No. 780,559. PATENTED JAN. 24, 1905.

C. H. FARMER.

FOLDER.

APPLICATION FILED MAY 28, 1903.

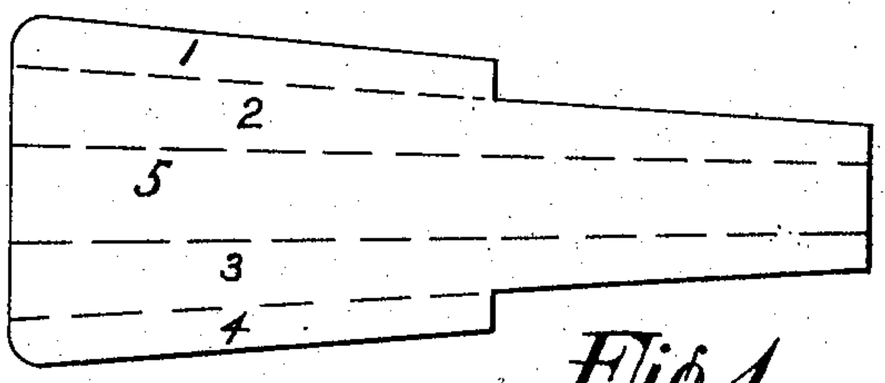

Fig. 1

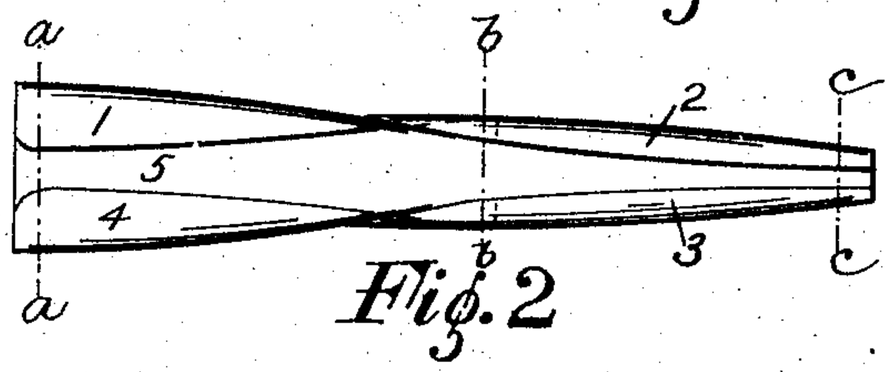

Fig. 2

Fig. 2a

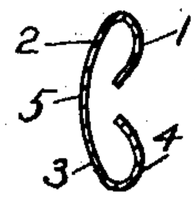

Fig. 2b

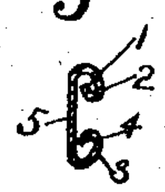

Fig. 2c

Fig. 3

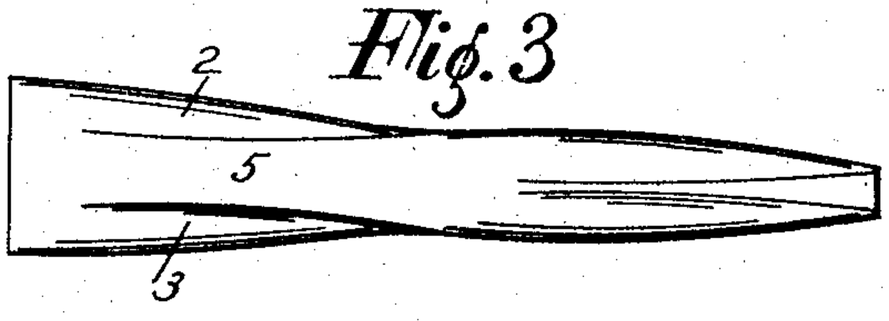

Fig. 4

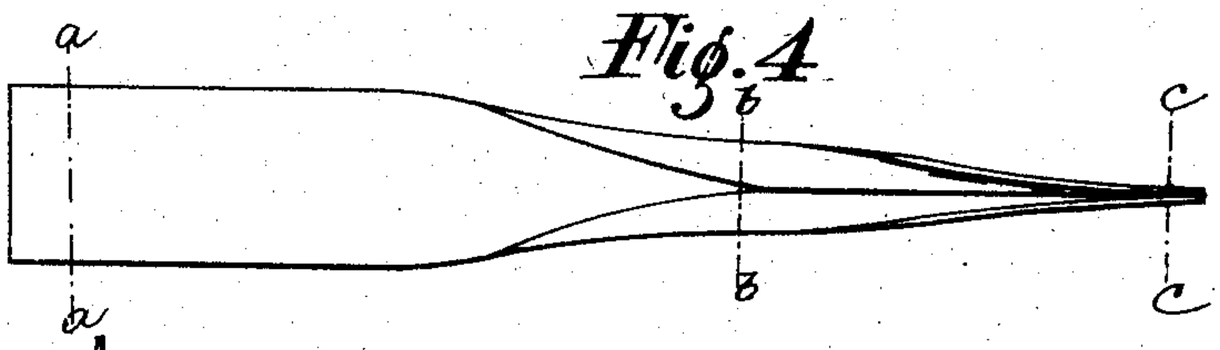

Fig. 4a

Fig. 4b

Fig. 4c

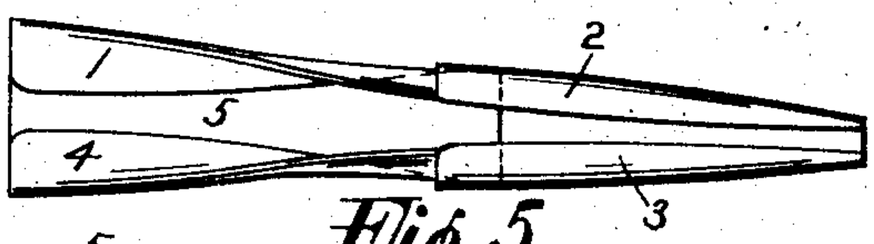

Fig. 5

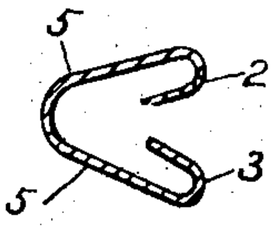

Fig. 6

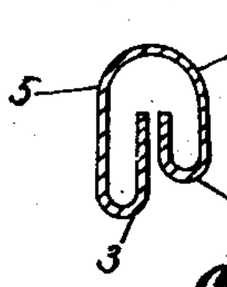

Fig. 7

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No. 780,559. Patented January 24, 1905.

UNITED STATES PATENT OFFICE.

CHARLES H. FARMER, OF NEW YORK, N. Y.

FOLDER.

SPECIFICATION forming part of Letters Patent No. 780,559, dated January 24, 1905.

Application filed May 28, 1903. Serial No. 159,114.

To all whom it may concern:

Be it known that I, CHARLES H. FARMER, a citizen of the United States of America, residing at New York city, State of New York, have invented certain new and useful Improvements in Folders, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same, in which—

Figure 1 is a plan view of a blank suitable for the formation of my folder. Fig. 2 is a view, slightly in perspective, of a complete folder. Figs. 2^a, 2^b, 2^c are cross-sectional views of said folder, taken on lines *a*, *b*, and *c*, respectively. Fig. 3 is a bottom face view of said complete folder. Fig. 4 is a view, slightly in perspective, of a piece of fabric, showing the folds as they are formed in the folder. Figs. 4^a, 4^b, 4^c are cross-sectional views of the piece of fabric shown in Fig. 4 on lines *a*, *b*, and *c*, respectively, of Fig. 4. Fig. 5 is a view of such a folder as that of Fig. 2 made in two pieces for convenience of manufacture. Fig. 6 is an enlarged 2^c; and Fig. 7 is a section, on a similar line, of an enlarged modification of Fig. 2, in which section 3 has only a half-turn in its entire length, and section 2 has substantially a whole turn.

My invention relates to devices for automatically folding fabrics; and it consists in a device having a succession of sections so formed as to automatically fold a flat fabric into a completed strip having what is called a "double" fold, though, in fact, it is a triple fold—that is, each edge is folded in and then the two folded portions are folded together, leaving no exposed raw edge and producing a fabric of four thicknesses at one part or edge, the other side or edge having two or more thicknesses, according to the depth of the respective folds.

Heretofore it has been generally considered impossible to automatically fold goods cut lengthwise so as to produce the double fold above described in a single device, and the general custom has been to first fold in the edges, producing a fabric such as is shown in Fig. 4^b in one device, and press the folds in place, and then form the second (third) fold in a separate machine, again pressing the folded goods that they may retain the form thus given to them; but in my device the entire series of folding operations is performed in one machine, thus saving much time and obviating the necessity of the intermediate pressing. Sometimes pressing is entirely omitted.

In making my folder I take a piece of material, preferably sheet metal, such as the blank of Fig. 1, though it is not imperative that it should taper. Considered in parts, it has four sections 1 2 3 4 and a connecting-strip 5. Sections 2 and 3 extend substantially from end to end of the device and are respectively adjacent to the connecting-strip 5. Sections 1 and 4 extend a portion (preferably nearly half) of the distance from the rear end of the device and are respectively outside of but adjacent to sections 2 and 3. At the rear end sections 2 and 3 and connecting-strip 5 are together preferably given an outward convex bend to facilitate the proper guiding of the fabric, and this bend or curve continues until at or about the line where sections 1 and 4 terminate, at which point said sections 2 and 3 should have received substantially a half-turn—that is, the face which was the upper face in the flat blank will have been turned over to such an extent that it faces downward and what was the under face of this section as a blank will at this point face upward; but at this point the floor or wall composed of strip 5 is preferably flat, as in the blank. The line of the edges of sections 2 and 3 where they join sections 1 and 4 will then present somewhat the appearance of a spiral curve. Sections 1 and 4 are joined to said edges, and of course their edges next sections 2 and 3 have the same form as the edges of said sections 2 and 3; but I also bend these sections so that at the rear they curve over and inward, as in 2^a, and this curve is continued and increased until at the front ends they are turned inward and away from each other, substantially as shown in Fig. 2^b, having thus altogether received progressively nearly or quite a full turn from their positions in the blank form. The floor or wall composed of strip 5 is preferably substantially flat.

The machine thus far, as will be manifest

to any one acquainted with folders, will automatically turn in and fold down each outer edge upon the main strip of the fabric, and at this point in its progress therethrough it will have in cross-section the form shown in Fig. 4^b. Now I give to one or both of the further parts of sections 2 and 3 at their front extremity another turn.

If the completely-folded fabric is to have the form of 4^c, each section 2 and 3 is gradually turned from its half-turned position (at or near the extremities of wings 1 and 4) till it has substantially a quarter-turn more, carrying with it of course in this latter bending the adjacent parts of connecting-strip 5, so that those parts (considered from their first position) have substantially a quarter-turn, the remaining portion of strip 5 being preferably creased to facilitate this operation and also to act as a guide for the fabric to be folded. The result is in this form of device that the front end of my device presents itself substantially the appearance of a double-folded fabric in which sections 2 and 3 are folded over upon the main body 5, and that is then folded centrally, bringing the two folds 2 and 3 over and in line, the face of one opposing that of the other, and upon the fabric being forced outward from line *b* through the space left for it between the sections and the body it (the fabric) will undergo what may be termed the "second" operation and be automatically forced into the final and desired form, such as is shown in cross-section at Fig. 4^c, and though the last turn is called a "second" operation it and the so-called "first" are merely sequential steps in one continuous operation by which from a flat band the fabric is converted into a so-called "double-fold" fabric. Thus the edges of the fabric are first turned in to make the first folds—one on each side—then those folds are folded together. If sections 2 and 3 alone were used, the fabric would slip out on one side or the other; but the sections 1 and 4, extending inward and having the material folded over them, respectively, prevent such slipping and hold the fabric in position while the final fold is in course of formation.

If the completed fabric is to have the form shown in Fig. 7, then one of the inner sections—say 3—receives no more than the half-turn already described—that is, said intermediate section 3, having been bent to the position shown in Fig 2^b, is bent no more; but the intermediate section 2, (which in 2^b has been bent to the same degree as section 3,) together with section 5, receives all the twist thereafter given. It is not only brought over to a horizontal position, as shown in 2^c, but receives still more twist, so that it passes the horizontal and again assumes the vertical position, as shown in Fig. 7, section 3 having remained in the position substantially shown in Fig. 2^b, but Fig. 7 being on a line similar to that of 2^c (in the varied device, however) outer sections 1 and 4 of course fail to appear. It is therefore plain that but the additional twist thus omitted from section 3 is added to wing 2 and that and the adjacent part of body 5 instead of receiving substantially a quarter-turn to bring it to the position shown in Fig 2^c receives substantially gradually a half-turn to bring it to the position shown in Fig. 7—that is to say, from the position shown in Fig. 2^b the then outer faces of sections 2 and 3 are to be brought to positions facing each other, which will require one hundred and eighty degrees of twist. That one hundred and eighty degrees may be divided equally, ninety degrees to each, as in the device of Fig. 2, or otherwise apportioned, as desired, even to the giving the whole additional twist to section 2 and no more to section 3, or vice versa. It will thus be seen that sections 2 and 3 considered as a whole receive altogether from end to end one and a half twists, one-half to each at first and one-half more apportioned between them for the remainder of their lengths.

Different sizes of bands of course require different-sized folders, and the width of the folds may also be modified as desired.

If a very narrow fold on each edge and a comparatively wide finished product is desired, the sections 1 and 4 will be narrow and the space between the inner edges of their junctions, respectively, with sections 2 and 3 at line *b* will be wider, and the width of the strip *b* will also be greater.

If it be desired that the completed fabric be four thicknesses for substantially its whole width, the parts will be proportioned to that end, the sections 1 and 4 of substantially the width of the completed fabric and sections 2 and 3 likewise. With this device it will be found that the difficulty experienced with prior folders—the running out of the fabric at the side of the folder, which was an almost momentarily-occurring trouble—has been entirely avoided.

In practice I usually bell the mouth of the folder somewhat to avoid catching of the material on the edges. I also sometimes for convenience of manufacture construct it in two parts, one substantially such as would be the equivalent of that shown from the rear end to line *b*, and the other that from line *b* to the front, though in such case I preferably make the second portion a little longer and of such size at the rear end that it will readily fit over the front end of the first portion. Such a device is exhibited in Fig. 5; but I do not limit myself to a device made in one or two or a dozen pieces, as that is optional with the constructor. Neither do I limit myself to one made of sheet metal, though no one would probably (if free to choose) use anything else; but it could be forged or cast or made of wood or other material. It is the form of the device I desire to secure, however that may be created,

and when I say "bend" or "turn" or "twist" I have reference to the form to be produced rather than to the method of producing it. A cast folder would not, of course, be bent, but its outlines would have the curves I have described as bends or twists.

The soul of the invention is the additional sections 1 and 4, which hold the forming first folds while the additional fold is in course of formation.

For convenience of description I call the sections 1 and 4 "outer" sections and 2 and 3 "inner" sections.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A folder composed of a body, having two inner sections on its respective sides, which extend from rear to front, twist gradually to a position, first substantially one-half of a complete turn from their first position, at a point between their ends, and then, at and near the front extremity, to a position facing each other, and an outer set of sections, which, at the rear, extend laterally inward toward each other, from the respective edges of the inner set of sections, and longitudinally to a point at or near the middle of the device, twist gradually in their length to a position where they lie under the inner sections respectively, at the line where the latter have a half-turn, and extend edgewise toward the outer walls of the folder, all substantially as set forth.

2. A folder composed of a main body slightly curved at the entering end, flattened toward its mid-length and from thence having a gradual bend, on a median line, each side up toward the other, so that at the delivery end the parts substantially face each other, also inner sections, one on each side of the said body, and of substantially equal length, having a gradual twist inward from end to end, to such extent that about midway of their length the twist substantially equals one hundred and eighty degrees and at their farther ends their twist is substantially two hundred and seventy degrees; and other outer sections, substantially half as long, respectively adjoining the said inner sections on the sides away from the main body; which outer sections, at the entering end, are so formed as to face the inner sections and from that line to their other extremity, having a twist of substantially one hundred and eighty degrees, all combined to operate substantially as and for the purpose set forth.

3. A folder composed of sections, whose combined width at the entering end, is greater than their combined width at the points of delivery; and consisting of a main body slightly curved at the entering end, flattened toward its mid-length and from thence having a gradual bend, on a median line, each side up toward the other, so that at the delivery end the parts substantially face each other, also inner sections, one on each side of the said body, and of substantially equal length, having a gradual twist inward from end to end, to such extent that about midway of their length the twist substantially equals one hundred and eighty degrees and at their farther ends their twist is substantially two hundred and seventy degrees; and other outer sections, substantially half as long, respectively adjoining the said inner sections on the sides away from the main body; which outer sections, at the entering end, are so formed as to face the inner sections and from that line to their other extremity, have a twist of substantially one hundred and eighty degrees, all combined to operate substantially as and for the purpose set forth.

4. A folder in two separate parts, one fitted to the other, the first part composed of a main body, two inner sections, one on each side of the main body, and two outer sections, respectively adjoining the inner sections, on the sides away from the main body, formed substantially as described, with the free edges of the outer sections extending toward each other at the rear end, but at their delivery ends turned away from each other and under the inner sections respectively and the second part composed of a main body substantially flat at one end and of a trough-like form at the other, and two sections, one on each side of the main body, corresponding in general to extensions of the main body and the inner sections of the first part, but with the outside edges of the said sections extending toward each other at their rear ends and having bends throughout their length and, at their delivery ends, their faces substantially opposite one to the other, and their free edges extending toward the main body all combined substantially as set forth.

5. A sheet-metal folder, having an outer section on each side extending a portion of its length, their free side edges extending toward each other at the rear ends, but turned inward and away from each other at the front ends, another and inner set of sections adjoining the outer set, and connected thereto, extending toward each other at the front ends at the first or outer set, also extending forward from that point to positions opposite one to the other, at their front or delivery ends, and a body connecting said inner sections, flat at the point where the outer set of sections terminate and turned so that at the forward ends, the inner second set of sections have their outer faces opposite, one to the other, all substantially as set forth.

6. A folder having an outer section on each side extending a portion of its length, their free side edges extending toward each other at the rear ends and inward and away from each other at the front ends, another and inner set of sections adjoining the outer set and connected thereto, which extend toward each other at the front ends of the outer set and also ex-

tend forward from that point to positions opposite and facing each other, at the front ends, and a body connecting said inner sections, convexly curved at the rear, flat at the point where the outer set of sections terminate and turning as it approaches the front end, whereby at the forward ends, the inner set of sections have their outer faces opposite one to the other, all combined substantially as set forth.

7. In a folder the combination of a body, an inner section on each side of the body, outer sections extending from the edges of the inner sections which are not adjacent to the body, which outer sections at their forward ends extend under the faces of the inner sections with their free edges away from each other, a body extending forward from the line of the front end of the outer sections, inner sections, one on each side of said extended body, which extend forward along said extended body and, at the ends farthest from the front ends of the outer sections, extend downward from the edges of said extended body, all substantially as set forth.

8. In a folder the combination of a body, an inner section on each side of the body, outer sections extending from the edges of the inner sections which are not adjacent to the body, which outer sections at their forward ends extend under the faces of the inner sections with their free edges away from each other, a body extending forward from the line of the front end of the outer sections, inner sections, one on each side of said extended body, which extend forward along said extended body and, at the ends farthest from the front ends of the outer sections, have their faces opposite one to the other, the combined twist of these inner sections along the extended body together substantially equaling one hundred and eighty degrees.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 9th day of May, 1903.

CHARLES H. FARMER.

Witnesses:

M. E. PRYOR,

A. G. N. VERMILYA.