(No Model.) 3 Sheets—Sheet 1.

F. E. & A. S. ELMORE.

MANUFACTURE OF WIRE, BANDS, &c.

No. 440,548. Patented Nov. 11, 1890.

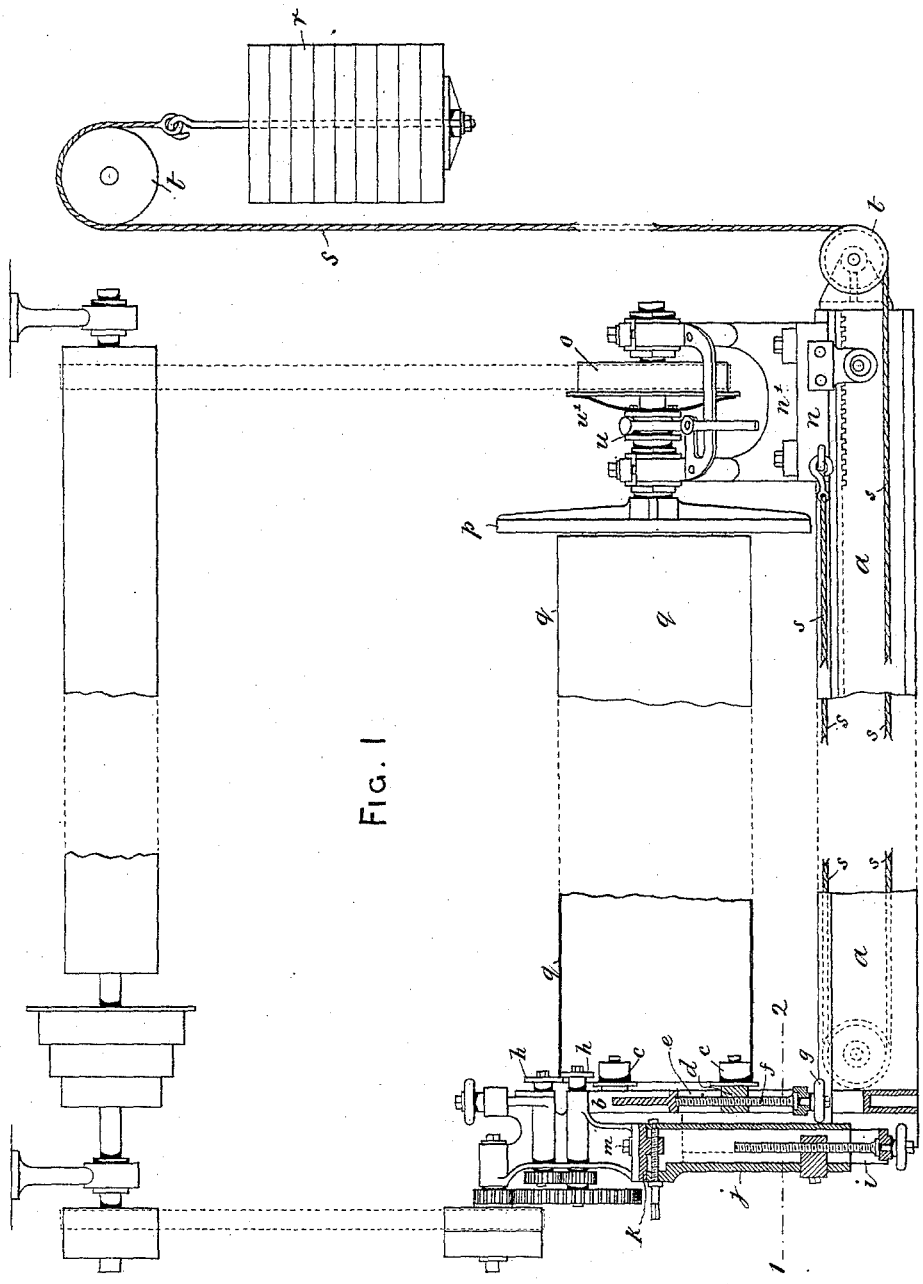

FIG. 1

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(No Model.) 3 Sheets—Sheet 2.

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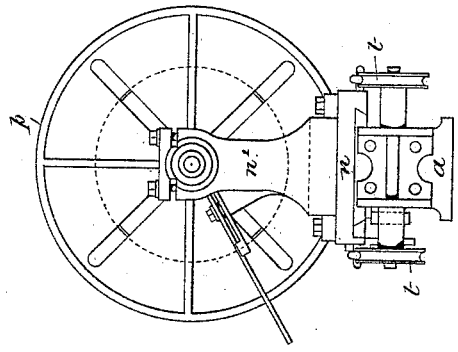
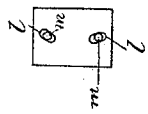


FIG. 4.

FIG. 6



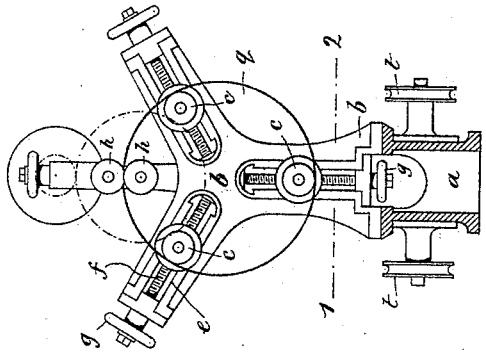
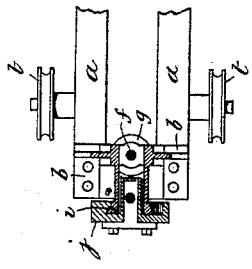


FIG. 2.

FIG. 5



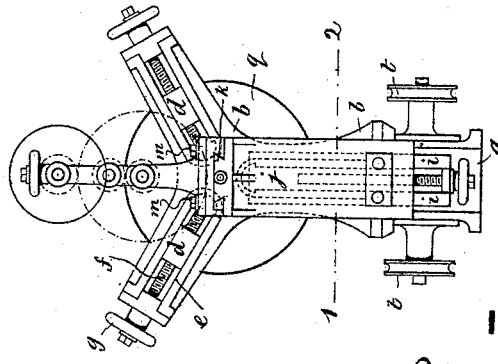


FIG. 3.

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MANUFACTURE OF WIRE, BANDS, &c.

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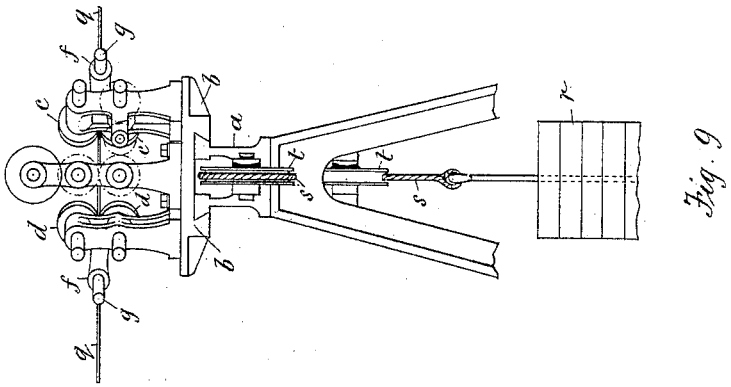

Fig. 9

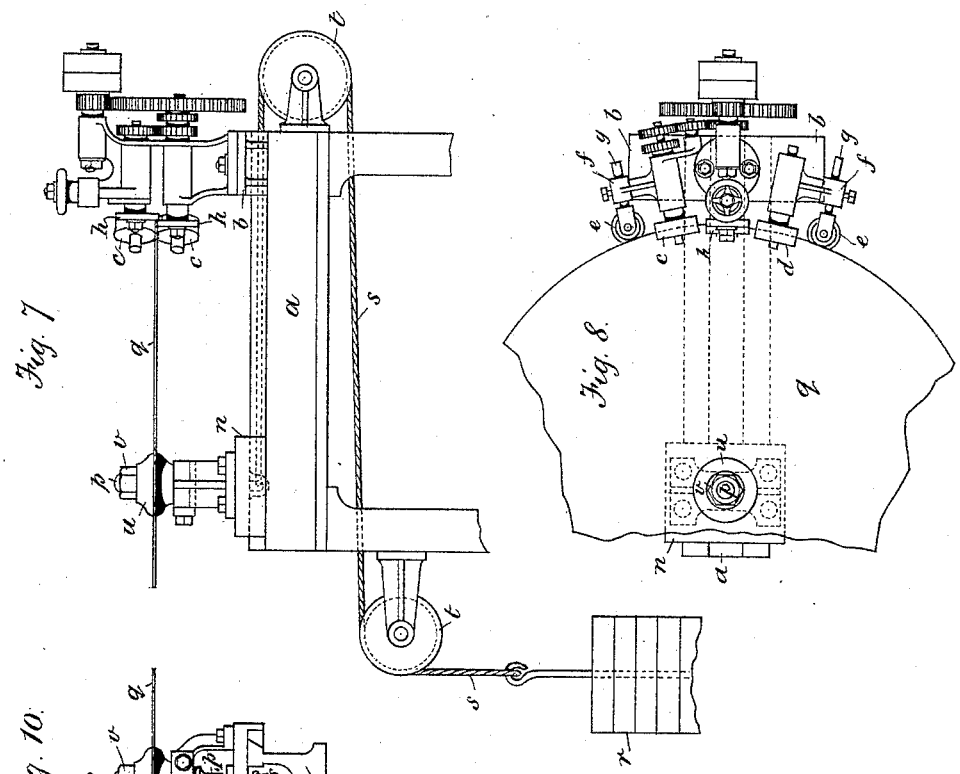

Fig. 7

Fig. 8.

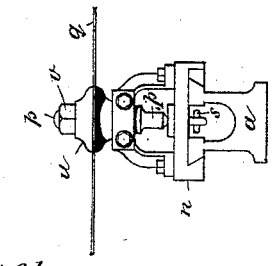

Fig. 10.

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UNITED STATES PATENT OFFICE.

FRANCIS EDWARD ELMORE AND ALEXANDER STANLEY ELMORE, OF ROTHWELL, NEAR LEEDS, ENGLAND.

MANUFACTURE OF WIRE, BANDS, &c.

SPECIFICATION forming part of Letters Patent No. 440,548, dated November 11, 1890.

Application filed January 17, 1889. Renewed May 14, 1890. Serial No. 351,714. (No model.) Patented in England December 3, 1887, No. 16,637; in France September 15, 1888, No. 192,985; in Belgium September 19, 1888, No. 83,323; in Italy September 26, 1888, XXII, 24,106, and in Germany October 2, 1888, No. 45,249.

To all whom it may concern:

Be it known that we, FRANCIS EDWARD ELMORE and ALEXANDER STANLEY ELMORE, subjects of Her Britannic Majesty, residing at the Mount, Rothwell, near Leeds, in the county of York, England, have invented certain Improvements in the Manufacture of Wire, Metallic Strips, Tape, or Rods, (for which we have obtained patents in Great Britain, No. 16,637, bearing date December 3, 1887; in France, No. 192,985, dated September 15, 1888; in Belgium, No. 83,323, dated September 19, 1888; in Italy, No. 24,106, Vol. XXII, dated September 26, 1888, and in Germany under Certificate No. 45,249, dated October 2, 1888, the grant of a patent not yet issued,) of which the following is a specification.

Our invention has for its object the obtainment of long continuous bars, strips, or wires of metal of high electrical conductivity and of great strength.

Up to the present time in the use of electrolytic copper for the manufacture of wire it has been usual to first melt the copper and then cast into wire, and by this process of melting it is found that small quantities of impurities are conveyed into the copper, thus reducing its conductivity and leaving it very little, if any, better than copper carefully made by the usual method of refining in a furnace, and as the cast bar of electrolytic copper is in a very similar state, both chemically and mechanically, as compared to a cast bar of ordinary copper, and as both bars receive a similar subsequent treatment, the mechanical properties of the resultant wire—the tensile strength, &c.—will be about the same.

By the application of this invention the intermediate operation of melting between the electro-deposition of the copper and the ultimate operation of drawing into wire is dispensed with, thus precluding the possibility of the absorption of any impurities, and the highest conductivity is thereby obtained.

In carrying our invention into effect we proceed as follows: A cylindrical core, mold, or mandrel to act as cathode or negative electrode in the electrolytic depositing-tank is prepared to receive a non-adhesive deposit, as is well understood. The cylindrical core, mold, or mandrel having previously been fitted with suitable gear to impart a rotary motion thereto when adjusted in its proper position in the depositing-tank, (said depositing-tank being fitted with anodes or positive plates,) the said tank is then filled with a suitable electrolyte—sulphate of copper, for instance—the cylindrical core, mold, or mandrel being connected to the negative pole and the anodes or positive plates connected to the positive pole of the same generator of electricity, as is well understood. Such core, mold, or mandrel may be submitted to the action of a burnishing device to burnish the surface of the deposited tube or cylinder during the time at which the deposit will be going on in the bath, the said core, mold, or mandrel being mounted upon its axis or journals in the tank, and upon the sides of the bath or tank will be mounted guides, and a traveler will be provided fitted with worm and change motion for traversing the said traveler to and fro over the bath. The traveler will have a carrier attached, upon which will be mounted burnishing-surfaces—such as agates, blood-stones, flints, or glass—having a polished surface—that is, a non-conducting substance capable of burnishing and not acted upon by the acid or alkali of the solution. The said burnisher will operate upon the surface of the deposited metal and a motion of rotation will be given to the core and the deposited surface. After this combination of apparatus has been in operation for a sufficient length of time and a sufficient thickness of copper has been deposited upon the cathode or negative pole of the electrolytic cell, the said cathode is removed from the tank and the shell or cylinder of deposited copper may be removed from its core, mold, or mandrel by subjecting the core, mold, or mandrel, together with the deposited shell, to an elevated or reduced temperature, according to the metal of which the core, mold, or mandrel is composed, and in virtue of the difference of expansion or contraction between the core, mold, or mandrel and its deposited shell said shell may be released and the man-

drel be withdrawn; or the deposited shell may be removed from its core, mold, or mandrel by mounting said core, mold, or mandrel in a lathe, so as to have a rotary motion communicated thereto, and a roller, free to revolve in a suitable holder, is pressed against the deposited shell and traversed from end to end of said shell or cylinder, which will expand, so as to free the same from the core or mandrel.

The shell or cylinder of deposited copper, obtained as above described, is mounted in a machine for the purpose of cutting the said cylinder circumferentially into a continuous strip or rod, such strip or rod to be ultimately drawn into wire, rolled, or used as cut, as may be most convenient for the purpose to which it is intended to apply such strip or rod. A machine for cutting such shell or cylinder of deposited copper is shown in Sheets 1 and 2 of the accompanying drawings, wherein—

Figure 1 is a side view, partly in section. Fig. 2 is a face view of the fixed head stock or standard. Fig. 3 is a back view of the same. Fig. 4 is an end view of the traveling head-stock; and Fig. 5 is a sectional plan through the vertical slide of the fixed head-stock at line 1 2 of Figs. 1, 2, and 3.

Upon a suitable bed *a* is mounted at one end a vertical standard *b*, carrying three or more flanged rollers *c* for supporting one end of the shell or tube to be operated upon. The rollers *c* are by their bearings *d* adjustable radially in slots *e* of the standard *b* by means of the screws *f* and hand-wheels *g* to suit tubes or cylinders of various diameters. A pair of circular shears *h* (or other cutting device) is also mounted upon the standard *b* in such manner as to allow of their adjustment vertically to operate upon tubes of different diameters or thickness, and are adjustable likewise in a horizontal as well as in an angular or oblique direction to allow any width of such strip or band to be cut, such vertical adjustment of the cutting device being obtained by means of the vertical slide *i* and slide-piece *j*, provided at the back of the standard *b*, as shown in Figs. 1, 3, and 5. The horizontal adjustment of the cutting device is effected by the horizontal slide *k*, formed upon the upper part of the vertical slide-piece *j*, (see Figs. 1 and 2,) and the very slight angular or oblique adjustment required to be given to the cutting device is obtained by two radial slots *l*, formed in the base of the frame of the cutting device, by means of which slots *l* the cutting device may be set at the required angle of obliquity and may be secured in such position by the bolts and nuts *m*, as is more clearly shown in Fig. 6, the cutting device being geared up in the usual manner and drawn from an overhead motion, as shown in Fig. 1. Upon the opposite end of the bed *a* there is mounted upon a traveling saddle *n* a sliding head-stock *n'*, fitted with driving-pulley *o* and carrying a suitable face-plate *p*, to which the other end of the tube or cylinder *q* is secured, the saddle *n* or the head-stock *n'* being provided with suitable means for traversing same horizontally along the bed *a*. For the purpose of illustration a means of traversing the movable saddle *n* and head-stock *n'* by a weight or weights *r* and ropes *s*, attached to the saddle and guide-pulleys *t*, is shown in the drawings; but the sliding saddle and head-stock may be traversed by a screw and change-wheels the same as the saddle or slide-rest of a lathe, or by any other convenient method.

Upon the driving-spindle of the movable head-stock *n'* is a friction-clutch *u*, with spring-fingers *u'*, by which motion can be taken up from the driving-pulley *o*, as required. The cylinder, shell, or tube *q* to be operated upon being mounted in position between such movable head-stock *n'* at one end and the adjustable flanged rollers *c* on the fixed head-stock or standard *b* at the other end of the bed *a*, is there caused to rotate by the driving-gear, and by means of the weight *r* (or other method employed for traversing the sliding head-stock *n'*) the one end of the said tube is kept constantly pressed against the stop-flanges of the rollers *c*, and being so continuously fed up to the cutters or cutting device *h* is thus cut circumferentially into a coil or continuous band, strip, or tape of any required width and of any length, according to the length of the tube or cylinder, and the coil so cut may be wound away in any convenient manner as it is cut from the rotating cylinder, shell, or tube; or the cathode may consist of a flat circular plate, prepared as before mentioned, to receive a non-adhesive deposit and mounted in the depositing-tank upon a revolving shaft and rotating between anodes or positive plates, so that a deposit may be obtained upon both sides of said cathode, which cathode-faces may during the operation of deposition be burnished, as before referred to in the case of the deposited cylindrical shell or tube. Such deposited sheets or disks, when of sufficient thickness, are then removed from the cathode-plates and are fixed to a revolving table or spindle. A pair of circular shears or other cutting device overlapping the edge of said sheet, so that when said sheet is revolved around its axis and is kept pressed against a stop or stops, the shears or other cutting device will remove from its periphery a continuous strip or band of any desired width. An arrangement of apparatus for cutting a continuous strip, band, or tape from such circular disks, sheets, or plates prepared as above described is shown in Sheet 3 of the drawings annexed, wherein—

Fig. 7 is a side view of the machine. Fig. 8 is a plan view; Fig. 9, a right-hand end view of Fig. 7; and Fig. 10 is an opposite end view showing the revolving spindle, to which is attached the plate to be operated upon when mounted in the machine.

A is the bed of the machine, upon one end of which is mounted a fixed saddle-piece *b*.

On the saddle-piece *b* is mounted the cutting device *h*, here shown as a pair of revolving cutters, as before. Upon the saddle *b* there is also mounted on the one side a pair of feed-rollers *c*, driven by gearing direct from the cutting device and geared to rotate at the same speed as the revolving cutters or other cutting device *h*. On the other side of the cutting device there is mounted upon the saddle *b* a pair of guide-rollers *d*, as shown in Figs. 8 and 9, but not shown in Fig. 7. The standards or supports of the feed-rollers *c* and of the guide-rollers *d* carry also small stop-rollers *e*, (flanged or otherwise,) said stop-rollers being adjustable horizontally in their sockets *f* by the arms *g*. Upon the bed *a* is also mounted a sliding saddle *n*, which, by means of a weight or weights *r*, a rope *s*, and guide-pulleys *t*, is made to traverse along the bed *a*. Upon the saddle *n* there is mounted a vertical spindle *p*, to which the circular plate or sheet *q* to be operated upon is attached by means of the washer *u* and the nut *v*. The plate *q*, being so mounted on the spindle *p*, is propelled forward by the weight or weights *r* toward the cutting device *h*. The edge of the plate being so kept constantly pressed against the stop-rollers *e* and engaging with the feed-rollers *c*, the plate *q* is by them rotated and kept continuously fed up to the cutters or cutting device *h*, and the continuous band, strip, or tape of metal as it is cut from the rotated plate by the cutting device, may be coiled or wound away from the machine in any convenient manner. By a simple adjustment of the stop-rollers *e* by their arms *g* in the sockets *f* any width of band, strip, or tape of metal may be readily cut from the plate, as required.

Having now particularly described the nature of our said invention, and in what manner the same may be performed, we wish it to be clearly understood that we do not confine ourselves to the cutting of electro-deposits of copper, as electro-deposits of other metals and alloys—such as tin or brass—may be obtained and treated in a similar manner; also, we do not confine ourselves to the particular form or kind of cutting device herein described and shown in the drawings, as any suitable cutting device—such, for instance, as a circular saw properly mounted, or a cutting-tool in a lathe—may be employed, as will be readily understood. Neither do we confine ourselves to the precise arrangement of devices or combination of devices described and shown, since any mere modification or change may be made without departing from the spirit or scope of our invention; but

What we do claim in respect of our said invention is—

The process of manufacture of wire, bands, and strips of metal of high electrical conductivity and great strength by first forming an electro-deposited cylinder, shell, tube, or plate which has been submitted to a mechanical burnishing action applied simultaneously with its formation in the electrolytic bath and afterward cutting circumferentially from said cylinder or plate so formed long continuous strips or bands of such metal to be further drawn into wire or not, substantially as set forth.

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Witnesses:
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