

## **Specification of Isac Louis Pulvermacher : electric chains, bands, &c.;**

### **Contributors**

Pulvermacher, Isac Louis.

### **Publication/Creation**

London : Great Seal Patent Office, 1871 (London : George E. Eyre and William Spottiswoode)

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A.D. 1871,      1st JUNE.      N° 1460.

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S P E C I F I C A T I O N

OF

ISAC LOUIS PULVERMACHER.

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ELECTRIC CHAINS, BANDS, &c.

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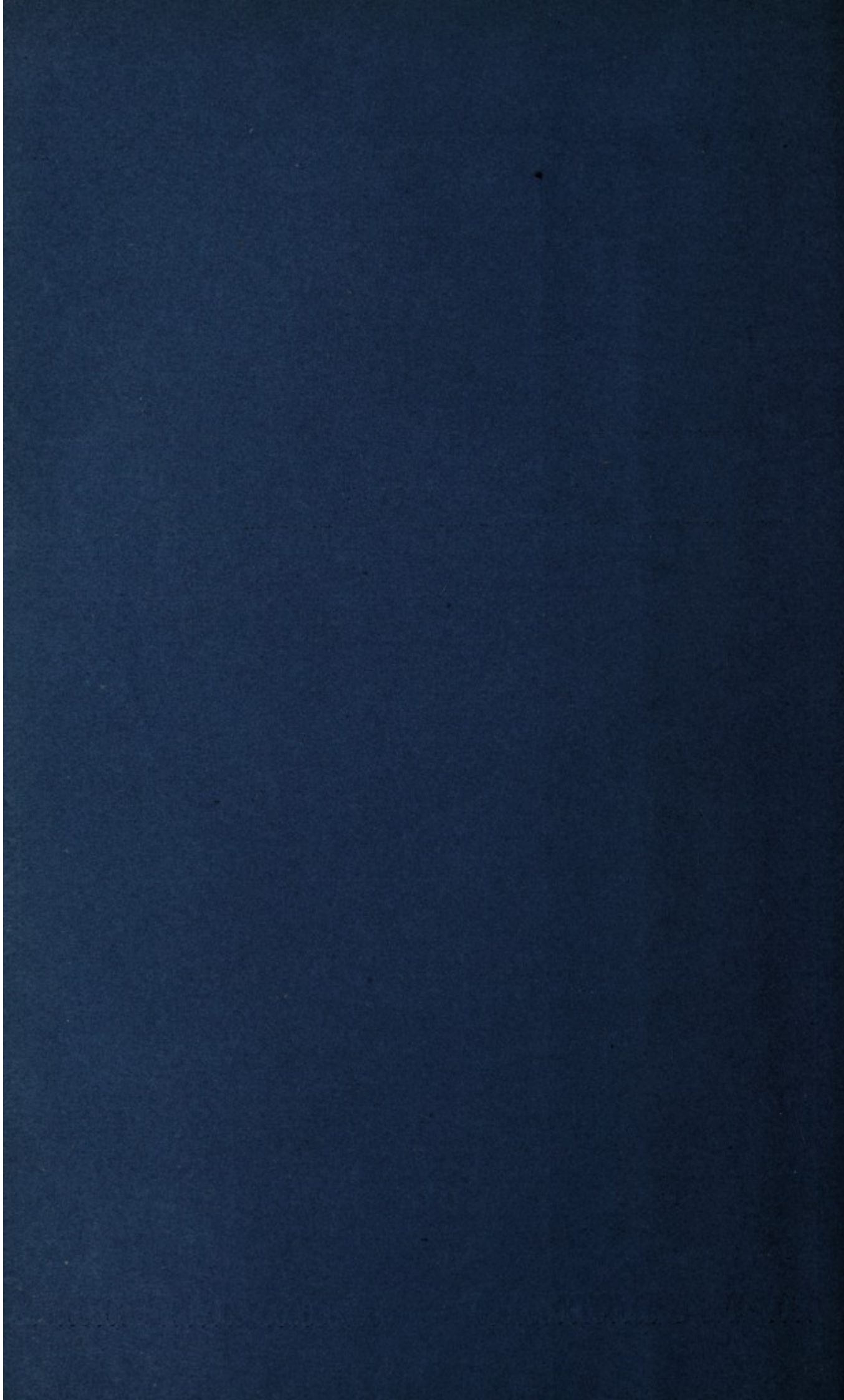
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1871.







A.D. 1871, 1st JUNE. N° 1460.

### Electric Chains, Bands, &c.

**LETTERS PATENT** to Isac Louis Pulvermacher, of Regent Street, in the County of Middlesex, Electrical Engineer, for the Invention of "IMPROVEMENTS IN THE CONSTRUCTION OF ELECTRIC, GALVANIC, AND MAGNETIC CHAINS, BANDS, AND GARMENTS, AND IN MEANS OF APPLYING SUCH TO THE HUMAN BODY FOR TREATING DISEASES AND COMPLAINTS, AND FOR OTHER PURPOSES, ALSO IN FASTENERS AND ELECTRO-CONDUCTORS IN CONNECTION WITH SUCH CHAINS AND BANDS."

Sealed the 28th November 1871, and dated the 1st June 1871.

**PROVISIONAL SPECIFICATION** left by the said Isac Louis Pulvermacher at the Office of the Commissioners of Patents, with his Petition, on the 1st June 1871.

I, ISAC LOUIS PULVERMACHER, of Regent Street, in the County of Middlesex, Electrical Engineer, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE CONSTRUCTION OF ELECTRIC, GALVANIC, AND MAGNETIC CHAINS, BANDS, AND GARMENTS, AND IN MEANS OF APPLYING SUCH TO THE HUMAN BODY FOR TREATING DISEASES AND COMPLAINTS,



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

AND FOR OTHER PURPOSES, ALSO IN FASTENERS AND ELECTRO-CONDUCTORS IN CONNECTION WITH SUCH CHAINS AND BANDS," to be as follows:—

The object of the first part of my present Invention is to manufacture chains, bands, and garments or articles of dress with metal plates or pieces of metal so arranged that they can be used with a self-sustaining 5 and permanent electrical or galvanic action derived either from an exciting liquid, or by the perspiration thrown off from the body of the wearer, and this I accomplish by sewing, looping, or otherwise securing the plates or pieces of metal upon a backing of porous or absorbent material, such material having a sticky substance, such as sparadrap, 10 on the exposed parts, to enable the patient to fasten the article upon his body at the part affected, or in lieu of the backing being covered with the sticky substance the plates or the pieces of metal themselves may be coated over a portion of their surfaces with such substance. The plates or pieces of metal may be of any shape, perforated or not, 15 or they may have pins or projections in or on them, or they may be formed of strips wound into flat spirals or helices, or of beads, eyelets, or tinsels; if spirals are used they may be wound upon a core, or secured to a backing after they are wound; in that case an independent core or lining elastic or not could be introduced into them, the filling 20 in material or substance being of a porous or absorbent nature, or it may be a chemical salt of exciting or electro-depolarizing action, or the spirals may be left open and the exciting liquid applied to the backing in any convenient manner. The backing may also be formed of threads wound upon portions of the spirals to prevent false contacts, 25 and these threads may form the means of combining the elements in voltaic arrangement without interfering with the flexibility and elasticity, or the spirals, beads, or other pieces may be joined in sections by looping the opposite metals of the elements together, or the core or lining may be composed of a combination of elastic and non-elastic material, one 30 of them forming the absorbent and the other the flexible and elastic portions of the article. In some cases the plates or pieces of metal forming the elements are to be soldered together either before or after they are stamped out or otherwise prepared; if this is done before stamping I propose to solder the overlapping edges of long strips 35 together to prevent waste of labour and material. In other cases the pins of one metal could be soldered to the pins of the other metal after they have been passed through the backing or the lining and bent down to touch to fasten and establish regular contacts.



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

The second part of my Invention relates to making magnetic bands, belts, and garments to be worn or applied to the body in a similar manner and by similar means to those referred to in the first part, whereby a gentle self-sustaining magnetic action is kept up on the affected  
5 parts, or throughout the whole body. I sew or otherwise secure thin plates, strips, or other pieces bent or not of magnetized steel, hardened, tempered, or annealed, in or to a fabric or web in sections, each section being composed of four, five, or more pieces in direct contact, to form compound magnetic staves or elements, and these may be connected to  
10 other similar elements in any convenient manner, so as not to interfere with the movements of the wearer.

The third part of my Invention consists in making bands, belts, and garments of a combination of elements such as those described in the first and second parts before referred to in order to produce combined  
15 electrical galvanic and magnetic action.

The fourth part of my Invention relates to certain improvements in the construction and form of the bands referred to in my previous Patents Nos. 2656, <sup>61</sup>; 773, <sup>68</sup>; and 2740, <sup>68</sup>, whereby I overcome many difficulties of manufacture, and make them more beneficial in use.

20 I propose to construct the bands of elements formed of two wires, say copper and zinc, wound side by side upon a mandril of such a shape as to make one side of the band plain and flat, to be applied to the body, and the other with one or more projecting portions to form channels to permit of sponge, paper, or fibrous material being placed  
25 therein. I prefer to give eight turns of the wires round the mandril for each element of the band, and these are connected for any length by cords or threads laid in the edges of the mandril before the pressure of the tool is brought upon the wires to hold the cords in place. The channels for the absorbent material may be round, square, or rectangular,  
30 to suit the material, which may be cut or made to the exact size to fill the channel, or of pieces built up such as would be the case if perforated cards were used, whether they had a film of sponge or fibrous material between them or not.

In some cases the absorbent material could be put in with the  
35 edge cords, and then it would be held in place in a secure manner.

The fastenings for the bands, belts, or garments, if such are required, consist of two plates stamped with raised flanges; one of them has a



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

rotating stud fitted on the inner side by a plate or eye soldered at the edges so that it can turn freely. The head of the stud is of elongated form to pass through a slot or aperture in its neighbouring plate, and then be turned a quarter round to secure it. The stud pin is sufficiently long to pass through the insulating interstices of the elements, and the eye plate projects beyond the edge, so that the plate of the opposite pole can be hooked to it to complete the circuit, or to connect other bands or portions of bands to combine several lengths together. In some cases more than one stud is employed on one plate or fastener. One of the plates, that is, the one which touches the part affected, can be of any size, and I prefer to make it of disc shape, so that the touching part can be easily reduced at the will of the operator by a perforated bag or cap provided with a string to draw the mouth in over the back of the plate, leaving only one or more openings on the face. By this means the conducting surface and consequently the power or intensity of the current can be concentrated or enlarged as desired.

The last part of my Invention relates to chains used for transmitting galvanic currents to persons for the relief of various complaints and diseases, and are also improvements upon the chains referred to in my previous Patents before spoken of, and others numbered respectively 582, <sup>66</sup> and 2062, <sup>69</sup>. According to this part I construct my plates or elements in ways different to any previously described, that is to say, the outer plates, say the copper ones, are trough shaped, and the zinc or opposite metal is inserted into them with pins or wires insulated therefrom, secured in the centre or turnover to hold them in position; these pins project through the ends of the troughs to form the means of attachment to the elements next thereto. The opposite or inserted metal is prevented touching by an insulating material and it is provided with an absorbent, perforated or otherwise, to retain the exciting fluid or liquid in the troughs or in contact therewith. The ends of the troughs have projecting lips, which can be bent into loops for fastening to the wires of the zinc or opposite metal of the next element. The zinc or opposite metal need not however be formed of plates in all cases, as metal wire can be twisted into the proper shape, and covered by a fibrous thread to prevent it touching, this thread also serving to hold the fluid.

According to a modification I make the troughs of open worked cylindrical plates, and I insert a wire stem into each end, the wires being fitted with a disc or plunger at each end to retain a covered wire,



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

which is twisted on the inner wire in place, and to form the means of insulating the metals by the cup-like shape the discs assume when being pushed in. The inner wire like the opposite plates before spoken of can be covered with a compound composed of bi-oxide of manganese  
5 mixed with graphite powder, or of bi-chloride of mercury, silver, or some other salt or oxide, which can be formed into a paste or a solution of some such salt mixed with other ingredients, or liquid can be used for the purpose. The ends of the wires which project beyond the cylinders take into the loops of the flaps or lips of the cylinders in a similar  
10 manner to those before explained, and to prevent these wires touching the cylinders should they move accidentally when in use, I fit an insulating disc or washer over them.

In some cases the central stems or wires may be threaded, so that they can be screwed through a plug or stopper by a key or turnscrew.

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15 **SPECIFICATION** in pursuance of the conditions of the Letters Patent, filed by the said Isac Louis Pulvermacher in the Great Seal Patent Office on the 1st December 1871.

**TO ALL TO WHOM THESE PRESENTS SHALL COME, I, ISAC LOUIS PULVERMACHER, of Regent Street, in the County of Middlesex,**  
20 **Electrical Engineer, send greeting.**

**WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the First day of June, in the year of our Lord One thousand eight hundred and seventy-one, in the thirty-fourth year of Her reign, did, for Herself, Her heirs and successors, give  
25 and grant unto me, the said Isac Louis Pulvermacher, Her special licence that I, the said Isac Louis Pulvermacher, my executors, administrators, and assigns, or such others as I, the said Isac Louis Pulvermacher, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times  
30 thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "**IMPROVEMENTS IN THE CONSTRUCTION OF ELECTRIC, GALVANIC, AND MAGNETIC CHAINS, BANDS, AND GARMENTS, AND IN MEANS OF APPLYING SUCH TO**  
35 **THE HUMAN BODY FOR TREATING DISEASES AND COMPLAINTS, AND FOR OTHER**



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

PURPOSES, ALSO IN FASTENERS AND ELECTRO-CONDUCTORS IN CONNECTION WITH SUCH CHAINS AND BANDS," upon the condition (amongst others) that I, the said Isac Louis Pulvermacher, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said 5 Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Isac Louis Pulvermacher, do 10 hereby declare the nature of my 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, reference being had to the Drawings hereunto annexed, that is to say :—

The object of the first part of my Invention is to manufacture chains, 15 bands, and garments or articles of dress with metal plates or pieces of metal so arranged that they can be used with a self-sustaining and permanent electrical or galvanic action derived either from an exciting liquid or by the perspiration thrown off from the body of the wearer, and this I accomplish by sewing, looping, or otherwise securing the 20 plates or pieces of metal upon a backing of porous or absorbent material, such material having a sticky substance, wax, diachylon, or sparadrap, on the exposed parts to enable the patient to fasten the article upon his body at the part affected, or in lieu of the backing being covered with the sticky substance the plates or the pieces of metal themselves may be 25 wholly or partially coated with such substance. The plates or pieces of metal may be of any shape, perforated or not, or they may have pins or projections in or on them, or they may be formed of strips wound into flat spirals or helices, or of beads, eyelets, or tinsels. If spirals are used they may be wound upon a core or secured to a backing after they are 30 wound ; in that case an independent core or lining elastic or not could be introduced into them, the filling in material or substance being of a porous or absorbent nature, or it may be chemical salt or chemical composed of exciting or electro-depolarising action, or the spirals may be left open and the exciting liquid applied to the backing in any con- 35 venient manner. The backing may also be formed of threads wound upon portions of the spirals to prevent false contacts, and these threads may form the means of combining the elements in voltaic arrangement 38



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

without interfering with the flexibility and elasticity, or the spirals, beads, or other pieces may be joined in sections by looping the opposite metals of the elements together, or the core or lining may be composed of a combination of elastic and non-elastic material, one of them forming  
5 the absorbent and the other the flexible and elastic portion of the article.

In some cases the plates or pieces of metal forming the elements are to be soldered together either before or after they are stamped out or otherwise prepared. If this is done before stamping I propose to solder  
10 the overlapping edges of long strips together to prevent waste of labour and material. In other cases the pins of one metal could be soldered to the pins of the other metal after they had been passed through the backing or the lining, and bent down to touch to fasten and establish regular voltaic currents.

15 The manner in which this the first part of my Invention is carried into effect is represented in the accompanying Drawing. Figure 1 is a view of part of a band or belt composed of flat rectangular plates C, Z, C being the copper or other metal of an equivalent character, and Z the zinc or metal of its equivalent character, which plates can be secured upon a  
20 backing of waterproof or other material by the tongues or lips *a, b*, in the manner shewn in Figure 2, that is, by bending the tongues outwards and then pushing their points through the meshes of the fabric *c* forming the backing, and afterwards pressing them down upon the other side, the tongues *a, b*, being of a suitable length to lap one over and  
25 upon the other to establish complete voltaic connection and to form a battery. I prefer to solder these tongues together to secure permanent contact and also to prevent them becoming disconnected; they may however be rivetted together if found advisable.

Figure 3 represents a series of plates C and Z of a different shape but  
30 formed with tongues in the manner and for the purposes as the previously described plates. These plates are arranged in voltaic order for the current to flow in a zig-zag manner, the two poles being indicated by the letters P, P<sup>1</sup>; there are other tongues *c, d*, to these plates, which are also bent over and soldered for directing the current in the proper  
35 direction from one element to the next, as will be understood.

Figure 4 shows a modified construction or formation of plates and in or through which the current flows in a zig-zag manner. Here instead of having additional tongues I employ a short length of coiled wire *d*<sup>1</sup>, by



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

which a springy character is given to the belt or article to which the plates are attached by the lips *a, b*, it also permits of the belt or other article being folded or rolled up without fear of one plate becoming disconnected from the other. The plates in Figures 3 and 4 are so arranged that the upper row can be folded over and upon the lower ones, 5 so that by laying a film or sheet of moist fibre or tissue between the folds the elements will be excited independently from the skin and be caused to act like a voltaic battery chain or band.

Figure 5 is another modification of the form of the plate C, Z, both of which have a tongue or projecting lip *c, d*, at the corner which lays 10 upon or overlap one another to establish and preserve voltaic contact in each separate element or battery; the elements may however be connected to form a continuous band by either of the foregoing means.

Figure 6 shows a series of plates C, Z, with tongues passed into and through the loops of a fabric so that the points project from the same 15 side as on that which the plates are arranged, which loops may be formed by additional or by stronger threads being used in the weaving at the proper places or in the usual threads, or the threads for the loops may be introduced by the sewing machine or by hand as desired. The plates C and Z in this Figure are shown as being lapped and soldered 20 together, the lapping and soldering having been effected when the plates were in strips and before they were stamped or cut out to form plates of the required sizes, the tongues being formed at the lapping to give strength and rigidity at those parts. I have spoken of fabrics, and it will be understood that felted, woven, knitted, or fabrics otherwise pre- 25 pared are equally applicable for securing the plates to or to form a lining as desired. The fabrics may be coated or impregnated with a solution of any acidulated liquor or body to assist the exciting action of the perspiration thrown off from the body. The parts of the fabric which are not covered by the plates may have an adhesive substance such as 30 one of those I have before referred to or a substance analogous to them by which the chain, band, or other article can be caused to adhere to the flesh with sufficient tenacity to hold it in place, or the plates themselves may be more or less coated with such or an analogous substance for the same purpose so long as the electrical or galvanic action upon the parts 35 affected is not interfered with.

I have in Figure 7 represented one article of dress called a chest protector. This is shown as having metal beads or tinsel plates sewn on



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

to it in clusters in voltaic connection, the beads or tinsels being arranged in voltaic order for proper action upon the chest when the protector is in wear. This Figure is only given to show to what extent my Invention can be made available, it being clearly indicated by the foregoing that  
5 drawers, stockings, shirts, slippers, caps, or other article capable of being worn or applied to the body can have the plates, beads, tinsels, or other pieces of metal (positive and negative) attached to each other in voltaic connection.

Figure 8 shows a portion of a band or belt composed of narrow strips  
10 of metals C, Z, bent into flat spirals, the metals of each element being soldered together in voltaic order; this arrangement may have a lining or core of linen or other material or a backing, such as I have shown in Figure 9, the difference in this case being that the backing has two series of plates or elements to obtain a double or an increased action  
15 upon the parts to which the band or other article to which the plates are attached is intended to be applied, whether of the sparadrap class or not. These plates like any of the others can be affixed to the lining, to the backing, or to themselves by pins, studs, or other appliances as found convenient. The lining or the backing may be perforated, recessed, or  
20 channelled to hold absorbent or other material capable of retaining moisture, such as sponge or pulp, which may or may not be first impregnated or prepared with a salt or a chemical compound possessing exciting and depolarizing properties, or the plates themselves may be recessed, channelled, or bent to hold the absorbent or other body in  
25 place as well as to form the means of attachment to the lining or the backing if such is used with the plates.

Figure 10 represents one form into which I propose to shape my plates, say the copper ones C, so that the absorbent can be held under the folds, flaps, or overlappings, the other plates, say the zinc ones Z,  
30 being flat and attached direct to the backing, as will be seen by the sectional views, Figures 11 and 12. By this means a faulty plate or a weak element can be removed and a fresh one inserted with facility and without interfering with the other elements.

The second part of my Invention relates to the employment of  
35 magnetic belts, bands, or other articles and to the manufacture or formation of plates from magnetized steel, hardened, tempered, or annealed, by which magnetic action can be applied to any part of the human body, and the plates retained in position by a self-sustaining power



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

similar to that referred to in the first part, the plates being arranged in elements or in clusters to form compound magnetic staves or horse shoes.

Some samples of the magnetic elements are represented in Figures 13, 14, and 15, but any other form or shape of steel plates can be arranged 5 for the purpose. In Figure 13 the plates are alternately flat and bent, the flat ones having holes in them which correspond with other holes in the underlap of the bent plates to enable every two plates to be sewn to a backing by the same thread or attached by the same pin or rivet. Figure 14 shows a different method of arranging the plates so that only 10 two rows of stitching for each element are brought to the front of the band or article. Figure 15 represents another method; in this view all the plates are flat with prongs arranged in reverse order, the sewing being through both legs, as seen at the left of the Figure, or stuck onto the backing by shellac or other body, as seen in the right of the Figure, 15 the plates in the latter part having no perforations. In each of the plans last referred to the plates have corners, but they may be rounded off or formed of other shapes, or they may be composed of strips wound into spiral or other forms before or after they are arranged upon or to a backing or lining. 20

The third part of my Invention relates to the combination of electrical, galvanic, and magnetic elements in or to the same belt, band, or other article for the purpose of applying an electrical and a galvanic current conjointly with magnetism at the one time to the part affected, the 25 plates, beads, tinsels, or other pieces of metal being so shaped and arranged in combination with a backing or a lining and with or without a salt or a chemical compound substantially in the manner heretofore referred to in the first or the second parts of this Specification.

The fourth part of my Invention relates to certain improvements in the construction and form of bands referred to in the Specifications of 30 my previous Patents, No. 2656,<sup>61</sup> 773,<sup>62</sup> and 2740,<sup>63</sup> whereby I overcome many difficulties in the manufacture and in the application, so that they are more beneficial in use. The bands are composed of two wires, say C and Z, which are wound into spiral form and in a continuous manner along the band for any length, one of them, say the 35 copper C, being first covered with a thread in distant spirals to keep the two wires apart. This band is rendered flexible by cords being inserted into the edges, as shown in Figures 16, 17, and 18, and it is



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

kept excited for any length of time by an acid or salt, or a chemical compound with which sponge, paper, fibres, or a tissue in a central channel is impregnated or made to imbibe, the channel *j* being shaped at the time of winding the wires upon the mandril or other apparatus  
5 employed for the purpose. In some cases I dispense with the spiral wound thread at those places forming the flat face of the band so as to obtain the action of the metals upon the part affected; this may be accomplished by passing a hot iron sharply over the face to destroy the threads on the flat side after the band is made up. I prefer to sever  
10 the wires at about every 8 turns to form elements, but any number of turns may be employed for one element as found necessary. The channel or channels for the absorbent material or body may be of any shape and at any part of the band, but I prefer to form it or them at one side, which could form the back of the band, by this means I preserve  
15 the front of the band in a flat state for its better application to the body. The absorbent material or the substance used in lieu thereof can be inserted before or after the band is made up. In some cases the absorbent material would be built up of separate layers to obtain the necessary thickness or bulk, and the passage of the acid or other exciting  
20 liquid or body to or from the interior could be ensured by perforations. The material could also be affixed to the edge cords to prevent it shifting, the pinch of the wires upon the cords being sufficient to hold both the elements and the material in position.

The fifth part of my Invention relates to the construction of fasteners  
25 for the chains, bands, or garments before referred to, or to any other form or arrangement of article by which electrical galvanic currents or magnetism can be produced, or a combination of such currents. The fastener is composed of two plates *k*, *k*<sup>1</sup>, hollowed out or cupped by dies for retaining the ends of the band or chain between them, as represented  
30 in Figures 18 and 19. One of the plates has a slotted hole *l* in it for a stud *m* to pass through after it has been pushed through the coils of the wires or the links of the chain, as the case may be. When the plates are brought together and the stud turned a quarter round for its shoulders to rest upon the solid portion of the upper plate, as seen  
35 in Figure 17, to hold the fastener in place. The base of the stud is enclosed in a washer or a cap *n* soldered in the plate *k*<sup>1</sup> so that it can turn freely for fastening or for unfastening the plates, which washer or cap may have a lug *p* on it to form the means of attaching another



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

band or chain to increase the length, so that should the band or bands be twisted round the leg or the arm of a patient, it can be done with facility. I prefer to make the stud plate  $k^1$  of various sizes and of different metals, to enable them to act as pole plates for localising currents. One of the plates may be much larger at one end than the other at the opposite end, as I have represented in the Figures 16, 17, and 20, so that the size of the touching can be reduced at pleasure by drawing a canvas bag over the surface to the desired extent, the drawing in of the bag being effected by a string or cord sewn or "let" into the edge; the bag may however have perforations in it, so that the exposed parts of the plate only shall rest upon the affected part of the body; by this means the intensity of the current can be concentrated or enlarged as desired.

The next part of my Invention refers to chains, and consists chiefly in improvements in the construction and in the means of linking or connecting the elements together to form a chain of any required length of those chains described in the Specifications of my previous Patents, Nos. 582, <sup>66</sup>, 773, <sup>68</sup>, 2740, <sup>68</sup>, and 2062, <sup>69</sup>. The links or elements C, Z, are, according to one method, made of openworked plates, as shown in Figure 21, where a series of them are represented as linked together, the links or eyes  $y, y$ , being formed during the stamping out of the plate and before it is rolled or bent into a cylindrical shape, after which the eyes are bent at right angles for the cylinder of the next element to be passed through, or a cap or an end piece which fits it, as the case may be. The cylinder is of tubular form, and one end of it has a plug  $s$  of the same or some other metal insulated from the cylinder or of wood fastened into it, while the other end has a plug or stopper  $x$  representing the portion of the element made in zinc wire covered in distant cotton spirals wound spirally upon a pin, and which can be withdrawn and replaced without disconnecting the links or elements. The stopper fits a short length of tube  $w$  fastened in the cylinder in an insulated manner to prevent false contacts. The plug last spoken of has a notch in its side, into which the finger nail or a tool can be inserted for withdrawing it from the cylinder. There is a space between the core wire and the outer cylinder, into which a salt or a chemical compound containing depolarising properties can be placed for the purpose of charging the elements, or the space may be filled up with sponge, pulp, or other porous body capable of retaining a solution of



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

exciting acid for maintaining a constant electrical or galvanic action. If a chemical compound is employed I prefer that bi-oxide of manganese should be made into a paste with or without the admixture of graphite powder by sulphite of potassium and a solution of some salt, or the  
5 compound may be composed by bi-chloride of mercury with other ingredients and a liquid, but I prefer the first-named mixture. In some cases I fit a sleeve or cylinder C<sup>1</sup> also openworked but without lugs or eyes over the first-mentioned cylinder, so that I can at pleasure by shifting the sleeve close up the apertures, its solid parts taking over  
10 the opening of the cylinder C. The arrangement of the sleeve will be understood by referring to Figure 22.

These improvements in chains are most important, as each link or element can be so easily connected or disconnected from its neighbouring ones, and also because each cylinder can be replenished with a fresh  
15 core or with a fresh supply of the chemical compound.

The next improvement in chains consists in making the cylinders C of solid flat plates in the manner represented in Figures 23 and 24, the eyes *y* in the lugs or ears in this case being of different diameters, the larger one for taking over the end of the short tube *w* insulated from  
20 the cylinder into which it is inserted, the other for a screw pin *t* to be pushed through in forming the link connection with other elements, the pin being screwed into a plug of wood *s* or other material. I insulate the central wire from the outer cylinder of each link by the washers *x* of non-conducting material which become bound against the inside of  
25 the cylinder by their own flexibility, thus ensuring the central position of the stem with the wire of the opposite metal upon it, as shown in Figure 25, in which several links or elements are in position. The distance to which the screws are inserted limits the play of the links or elements and prevents false contacts.

30 In some cases I fasten on both ends of the cylinder short tubes in an insulated manner, round which the rings of the neighbouring element is linked into a chain, one side of the cylinder receiving the plugs connected with the zinc portion of the element, and the other side receiving hollow depolarizing cores connected to the plugs, by which it can be  
35 put into place or withdrawn. These depolarizing cores I make of a cylinder of porous paper on which are wound (on a mandril) stout threads in distance spirals. The depolarizing paste is made to surround the porous cylinder in a thickish layer, which is kept from falling off by



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

the spiral threads. When the effect of the paste is used up it can thus be easily changed for fresh ones.

The screw pin need not in all cases be a headed pin, as by making a fillet or beading on the short end tube, as seen in Figure 21, the outer end of the screw pin *t* need only be nicked, as shown in Figure 26. As 5 a modification I propose to thread the ends of the central wire so that it can be screwed into the plugs.

In Figure 27 I have shewn an openworked plate C, from which a cylinder can be formed with lugs *y, y*, at each end, which lugs are to be rolled up into eyes for taking over the short tube *w* at one end and over 10 the screw pin *t* at the other end of the next cylinder in making up a chain of a desired length. In stamping out cylinders in this manner there is a great saving of metal, as the lugs of each of them are cut from the ends of the plate, from which another cylinder can be cut.

I do not confine myself to the use of one central wire nor to one 15 supply of chemical compound to each cylinder, as the cylinder can be divided, so to speak, by the employment of two wires, as in Figures 28 and 29, Figure 28 being on a larger scale to show the parts more clearly. In this construction the central wire has a metal nut on its inner end, over which a leather disc is fitted, and which when pushed into the 20 cylinder forms itself into a cup shape, whereby a perfect insulation is established; the pasty compound is then inserted and a second disc is placed over the outer end of the central wire, upon which a metal disc is made to bear; this being pushed down causes the second disc to form a cup-like shape to insulate the cylinder from the wire at that end; 25 another disc *z* of insulating material is now placed over the wire and pressed down upon the edge of the cylinder C to prevent the lug or the ear of the next cylinder which embraces the pin or wire from making a false contact. The opposite end of the cylinder C is fitted in a like manner with a central wire, two cup discs, two metal discs, and a plain flat disc, 30 the inner ends of the two central wires being prevented touching by a coiled spring which bears against the inner cup discs of each central wire. By constructing a chain in this manner the positive pole or wire of each link is in direct voltaic connection with the negative pole of the next link or element throughout the whole chain. 35

Figure 30 represents another construction of voltaic chain, the outer plates C of which are trough-shaped for receiving the plates Z of the opposite metals which are enclosed or enveloped in a film of fibre or



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

tissue or in a chemical compound for maintaining a proper exciting and depolarizing action in the element. The plate Z of the opposite metal is doubled or folded over a wire, the ends of which pass through holes in insulating blocks fastened in the ends of each trough plate, the wires  
5 projecting far enough for the eyes or lugs of the next trough plate to take over for forming the voltaic connection of one element with the next.

Elements of this form can be made available for other purposes besides that of application to the human body, providing the troughs are made  
10 deep enough, and by being rigidly fixed in a frame in a manner such as I have represented in Figures 31 and 32, the frame being composed of ebonite sticks or rods A, A, tied in position by cross bars and screws. In making up a battery of this kind I form notches in the top edges of the trough-shaped plates leaving a projecting lip B to each of them,  
15 under which the ebonite side bars can take for holding each trough in position, the plates of the opposite metals holding themselves firmly in the centres of their respective troughs by the nip or pinch of the flaps J, which are bent outwards from the sides of the notches of the neighbouring troughs, as will be understood by reference to Figures 33, 34,  
20 and 35, the flaps being formed on one side only of each trough. I groove the flaps J after they are turned outwards to hold the plates Z of opposite metal, which are pushed down into the grooves. The troughs may be charged with a suitable exciting liquid and with or without either of the chemical compounds before spoken of.

25 Figures 36 and 37 represent a chain composed of a series of metal boxes C which contain the plates of the opposite metal Z upon wires, the ends of which are passed through insulating blocks K, one of which is shown detached in Figure 38. The side edges of the block are recessed for the edges of the notch in the box to take into, it being made  
30 to the exact size of the notch, so that it becomes bound in position thereby, or I form a lip B, Figure 39, on the top edge, as before referred to, to hold the block in place, the lip being burred down upon it after it is pushed home. The box in this last construction is stamped or formed from a flat plate (perforated, openworked, or left plain); the two side  
35 and the two end pieces are then turned up, the lugs being formed on the end pieces, and also ears for carrying the lid or cover by which the exciting wet conductor or compound is kept in place, the lid being hinged to the ears in the ordinary manner. I propose to make one of the side



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

pieces to act upon the lid like a spring, so that when the lid is closed down it is prevented shifting by accident or otherwise unless a pressure is applied under it.

And having now described the nature of my said Invention, and in what manner the same is to be performed, I declare that I claim,— 5

Firstly. The general construction and combination of plates or other pieces of metal for forming chains, bands, garments, or other articles as herein-before described when such are intended for treating diseases of the human body.

Secondly. I claim the modifications herein-before referred to in such chains, bands, garments, or other articles. 10

Thirdly. I claim the construction of fasteners in the manner and for purposes set forth.

Fourthly. I claim the employment of the trough-shaped battery for other purposes than that of application to the human body as herein- 15 before set forth; also the special formation of the flaps by which the battery is made rigid.

Fifthly. I claim the means of securing metal plates upon or to a fabric as shown in Figures 1, 2, 3, 4, 5, and 6 of the accompanying Drawings, as well as the formation of lips *a*, *b*, *c*, *d*, in or from such plates, as 20 herein-before described.

Sixthly. I claim the employment of flat strips of metal bent into spiral form and arranged upon or to a fabric in the manner and for the purposes described.

Seventhly. I claim the employment of steel plates arranged in groups 25 or elements upon or to a fabric for the purpose of applying portable magnetism to the human body as described.

Eighthly. I claim the combination of metal plates forming elements by which an electrical galvanic current conjointly with magnetism can be applied to the human body, substantially in the manner and for the 30 purposes set forth.

Ninthly. I claim the construction of bands of spirally wound wire in which channels are formed for holding and retaining an absorbent material, substantially in the manner and for the purposes described.

Tenthly. I claim specially the construction and arrangement of the 35 parts of the chain elements shown in Figure 21 of the Drawings, together



*Pulvermacher's Impts. in the Construction of Electric Chains, Bands, &c.*

with the means of insulating the metals C, Z, and the mode of attaching one element to the next, as described.

Eleventhly. I claim the employment of hollow cylindrical cores serving either as wet conductors or as depolarizing agents, or as both, 5 when such are inserted into the opposite ends of the cylinders to that at which the zinc is inserted, so that the zinc or the cores can be withdrawn for changing without interfering with the other, as herein-before described.

Twelfthly. I claim the employment of an openworked sleeve-like 10 shutter upon the cylinder C, also openworked, as herein-before described and shown.

Thirteenthly. I claim the employment of bi-oxide of manganese or a compound composed of bi-oxide of manganese, bisulphite of potassium, and graphite powder in a moulded or a pasty state in the several 15 chains or bands herein-before described for the purpose of exciting and depolarizing the elements thereof.

And, fourteenthly. I claim the means herein-before described of affixing chains, bands, garments, or other articles upon the human body by which a self-sustaining and permanent electrical, galvanic, or magnetic 20 action separately or combined can be maintained upon the part or parts of the body affected.

In witness whereof, I, the said Isac Louis Pulvermacher, have hereunto set my hand and seal, this First day of December One thousand eight hundred and seventy-one.

25

I. L. PULVERMACHER. (L.S.)

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LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
Printers to the Queen's most Excellent Majesty. 1871.



I, Petermannacher, of the City of London, do hereby certify that the following is a true and correct copy of the specification of my invention, as filed in the High Court of Justice, in the City of London, on the 1st day of December, 1870.

With the means of insulating the metals C, N, and the mode of attaching one element to the next, as described.

Eleventhly, I claim the employment of hollow cylindrical cores serving either as wet conductors or as depolarizing agents, or as both, when such are inserted into the opposite ends of the cylinders to that at which the zinc is inserted, so that the zinc or the cores can be withdrawn for changing without interfering with the other, as herein-before described.

Twelfthly, I claim the employment of an openworked sleeve-like shutter upon the cylinder C, also openworked, as herein-before described and shown.

Thirteenthly, I claim the employment of bi-oxide of manganese or a compound composed of bi-oxide of manganese, bisulphide of potassium, and graphite powder in a moulded or a pasty state in the several chains or bands herein-before described for the purpose of exciting and depolarizing the elements thereof.

And, fourteenthly, I claim the means herein-before described of affixing chains, bands, garments, or other articles upon the human body by which a self-sustaining and permanent electrical, galvanic, or magnetic action separately or combined can be maintained upon the part or parts of the body affected.

In witness whereof, I, the said Isaac Louis Petermannacher, have hereunto set my hand and seal, this 1st day of December, 1870.

ISAAC LOUIS PETERMANNACHER. (s.s.)

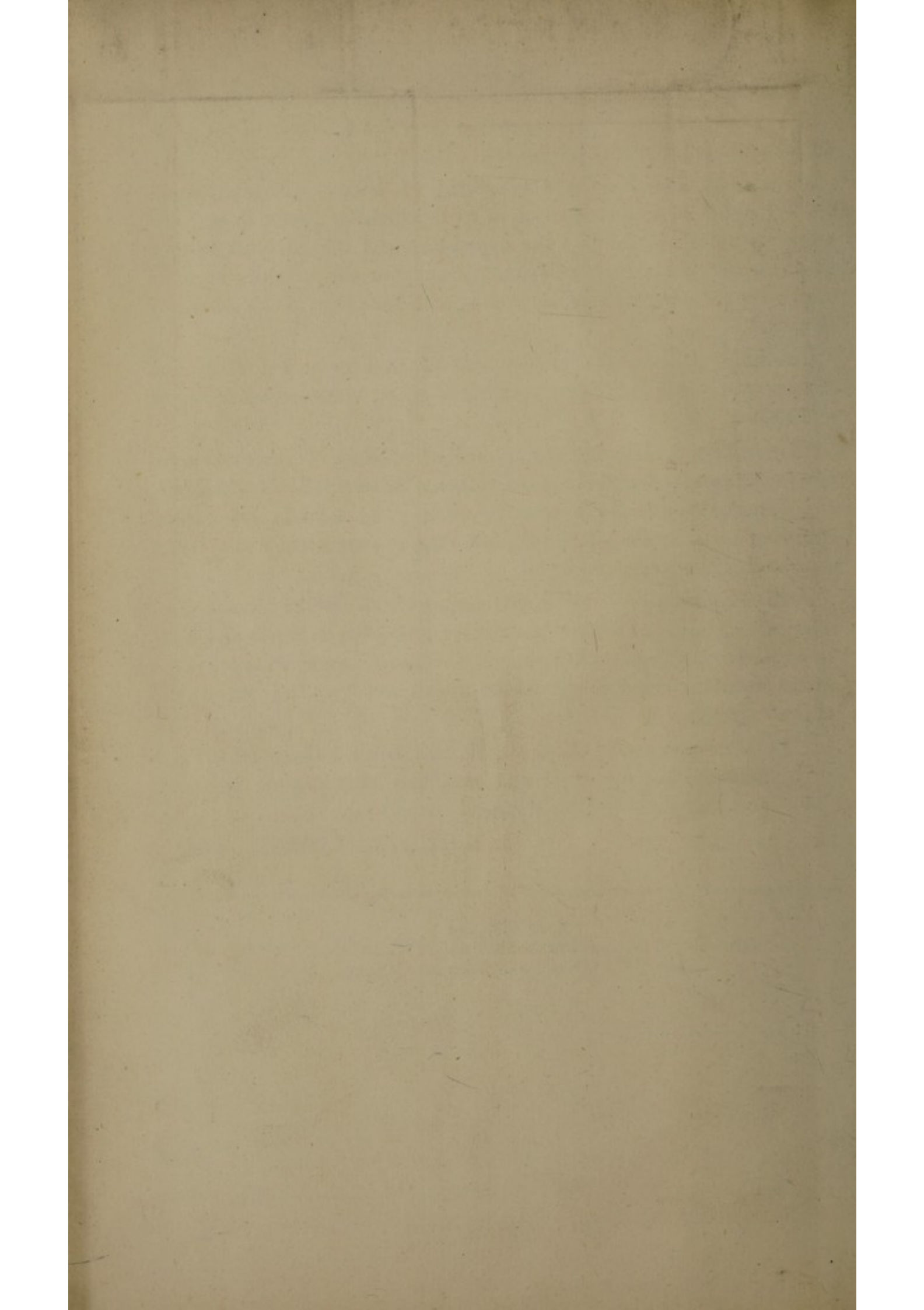
LONDON:

Printed by GEORGE EDWARD RYER and WILLIAM STROTHERWOOD,  
Printers to the Queen's most Excellent Majesty. 1871.

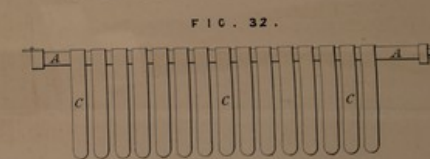
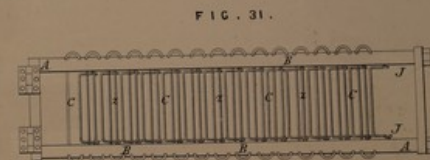
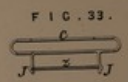
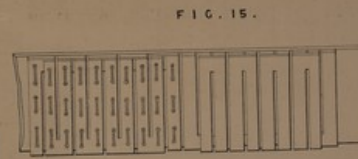
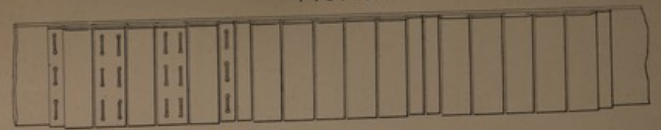
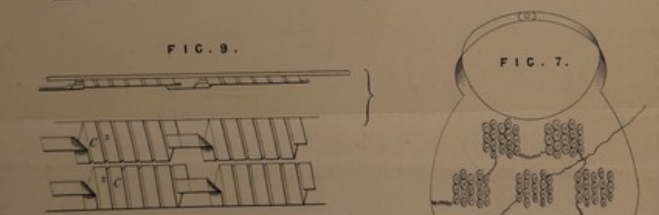
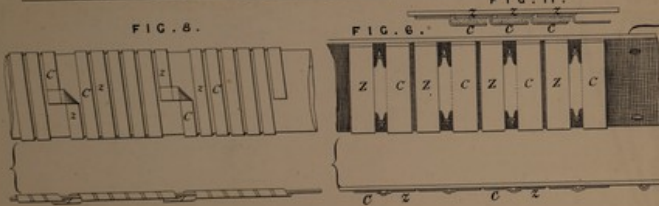
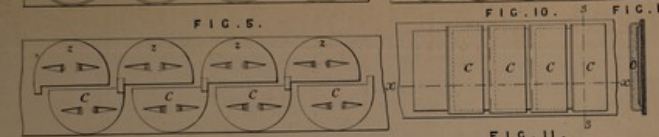
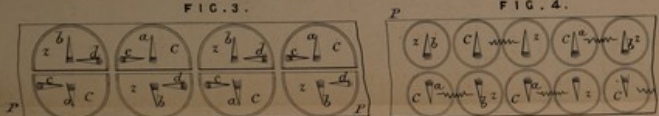
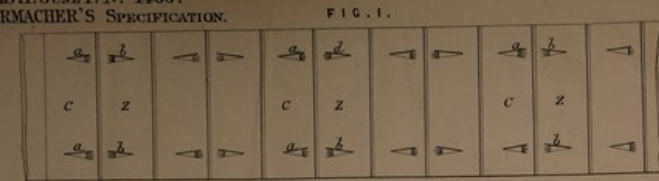


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FIG. 16.



FIG. 18.



FIG. 17.

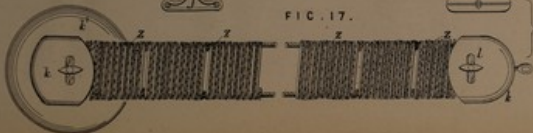


FIG. 20.



FIG. 18.



FIG. 19.

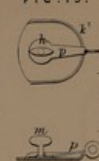


FIG. 28.

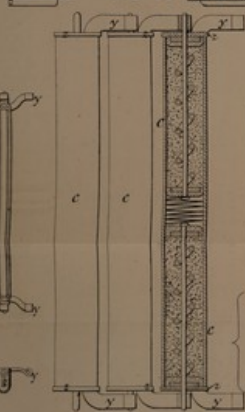


FIG. 29.

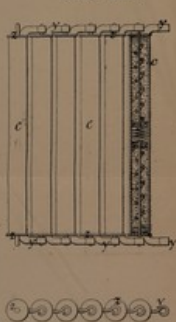


FIG. 30.

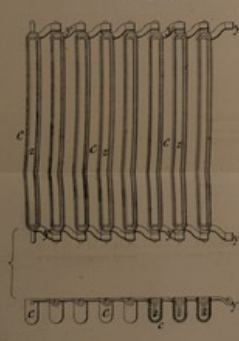


FIG. 36.

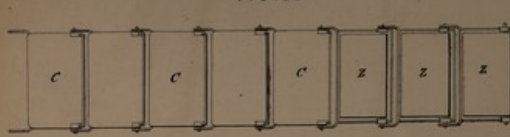


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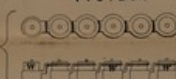


FIG. 39.



FIG. 38.

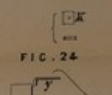


FIG. 24.



FIG. 23.

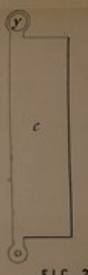


FIG. 27.



FIG. 22.



FIG. 26.



FIG. 21.



The filed drawing is not colored.

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