W. KENERSON.

Wire Finishing and Straightening Machine.

No. 226,175 **Patented April 6, 1880.**

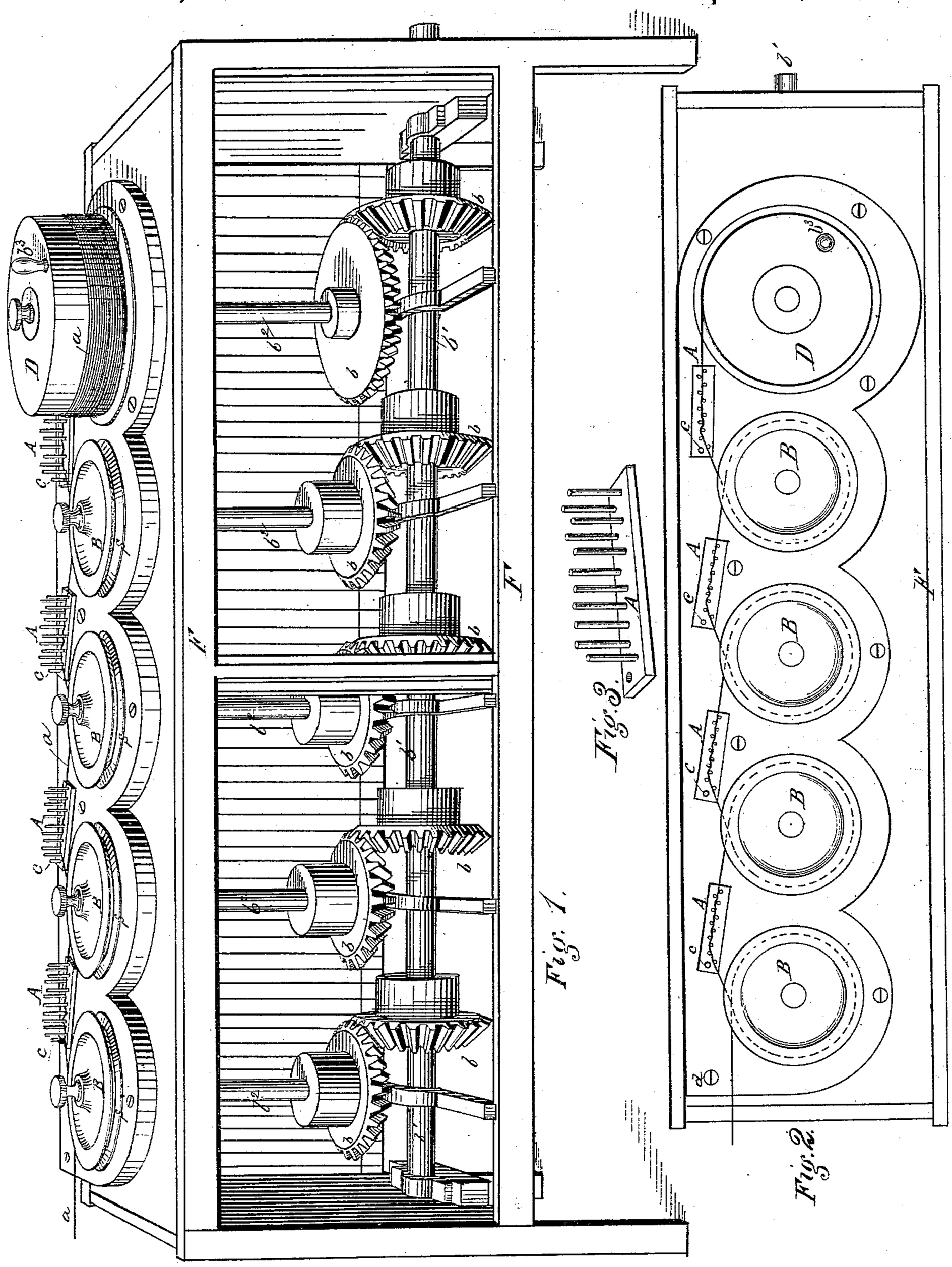

Fig. 1.

Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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WIRE FINISHING AND STRAIGHTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 226,175, dated April 6, 1880.

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To all whom it may concern:

Be it known that I, WALLACE KENERSON, of Cleveland, county of Cuyahoga, State of Ohio, have invented or discovered a new and useful Improvement in Wire Finishing and Straightening Machines; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a perspective view of my improved machine. Fig. 2 is a top or plan view of the same; and Fig. 3 is an enlarged view, in perspective, of the finishing-tool employed.

My present invention relates to a machine for finishing the finer qualities of light or fine wire, in which great perfectness of finish is desired, and also a high degree of uniformity is requisite in the elasticity or resiliency or straightness of the finished product, or in the successive parts or lengths thereof, when cut up into blanks or lengths for further operations.

The wire I particularly have in mind, and with especial reference to which my invention has been made, is what is commonly known as "card-wire," or wire for making the teeth of cards, such as are in ordinary use in the preparation or working of cotton, wool, or other like vegetable or animal fiber.

As heretofore practiced in the art, such wire has been brought to the required gage by the ordinary operations of scaling, drawing, and annealing. It then has the white silvery appearance of pure metallic iron, and receives from the last drawing operation, as nearly as may be, not only the proper size or gage, but also the proper elasticity or resiliency.

It has been found, however, that a product having the required degree of perfectness in these respects cannot be thus secured, since the slight variations of tension which necessarily occur in drawing will make some parts of the reel or coil of wire more elastic or less resilient or stiffer than other parts. As a result of this, when the wire is cut up into lengths or tooth-blanks, and bent into U form preparatory to being inserted through the prick-holes of the leather card-back, the same bending motion or force applied mechanically to the different lengths or blanks will give to them a different amount of bend or degree of curvature, so that the points of the bent blanks will not, in every case, when fed by machinery to the card-back, come exactly opposite to the prick-holes.

In order, now, to overcome these difficulties, such wire has been further worked by drawing it, say, from two to five times (more or less) through between the teeth of a finishing-tool having the general features of construction shown in Fig. 3. This tool has its teeth so arranged with reference to each other that the sides which engage the wire passing through shall be a little out of line, but so little that the amount of deflection to which the wire is subject in passing through shall become less and less from the end at which the wire is fed in to or toward the other end, and so that the wire shall leave the last tooth exactly or approximately in the tangential line of the side of the tooth at the point where the wire bears on or touches it. The object of these successive drawings through between such teeth is to secure a working of the wire under a tension or strain which shall be perfectly uniform, or as nearly so as possible, not only throughout the entire length of each separate coil of wire, but also on all the wire of all the coils, so that any two or more blanks cut from different parts of the same coil, or from any desired parts of different coils, shall, when mechanically bent and fed with their points to the prick-holes of the card-blank, have their points so accurately in line with the prick-holes that they may be readily and with certainty inserted therein. Now, in each of these successive workings through the finishing plate or tool A the coil of wire is placed carefully on a drum, from which it is reeled off through between the teeth of the tool A and coiled onto another drum, the drawing tension being applied by power communicated to the latter drum; and it has been found that irregularities of tension arise in these successive operations, (but becoming gradually less and less,) partly from accidental kinks or bends in the wire, partly from slight inequalities in the metal itself—as, for example, being slightly harder in one place than in another—as well as partly from the interfolding or crossing of the wires in the coil on the feeding side or end of

the tool. Any of these causes, and perhaps others, may and often do vary the resistance which the wire gives in unreeling and passing through between the pins or teeth of the plate A, and as such resistance is varied the drawing tension is also varied, and the desired degree of perfectness of uniformity in finish and in elasticity or resiliency is correspondingly lessened or impaired. Hence the object of such repeated workings is chiefly, by eliminating or getting rid or even lessening these or other elements which vary the tension, to get, as a result of the last working, a product which meets the required conditions of use.

The difficulties above referred to are encountered in the highest degree and in their worst form in the finishing of steel wire, and as steel wire is now chiefly used in making cards, the importance of an improvement which will facilitate the manufacture of a practically perfect product will be readily apparent.

The process thus far described is old, and I have described it at such length simply in order that my improvement may be more readily understood. In the latter I combine a series of two or more such tools or plates A as are above referred to with a series of two or more revolving sheaves in such manner that each sheave operated by a positive motion shall take by frictional contact a working bite on the wire, and, after drawing it through between the teeth of the previous plate, (in the line of feed,) shall pass it on or deliver it to the next plate, (in the line of feed,) as a result of which no irregularities or inequalities of resistance can arise between one sheave and the next in the order of feed, and the inequalities of resistance which arise, occur, or exist before the wire enters the first plate (in the line of feed) will gradually and progressively be worked out, lessened, eliminated, or caused to disappear to such extent or so perfectly that after the required or desired number of workings the finished or perfected product may be coiled directly onto a drum, ready for sale or use. Such drum is shown at D, and a series of sheaves at B.

Each sheave has a groove, *s*, of suitable size for the ready working therein of two or three folds or coils of the wire *a*.

The sheaves and drum have each a positive motion communicated by any suitable gearing, such as that shown at *b b*, and such driving-gear is so arranged that a uniform speed will be given to the wire while passing around the sheaves, through the plate, and onto the drum.

A main driving-shaft is shown at b', and at b^2, I have shown the spindles of the sheaves and drum, all of which are made and mounted in any of the ways known to the art, and are supported in any suitable frame-work, F.

In the line of feed of the wire from one sheave to the next and from the last sheave to the drum I arrange one of the plates A, and by a hole through the bottom of each plate I pivot the same, in the ordinary way, on a post, *c*. Each of these plates is pivoted in such position that the wire *a* (which is fed from the usual drum to the first sheave) shall pass from that or any subsequent sheave to and enter such plate in the proper manner and relationship to the pins of the plate, as the same is already understood in the art, and shall leave such plate in its direct course to the next sheave (or to the final drum) substantially in line tangential to the face of the last pin at the point of contact therewith. The wire *a* will be passed around each sheave one, two, or more times, as may be necessary, in order that the sheave may take thereon in operation a frictional bite sufficient to draw it along through the pins of the last previous plate; but it should not go around often enough for one fold to be liable to overlie or overlap another fold in such manner that a new element of resistance might be introduced, and for most purposes, or under ordinary circumstances, I have found that it was quite sufficient to pass the wire twice around each sheave.

At the beginning of the operation the wire is to be passed around each of the sheaves and through each of the plates A, and at its forward end secured in any convenient way to the drum D. Then, on starting, if the wire be slack on the sheaves, they will revolve without doing any work, but the drum D will draw the wire through the last plate, and thereby tighten it up on the last sheave. As soon as it is thus tightened sufficiently for that sheave to take a biting as distinguished from a sliding engagement therewith, that sheave will begin to draw the wire through the next previous plate, (in the line of feed,) and so tighten up the wire on the next previous sheave, and so on backward, if other sheaves be used, until the entire series of sheaves and plates are in complete and regular operation, and thence the work goes on uniformly and regularly. As a result of this the final drum and each sheave (except the first) act with just enough effective power to draw the wire through the last previous plate, and also hold the wire in biting contact with the previous sheave, and no more. Hence the resistance offered by the wire in going from one sheave to another, or from the last sheave to the drum, is not subject to any elements of increase which can vary the tension thereon, and such tension must be practically constant and invariable, except as it may be affected by irregularities, such as are already referred to, and which are in the wire before it comes onto the first sheave, and these elements of irregularity or of non-uniformity will become less and less as each plate is passed, and, practically, will disappear entirely by the time the drum is reached.

Thus it will be seen that the operation referred to is carried on under such conditions that after the first sheave is reached by the wire no new elements of irregular or non-uniform resistance to tension can come into operation, and that irregularities in the wire before it reaches the first sheave will gradually

become less and less as each tool is passed, and, if the operation be continued far enough, will entirely disappear, so that thereby a product practically perfect for the uses intended can thus be secured. For most purposes I deem it sufficient to pass the wire thus continuously through, say, four or five plates, and around intervening sheaves, and into a final drum; but the number of sheaves and plates may be varied at pleasure, though it will be essential to the use of the invention that at least two plates be used with an intermediate sheave and a final drum. After this the number of plates and sheaves may be increased at pleasure. A plate may also be arranged at *d*, intermediate between the feeding reel or drum and the first sheave, if so preferred. The size of the drum is such as gives a convenient-sized coil for shipment or use, and for the sheaves I have found a diameter of nine or ten inches suitable, but do not limit myself in these respects.

In the coiling of the wire on the drum the successive wire coils will be liable to overlie each other, so that as the coils increase in number the surface onto which they are coiled will become slightly larger. To provide for the inequality liable to result therefrom, and also to guard against any liability of one sheave to draw faster than the previous sheave will deliver, I prefer to lessen gradually the diameters of the sheaves from the first to the last—say by about a quarter of an inch, more or less—and make the drum so that it will at first draw a little, but very little, less rapidly than the last previous sheave is designed to draw. Also, by properly making the plates with reference to that end, the tension may be made a little less from one sheave to the next; but I do not limit myself in my present invention in either of these respects.

As a matter of convenience, the drum may be connected with its shaft by a clutch device or a dog, so that at pleasure it may be thrown out of gear and the operation stopped by the wire on the sheaves and without stopping the machine. The sheaves will then run loose inside the coils of wire thereon, and when the drum is again thrown into gear the work will proceed from the very point at which it stopped, and without change of tension. When out of gear, particularly in putting on the forward end of a coil of wire to be treated, (which may be secured to the drum in any convenient way,) as also in taking off a finished coil, it may be desirable to rotate the drum by hand, for which purpose a knob, b^3, may be added.

As I am unable to give any rule mathematically for making the plates A, I can only say that they should be such as are adapted to do good work in the old operation first referred to, or, if varied therefrom, that they should, in the machine herein described, be capable of giving good results. The manufacture of such plates is already a known branch of the art.

I have found it sometimes best to make the last sheave previous to the drum of the same diameter as the drum, and, in fact, all the sheaves may have this diameter, the gearing being changed to correspond.

I claim herein as my invention—

1. In a wire-finishing machine, the combination of plates A, a sheave interposed in the line of movement of the wire between the plates, and a coiling-drum, substantially as set forth.

2. A series of two or more wire-finishing plates, A, one or more sheaves, B, suitably arranged for the wire to pass around the same in going from one plate to the next, and a coiling-drum, D, in combination with suitable driving-gear, whereby to give the moving biting or engaging surfaces of drum and sheave or sheaves practically the same speed, substantially as set forth.

3. A wire-finishing machine having in combination a series of two or more plates, A, alternating with a series of two or more sheaves, B, a coiling-drum, D, and gearing for giving a practically uniform speed, as described, whereby the final drum and each sheave shall exercise on the wire such degree or amount of tension as shall suffice to preserve the binding bite of the wire on the previous sheave and draw the wire through the previous plate, substantially as set forth.

In testimony whereof I have hereunto set my hand.

WALLACE KENERSON.

Witnesses:
WM. H. ROSE,
GEORGE H. CHRISTY.