To all whom it may concern:

Be it known that I, HEYMAN ROSENBERG, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Sheet-Metal Structures and Fastenings Therefor; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the art of fastening together sheets of metal and other like relatively thin sheets of material.

The object in view is to easily, quickly and permanently fasten together in a simple and inexpensive manner a plurality of sheets of relatively thin material such as sheet iron and the like.

With this and other objects in view as will in part be stated and hereinafter become apparent, the invention comprises certain novel constructions, combinations and arrangements of parts as will be subsequently specified and claimed.

In the accompanying drawing—

Figure 1 is a view in side elevation of a screw illustrating one phase of an embodiment of the invention such as is adapted for use in the complete combination.

Figure 2 is a sectional view through two sheets of material with a perforating tool indicated in position for penetrating the sheets.

Figure 3 is a similar view with the tool shown as in the position assumed after completion of the penetrating operation.

Figure 4 is a view similar to Figure 3 of the parts with the tool removed, the parts being seen on an enlarged scale.

Figures 5 and 6 are similar views illustrating the screw of Figure 1, respectively, in its initial position and in its final position, Figure 6 showing the complete combination.

Figure 7 is an enlarged, detail fragmentary sectional view of the parts as seen in Figure 6.

Figure 8 is a view similar to Figure 6 showing more than two sheets connected together.

In the art of fastening together metallic sheets, various methods have been proposed and the one usually preferred for such construction work as cornices and metal trim on buildings, housings for blowers, and elsewhere where for various reasons it is impractical or undesirable to use solder, has been to employ bolts of the machine screw type engaging the plates at one face by the head of the bolt and at the other face by the nut of the bolt. Much difficulty has been experienced in fastening together sheets in this manner, both from the fact that it is frequently difficult to provide access to the nut, and from the fact that variations in temperature and vibrations cause the nut to loosen.

The object of the present invention is to overcome all of these difficulties by employing a construction which eliminates the need for a bolt having a machine thread and for a nut engaging the bolt, which construction is stable in every respect and which has throughout long and careful tests proved to remain absolutely tight notwithstanding vibrations and temperature variations.

Referring to the drawing by numerals, 80 indicates the body of a screw whose thread is of the form and pitch of what is known as a "wood screw" by which is meant the commercial iron screw adapted for use in wood. The body 1 tapers to a point at one end and at the other end is provided with the usual notched head 3. In other words, the screw is of the shape of the ordinary commercial wood screw, but differs therefrom in the fact that the screw is made of steel and that the thread 2 is hardened preferably by a special case-hardening process, as by the known cyanide process or its equivalent. The structure of the screw, therefore, consists essentially of a body whose thread is hardened while there is no attempt at or need for hardening of the body. Incident to the treatment in hardening the thread 2, the surface of the body of the screw may also be hardened, but that is an incidental result and not one necessary to the effective operation of the screw, the essential need being that the thread itself shall be hardened and provided with a cutting edge, such as seen at 2' in Figure 7, and that the body of the screw shall terminate in a tapered end with the thread corresponding tapering.

The sheet material to be connected together may have quite a wide variation in thickness, but must be sufficiently thin to be susceptible of perforation by some form of
punching apparatus whether manually or machine operated. Perhaps the widest field of utility of the present improvement in the art finds application in the connecting of relatively thin sheets of material such as galvanized iron, ordinary sheet iron, and tin coated or plated iron, commonly known as sheet tin, and like thin sheets of material, but it will become obvious that the invention is just as applicable to sheets of material having greater thickness. For the sake of illustration, however, I have selected the thinner sheets for disclosure of the invention herein, and to this end it will be noted that the two sheets of metal 4 and 5 are arranged in contact face to face, and the tool 6, which in the present instance is an ordinary hand punch having the usual limiting shoulder 7, is arranged with its point in contact with the plate 4 in position for penetrating the two plates. A blow on the punch 6, as by a hammer not illustrated or force otherwise applied, causes the punch 6 to penetrate the sheets 4 and 5 until the punch assumes the position indicated in Figure 3, resulting in the perforation of the two sheets and the formation of a burr on each, the two burrs being nested as clearly seen at 4' and 5' in Figure 4. The penetrating point portion of the punch 6 is of less diameter than the diameter of a circle such as would touch diametrically opposite points of any helix of the larger portion of the thread 2, and is preferably of approximately the size of the body 1, so that the screw cannot be introduced into the opening surrounded by the burrs 4' and 5' except by revolving the screw and thus causing the thread to cut a corresponding or female thread in the burrs 4' and 5'. As the thread 2 is tapered to the end of the body 1 the thread has an excellent opportunity to enter and get an effective start in the cutting of a female thread. For thin sheets of metal, it is usually sufficient to provide an ordinary hand-operated screwdriver for revolving the screw and thus threading the same down from the position indicated in Figure 5 to the position indicated in Figure 6. In doing so, the female thread is cut in the inner face of the burr 4' across the edge of the burr and across the edge of the burr 5' which slightly underhangs the edge of the burr 4', so that the thread of the screw assumes the position with respect to the burr seen in detail in Figure 7. The head 3 resting on the upper surface of the plate 4 and the thread 2 engaging the edge of the burr 5' cooperate to prevent separation of the sheets.

It should be obvious that the invention is not limited to the art of connecting any specific number of sheets, but the improved structure may comprehend more than two sheets as clearly indicated in Figure 8, wherein the sheets 4', 5' and 8 are connected by the screw 1 after the manner above set forth.

One of the essential features of the present invention, representing a valuable step of advance in the present art attaches to the fact that the opening through the nested burrs 5' is substantially cylindrical throughout that portion extending through the sheets. This cylindrical formation results from the use of the punch 6 of the form shown. This punch is provided with a tapering entering point followed by a cylindrical portion terminating in a stop and all the operator has to do is to place the punch on the sheets and deliver a sufficiently heavy blow to drive the punch through the sheets to the position indicated in Figure 3. Heretofore punches have been employed of the ordinary tapered type, but with them difficulty is experienced because the constricted taper of such punches causes the nested burrs to turn or roll outward or away from the axis of the punch so that a curved surface is presented which is more or less thus caused to be inaccessible to the action of the cutting thread.

What I claim is:

1. A metallic structure comprising a plurality of sheets arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets.

2. A metallic structure comprising a plurality of sheets arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets and the thread extending to the head of the screw.

3. A metallic structure comprising a plurality of sheets of metal arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, the wall of the opening being substantially cylindrical throughout that portion extending through the material of the sheets themselves, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets.

4. In sheet metal construction, the combination of a plurality of sheets of metal and a screw connecting said sheets, the said screw conforming generally in body and thread contour with that of a wood screw.
and having the thread hardened and extending substantially from the tip to the head of the screw, the sheets having been formed with an entering opening of a diameter less than the greatest distance between substantially diametrically opposite points of the larger portion of the thread, and the screw having been forced into the opening by forcible rotation of the screw until the thread cuts its way into the material of the sheets and brought the head into contact with one of the sheets.

5. In sheet metal construction, the combination of a sheet of metal and a screw extending therethrough, the screw having a tapered body and conforming generally in body and thread contour with that of a wood screw and having the thread hardened and extending substantially from the tip to the head of the screw, the sheet having been formed with an entering opening of a diameter less than the greatest distance between substantially diametrically opposite points of the larger portion of the thread, and the screw having been forced into the opening by forcible rotation of the screw until the thread cuts its way into the material of the sheet and brought the head into contact therewith.

In testimony whereof I affix my signature in presence of two witnesses.

HEYMAN ROSENBERG.

Witnesses:
ALMON B. CALKINS,
MARCEL K. SESSLER.
DISCLAIMER


Hereby enter their disclaimer of said claims 1, 2, 3, 4, and 5 of said United States Letters Patent No. 1,411,184, which claims are in the following words, to wit:

“1. A metallic structure comprising a plurality of sheets arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets.

“2. A metallic structure comprising a plurality of sheets arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets and the thread extending to the head of the screw.

“3. A metallic structure comprising a plurality of sheets of metal arranged with their faces in contact and formed with an opening surrounded by nested burrs of the material of the sheets, the wall of the opening being substantially cylindrical throughout that portion extending through the material of the sheets themselves, and a screw extending through the opening, the said screw being formed with a hardened thread of a size relative to the opening causing the thread to extend into the surrounding material of the sheets.

“4. In sheet metal construction, the combination of a plurality of sheets of metal and a screw connecting said sheets, the said screw conforming generally in body and thread contour with that of a wood screw and having the thread hardened and extending substantially from the tip to the head of the screw, the sheets having been formed with an entering opening of a diameter less than the greatest distance between substantially diametrically opposite points of the larger portion of the thread, and the screw having been forced into the opening by forcible rotation of the screw until the thread cuts its way into the material of the sheets and brought the head into contact with one of the sheets.

“5. In sheet metal construction, the combination of a sheet of metal and a screw extending therethrough, the screw having a tapered body and conforming generally in body and thread contour with that of a wood screw and having the thread hardened and extending substantially from the tip to the head of the screw, the sheet having been formed with an entering opening of a diameter less than the greatest distance between substantially diametrically opposite points of the larger portion of the thread, and the screw having been forced into the opening by forcible rotation of the screw until the thread cuts its way into the material of the sheet and brought the head into contact therewith.”

[Official Gazette April 19, 1932]