Specification of the Patent granted to LOUIS SCHWABE, *of Manchester, Manufacturer, for certain Processes and Apparatus for Preparing, Beaming, Printing, and Weaving Yarns of Cotton, Linen, Silk, Woollen, and other Fibrous Substances, so that any Design, Device, or Figure printed on such Yarn may be preserved when such Yarn is woven into Cloth or other Fabric.* —Sealed January 22, 1830.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c. *Now know ye*, that in compliance with the said proviso, I, the said Louis Schwabe, do hereby declare that the nature of my invention, and the manner in which the same is to be performed and carried into effect is described and clearly shewn by the drawings hereto annexed, and the following description thereof, the same letters and figures marked thereon, indicating the same parts throughout. Before I commence the description of my various apparatus by which I effect the printing of yarn so as to preserve the figure or design after such yarn is woven into cloth or other fabric, I shall state a few particulars to be attended to in the selection and preparation of yarn to be used for this purpose. Although the effect which I am about to describe may be produced with yarn of any description ordinarily used as warp, yet that which I recommend, when cotton, linen, or worsted is used, is such as has been singed or gased so as to divest it of its loose fibres. This yarn should be made into hanks, and bleached or submitted to any of the ordinary preparations practised by printers previous to block printing, which preparations must altogether depend on the style of pattern which it is intended to print thereon. The yarn is now formed into a warp, and afterwards beamed in the usual manner, care being taken to have the beam particularly true. At this period of the process it is essential to pick

the warp carefully, and clean it in the same manner as weavers do previous to weaving cloth.

The warp being now placed on the beam, my "certain processes and apparatus" will be more clearly understood by reference to the annexed drawing, which I shall now proceed to describe along with the mode of operation by which the warp is rebeamed, printed, and wove, so that any design, or figure printed thereon is preserved when such yarn is woven into cloth.

Description of the Drawing.

Fig. 1, sheet 1, represents an elevation or side view of a machine for rebeaming the warp from the first beam on which it has been placed in the ordinary manner. In this figure A A, A A, represents the framing, and B the first beam whereon the warp is placed. This is supported on its centre and held stationary by means of a break or drag shewn at C. This arrangement of a break is too well known to require any particular description, and is regulated by the position of the weight *e* on the lever from which it is suspended. D, D, represents a board pierced full of holes, better seen in a plan of it at fig. 2. This board is suspended by means of strings from each corner, which are attached to the framing above, and so arranged as to enable the operator to place it in the position shewn at D, D, fig. 1, or lower it to the dotted line, *d*, *d*. It is called a "cumber-board," and is here for the purpose of supporting and arranging small metallic pieces, called "mails," one of which is represented at its full size at fig. 3. These mails are arranged on the upper side of the "cumber-board" one to every end of the warp and at a distance from each other, which agrees with the count or fineness of the reed to be used in the weaving about to be performed. In referring to fig. 3, it will be seen that there are two holes in the mail there represented, to the lower of which is attached a small string and leaden weight, E, fig. 1, commonly called a "lingo," so that, when put

in its place, as seen at D, D, fig. 1, the mail, being too large to pass through the hole in the cumber-board, rests on its upper surface, and is held stationary by means of the string and lingo weight, E. Through the upper hole of every one of these mails an end of the warp is passed, which proceeds forwards over the cylinder F, as seen in fig. 1, through the healds G, and the reed of the lathe H, on to the beam I, whereon it is rebeamed.

In the first operation of a machine of this construction, it will necessarily require to be gaited, or put in order by passing the ends of the warp through the respective mails and other parts of the apparatus; but supposing it to have been in action, and a warp finished rebeaming from the beam B to the beam I, the mode of proceeding would be as follows. The first warp being placed in the position represented at B, it is twisted or joined to the thrum of the last warp at the point M, in the ordinary manner the ends of the respective warps being preserved by means of leashes, as shewn at *m* and *n*. As soon as this twisting or joining of the old and new warp is effected, the beam I is revolved in the direction of the bent arrow on its periphery, and the warp drawn forward until the twisting arrives in the front of the reed H, where a piece of cloth is woven of from three to four inches, having a rod or straight piece of wood woven into it. The thrum or end of the old warp is now removed, and the remainder, which contains the rod on the new warp, is attached to an empty beam I, by means of the rod, which fits into a slot or groove in the beam I. At this period the cumber-board is lowered to the position *d*, *d*, and the mails and lingoes allowed to hang on the warp, thus producing an equal tension on every end of the warp during the rebeaming process.

It will be remembered that this machine is for the purpose of rebeaming preparatory to printing, and that the use of harness or weaving apparatus is, firstly, to weave a piece of cloth as before described, by which the rod is

secured in the warp and thereby attached to beam I; secondly, to strike a leash in front of the reed when the warp is near its termination on the beam B; and, thirdly, to weave a second piece of cloth for the purpose of securing the leash, and also for the fastening the ends of the thrum which remain in the machine for the succeeding process. In operating with this machine attention must be paid that none of the mails at any time rest on the cumberboard when in the position *d*, *d*, which would necessarily destroy their action of keeping the ends of the warp at an equal tension. I also recommend pasteboard to be placed occasionally on the beam I, during the process of filling, to keep the surface more regular. The position of the weight C, must also be attended to, as it is obvious that the drag of the beam B, must increase as its circumference decreases; but these and other minor points must be acquired by practice, and are well known to parties engaged in fancy weaving.

Fig. 4 represents an elevation or side view of another machine for the purpose of transferring the warp which has been rebeamed on to the beam I, in the last-described machine to another beam marked O, in this figure; and at the same time printing the warp so transferred with a pattern or design, which is to be preserved in the cloth into which the warp is afterwards to be woven. In this machine the beam I, containing a warp as placed by the last machine, is seen in front of the harness or weaving part of the machine; which harness, as in the last described machine, is for the purpose of weaving small pieces of cloth at the extremity of the warp, by which means the ends are kept even, and a rod inserted, as before described, for the purpose of attaching to the beam. The warp in this machine is carried in an horizontal direction from the beam I, through the healds and over a printing table N, N, to the beam O, which beam being forced round by a lever or otherwise, take up the warp from the beam I, which latter gives it off at a tension determined or regu-

lated by the friction of the drag P, and weight *p*, similar to the drag in the last machine. The gudgeons or supports on which the beam O, revolves, are elevated or depressed by a screw movement, shewn at Q, by means of which the operator is enabled to keep the warp horizontal in its passage over the printing table N, N, and to compensate for the rise caused by the filling of the beam O, during the process. In commencing with this machine it is required that a thrum be put in or drawn through the healds and the scale marked *t*, which is of a peculiar construction, hereafter described, to the end of which the new warp is twisted or pieced in the ordinary manner; and, supposing the machine to be regularly at work, and a full beam I, brought from the last described machine, the mode of proceeding would be as follows. The small piece of cloth on the new warp must be gradually cut away as the twisting proceeds, which is to join the new warp to the old thrum at the point S; and as soon as this is done the beam O, is put in motion till the twisting is carried in the direction of the arrow to the point T, at which point a piece of cloth of from three to four inches is woven by means of the scale *t*, which is suspended from the frame above by strings. This cloth is for the purpose of holding the ends correct and containing a rod as already described. This being done, the old thrum is removed, and the scale *t*, placed between the table and the beam O, at the point T, where it is suspended as before, the warp is attached to an empty beam O, and the printing commences. I must here remark that it is requisite that the machinery be accurately constructed, and the beams I, and O, parallel to each other, which being the case, it is obvious the whole of the warp will remain at an equal tension and present a uniform surface in its transit over the printing table N, N. The printing is performed by blocks, plates, or otherwise, precisely in the same manner as calicoes are printed, and the traverse of the yarn is only caused to take place at stated periods,

namely, when the printing of that part immediately over the table N, N, is completed. During this part of the process any irregularity which may arise by the moving the warp over the surface of the printing table is immediately rectified by moving the healds. Annexed to the printing table N, N, is placed a cylinder U, over which the warp passes towards the table, the upper surface of which is about one-sixteenth of an inch above the surface of the printing table and on a level with the beam O, which is adjusted by means of the screw Q, before described, so that the warp has a tendency to spring up from the blanket when released from the block which I consider essential to producing good work by my process. W and ^{1}W, fig. 4, represent two cylinders, both parallel with the beam O. On the cylinder W, is placed a piece of calico somewhat wider and longer than the warp at the commencement of printing. This calico is passed in the direction of the arrows under the printing table N, N, and over the guide roller Z, where it proceeds over the printing table and on to the upper cylinder ^{1}W, the cylinder ^{1}W, is moved by a strap from the beam O, which causes it to take up as much calico on to its surface as there is warp taken on to the surface of the beam O, thereby presenting a fresh surface of calico to every surface of warp which passes over the printing table N, N, and consequently keeping the blanket clean during the process of printing. There only remains now to remark that the healds which I have found to answer best, both in the process of rebeaming and printing, are those called long-eyed healds, from their offering less obstruction to the passage of the warp during the process, and that the use and construction of the scale *t*, is very essential to the performance of good work. This scale *t*, is constructed as follows:—Having determined the number or fineness of the reed to be used in the cloth about to be manufactured, I take the same reed for the purpose making the scale *t*, and form a

warp of strong yarn, of which I prefer hard silk, which must be carefully beamed and rebeamed in the manner already described. It must be then woven in the following manner, with as much weight as possible. First, one inch of cloth, then insert a perfectly straight iron rod, after which about half an inch more cloth is woven. This being done, about five inches of the warp is drawn over without being woven, and then another half inch of cloth is woven, and a second iron rod inserted, which is kept fast by weaving another inch of cloth as before. At this period the whole of the woven parts of the scales are saturated with a strong solution of gum, for the purpose of keeping the threads of the warp more firmly in their position. The appearance of the scale thus far constructed will be seen at fig. 7; but as the spring or elasticity of the rods x, x, which are kept equidistant by the side pieces y, y, would not keep the warp at the requisite tension, I have found it necessary to imbed the rods in hard wood frames, of which I represent a section at fig. 8, which when closed together, by means of screws or other fastenings, forms a scale as represented at fig. 9. The scale *t*, thus constructed, is suspended from the framing of the machine, and it is requisite, in the first place, to spread the warp to be printed even and regular in its passage over the printing table, which is effected by carrying each separate end of the warp through a distinct opening in the scale; in the next place, to obviate the necessity of rods in the subsequent process of weaving, when removed to the loom, which it does by enabling the weaver to find an end when broken, in the same manner as rods would do; and, lastly, as it is not affected by the chemical action of the mordant or other preparation used in printing, and any accumulation of mordant or other preparation is easily removed by a sponge or other means, as the process of printing proceeds. In using the scale, it is desirable to commence with the scale suspended at its highest point, and as the printing proceeds the operator should gradually

lower it as the scale becomes soiled by the printed warp passing through it, and as soon as the whole five inches of the scale which are left open for the passage of the warp have been passed downwards, it may be cleaned, which being done, it is again raised to *w*, its highest elevation, and the process recommenced; when the printing of the warp is finished, I recommend to let about one yard and a half be wound back on the beam I, and having raised the beam O, by means of the screws Q, to replace the scale in its first position at T, and weave ten or twelve picks of weft for the purpose of securing the warp ends. The printed warp is then again drawn forward to the beam O, a leash is taken and secured by weaving five or six inches of cloth with a rod in it, so that when the five or six inches of cloth is divided, the rod remains with the thrum healds and scale; and the printed warp on beam O, is removed to the loom wherein it is to be woven, and when removed to the loom the ten or twelve picks abovenamed are taken out as soon as the twisting is complete, and about a yard of cloth woven. It will also be remarked that the pasteboards which have been previously placed on the beam I, are in this process replaced on the beam O, as it becomes liberated from I, for the same purpose of keeping the warp more regular, and that the drying of the printed yarn is greatly accelerated by the use of a fan similar to those used by weavers for drying their warps in ordinary weaving. The printed warp upon the beam O, is now transferred to a loom which should have as short a ratch as can be allowed, and the greatest care must be taken that the cloth beam and the beam O, are accurately parallel, as well as that the surface of the warp be kept horizontal, which is effected by means of screws similar to those seen at Q, in fig. 4, and I also recommend in the weaving of printed yarns the use of clasped healds, which consists of opposite loops interlocked in each other, so that the warp passing through both loops, as shewn at fig. 6, is held firm in the healds and not allowed to move

in them during the action of weaving. The use of clasped healds, together with the scale *t*, which enables me to dispense with rods in the process of weaving, I consider essential to preserving the pattern on the warp, and as an important part of my invention. When the warp is woven into cloth, the pattern which has been printed on it must be dyed, raised, washed, or prepared, or perfected according to the ordinary processes used in printing, all which must depend on the previous preparation of the yarn and the style of work which it is intended to produce.

Having now described my certain processes and apparatus for preparing, beaming, printing, and weaving yarns of cotton, linen, silk, woollen, and other fibrous substances, so that any design, device, or figure, printed thereon may be preserved when such yarn is woven into cloth or other fabric, I declare that I do not claim as of my invention any separate or well-known parts of the apparatus or machinery hereinbefore described, but I do claim the arrangement and application of those parts as an apparatus, and the processes or manner of working the same, by which the rebeaming, printing, and weaving the warp so as to preserve the pattern, is effected. All which I believe to be new and never before practised in this kingdom.—In witness whereof, &c.

Enrolled July 16, 1831.

Specification of the Patent granted to EDWARD COWPER, *of Streatham, in the County of Surrey, and* EBENEZER COWPER, *of Suffolk Street, Pall Mall East, Westminster, in the County of Middlesex, Engineers, for certain Improvements in Printing Machines.*—Sealed July 19, 1830.

WITH AN ENGRAVING.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso,