

May 16, 1933.

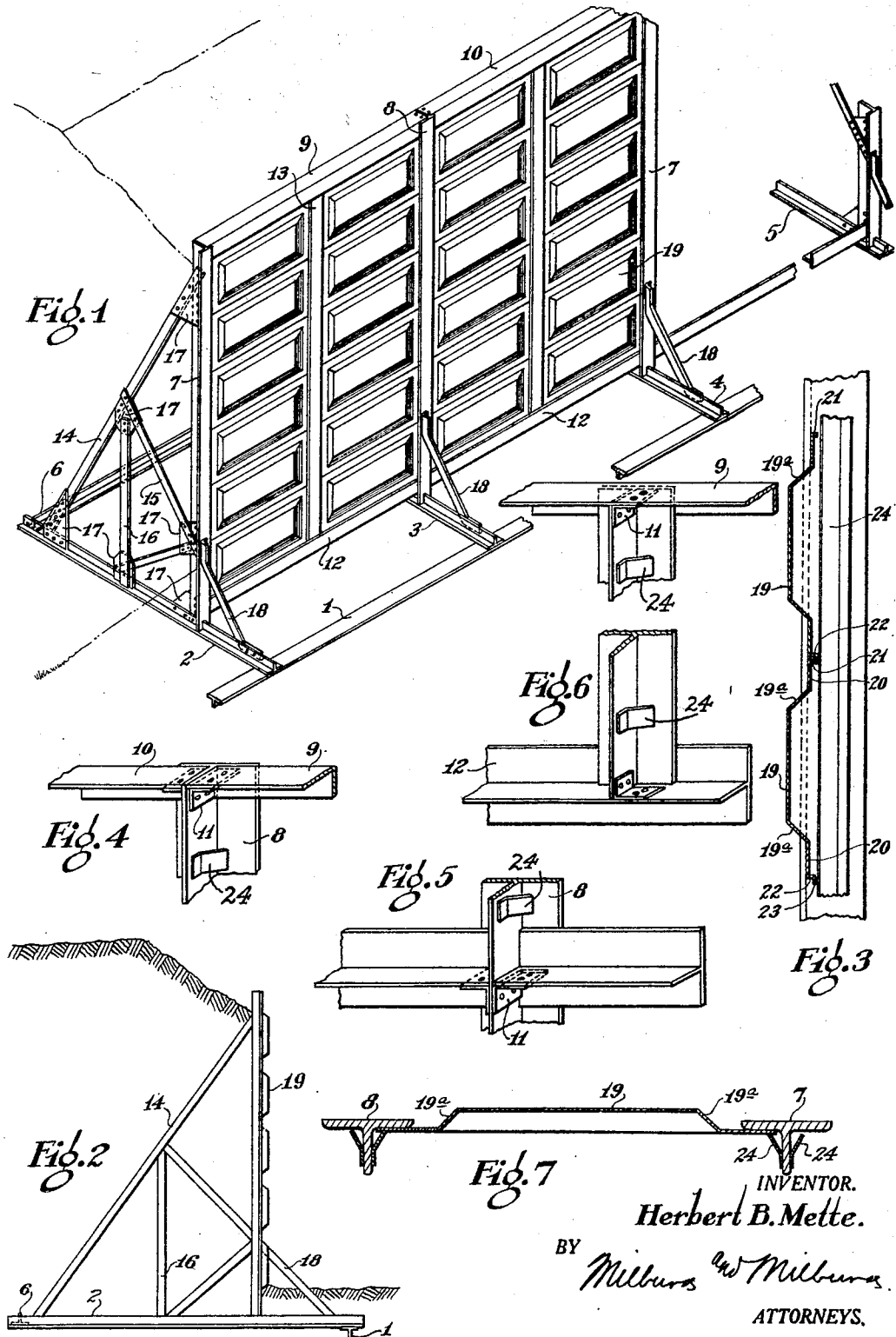
H. B. METTE

1,909,299

RETAINING WALL

Filed Aug. 7, 1931

2 Sheets-Sheet 1



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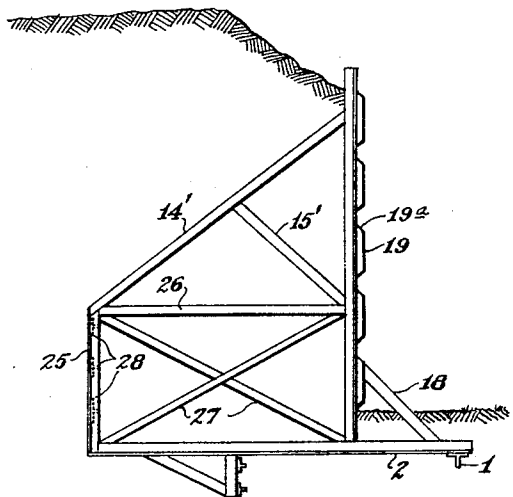


Fig. 8

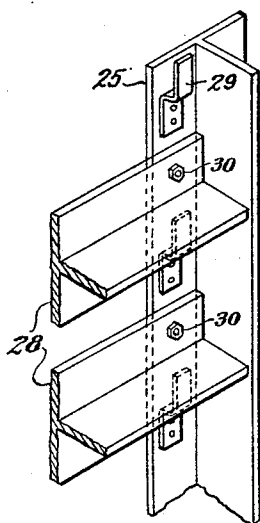


Fig. 9

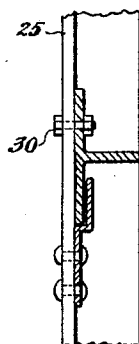


Fig. 10

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RETAINING WALL

Application filed August 7, 1931. Serial No. 555,815.

This invention relates to an improved construction of retaining wall.

The object of the present invention is to devise a retaining wall which may be constructed entirely of metal and in which the frame consists of stock metallic forms which may be cut into the lengths desired and in which the wall proper may be constructed of sheet metal panels which are pressed into the desired design and assembled in a convenient and efficient manner.

Accordingly, the present invention contemplates a retaining wall construction which may be fabricated and assembled at a comparatively low cost while at the same time possessing the advantage of being varied with respect to the proportions and design according to conditions.

Other objects will appear from the following description and claims when considered together with the accompanying drawings.

Fig. 1 is a perspective view illustrating my improved retaining wall construction and the manner of assembly;

Fig. 2 is an end view of the same form of construction illustrated in Fig. 1;

Fig. 3 is a vertical sectional view illustrating the panel form of the wall members and the means of interengagement between the same;

Fig. 4 illustrates in perspective the joint between the upright post and the upper transverse members;

Fig. 5 is a perspective view illustrating the bottom connection between the main upright member and the lower transverse members of the frame;

Fig. 6 illustrates in perspective the manner of connection between the upper and lower ends of one of the intermediate upright members and the upper and lower transverse members;

Fig. 7 is a transverse sectional view illustrating the manner of engaging the panel members in position;

Fig. 8 is an elevation illustrating a modified form of retaining wall construction;

Fig. 9 is a perspective view illustrating the manner of mounting the transverse members upon the uprights at the rear of the crib

forming part of the construction illustrated in Fig. 8;

Fig. 10 is a transverse vertical section illustrating the mounting of the transverse members of the crib in such engagement.

According to the present invention, the frame structure to which the sheet metal panels are applied for forming the wall proper and which are adapted to support the same, is fabricated from various forms of stock metallic members such as T-bars, channel members, I-beams, angle bars, etc., which may be adopted of any desired size and formed of any desired length, according to the specifications of any given construction.

The skeleton frame construction is partially fabricated prior to shipping the same to the field where it is to be erected and after assembling the same in position, the sheet metal panels which have already been preformed as duplicate parts, are attached to the supporting frame in tiers. Then with the retaining wall in completed form, the earth is filled in at the rear thereof in the usual manner and the engagement of the earth with the rear surface of the panel members will further serve as a means of maintaining the same in proper position.

In constructing the frame, referring to the first form of device, the toe plate 1 which consists preferably although not necessarily of a T-bar, is extended along the ground with its middle flange engaging the earth so as to constitute the front portion of the frame. The trusses which have been fabricated in the shop and which include the bars 2, 3, 4, and 5 are then placed in position with their forward ends overlapping and secured to the toe-bar. In the present illustration, I have shown the members 2, 3, 4, and 5 in the form of T-bars with their middle flanges extending upwardly. Then the heel bar or bars 6 of T-form are placed in position with their middle flanges extending upwardly and with their ends overlapping the T-bars 2 and 3, and which are secured thereto.

The trusses which brace and hold the wall in place include as part thereof the main upright members 7 and 8, which are here shown as of T-form. These trusses, as will later appear,

are erected completely before application of the panel members. The upper members 9 and 10, which are of angular form, are then placed in position between the upright members 7 and the intermediate member 8 and are secured thereto by means of angular cleats 11 which may be secured in position by riveting, bolting, or welding. Such connection between the upper members 9 and 10 and the upright member 8, is illustrated in Fig. 4 and the same manner of engagement is employed between the ends of the upper members 9 and 10 and the upright members 7 except that at the ends such engagement is applied to only one side of the members 7.

The lower transverse members 12 are of T-form, channel iron, or other desired shape, and extend between the end uprights 7 and the upright member 8 and are secured thereto by means of angular cleats 11, as illustrated in Fig. 5. It will be observed that the lower transverse members 12 may be connected to the upright members 7 and 8 at points somewhat above the lower ends thereof.

There are provided also intermediate upright members 13 which are of T-form and which have their front sides applied to the vertical flanges of the upper transverse members 9 and 10 and the lower transverse members 12 and are connected thereto. The connection between these members at the upper and lower ends of the intermediate members 13 is effected by means of angular cleats 11 in the same manner as already explained except that in this case, the upper and lower ends of the members 13 terminate below and above the flanges of the upper and lower transverse members. These connections for the upper and lower ends of the members 13 are illustrated in Fig. 6.

At the ends of the frame, there are applied also fabricated truss members which are assembled prior to shipping the same to the field. This truss construction comprises in each case, the member 2, 3, 4, or 5 and upright member 7 or 8, and also the member 14 which extends angularly between the rear of the upright member 7 and the rear end portion of the bottom member 2. Another member extends from approximately the middle of the member 14 and engages the rear part of the upright 7 at a point near the lower end thereof. This truss member, is indicated by reference numeral 15. A vertically disposed member 16 is secured to the member 2 at a point approximately midway thereof and is connected above at the point of engagement between the members 14 and 15. Another connection is provided between the lower T-bar 2 at a point corresponding to the lower end of the member 16 and the upright 7 at a point corresponding to the end connection of the truss member 15. These several members which constitute the fabricated truss, are secured together by means of truss plates 17

which are formed of suitable shapes at the various points of connection, as illustrated in Fig. 1.

The truss, in each instance, may be fabricated from metal bars of angular or other form and may be given any desired shape or size, all according to the conditions for which the retaining wall is intended. Accordingly, the present showing of angle bars and the particular proportions thereof, are intended merely for purposes of illustration.

In the front of the frame structure, there are here shown the angularly disposed angle bars 18 which have their upper and lower ends bent for engagement with the upright members 7 and 8 and the flanges of the bottom members 2 and 3. These bars are intended for use only where calculations and field conditions warrant, and may be omitted.

Such a fabricated truss may be applied not only at the ends of the frame but also at regular intervals for bracing the wall structure. Where the space between trusses is more than desired for panel lengths, considering the factor of stresses, this space is subdivided by means of intermediate upright members.

Any number or size of toe-plates and heel plates may be selected according to conditions, or there may be substituted a properly reinforced sheet metal plate fastened to the horizontal legs of the trusses. The function of the toe plate 1 is to prevent the front portion of the bottom of the frame from being submerged in the earth as might otherwise be caused by the load applied to the rear of the retaining wall and the tendency of the same to tilt forwardly. The function of the heel plate or plates is to serve as an anchoring means to prevent such tilting forwardly of the retaining wall because of such load upon the rear side of the wall proper.

Upon erection of the frame construction in the manner above outlined, the sheet metal panel members are then applied thereto. These panel members may be pressed or otherwise formed from sheet metal in the particular form indicated in the present drawings or may be given any other design desired. A certain degree of reinforcement is realized from the form of panel herein illustrated. For this purpose, there may be employed any gauge or kind of metal desired, and the panels may be of any desired design and may be further reinforced by means of integrally formed ribs or by attachment of additional parts. In the present case, these panel members comprise the main front portion 19 and the inclined intermediate portions 19^a extending along the top, bottom, and ends thereof and the flange portions 20 which are parallel to the main portions 19. The end flanges 20 are of plain form, as indicated in Fig. 7, while the upper flanges 20 are bent inwardly at right angles thereto, as indicated

at 21. The lower portions 20 are bent inwardly, as at 22, at right angles thereto and then downwardly at right angles, as indicated at 23. The flange portions 22 and 23 of the upper panel members are adapted to engage over the flange portion 21 of the panel members which are arranged therebeneath so as to form an interlocking engagement therebetween.

Upon placing the panel members in position, the lower panels are first applied and the others are applied one above the other throughout the entire height of the wall. It is understood, of course, that the height of the frame structure will be exactly sufficient to accommodate a certain number of tiers of panels so that the space between the top and bottom members of the frame structure will be completely closed by the panel members.

As a means of securing the panel members in engagement with the upright members of the frame as they are applied thereto, I have provided the spring metal clips 24 which are welded, riveted, or secured in any other manner at intervals to the rearwardly extending flanges of the upright T-bars 7 and 8, as illustrated in Fig. 7. Or, if so desired, there may be employed a continuous clip strip instead of separate spaced clips. The main portions of the clips 24 extend inwardly and are adapted to be engaged by the end flanges of the panel members so as to snap past the same and to thereby permit the extreme edge portions of the end flanges of the panels to become engaged between the flanges of the T-bars 7 and 8 and the angularly disposed clips 24 which snap back into their normal position after the panels are thus applied. Thus, the panel members when applied in this manner, are supported one upon the other with their flanges in inter-engagement and are maintained in vertical arrangement by means of the spring clips. With the tiers of panels arranged in this manner, the bottom flanges of the lowermost panels will engage the upright flanges of the bottom members 12 while the upper flanges of the uppermost panels will engage the depending flanges of the angular top members 9 and 10.

With the panel members in position, the earth may then be filled in at the rear of the retaining wall in the usual manner and the pressure of the same against the rear sides of the panel members will serve to maintain the same in proper assembly in an even more secure manner than already provided by the engaging means already described.

As a modification of the truss construction illustrated in Figs. 1 and 2, I have devised a crib form or cellular type of wall illustrated in Fig. 8. In this modified form of construction, the upright members 25 of T-bar, channel or other form, are provided at the rear ends of the members 2, 3, and 4, and may be affixed to the truss in any way conforming

to structural truss design. The specific form of disclosure herein is therefore merely for illustration and is shown as comprising the members 14' extending from the tops of the members 25 to the uprights 7 and 8 in the same manner as the truss members 14, the members 15 extending between the members 14' and the upright members 7 and 8 at points substantially midway of the height thereof, the transverse members 26 extending parallel to the bottom members 2 and 3 and connected to the top of the members 25 and to the uprights 7 and 8 at the points of connection of the members 15'. There may also be added the angularly disposed cross members 27 which extend from the rear ends of the members 2, 3, and 4 diagonally to the points of connection to the members 15' and 26, and the other members 27 extending from the upper ends of the members 25 angularly to the lower ends of the members 7 and 8.

Thus, there is formed what might be recognized as a crib at the rear of the retaining wall, this crib being of any height desired according to the nature of the soil encountered and used for fill. The rear wall of such crib may be wholly or partially closed by means of T-bars 28 which are applied to the upright members 25 by means of the clips 29 which are bolted, riveted, or otherwise secured to the uprights 25. The upper ends of the clips 29 are spaced parallel to the uprights 25 so as to afford space therebetween to receive the ends of the T-bars 28. The members 28 may be provided in any number desired so as to entirely close the space at the rear of the cribbing or to close the same to only a partial degree. The members 28 instead of being supported in the manner just described, may be bolted to the members 25, as indicated at the point 30; or if desired, both means may be employed for maintaining the members 28 in position.

There may be provided also upon the under side of the frame a means for preventing the same from slipping forward. This means, in the form here shown, comprises the depending bars 31 which are attached to the members 2, 3, 4, and 5 and to which are secured the bars 32 on the front sides thereof, extending therebetween. The metal bar brace members are provided at the rear of the bars 31. Bars 32 may be attached in the same manner as bars 28.

Upon completion of the structure as just explained, the crib may be filled with rock or any other material, and the earth then filled in completely at the rear of the retaining wall in the same manner as already explained. The purpose of this crib construction is to afford increased anchoring means at the rear of the wall with which the weight of the filled crib acts as a unit so as to maintain the same against accidentally falling or tilting forward as might

otherwise be due to the excessive weight of the earth at the rear side thereof in cases of increased heights of the wall structure, and to lessen the earth pressure under the toe of
 53 the wall due to the turning or tilting movement of the wall.

As above stated, this construction is partially fabricated and assembled prior to shipment to the field. The entire truss
 103 structure is pre-formed and all of the other members are cut to proper lengths before shipment. Also, the cleats are riveted or otherwise secured to one of the members which they are intended to connect, as a preliminary operation in the shop, and the cleats
 153 are connected, as for instance by bolting, to the other member during erection in the field.

My invention possesses the advantage of
 203 employing stock material for the frame structure, that is, forms already on the market, and duplicate panel members for the wall proper. Thus there may be erected a wall of any length or height desired without
 253 requiring any specially constructed parts for walls of various dimensions. As above suggested, the exact form and size of the frame construction will of course be determined by the height of the wall which it is
 303 contemplated to construct.

My improved form of wall may be manufactured, shipped, and assembled with comparatively low labor cost and the finished wall construction is not only highly efficient
 353 but it also presents a very satisfactory appearance.

It is to be understood that the present disclosure is merely for purposes of illustration and that other modifications and variations
 403 may be devised without departing from the spirit of the present invention as herein set forth and claimed.

For instance, my improved retaining wall structure can be used also upon a concrete
 453 base to which the trusses would be anchored; in which case, the toe plate or plates as well as the heel plate or plates would be omitted. Or, the trusses might be anchored to a concrete base portion only at the front; and in
 503 this case, the toe plate or plates would be omitted but the heel plate or plates would be retained.

If so desired, the bottom of the crib may also be closed or partially closed by means of
 553 metal bars extending across the top of bars 2, 3, 4, and 5 and suitably secured thereto.

Also, regarding the trusses, when of comparatively large proportions, they might be fabricated only partly in the shop and their
 603 fabrication completed in the field, so as to avoid the use of derricks for handling the same. This as well as other such modifications are to be understood as coming within the purview of my invention.

633 What I claim is:

1. A retaining wall structure comprising a metal frame structure, metal panels, and means on the rear side of the frame structure for laterally receiving and securing the panels in assembly with the frame structure so as to
 70 form the wall thereof preparatory to filling in material at the rear thereof.

2. A retaining wall structure comprising a frame structure, panels, means for interlocking the panels with each other, and snap-engaging means for permitting lateral application and securing of the panels to the frame structure so as to form the wall thereof.
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3. A retaining wall structure comprising a metal frame structure, reinforced metal
 80 sections formed into panel form and having their edge portions adapted for interengagement with each other and for lateral application and attachment to said frame structure, and means provided upon the rear of said
 85 frame structure for such attachment of the panels so as to form the wall thereof.

4. A retaining wall structure comprising a frame structure of a plurality of fabricated members, said frame structure including toe
 90 and heel members, interconnecting base members therebetween, upright members and inclined brace members for anchoring the upright members to the base members, means for securing said members together, unitary
 95 reinforced panel members arranged between said upright members, and laterally engageable means provided upon said frame structure for securing the panel members in such
 100 position and in engagement with said frame structure, said securing means being so constructed and arranged as to permit application of the panel members from the rear of the frame structure.

5. A retaining wall structure comprising
 105 a frame structure of a plurality of metallic members, said frame structure including toe and heel members, interconnecting base members therebetween, upright members and inclined brace members for anchoring the upright
 110 members to the base members, top and bottom members defining the corresponding margins of the wall, means for securing all of said members together so as to form the same into a unitary frame structure preparatory to receiving the panel members, reinforced panel members arranged between
 115 said upright members and said top and bottom members, and means in the rear of the frame structure for securing said panel members to said upright members so as to maintain the same in assembled position preparatory to the filling-in of material at the rear thereof.

6. A retaining wall structure comprising
 125 a frame structure of angular metallic members, said frame structure including toe and heel members, interconnecting base members therebetween, upright members and inclined brace members for anchoring the upright
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members to the base members, pressed sheet metal panel members arranged in tiers between said upright members, means provided upon the rear of said upright members for engagement by the side edge portions of said panel members so as to maintain said panel members in assembled position, said panel members being provided with plain marginal side portions adapted for engagement with said engaging means, and said panel members being provided along their top and bottom portions with means of interengagement between the same, whereby said panels may be maintained in assembly preparatory to the filling in of material to the rear thereof.

7. A retaining wall structure comprising a metal frame structure and panels attached thereto, said frame structure consisting of toe and heel members, intermediate base members extending between said toe and heel members, and upright members supported upon said base members, said members all being formed of proper lengths of uniform metallic stock material, said panels being formed as duplicates of pressed sheet metal adapted to be assembled laterally from the rear, and means for securing said panels in assembly with said frame structure to form the same, said securing means including snap-engaging means at the rear side of the frame structure.

8. A retaining wall structure comprising a metal frame structure and panels attached thereto, said frame structure consisting of toe and heel members, intermediate base members extending between said toe and heel members, and upright members supported upon said base members, said members all being formed of proper lengths of angle bars of uniform metallic stock material, said panels being formed as duplicate forms of pressed sheet metal, said panels having plain, flat side marginal portions adapted for engagement with the rear faces of the upright members, the top and bottom edge portions of the panels being formed with integral interengaging joints, and spring clips provided upon the legs of the upright members for snap engagement by the side portions of said panel members so as to permit application of the same from the rear end to hold the same in engagement with the rear side of the upright members.

9. A retaining wall structure comprising a frame structure and panels attached thereto, said frame structure consisting of toe and heel members, intermediate base members extending between said toe and heel members, and upright members supported upon said base members, said members all being formed of proper lengths of metal bars of uniform stock material and being constructed and arranged so as to form a plurality of rectangular divisions which are closed upon all four sides thereof, said panels being formed as

duplicate forms of pressed sheet metal having means of interlocking with each other and adapted for engagement with the surrounding sides, top and bottom of said divisions by application thereto from the rear thereof, and means for maintaining said panels in such assembly.

10. A retaining wall structure, comprising a frame structure, said frame consisting of a toe member at the front thereof, a crib at the rear thereof, intermediate base members extending between said toe member and said crib, said crib including rear upright and lateral members forming a substantially closed rear wall, upright members supported upon said base members, said members all being formed of proper lengths of uniform metallic stock material, unitary metallic reinforced panels, and means for securing said panels in assembly with said frame structure.

11. A retaining wall structure comprising a fabricated unitary metal frame structure subdivided into sections to receive the panels for the wall, reinforced metal panels, and means for securing the panels in assembly with the frame structure so as to form the wall thereof.

12. A retaining wall structure comprising a fabricated unitary metal frame structure provided with sections having top and bottom members, reinforced sheet metal panels arranged in said sections, and means for securing the panels in assembly with the frame structure so as to form the wall thereof.

13. A retaining wall structure comprising a metal frame structure and panels attached thereto, said frame consisting of a toe member at the front thereof, a crib at the rear thereof, intermediate base members extending between said toe member and said crib, said crib including rear upright and lateral members forming a substantially closed rear wall, upright members supported upon said base members, said members all being formed of proper lengths of uniform metallic stock material, said panels being formed of metal and as duplicates, and means for securing said panels in assembly with said frame structure.

14. A retaining wall structure comprising a frame, panels, means for securing the panels in assembly with the frame so as to form the wall thereof, and a crib forming part of the frame at the rear of the wall, with the panels forming the front wall of the crib.

15. A retaining wall structure comprising a main frame structure of metallic structural shapes, said main frame structure including spaced vertical members, toe, heel and other members reinforcing the vertical members, auxiliary spaced, truss-shaped, vertically disposed frames comprising upright members and inclined and horizontal bracing members connected together, metal panels arranged in tiers between said upright mem-

bers of the truss-shaped frame and the intermediate vertical members, and means provided upon said vertical members for holding said panel members in assembled positions preparatory to the filling in of material in the rear thereof.

In witness whereof, I hereby affix my signature.

HERBERT B. METTE.

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