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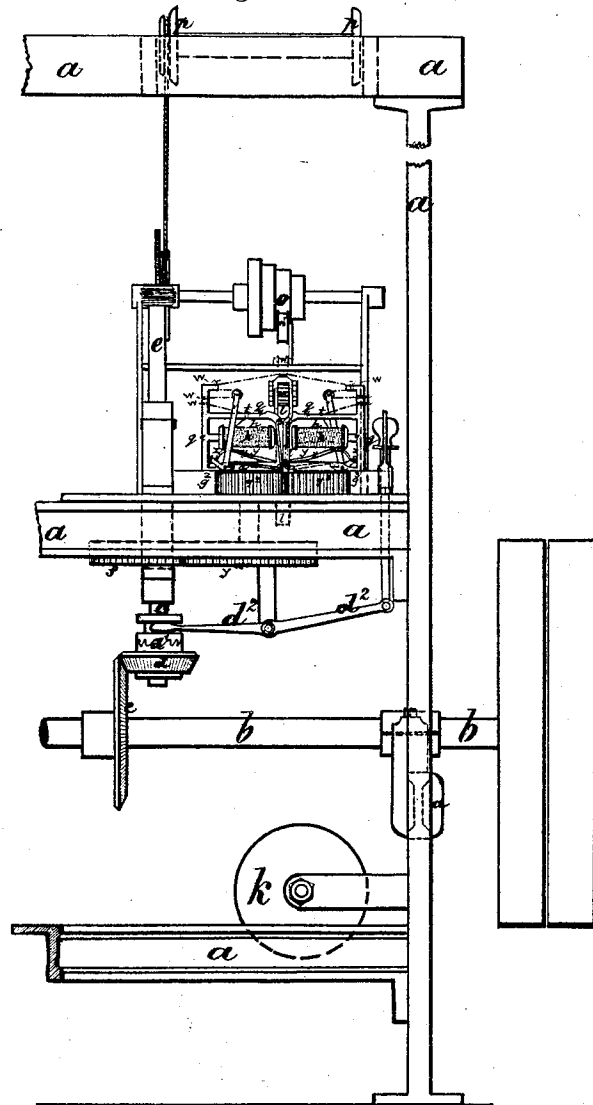
R. F. DONISTHORPE & T. A. W. CLARKE.

Manufacture of Crimped Hair.

No. 145,056.

Patented Dec. 2, 1873.

Fig: 1.



Witnesses

Stephen Blake
Thomas Quinn

R. F. Donisthorpe
T. A. W. Clarke

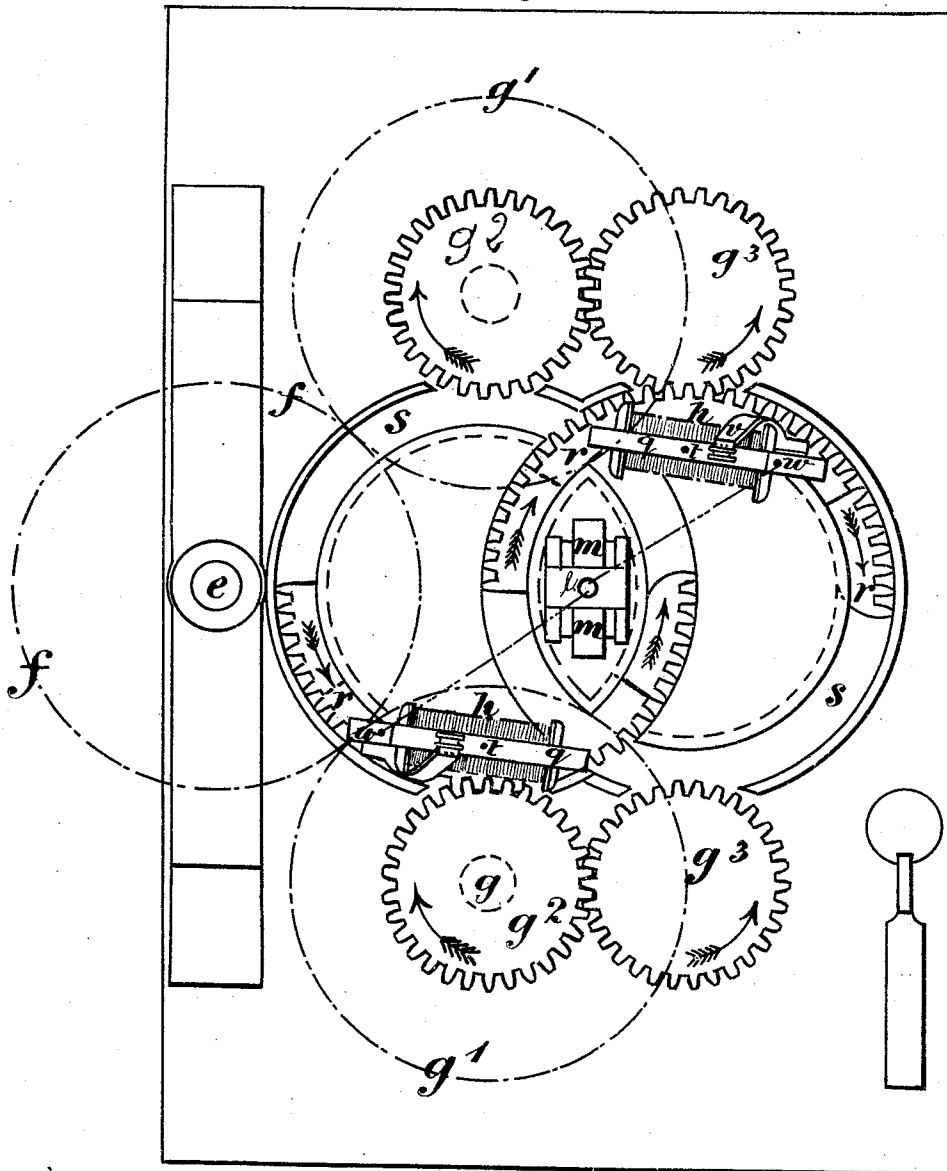
R. F. DONISTHORPE & T. A. W. CLARKE.

Manufacture of Crimped Hair.

No. 145,056.

Patented Dec. 2, 1873.

Fig: 2.



Witnesses
 Stephen Peake
 Thomas Durbin

R. F. Donsthorpe
J. McIlwaine

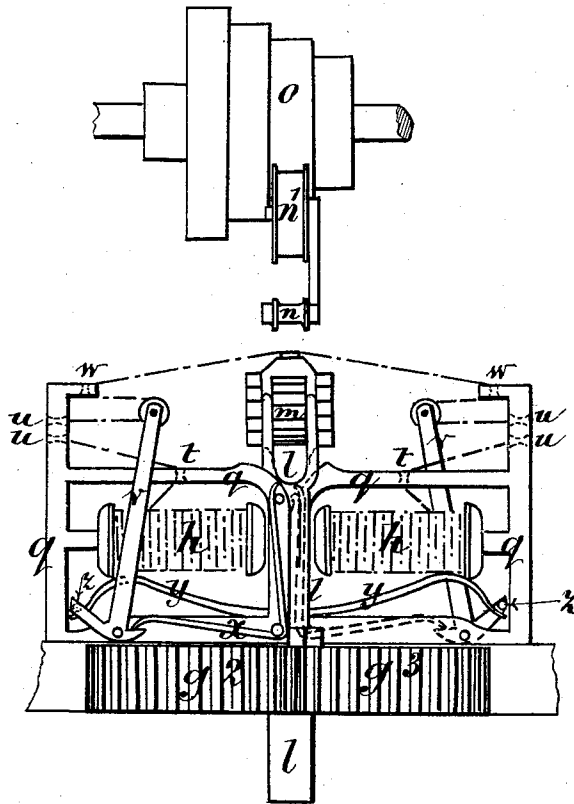
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Fig: 3.



Witnesses
Stephen Platt
Thomas Quinn

R. F. Donisthorpe
T. A. W. Clarke

UNITED STATES PATENT OFFICE

RODERIC F. DONISTHORPE AND THOMAS A. W. CLARKE, OF LEICESTER,
ENGLAND.

IMPROVEMENT IN THE MANUFACTURE OF CRIMPED HAIR.

Specification forming part of Letters Patent No. **145,056**, dated December 2, 1873; application filed
June 25, 1873.

To all whom it may concern:

Be it known that we, RODERIC FLOWER DONISTHORPE and THOMAS ALFRED WILLIAM CLARKE, both of Leicester, in the county of Leicester, England, subjects of the Queen of Great Britain, have invented or discovered new and useful Improvements in the Manufacture of Crimped Hair, and in apparatus employed therein; and we, the said RODERIC FLOWER DONISTHORPE and THOMAS ALFRED WILLIAM CLARKE, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof—that is to say:

Heretofore, in the manufacture of crimped hair, tufts of hair have been plaited or wound between and around two parallel strings in a figure-of-eight pattern, and when one tuft has thus been plaited onto the strings another tuft has been taken and plaited on in a similar manner. Afterward, the hair thus plaited has been boiled, and subsequently stoved or dried, and when drawn off from the strings it retains the crimpings or bends which it had when plaited upon the strings. This process has, however, the disadvantages that the hand plaiting is comparatively slow, and also that, as the extreme ends of the tufts cannot be properly twisted around the strings, they, consequently, are not properly crimped, and spoil the appearance of the remainder of the crimped hair; the crimping of the hair is also uneven and irregular, by reason of some of the tufts containing more hair than others, and by reason of the ends of the several tufts being thinner than their central portion.

According to our invention, in order to remedy these disadvantages, we first form the hair into a continuous roving, or it might be a narrow sliver; and in this form we, by automatic apparatus, plait or twist it, as above described, around strings or wires, and thus obtain an even and continuous plait without any projecting and unplaited ends, or with such ends at long intervals only; and this continuous plait or twist we afterward treat in the ordinary manner. The continuous roving may simply be wound in a continuous spiral around a wire or cord, the roving being, for this purpose, wound upon a bobbin, which is caused to re-

volve around the wire or cord, while at the same time the wire or cord is drawn slowly forward; or the wire or cord itself may be caused to revolve around the roving; or the roving may by itself be looped together, so as to form a single plait, or be worked up so as to form a knitted or looped fabric; or a roving of hair wound upon a bobbin might also, for the same purpose, be mounted in a shuttle, to be moved to and fro between two cords, which are alternately raised and lowered like the warps in a loom; or the roving may be twisted around two cords or wires, in the manner above described, by leading the roving up through a hollow cone or tube, and carrying the cords or wires alternately around it in opposite directions, the cords or wires being carried upon bobbins, which, by apparatus, are moved alternately around the cone in such a manner that each cord, as it is passed around the roving, comes below the other cord or wire.

A machine constructed to work in this manner is shown by the drawings hereunto annexed.

Figure 1 is a front elevation; Fig. 2, a horizontal section of part of the machine, and Fig. 3 a separate view of some of the parts.

In these figures, *a* is the fixed framing of the machine; *b*, the main or driving shaft, having upon it a bevel-wheel, *c*, by which motion is given to the plaiting apparatus. The shaft *b* may have several bevel-wheels, *c*, upon it, each to give motion to a separate plaiting apparatus, as will readily be understood. Each wheel *c* gears into a bevel-pinion, *d*, which is capable of turning loosely on a shaft, *e*, but is made fast thereto by a sliding clutch, *d'*. This clutch can be raised, whenever the apparatus is to be thrown out of action, by means of a lever, *d''*, as shown. On the shaft *e* is a toothed wheel, *f*, and this gears with two toothed wheels, *g*¹, on the shafts *g*, and so transmits motion to these shafts. On each shaft *g* is also a toothed pinion, *g*², and these gear with other pinions, *g*³, which turn on fixed studs. The pinions *g*² *g*³ serve to give motion to two bobbins, *h*, each carrying a cord, and cause them to lap their cords in opposite directions around a roving of hair, as we will now proceed to describe.

The roving of hair is wound around a bobbin,

k , and is led therefrom up through a tube, l , the top of which is somewhat rounded on the edge, as shown; and as it passes out from the top of the tube the cords are lapped around it, and the plait so formed passes up between fluted friction-rollers m , and over a small guide-pulley, n , then around a roller, o , and is led back over another guide-pulley, n' , from which it passes to the bobbin p , onto which it is wound. The bobbins h , carrying the two cords, are each carried by a small frame, q , mounted on the top of a semicircular arc, r . Each arc has teeth formed around its outer edge, and these come into gear with the pinions $g^2 g^3$. The arcs are received in circular grooves $s s$, which intersect one another, as shown at Fig. 2; and as the pinions $g^2 g^3$ revolve they are caused to travel around these grooves in opposite directions, and cross one another's path. The ends of the toothed arcs are cut away for half their thickness, the upper surface of one end and the under surface of the other end being so cut away in order that the end of one arc may pass under the end of the other arc, and so clear one another as they cross each other's track. The tube l rises up in the central space inclosed by the intersection of the two circular grooves, so that it will be seen the two bobbins are carried around it in opposite directions, and lap their cords around the roving which rises up from the top of the tube. In order to keep an even tension on the cords, each cord is led through an eye marked t , then through other eyes, $u u$, and over a pulley on the upper end of a small lever, v , and through another eye, w , and from thence around the roving. An arm at the lower end of the lever v is acted upon by a spring, x , or springs, so that, as the bobbins approach nearer to or recede from the tube l , the lever v takes up all slack in the thread. $y y$ are springs for putting friction on the periphery of the bobbins, and so putting tension on the threads passing therefrom. Should this tension become too great, and the upper end of the lever v be consequently brought too close to the eye w , a pin, z , on another arm of the lever, comes down onto the spring y , and presses it away from the bobbin, so relieving the tension on the cord.

It will be seen that the eyes $w w$, from which the cords pass to the roving, are below the top of the tube l , and also that when one bobbin is in its nearest position to this tube the other

is in the position farthest from it; consequently each bobbin, as it passes around the tube, passes its cord below the cord of the other bobbin, and, the tension on the cords being greater than the tension on the roving, the roving is drawn first in one direction and then the opposite direction by the two cords, while the cords themselves, in the completed plait, lie parallel with one another, the roving lying around them in a series of figure-of-eight bends.

In order to take up the plait as it is produced, and to raise the roving continuously through the tube l , the axis of the roller o has a slow revolving motion given to it by a worm and worm-wheel from the upright axis e . The bobbin p has also a revolving motion given to it by an endless cord passing over a grooved pulley on the axis of the roller o , as shown, so as to cause the bobbin to wind up the plait; and the plait is laid evenly onto the bobbin by a traversing thread-layer. (Not shown in the drawing.)

The arrangement of machine above described is the one which we prefer to employ in order to lay a roving of hair in a figure-of-eight pattern around two parallel cords. Other arrangements may, however, be adopted—as, for example, the cords may be led up through two hollow spindles, and a bobbin carrying the roving be caused to move between and around the spindles in a figure of eight.

Having thus described the nature of our invention, and the manner of performing the same, we would have it understood that we claim—

1. The improvement in the art of manufacturing crimped hair, consisting in plaiting the hair from a continuous roving, substantially as before set forth, whereby all the hair, including the ends, is crimped with uniformity.

2. The combination, with a tube, l , through which a roving of hair is led, of pinions $g^2 g^3$, giving motion to arcs r , which have mounted upon them bobbins h , holding cords or wires, substantially as described, and for the purpose set forth.

R. F. DONISTHORPE.
T. A. W. CLARKE.

Witnesses:

STEPHEN PEAKE,
115 Brunswick Street, Leicester.
THOMAS QUINN,
22 Woodboy Street, Leicester.