on pulleys or sprocket wheels, p , p' , p^2 , p^3 , while the inner belt, b' , is provided upon
 40 the pulleys or sprocket wheels, s , s' , s^2 , s^3 , the belts or pulleys being duplicated on the respective sides of the machine to carry both ends of the respective rollers, r , r' . The rollers, r , r' , are so adjusted on their respective
 45 belts to each other as to preferably carry the skeins, y , at an oblique angle to the line of the belt so as to allow the respective air currents to pass through the skeins obliquely as the skeins travel through the currents thus
 50 presenting more surface of yarn to the air current and for a length of time which, however, may be regulated by the speed of the machine. The pulleys carrying the belts b , b' , are operated by a band pulley, D , provided on the outside of the casing, A , on
 55 the shaft, d , carrying the pulleys, p , s , or by any other suitable device. The belts, b , b' , are preferably linked belts constructed to engage on spurs provided on the respective
 60 pulleys or sprocket wheels, so that the rollers, r , r' , carrying the respective skeins of yarn may retain their relative position to each other without slipping. A cord, c , is preferably passed over a large pulley, C , provided on one of the pulley shafts and alter-
 65 nately in and out bearing upon the rollers r ,

r' , above and below continuously throughout the course of the rollers, said cord traveling at a different speed from the speed of travel of the rollers, r , and preferably bearing in a
 70 small grooved bearing, c^2 , provided on one end of the rollers, r , for the purpose of revolving the said rollers, r . As they travel through the machine, the yarn, y , being tautly
 75 adjusted on the rollers, r , r' , will by the revolution of the rollers, r , be made also to revolve thus additionally securing the complete exposure of the different portions of the yarn to the air current or currents. The foremost
 80 pulleys, p^2 , p^3 , s^2 , s^3 , properly journaled to each side of the casing are preferably adjusted slightly farther apart on their respective shafts than the rear pulleys, p , p' , s , s' , so that the journal bearings, y' , of the rollers r , r' , when
 85 they reach the front of the machine are farther apart from each other and will allow the spindles of the respective rollers to be readily withdrawn, by slight pushing or pulling, from their respective journal bearings, y' , so that the
 90 skeins of yarn, y , after they have gone through the drying and oxidizing process can be taken off of the rollers and other undried skeins can be inserted thereon and the rollers properly
 95 adjusted in their bearings once more by the attendant, as the machine operates sufficiently slowly to allow of this being done. Horizontal guide rails, g , g' , are provided under the belts, b , b' , between the pulleys, p , p^2 , so that the belts may slightly bear on the
 100 same and thus prevent sagging, while like guide rails, g^2 , g^3 , are provided beneath the said belts, b , b' , between the pulleys, p' , p^2 , for the same purpose. As the skeins of yarn, y , obliquely adjusted on the rollers r , r' , are
 105 slowly propelled through the central part of the casing by means of the construction described, and at the same time slightly rotated on the rollers, the current of air, preferably heated, as by the steam coil, S , in the
 110 flue, a , is driven first through the skeins as they pass through the flue, E . Thence the current passing up through the side flues, E' and down through the flue, E^2 , is again driven through the skeins as they pass through
 115 the said flue, E^2 . The current then passing up through the said flue, E^3 , and down through the flue, E^4 , into the chamber, E^5 , is again driven through the skeins as it passes through
 120 the said chamber or flue, E^5 , and thence down and out of the exhaust flue, A^2 , the fans, F , F' , F^2 , operating in the proper direction indicated directing and controlling this course
 125 of the air current through the respective flues, as hereinbefore described. The steam coil, S , is also preferably provided in the flue, E^4 , as is also a perforated jet, j , for distributing any desired amount of moisture. In this
 130 manner the yarn in a single passage through the machine slowly operated is thoroughly dried and oxidized without further rehandling. The machine may be of any desired
 length in order to provide a greater amount

of exposure to the drying and oxidizing atmosphere. In the construction described a comparatively short casing is all that is necessary, under ordinary circumstances, for

5 treating the aniline dyed yarn.

I have illustrated herein a preferable construction of machine for carrying out my invention though this construction may be deviated from and other mechanical constructions employed without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

15 1. The method or process herein described of treating unwoven dyed yarns, said method consisting in causing heated currents of air to pass into and through the yarn, of passing at the same time the yarn through the heated currents of air suspended in loops or skeins in a taut or partially taut condition disposed at an angle to the line of the currents of air passing through the yarn, and in carrying the yarn thus suspended uninterruptedly

25 through two or more currents of air, at the same time causing the yarn to travel rotatively on hangers or rollers supporting the same so as to allow the air to come more freely into contact with the yarn threads drying or oxidizing the same.

2. A yarn drying and oxidizing apparatus having an outer casing, a longitudinal yarn drying chamber, endless belts provided therein on pulleys secured to the casing, rollers

35 removably journaled upon said belts for carrying the yarn skein through said chamber and means for propelling said belts, flues provided in said casing for directing a current of air through said yarn, flues for conducting

40 said current to the upper portion of the casing and directing it again through said yarn once or twice before its passage from the casing, heating apparatus provided at the induction portion of the main flue and heating

45 apparatus provided in the casing in an intermediate air flue for raising the temperature of the air partially cooled by its first passage through the yarn for reheating before its final passage through the yarn and means for removing the rolls and adjusting the yarn skeins thereon and removing the rolls after the passage of the yarn through the casing for resupplying it with fresh skeins substantially as described.

55 3. In a yarn drying and oxidizing apparatus an outer casing, a centrally located drying chamber provided with two sets of endless belts on pulleys, one set of belts being shorter than the other set, the shorter set situated

60 within the longer set, rolls removably journaled, &c., to each respective set of belts for engaging the respective skeins of yarn and means for propelling the belts and yarn through said chamber and for adjusting the skeins to the rolls and removing the same after their passage through the chamber, air

70 flues for directing a current of air through the yarn repeatedly during the passage of the yarn through the drying chamber, apparatus for heating said air as it enters the induction flue and for reheating said air before its final passage through the yarn and means for producing, controlling and exhausting the current of air substantially as described.

75 4. In a yarn drying apparatus a main casing, A, having a main longitudinal drying chamber, endless belts, *b, b'*, provided in said chamber upon belt pulleys and means for propelling the same through said chamber, rolls, *r, r'*, removably journaled in open journal bearings, *y'*, and means for revolving said rolls in their travel through the drying chamber, air flues, *A', E, E', E², E³, E⁴, A²*, for directing the current of air through the apparatus, means for inducing, controlling and exhausting the currents of air through said flues, and apparatus provided in the air flue at or near the point of induction for heating said current of air and heating apparatus

80 intermediately provided in said casing, A, for reheating the air after its preliminary passage through the wet yarn and before its final passage through the yarn and out of the education flue in the manner and for the purpose substantially as described.

5. A yarn drying and oxidizing apparatus having an outer casing, longitudinal yarn drying chamber, endless belts provided therein on pulleys secured to the casing, rollers

85 removably journaled upon said belts for carrying the yarn skeins through the said chamber, and means for propelling said belts, flues provided in said casing for directing the current of air through said yarn, flues for conducting said current again through said yarn once or twice before its final passage from the casing, heating apparatus provided near the induction portion of the main flue, heating apparatus provided in the casing in an intermediate air flue for raising the temperature of the air partially cooled by its first passage through the yarn, and means for supplying moisture to the air current, means for removing the rolls and adjusting the yarn skeins thereon substantially as described.

90 6. An apparatus for drying or oxidizing yarns having an outer casing, A, interior flues, *E, E', E², E³, E⁴, E⁵*, inducing aperture, *A'*, and exhaust aperture, *A²*, rotary fans, *F, F', F²*, for inducing and controlling and exhausting the air current in and through said flues, steam coil, *S, S'*, for regulating the temperature of the air current, and perforated jet, *j*, for supplying moisture thereto, rollers, *r, r'*, adapted to engage within each skein of yarn for carrying the same through the casing, belts, *b, b'*, provided on the pulleys, *p, p', p², p³*, and *s, s', s², s³*, said pulleys carrying said belts and rotatively operating the same through the said casing, fixed journal-bearings, *y'*, provided on the belt, *b*, for carrying

the rollers, r , and fixed journals, y' , provided on the belt, b' , for carrying the rollers, r' , and means for revolving said rollers as they travel through the casing, A, substantially as described.

7. A yarn drying and oxidizing apparatus having an outer casing, A', interior flues, A, E, E', E², E³, E⁴, E⁵, rotary fans, F, F', F², for inducting, controlling and exhausting the air currents through said flues, steam pipe, S, S', for regulating the temperature of the air current and moistening jet, j , rollers, r , r' , adapted to engage within each skein of yarn for carrying the same through the casing, belts, b , b' , provided on pulleys, p , p' , p^2 , p^3 , and s , s' , s^2 , s^3 , respectively said pulleys carrying said belts, b , b' , and rotatively operating the same through the said casing, fixed journals or bearings, y' , provided on the belt, b' , for carrying the rollers, r' , cords, c , carried on the pulley, C, and provided alternately above and below the rollers, r , throughout their course in a groove or pulley, c^2 , traveling at a different rate of speed from the said rollers as a means for revolving said rollers as they travel through the casing, A, guide rails, g , g' , g^2 , g^3 , for guiding and supporting the belts, b , b' , while traveling horizontally between the pulleys p , p^3 , and p' , and p^2 , respectively substantially as described.

8. An apparatus for drying and oxidizing yarns having an outer casing, A, interior flues,

A, E, E', E², E³, E⁴, E⁵, rotary fans, F', F², for inducting, controlling and exhausting the air currents through the said flues steam pipe S, S', for regulating the temperature of the air current and moistening jet, j , perforated plates, P, P', provided above and below the chamber or flue, E⁵, rollers, r , r' , adapted to engage within each skein of yarn for carrying the same through the casing, belts, b , b' , provided on pulleys, p , p' , p^2 , p^3 , and s , s' , s^2 , s^3 , respectively, said pulleys carrying said belts, b , b' , and rotatively operating the same, the said fixed journals or bearings, y' , provided on the belt, b , for carrying the rollers, r , and fixed journals, y' , provided on the belt, b' , for carrying the rollers, r' , cords, c , carried on the pulley, C, and provided alternately above and below the rollers, r , throughout their course in a groove or pulley, c^2 , traveling at a different rate of speed from the said rollers as a means for revolving said rollers as they travel through the casing, A, guide rails, g , g' , g^2 , g^3 , for guiding and supporting the belts, b , b' , while traveling horizontally between the pulleys, p , p^3 , and p' , and p^2 , respectively substantially as described.

In witness whereof I have hereunto set my hand this 9th day of April, A. D. 1892.

ORMEROD DUCKWORTH.

Witnesses:

HORACE PETTIT,

H. GORDON MCCOUCH.

Corrections in Letters Patent No. 508,094.

It is hereby certified that in Letters Patent No. 508,094, granted November 7, 1893 upon the application of Ormerod Duckworth, of Norristown, Pennsylvania, for an improvement in "Process of and Apparatus for Oxidizing Yarn," errors appear in the printed specification requiring correction as follows: In line 73, page 2, the period after the reference letter "*r*" should be stricken out and a comma inserted instead, and the following word "As" should commence with a small *a*, making a continuous sentence; page 3, line 61, the abbreviation "&c." should be stricken out, and page 4, line 29, a comma should be inserted after the word "respectively"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the papers pertaining to the case in the Patent Office.

Signed, countersigned, and sealed this 2d day of January, A. D. 1894.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.