This invention relates to concrete form constructions, to spreader and tie bars used in the forms, and to concrete walls constructed by use of the spreader and tie bars.

It is an object of this invention to provide a novel and improved spreader and tie bar for mold forms which can be cheaply and readily manufactured, and can be conveniently used in the construction of concrete forms to save labor and expense in the construction of forms.

A further object is to provide a wall form construction, wherein the spreader and tie bars are used which will eliminate the necessity for using any studding at one side of the wall, and will eliminate the necessity for using more than one-half the usual number of studs at the other side of the wall.

To these ends, the invention consists in the novel parts and novel combinations of parts hereinafter defined in the claims, and described in the following specification, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the various views and, in which,

Fig. 1 is a perspective view illustrating an embodiment of the spreader and tie bar of the present invention;

Fig. 2 is a perspective view illustrating a wall form with a concrete wall poured therein, the wall form being constructed in accordance with the present invention;

Fig. 3 is a vertical section taken substantially through the wall form on the line 3—3 of Fig. 2, as is indicated by the arrows, before the concrete wall has been poured therein;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3, as is indicated by the arrows;

Fig. 5 is a vertical section through the wall form illustrated in Fig. 2, taken substantially on the line 5—5 of Fig. 2, as is indicated by the arrows, the section being taken before the concrete wall has been poured;

Fig. 6 is a horizontal section taken substantially on the line 6—6 of Fig. 5, as is indicated by the arrows;

Fig. 7 is a view in side elevation of a portion of the wall form shown in Fig. 2;

Fig. 8 is a vertical section taken through a concrete wall, constructed by the use of the form of the present invention and illustrating a brick wall tied to the concrete wall;

Fig. 9 is a horizontal section taken on the line 9—9 of Fig. 8, as is indicated by the arrows, and

Fig. 10 is a view in side elevation illustrating a slightly modified form of spacing and tie bar for use in the construction of wide walls.

Referring to the drawings, a spreading and tie bar 11 is illustrated. The bar 11 is formed from long, narrow, thin, gauge sheet material and is provided adjacent its central portion with a down turned flange 11a which is of the same length as the thickness of a concrete wall to be formed. The two ends of the flange 11a form shoulders 11b and spaced outwardly from the shoulders 11b a distance slightly less than the thickness of the mold boards to be used in constructing a mold form, pin openings 11c are provided. Spaced outwardly from the shoulders 11b at each end of the bar 11 a distance equal to approximately one-half the thickness of the form boards to be used, are the small nail openings 11d. At the left end of the bar, as viewed in Fig. 1, there is provided a second pin opening 11e and this opening is spaced outwardly from the left shoulder 11b a distance slightly less than the thickness of two mold boards. At the right end of the bar, as viewed in Fig. 1, is a rod opening 11f and this rod opening is spaced outwardly from the right shoulder 11b a distance approximate to one-half the thickness of a mold board to be used.

Toward the left end of the bar, there is a wing 11g struck upwardly from the bar 11 and this wing forms a shoulder which, for convenience will also be designated 11g, and is spaced inwardly from the left end of the bar a distance equal to the inward spacing of the left shoulder 11b. The wing 11g is bent upwardly towards the rear side of the bar, as viewed in Fig. 1, so that it will extend longitudinally in the bar and in spaced relationship transversely of the bar respective...
to the left shoulder 11b. Adjacent the central portion of the bar, as viewed in Fig. 1, there are opposing upstruck wings 11a and the general plane of these wings is transverse to the length of the bar. In Fig. 10, a bar 12 is illustrated, which is constructed exactly like the bar 11 with the exception that instead of but a single pair of wings upstruck from the center of the bar, the bar 12 has three pair of upstruck wings 12a, one of which is arranged centrally on the bar and the other two of which are spaced longitudinally respective to the central wings 12a. The bar construction illustrated in Fig. 10 is used where quite thick walls are desired within which a number of reinforcing rods must be imbedded.

When it becomes desirable to construct a mold form for a concrete wall, studs need be used at but one side of the wall and these studs may be spaced apart a distance twice as great as studs are now commonly spaced in wall form constructions. Referring to Fig. 2, a form wall and poured concrete wall 14 and 16 are illustrated, constructed according to the principles set out above. Two sets of studs may, of course, be placed on either side of the wall but in the illustration they are shown on the outer sides of the wall. In building the forms, vertical studs 13 are first erected and form board 14, which is half the width of the form boards 15 used in the general construction of the wall, is nailed to the studs 13, so that the width of the board 14 extends vertically. A second form board 16 corresponding in width to the form board 14 is then laid, and this board 16 is spaced inwardly from the board 14 a distance equal to the desired thickness of the wall. A plurality of spreader and tie bars 11 will then be placed across the two boards 14 and 16 at spaced intervals longitudinally of the boards 14 and 16. The spreader and tie bars 11 will be so positioned that the right ends of the bars, as illustrated in Fig. 1, will project outwardly and the left ends of the bars will project inwardly. The ends of the bars will rest directly on the upper edges of the two boards 14 and 16, and the flange 11a will project downwardly from the upper edges of the board so that the shoulders 11b will abut the inner sides of the two boards 14 and 16, to hold the same in spaced relationship. To maintain the spreader bars and the boards 14 and 16 in proper assembled relation until upper form boards are laid, small nails, such as shingle nails, will be pounded into the upper edges of the two boards 14 and 16 through the small nail holes 11d in certain of the spreader bars. Above the board 14 is placed a board 17 which is twice the width of the board 14 and is of the standard width of the form boards to be used. The boards 17 are nailed to the studs 13. Laid with its edge resting on the outer edge of the board 16 is a mold board 18, which is similar in all respects to the board 17. The shoulders 11g of the spreader and tie bars will abut the board 18 at its inner side, so as to maintain the proper spaced relationship between the two boards 17 and 18. Pins 19 are now provided and these pins are preferably of a length approximately equal to the width of the boards 15, 17 and 18. At their central portions, they are pinched outwardly slightly to form projecting tibs 19a. The pins 19 are inserted through the pin openings 11c at the two ends of the spreader bars. The lower ends of the pins are partially pointed and are rounded at their extreme lower ends and due to the fact that the openings 11c are spaced outwardly from the boards 11b of the spreader bars a distance slightly less than the thickness of the various form boards used, the lower ends of the pins will first have to be engaged in the openings 11c, whereupon the pins will have to be driven downwardly until the tibs 19a strike the upper sides of the spreader bars, to prevent further downward movement of the pins respectively. The pins 19 will, therefore, force the boards 14, 16, 17 and 18 under pressure against the shoulders 11b and the shoulders 11g of the bars 11. As the pins 19 are of a length equal to the entire width of one of the boards 15, the pins will project downwardly substantially across the boards 14 and 16 and will project upwardly substantially half way across the boards 17 and 18. Above the boards 17 and 18, the form boards 15 will be placed, the lower edge of one form board resting on the upper edge of the other form board in the immediate lower course. Above each pair of opposing boards 15 in a horizontal course, there will be placed the spreader and tie bars 11, and as the wall is built up, the pins 19 will be inserted in the pin holes 11c. The shoulders 11b and 11g, together with the studs 13, will hold the boards 15 in proper spaced arrangement and the pins 19 will tie the two walls of the mold form together, and will press the form boards 15 tightly against the various shoulders. In constructing the wall, the spreader and tie bars 11 will be placed in vertical alinement at spaced intervals longitudinally of the wall. Accordingly, as the mold form for the wall is built up, the pins 19 will be vertically aligned throughout the wall and will form practically continuous studs at both the inner and outer sides of the wall. The wall form can thus be built by approximately one-fourth the usual number of studs required.

If at the side of the wall form where studs are not used, one of the form boards, such as the board 20 should terminate short of the end of the wall, a second form board 21 will be used and the two boards 20 and 21 will be placed, so that their two ends abut each other.
If the abutting ends of the two boards should fall in approximately vertical alignment with certain of the vertically aligned bars 11, the construction illustrated in the left wing of the wall shown in Fig. 2 will be used. If, however, the jointure between the two boards 20 and 21 should fall approximately midway between two lines of bars 11, the construction illustrated in the right wing of Fig. 2 and in Figs. 5 and 6 would be used. Referring to the first construction as illustrated in the left wing of Fig. 2, a short spanning board 22 would be used by the carpenter laying up the wall and this board would be so placed that it would span the joining ends of the boards 20 and 21, and the spanning boards 22 used would be of a width corresponding to the width of the boards 21 and 22, so that it would extend between the bars 11 above and below the board 20 or 21 most closely adjacent the jointure. Small blocks 23 would be nailed to the form immediately above and below the boards 20 and 21, and these blocks would be so placed as to abut the ends of the bars 11 recently above specified. A special type of pin 24 could be used for securing the spanning board 22 in place. The pin 24, as illustrated in the drawings, is approximately twice the length of the width of the form board 15 and has a pinched portion forming a projecting tip 24a one fourth of the distance downwardly from its upper end. The pin 24 would be inserted through the pin opening 11e in the spreader bar 11 immediately below the spanning board 22, and the pin would be pounded downwardly and its lower end would be engaged in the pin opening 11e in the spreader bar immediately below the spanning board 22, whereupon the pin would be further pounded downwardly until the tip 24a struck the upper side of the upper spreader bar 11. The pin 24 would force the spanning board 22 and the joining ends of the two boards 20 and 21 inwardly to maintain the proper spaced relationship between the inner and outer walls of the wall form and to cause one of the boards 20 or 21 to abut the shoulders 11b and 11g of the spreader bars.

If the jointure between the two boards 20 and 21 should fall approximately midway between two rows of the bars 11, as shown on the right wing of Fig. 2, a spreader board 22 is used and this board is of a length greater than the spacing between two rows of bars 11. The spanning board 22 is placed to extend over the jointure between the two boards 20 and 21 and between the ends of bars 11 above and below both boards 21 and 20 adjacent the joining ends of the two boards. Above and below the said bars, small blocks 23 are nailed to the mold boards 15 and two pins 24 are used which extend through the pin openings 11e in upper and lower bars 11 immediately above and immediately below the spreader board 22. With this construction, the joining ends of the two boards 20 and 21 will be maintained in proper spaced relationship relative to the opposing board on the outer wall of the form, and yet no studding need necessarily be used on the inner wall of the form.

Instead of using the long pins 24 in connection with the spanning boards 22 and 25, two short pins 19 could be used if desired. The use of the spanning boards 22 and 25 will not interrupt the continuous stud arrangement formed by the pins 19, inasmuch as whether the pins 19 are used or whether the pins 24 are used, the pins will extend across practically the whole width of the form boards used. The various pins 19 and 24, accordingly, extend practically continuously throughout the entire height of the wall forms and bear against practically all portions of every board used in the form walls. Knotted or cracked boards can thus be properly tied into the wall.

At the upper edge of the wall form, a slightly different construction is used than in the main body of the wall form. Instead of using the short pins 19, connection with the two uppermost courses of bars 11, long pins 24 are used, and these pins are inserted through the pin openings 11c at both the inner and outer sides of the wall form of the aligned uppermost bars 11 and the bars 11 immediately below the same, so that the pins 24 bridge the uppermost boards 15 in the form. With this construction, there will be no danger that the pins will slip or turn inwardly to permit the uppermost boards to spread apart as would be the case if the short pins 19 were used.

If it is desired to use horizontal reinforcing rods in the wall to be poured, the central wings 11h of the spreader and tie bars together with the upper surfaces of the tie bars form proper seats for holding the reinforcing rods. As illustrated in the drawings, horizontal reinforcing rods 26 are used and as the various horizontal courses in the wall form are built, these rods 26 will be laid on the bars 11 so that they rest between the opposing wings 11h of the bars.

If it is desirable to construct one side of the wall form first as, for example the outer side, the right ends of the bars 11 may be inserted between the various edges of the bars as they are laid one on top of each other and nailed to the studs 18. The pins 19 may be inserted in the pin holes 11e at the right end of the bars 11, in the usual manner. When it becomes desirable to construct the inner wall of the mold form, all the bars 11 may be swung upwardly so as to be out of the way of the workmen by bending the same upwardly from the right shoulder 11b, as illustrated in Fig. 1. As the boards in the inner wall are laid, the various bars adapted
to extend between adjacent vertical courses in the wall, will be swung downwardly to cause the right shoulders 11b of the bars, as viewed in Fig. 1, to abut the inner sides of the boards of the outer wall and to cause the left shoulders 11b to abut the inner sides of the boards of the inner wall. The inner ends of the bars will be secured, as usual, by means of the pins 19 and 24. It will be seen that the workmen can readily construct the wall forms in this manner, and the bars secured in the outer walls will not be in the way of the work on the inner walls.

The spreader and tie bars may also be inserted between form walls which are already erected, due to the fact that there are no upwardly extending or downwardly extending flanges or obstructions at the ends of the bars which will prevent the bars from being turned, as they are inserted between the edges of adjacent boards. The bars, accordingly, can be used in beam forms where the sides of the forms are constructed from panels or the like. Also in wall forms, after the forms are built, certain spreader and tie bars 11 may be inserted as necessary, at weak points in the form construction.

After the form wall has been made, the concrete can be poured to form a poured concrete wall 27, as is illustrated in Figs. 2, 8 and 9. As the concrete is poured into the form, the central wing openings in the bars 11 will permit any air or water beneath the spreader and tie bars to run upwardly, thereby preventing air pockets in the wall and causing bars 11 to be tightly and firmly imbedded in the concrete wall. When the wall is formed, the forms can be readily removed by simply removing the pins 19 and 24. The form boards will be practically free of nails and may be easily removed. Also, due to the fact that but very few studs are used in the construction of the forms, the time necessary to remove the wall will be much less than the time required to remove a wall of common standard construction. Also in preparing the mold boards for further use, a great deal of time will be saved inasmuch as but few nails will have to be removed from the boards. The present construction is particularly advantageous where it is desired to pour a flooring of concrete above the concrete wall. In order to tie the flooring properly to the wall, the central portion of the reinforcing and tie bar 11 will prevent the bar from bending, while the wall is being poured, a space in the wall forms adjacent its top is permitted to remain free of concrete. When the flooring is poured, the unpoured space at the top of the wall is also poured. The upper two or three courses of form boards must, therefore, be left standing on the wall until the floor above the wall is poured. With the common standard construction where studs are used at both sides of the wall, these studs must remain in place until the extreme upper portion of the wall is poured, thereby retaining all the form boards in place and preventing their use elsewhere. With the present construction, the upper two or three courses of the wall form may be retained in position until the flooring above the concrete wall is poured, and yet the pins 19 and 24 may be removed from the lower portion of the wall, to release the lower form boards and permit their use elsewhere. The studs at the outer side of the wall can be removed before the flooring is poured. A great saving in the number of form boards required in the construction of a building will thus result from use of the present construction.

After the form boards and pins have been removed from the wall 27, the projecting ends of the bars 11 may be clipped off close to the wall if desired. The bars 11 will then act to strengthen the concrete wall and if reinforcing rods 26 are used, the bars 11 will act to tie the concrete at all portions of the wall to the reinforcing rods.

If it is desired to erect a brick wall at the outer side of the concrete wall 27, vertical reinforcing rods 28 will be provided and these rods will be run downwardly through the reinforcing rod holes 11f in the vertically aligned bars 11. The brick wall 29 may then be built up at the outer side of the concrete wall 27 and spaced slightly outwardly therefrom, in the usual manner. As the brick wall is constructed, the same may be tied to the concrete wall at various points by means of the brick tie rods 30. These tie rods each have a hook shaped inner end adapted to fit above the vertical reinforcing rods 28, and the outer ends of the brick tie rods are suitably bent or shaped to tie into the plaster used between the successive courses of bricks.

The tie rods 30 may be hooked over the vertical reinforcing rods 28 at any desired height of the concrete wall, the brick wall 29 may be tied into the concrete wall at any desired point. The brick ties, accordingly, need not be molded into the concrete wall at certain fixed points as is the case with the usual type of brick tie construction. Also vertical adjustment of the ties can be made without, in any manner, weakening the concrete wall, as by grooves or similar construction.

The angle construction of the central portion of the reinforced concrete construction will be such as to permit the bar to be bent, while the wall is being built, even though concrete be poured into the wall form at a considerable height, and when the wall is built, the angle construction will efficiently tie the bar to the concrete structure of the wall. It will be understood that the inventor does not wish to limit himself to a spreader and tie bar having only a single pair of wings 11a at the central portion thereof for holding reinforcing rods. If desired, bars such as the bars 12 having a plurality of upstruck wings at the central
portion thereof for holding a number of reinforcing rods, may be substituted for the bar 11. The spreader and tie bar may be used in practically any type of form mold construction, whether the molds are used for walls, beams, columns, pilasters, jams, etc. Wherever the bars are used, a great saving in labor and in mold material will result. It will, of course, be understood that any desired type of key or pin may be substituted for the pins 16 and 24, and that suitable openings may be substituted for the openings 11c and 11d in the bars 11 to accommodate the particular type of key or pin used.

The device has been demonstrated in actual practice and has been found to be very successful for the purposes intended. The length of the bar will, of course, be varied for walls of different thicknesses.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the various parts without departing from the scope of the present invention.

What is claimed is:

1. A wall mold form construction having in combination, a plurality of boards laid edge on edge to form spaced form walls, the ends of certain boards being laid to abut the ends of certain other boards, short boards spanning the abutting ends of adjacent boards at the outer sides thereof, and a plurality of spacing and tie bars inserted to extend transversely between the form walls and between the edges of opposing form boards and projecting outwardly therefrom, said bars having shoulders inwardly from the form boards adapted to abut the inner sides thereof, and having openings adjacent their ends which extend outwardly from the form boards and also having openings adapted to extend outwardly from the spanning boards, and members inserted through certain of said first mentioned openings and bearing against the outer sides of said form boards and members inserted through certain of said last mentioned openings and bearing against said spanning boards, said first and last mentioned members pressing said form boards inwardly towards said shoulders.

2. A wall mold form construction having in combination a plurality of mold boards laid edge on edge to form spaced parallel form walls, the ends of certain boards in the various horizontal courses in the form walls being laid to abut the ends of certain other boards therein, short boards spanning the abutting ends of adjacent boards on the outer sides thereof, spacing and tie bars extending transversely between the form walls and extending between the edges of adjacent horizontal courses, said spacing and tie bars having shoulders thereon abutting the inner sides of the boards of the form walls and having openings therethrough adjacent their ends spaced from said shoulders a distance slightly less than the width of the form boards, members projecting through said openings and adapted to bear against the outer sides of the form boards to press the same tightly against said shoulders, each spacing bar adjacent one end having an opening projecting there-through spaced outwardly from an inner shoulder a distance slightly less than the width of a form board plus the width of a spanning board, and members projecting through said last mentioned openings outwardly from spanning boards to bear against the outer sides thereof and force the same inwardly.

3. A wall mold form construction having in combination a plurality of boards laid edge on edge to form spaced form walls, the ends of certain boards being laid to abut the ends of certain other boards, boards spanning the abutting ends of adjacent boards at the outer sides thereof, a plurality of horizontally spaced and vertically aligned spacing and tie bars extending transversely between the form walls and projecting outwardly between the edges of adjacent boards, said bars having shoulders inwardly spaced from their ends and abutting the inner sides of the form walls, and having openings therein outwardly spaced from said shoulders, members inserted within said openings except where spanning boards are used, said members bearing against the outer sides of said form walls to force the same against said shoulders, said bars above and below said spanning bars having openings outwardly therefrom, and members fitting through the last mentioned openings in bars above and below spanning boards and extending across the spanning boards to force the same inwardly, said first mentioned and last mentioned members forming practically continuous vertical studs for said form walls.

4. A spacing and tie bar having shoulders inwardly spaced from its ends adapted to bear against the inner sides of opposite boards in the two walls of a concrete mold form, said bar outwardly from said shoulders having portions adapted to extend outwardly between the edges of form boards, said portions having openings therein spaced outwardly from said shoulders a distance approximating the thickness of form boards and one of said portions having therein an opening spaced outwardly from its adjacent shoulder a distance approximating the thickness of a form board plus the thickness of a board adapted to be used to span abutting ends of the form board, members adapted to be inserted within said first mentioned openings to bear against the outer sides of form boards and adapted to be inserted within said last mentioned opening to bear against a spanning board.

5. A spacing and tie bar for concrete mold
forms and the like having downwardly projecting shoulders adjacent but spaced from the two ends of the bar, an upwardly projecting shoulder spaced from one end of the bar the same distance as one of said downwardly projecting shoulders, said bar having openings adjacent the ends thereof spaced outwardly from said shoulders slightly less distances than the width of form boards, whereby said bar can be placed to extend transversely between the two walls of a mold form with the outer ends of the bar projecting outwardly between the edges of adjacent boards of the form and the downwardly projecting shoulders bearing against the inner sides of the opposite boards of the form below the bar and the upwardly projecting shoulder bearing against the inner side of a form board above the bar, wedging members insertable in the openings of said bar to bear against the outer sides of form boards and force the same tightly against said shoulders, and a vertical hole in at least one end of said bar, said hole being located substantially midway between the corresponding shoulder and opening at that end of the bar for the purpose of receiving a nail or the like to be driven into the horizontal surface of the adjacent form board during the assembling operation.

In testimony whereof I affix my signature.

DIRK BIERHAALDER.