H. KOREN AND D. A. CLARK.

BOX.

APPLICATION FILED SEPT. 5, 1914.

1,318,771.

Patented Oct. 14, 1919.

2 SHEETS—SHEET 1.

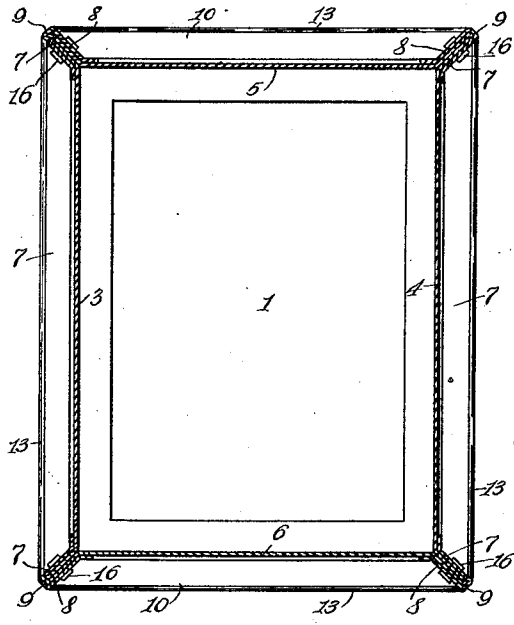


Fig. 1

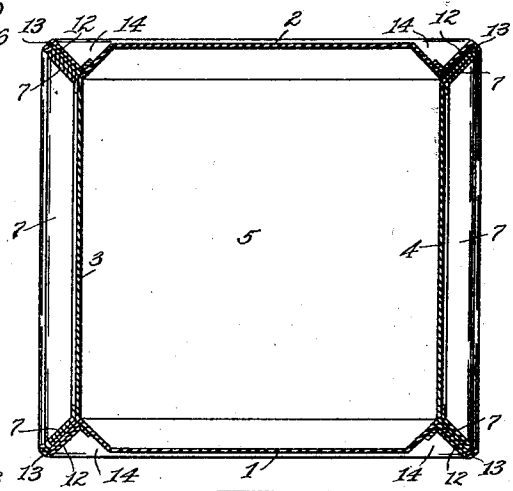


Fig. 2

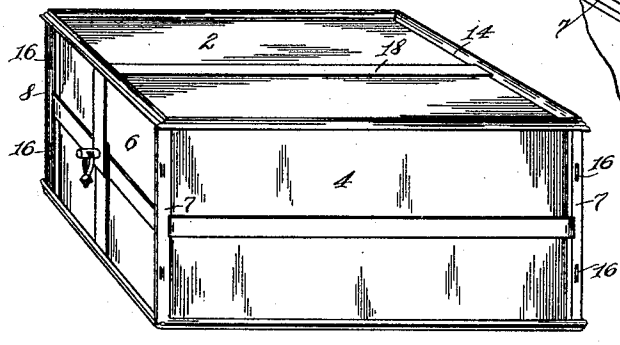


Fig. 4

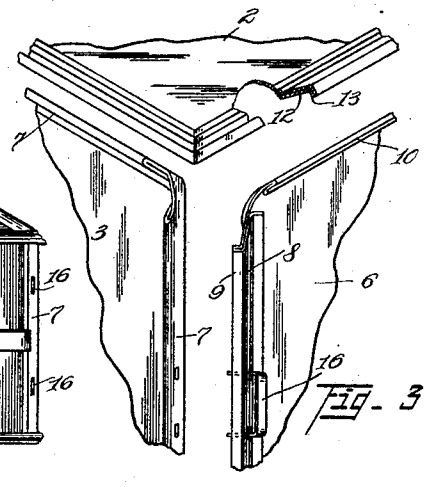


Fig. 3

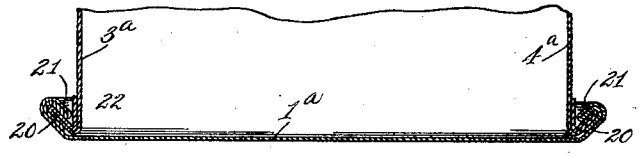


Fig. 9

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2 SHEETS—SHEET 2.

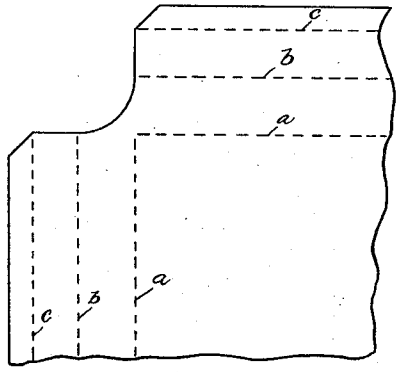


Fig. 5

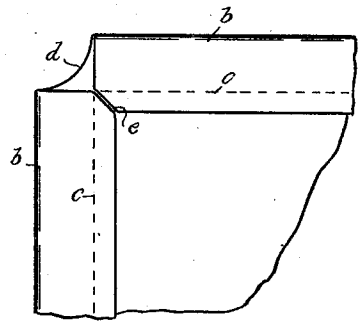


Fig. 6

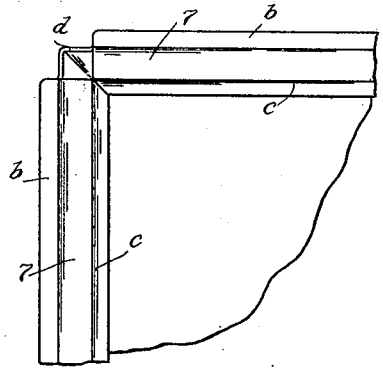


Fig. 7

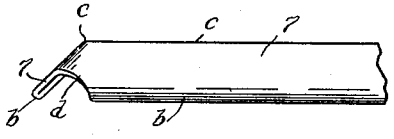


Fig. 8

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UNITED STATES PATENT OFFICE.

HARALD KOREN AND DON A. CLARK, OF CLEVELAND, OHIO, ASSIGNORS TO THE DIAMOND STAMPING WORKS COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

BOX.

1,318,771. Specification of Letters Patent. Patented Oct. 14, 1919.

Application filed September 5, 1914. Serial No. 860,496.

To all whom it may concern:

Be it known that we, HARALD KOREN and DON A. CLARK, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Boxes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to the general class of containers in which goods, wares and merchandise can be packaged for purposes of storage or transportation, and the general object of the invention is the provision of a construction and arrangement of parts permitting a box or like container to be made of sheet metal with a weight not materially if any greater than that of the slightest practical wooden box of like size, while having a strength far in excess of any wooden container. Another object of the invention is the provision of a metal box having an improved corner and edge construction, permitting the box to be constructed of a minimum of parts, while possessing a maximum of strength and tightness; the provision of a metallic box construction hav- the provision of a box having a smooth and ing a symmetrical arrangement of members; unbroken interior; the provision of a box which may be made of thin metal and with a minimum number of operations; the provision of a box which can be operated by a single person under all conditions and which can be used and reused many times without becoming so damaged in transit as to become worthless; the provision of a box of such construction that upon damage in transit it can easily be repaired; the provision of a box having improved sealing qualities whereby theft of its contents may be prevented; the provision of a container of this character which can be readily knocked down for return to its starting point; while further objects and advantages of the invention will become apparent as the description proceeds.

Our experiments have shown that a box to possess the greatest efficiency per pound of metal must consist essentially of a rigid frame defining the edges of the box, with filling or web members in said frame, the latter being of thin metal under tension. Preferably this frame is made integral with the webs or fillings, and in our preferred embodiment is formed by folding over the marginal edges of the metal sheets, and afterward stamping the sheets in a punch press so as to give the same a tray or dish form having the folded portion as a rim. This operation adds strength to the edges by reason of the folding and the drawing operations thus forming a kind of frame, and also stretches the metal of the sheet or web thereby placing it under tension.

The angle between this rim and the metal of the web is preferably about 135°, so that when adjacent box members are brought together the adjacent rims make close facial contact with each other, thus permitting their securing together in any one of several different ways thus increasing the stiffness of the frame work above mentioned. Also in many cases one of the rims will be formed with a lip or flange adapted to embrace the edge of the abutting rim so as to prevent side shifting.

All the above requirements and advantages, together with others soon to be described, are combined in the constructions illustrated in the drawings accompanying and forming a part of this application, wherein we have illustrated in detail certain boxes constructed in accordance with our invention, together with certain blanks and steps employed in the construction thereof, although it will be understood that other specific constructions than the one here illustrated could be adopted within the scope of our invention and within the meaning of the claims hereto annexed. In these drawings: Figure 1 represents a horizontal, sectional view taken through a box of our invention; Fig. 2 represents a vertical, transverse, cross-sectional view through the same box; Fig. 3 is a perspective view illustrating in enlarged scale the edge and corner construction of our improved box, the parts being slightly separated in order to show their individual shape; Fig. 4 is a perspective view of a complete assembled box secured together and sealed ready for shipment; Fig. 5 illustrates one corner of a blank used in the construction of our improved box, it being understood that in the preferred form here illustrated all corners are alike; Fig. 6 is a similar view of the same blank showing the edges folded over, which is the second operation thereon; Fig. 7 is a similar view of the same blank showing the shape

of the parts after forming, which is the third operation; Fig. 8 is an edge view of the construction shown in Fig. 7; and Fig. 9 is a partial cross-sectional view of a slightly modified box, illustrating a different way of securing the sides and bottom together.

Describing the parts by reference characters, 1 represents the bottom, 2 the top, 3 and 4 the sides and 5 and 6 the ends of our improved box. Each of these members is formed of a smooth, flat plate of thin sheet metal having at its margin a rim 7, the rim projecting outwardly at an angle of approximately 135°. Each of the members has its opposite rims substantially symmetrical, although generally not identical with the engaging rims of the adjacent members, but complementary thereto. Thus, in the embodiment here shown, the margins of the sides 3 and 4 are formed with plain outturned rims 7—7, all of which are exactly alike. Similarly the end members 5 and 6 are provided with marginal rims 8—8, their extremities being formed with the laterally turned lips or flanges 9 adapted to overlap the rims of the adjacent members. The bottom and top margins of these members are, however, formed with plain rims 10—10 as shown in Fig. 3 similar to the rims 7—7 of the adjacent sections, thus forming a uniform seat for the bottom and top members 1 and 2. The top and bottom of the box are preferably formed at their margins with outwardly bent rims 12—12 adapted to rest upon the rims 7 and 10 of the side and end members, respectively, and having at their extremities the lips or flanges 13 adapted to overlap the edges of the rims beneath. Preferably the mid-portions of the top and bottom are struck outwardly as shown in Fig. 2 so as to bring their outer faces substantially level with the edges of the rims 12—12 and form an endless channel 14 adjacent thereto. The effect of this is to facilitate piling or stacking of the boxes, although it presumably decreases the strength and rigidity of these portions somewhat since it tends to separate the web portions from the frame portions. If desired, a similar construction could be adopted for the sides and ends, although the plain construction is preferred both by reason of strength and by reason of facility in making. Also this undercut arrangement is a matter of considerable convenience since it facilitates the grasping of the boxes by forming flanges upon which the fingers can hold. It will be understood that the arrangements illustrated in the accompanying drawings are somewhat exaggerated for purposes of clearness, and that in a commercial box the height of the rims is much less in proportion to the size of the members than is here illustrated.

In the simplest construction the adjacent members of the box are secured together by means of flexible metal staples 16 whose legs are inserted in spaced registering apertures formed in the marginal rims of the box members and afterward clenched. With the arrangement of flanges shown herein, nearly every strain or blow to which the box may be subjected will be transmitted to one of these lips or flanges, and will be taken up thereby without any excessive shearing strain upon the stables. Thus any outward pressure upon the sides 3 and 4 will be resisted by the flanges 9 and 13, and any outward pressure on the ends 5 and 6 will be opposed by the flanges 13; likewise any inward pressure upon the ends 5, 6 or the top and bottom 1, 2 will be withstood by the flanges acting upon the edges of the adjacent rims. Any inward pressure upon the sides 3 and 4 will find no flanges to rest against, yet the inclination of the abutting rims will take up so much of the pressure frictionally as to render the shearing force very small. As a consequence of this construction the container when fully assembled is extremely rigid, and advantage is taken of this fact for the sealing of the box, such sealing being preferably effected by the use of endless flexible metal ribbons 18—18 passing around the box in opposite directions and intersecting at 19, where they are secured together by a seal 20 of the usual or any suitable type, these ribbons being passed through registering apertures formed in the marginal rims of the box members. It will be impossible to shift these members sufficiently to open any part of the box without immediately indicating the fact that the container has been tampered with. The dish shaped formation of the box members affords a recess for these seals and shields them from accidental injury. The box is entirely complete without the seals which may or may not be used.

In the construction of our improved box we preferably take six blanks of thin sheet metal and cut the same by means of a punch press to the form shown in Fig. 5. In this view the dotted lines *a*, *b*, and *c* indicate the points where folds are later to come. The second operation consists of folding each of the marginal edges of this blank upon the line *b* so as to bring the line *c* upon the line *a* as shown in Fig. 6, there being left at each corner of the blank a gusset *d* connecting the region between *a* and *b*, and the marginal portions of the flaps between the line *c*—*c* and the extremities being mitered together at the corners of the blank as indicated at *e*. The third operation consists in drawing this blank between suitable dies so as to give it the dish or tray shape heretofore described, as a consequence of which an additional bending takes place upon the line *c*—*c*, and the gusset *d* is creased corner-wise so as to be taken up the necessary amount while still affording a bracing action to the rims.

The over all size of the blank is not materially decreased by this step, the necessary metal being obtained by the stretching of the web which is thus put under tension as already explained. Also the gussets are so shaped as to coöperate with the gussets of adjacent members in closing up the box corners, thus avoiding the open apertures frequently observable in prior devices.

The location of the crease *c* inside the edge of the folded flap increases materially the bracing action, while the striking of the side members in the manner described after the folding of the edges causes a stretching of the metal, which, owing to the elasticity of the metal, places the web under constant tension from the stiffer marginal edges. The result is a construction which will stand much hard usage without becoming bent, dented, or seriously deformed. However if any denting or deformation should occur, the regularity and symmetry of the sides renders it entirely feasible merely to return the member to the press, whereupon it can be restored to shape by a single blow so as to be rendered practically as good as new.

If desired a modified form of connection may be employed between various of the box members, so as to reduce the number of staples required and to facilitate the assembling of the members. Such a construction is shown in Fig. 9 wherein we have illustrated a modified form of joint between the side and bottom members of the box. In this construction the bottom member 1^a is formed with a substantially flat web portion terminating in the folded upwardly deflected rims 20—20, each of which has its marginal portion folded over inwardly as at 21—21 so as to define an open groove. The angle between the bottom 1^a and rim 20 is preferably about 135° as before, and the lip 21 is substantially parallel with this rim. The upright members 3^a and 4^a are formed at their lower edges with outwardly turned rims 22—22 formed by folding the metal as before, but in this case arranged at an angle of substantially 45° so as to permit their being hooked under the lips 21—21. The width of the various rims, lips, etc., is preferably such that all of the same come to close abutting contact when the members are assembled.

While we have described our invention in detail and pointed out at length the constructions and arrangements now preferred together with the reasons therefor, it will be understood that many changes may be made in minor points without sacrificing entirely the benefits hereby contemplated; wherefore we do not confine ourselves to the details herein set forth except as the same may be specifically recited in the claims hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described our invention, what we claim is:—

1. A rectangular sheet metal box formed of flat wall members each of which has its marginal portions folded outwardly upon itself and a part of such folded portion subsequently bent outwardly from the planes thereof at an angle of substantially 135 degrees and engaging similarly bent portions of adjacent members, one pair of opposite sides having its bent portions laterally extended to form lips which over hang the edges of adjacent side portions, each end member having its bent marginal portions laterally extended to form lips which overhang the edges of adjacent side members and each end member having its mid portion struck outwardly to bring the face thereof substantially level with the edges of the bent portions and place the metal under tension.

2. A rectangular sheet metal box formed of flat wall members each of which has its marginal portions folded outwardly upon itself and a part of such folded portions subsequently bent outwardly from the plane thereof at an angle of substantially 135 degrees and engaging similarly bent portions of adjacent members, one pair of opposite sides having its bent portions laterally extended to form lips which over hang the edges of adjacent side portions and each end member having its bent marginal portions laterally extended to form lips which overhang the edges of adjacent side members, and means surrounding the box and clamping the overhanging lips upon the edges of the adjacent portions.

In testimony whereof, we hereunto affix our signatures.

HARALD KOREN.
DON A. CLARK.

Witness:
BRENNAN B. WEST.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."