P. F. FLAGGE.

SHEET METAL JOINTING MACHINE.

APPLICATION FILED SEPT. 3, 1912.

1,103,953.

Patented July 21, 1914.

5 SHEETS—SHEET 1.

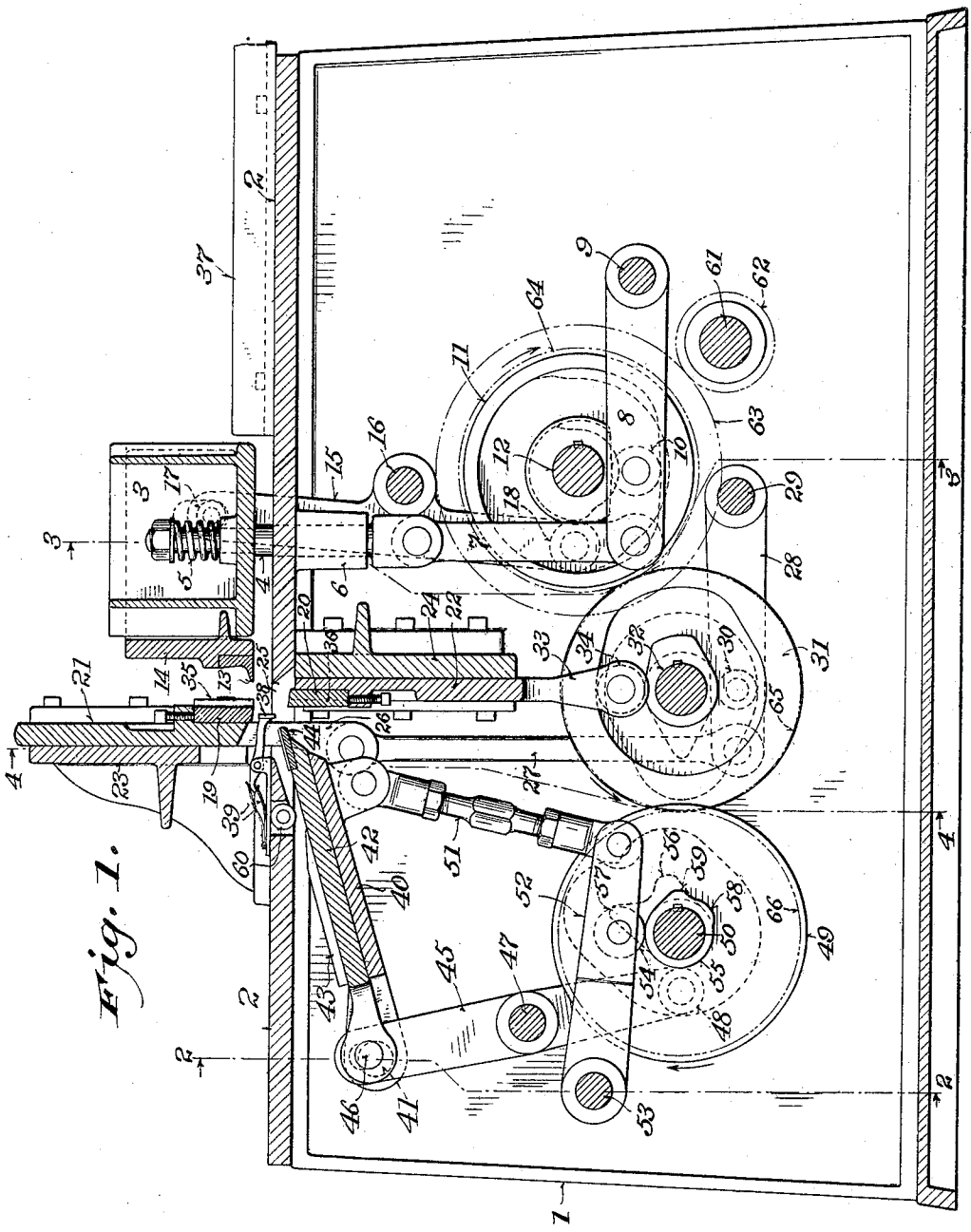


Fig. 1.

Witnesses:
Fred Palm
Chas. L. Goss.

Inventor:
Phillips F. Flagge
By Flanders Bottum Fawcett & Hoff
Attorneys.

THE NORRIS PETERS CO., WASHINGTON, D. C.

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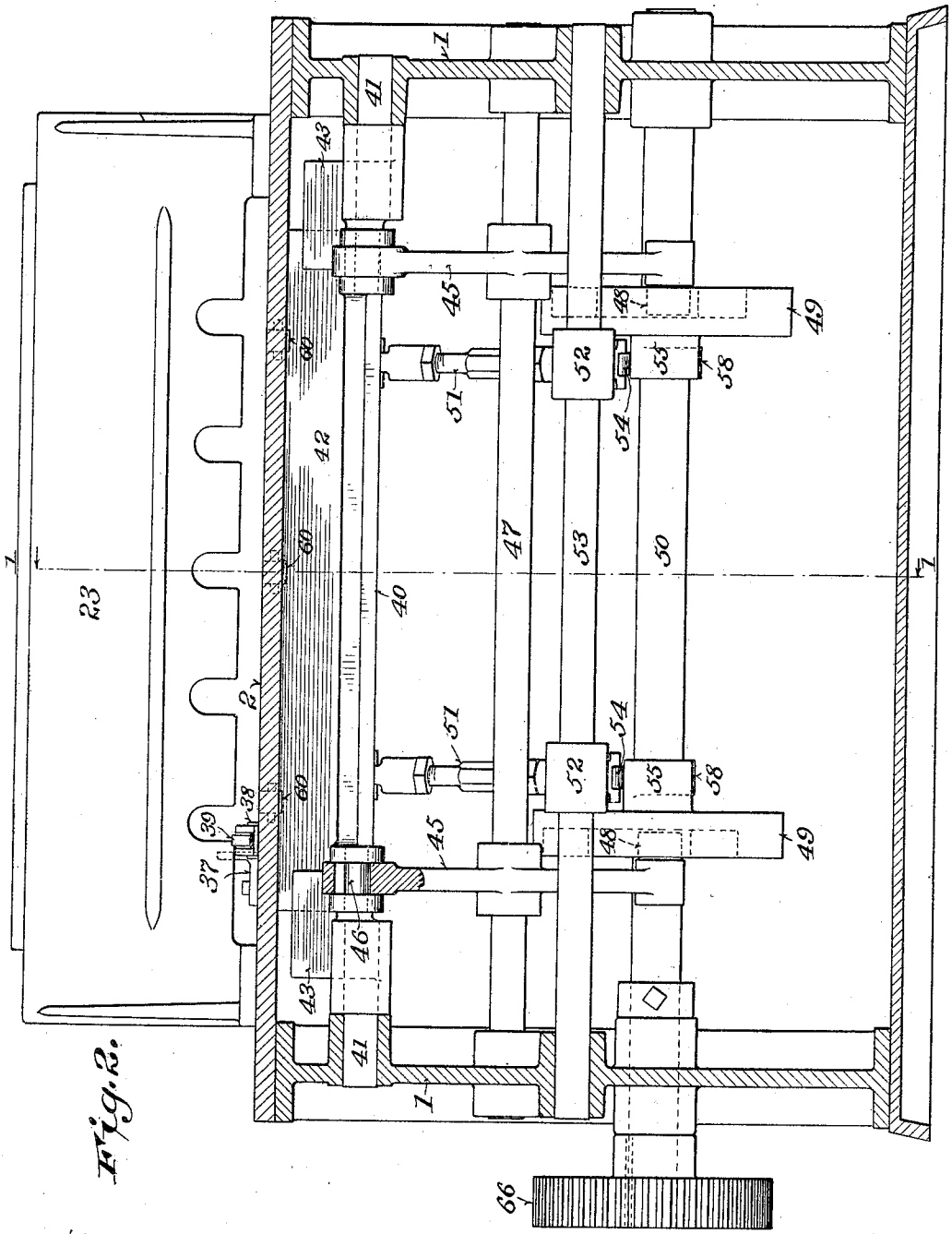


Fig. 2.

Witnesses:
Fred Palm
Chas L. Goss.

Inventor:
Phillipp F. Flagge.
By Flanders Bottum Fawcett & Bottum
Attorneys.

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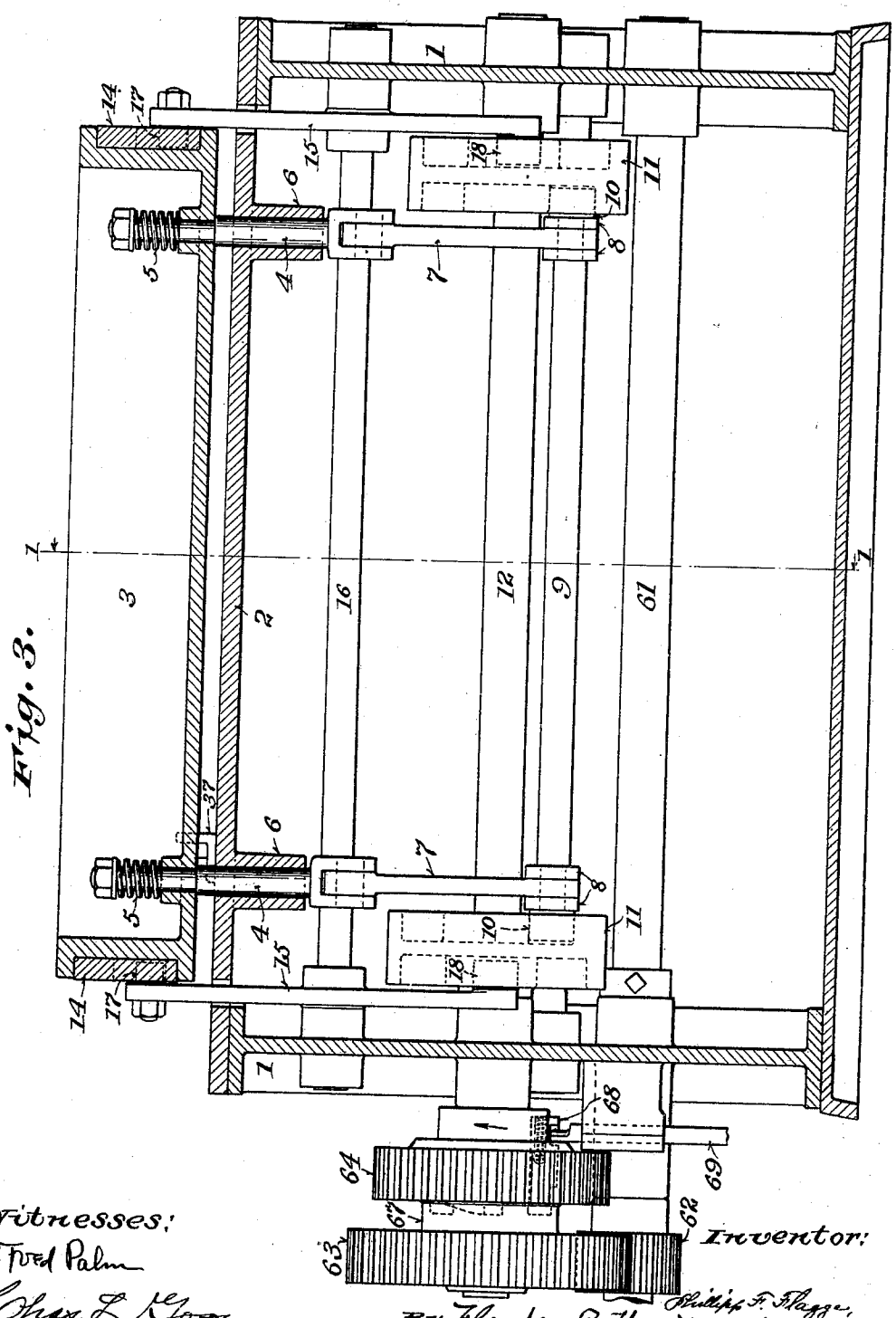


Fig. 3.

Witnesses:
Fred Palm
Chas. L. Goss.

Inventor:
Phillips F. Flagge,
By Flanders Bolton Fawcett & Bolton
Attorneys.

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5 SHEETS—SHEET 4.

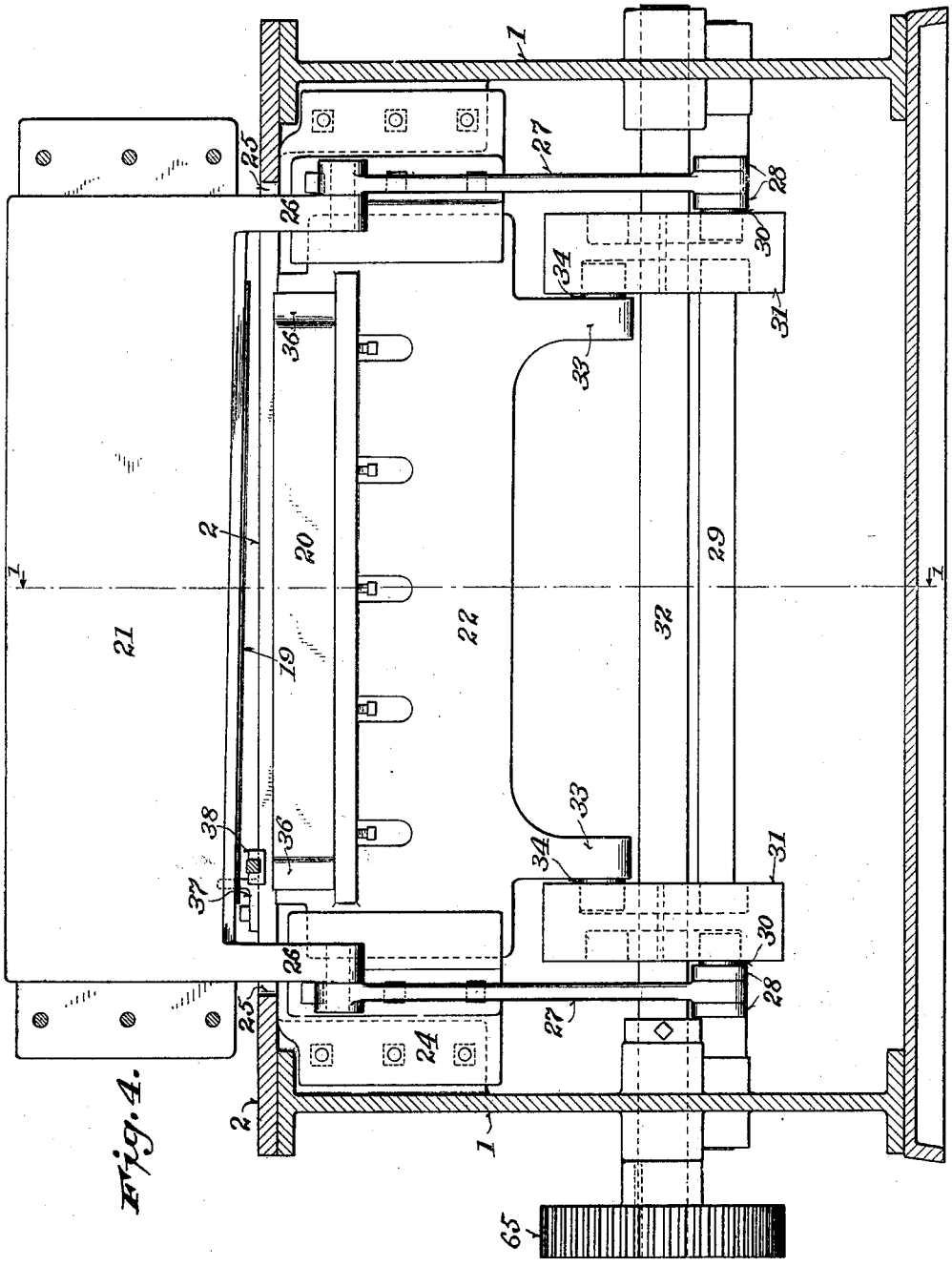


Fig. 4.

Witnesses:
Floyd Palm
Chas. L. Goss.

Inventor:
Phillipp F. Flagge,
By Howson Bottum Howson & Bottum
Attorneys.

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5 SHEETS—SHEET 5.

Fig. 8.

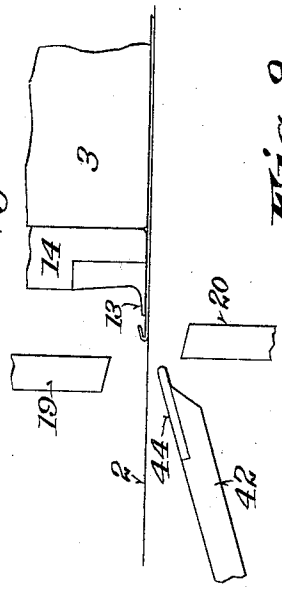


Fig. 9.

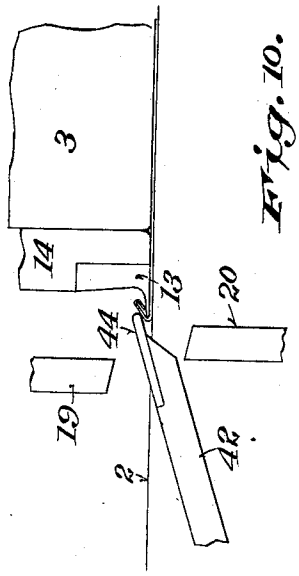


Fig. 10.

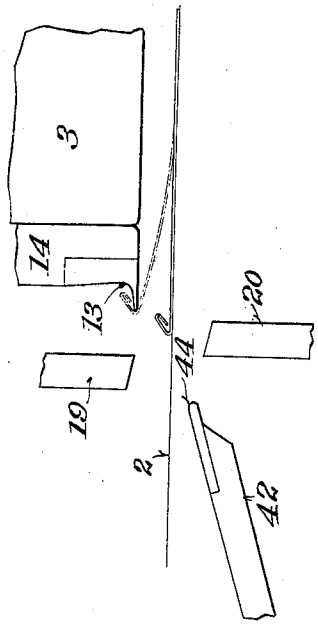


Fig. 5.

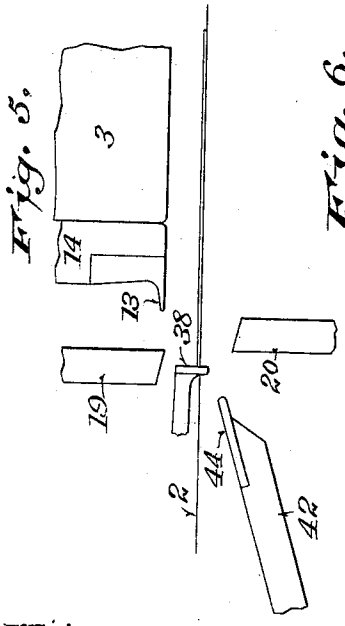


Fig. 6.

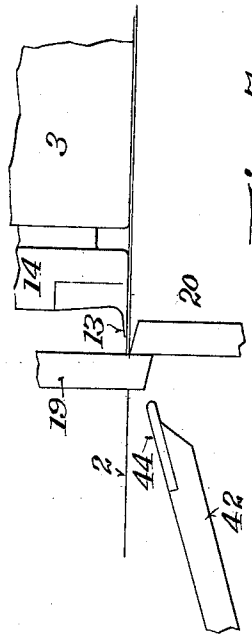
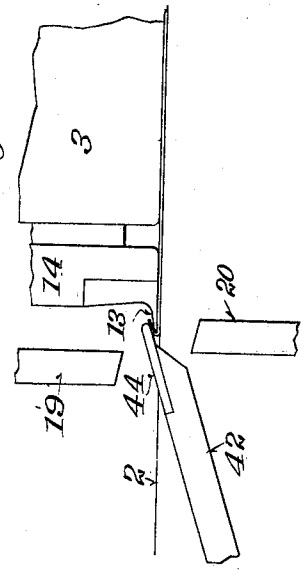


Fig. 7.



Witnesses:

Fred Palm

Chas. L. Goss.

Inventor:

Phillips F. Flagge.

By Flanders Bottum Townsend & Bottum

Attorneys.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PHILLIPP F. FLAGGE, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALBERT LYNN LAWRENCE, OF CLEVELAND, OHIO.

SHEET-METAL-JOINTING MACHINE.

1,103,953. Specification of Letters Patent. **Patented July 21, 1914.**

Application filed September 3, 1912. Serial No. 718,215.

To all whom it may concern:

Be it known that I, PHILLIPP F. FLAGGE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Sheet-Metal-Jointing Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to machines for truing and folding the edges of sheet metal preparatory to uniting correspondingly folded edges of a number of sheets for roofing and other purposes.

The main objects of the invention are to facilitate the operation of trimming, or truing and folding the edges of such sheets and to simplify and improve the construction and operation of mechanism for performing these operations.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the following claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on line 1—1, Figs. 2, 3 and 4, of a machine embodying the invention; Figs. 2, 3 and 4 are vertical cross sections on the lines 2—2, 3—3 and 4—4, respectively, Fig. 1; and Figs. 5 to 10 are diagrams illustrating the operation of the machine in trimming and forming folds on one edge of the sheet preparatory to joining it with a correspondingly folded edge of another sheet.

Referring to Figs. 1, 2, 3 and 4, 1, 1 designate side members of the frame on which is supported the top plate 2, constituting the work supporting bed of the machine.

A cross head 3, forming a work holder or clamp, is loosely mounted upon the upper reduced ends of vertically movable guide rods 4, above and transversely to the bed 2. It is normally held down against shoulders on the guide rods and permitted to yield upwardly thereon, by springs 5, interposed between it and nuts and washers on the upper ends of said rods.

The rods 4 are fitted to slide freely in downwardly extended bearings 6, on the bed 2, and are connected at their lower forked ends by links 7, with rocker arms 8, which are mounted on a cross shaft 9, supported at its ends in the side members 1 of the frame. The arms 8 are provided on their outer sides with rollers 10, engaging grooves in the inner faces of cams 11, which are mounted on a cross shaft 12 having bearings in the side members 1 of the frame, as shown in Figs. 1 and 3.

A hardened steel folding form 13, having on the lower side thereof a laterally projecting lip or flange beveled on the upper side to a comparatively thin edge, is fastened above and crosswise of the bed 2, to a U-shaped frame or member 14, the ends of which are fitted to slide horizontally in recessed ways formed in ends of the work holder or clamp 3. Vertically disposed rocker arms 15 mounted on a cross shaft 16, and extending upwardly therefrom through openings in the bed 2, are provided at their upper ends with inwardly projecting rollers 17, engaging with vertically elongated openings in the ends of the frame or member 14. At their lower ends the arms 15 are provided on their inner sides with rollers 18, engaging grooves in the outer faces of the cams 11.

Upper and lower trimming blades 19 and 20, are adjustably fastened parallel with the folding form 13, to vertically movable cross heads 21 and 22, which are guided at their ends in ways on cross pieces 23 and 24 of the frame, above and below the bed 2 and adjacent to a transverse opening 25 therein, as shown in Figs. 1 and 4. The cross head 21 is formed at the ends with arms 26, projecting downwardly through the opening 25 in the bed and connected by links 27 with horizontally disposed rocker arms 28, mounted on a cross shaft 29. The arms 28 are provided on their inner sides with rollers 30, engaging grooves in the outer faces of cams 31, which are mounted on a shaft 32. The cross head 22 is provided on the outer sides of downwardly projecting arms 33 thereof, with rollers 34, engaging with grooves in the inner faces of the cams 31. The cutting edges of the blades 19 and 20 are arranged to come together approximately in the plane of the upper face of the bed 2, and the cutting edge of the upper blade is slightly inclined, as shown in Fig. 4, to the cutting edge of the lower blade 20 so as to produce therewith a shearing cut. The upper blade is formed or provided at

the ends, as shown in Fig. 1, with projections 35, and the lower blade is formed or provided at the ends, as shown in Fig. 4, with corresponding recesses 36, to indent the corners of the sheets at the ends of their jointed edges when they are trimmed.

The bed 2 is provided adjacent to one side of the machine and on the opposite side of the clamp 3 from the trimming blades 19 and 20, with a side gage 37. Adjacent to the plane of the cutting edges of the blades and on the opposite side thereof from the folding form 13, an end stop 38 is pivotally mounted on the bed 2 at one side of the opening 25. As shown in Fig. 1, it is normally and yieldingly held by opposing springs 39, in position to engage with the front edge of a sheet when it is placed on the bed and pushed forward between said blades.

An oscillatory guide 40 is pivotally mounted at the ends and one side thereof by trunnions 41 in the side members 1 of the frame parallel with the folding form 13, as shown in Figs. 1 and 2. A reciprocatory fold turner 42 is guided at the ends in parallel ways 43 on said guide, and is provided on its inner upper side adjacent to the opening 25 in the bed, with a hardened steel blade or bar 44. On the opposite side from the blade or bar 44 the fold turner 42 is pivotally connected with the upper ends of vertically disposed rocker arms 45 approximately in line with the trunnions 41 of the oscillatory guide 40, by pins 46 passing through elongated openings in said arms. The arms 45 are mounted on a cross shaft 47 and are provided at their lower ends with inwardly projecting rollers 48 engaging with grooves in the outer faces of cams 49 mounted on a cross shaft 50.

The guide 40 is connected adjacent to the ends and inner side thereof by longitudinally adjustable links 51 with horizontally disposed rocker arms 52 mounted on a cross shaft 53. The arms 52 are provided between their ends and on the under side with rollers 54 bearing on the peripheries of cams 55 on the shaft 50. The cams 49 have two high points 56 and 57, as indicated in Fig. 1, adapted to produce two successive and complete reciprocations of the fold turner 42 to each revolution of the shaft 50. The points 57 being higher than the points 56, produce a greater movement of the fold turner 42. The cams 55 also have high points 58 and 59, corresponding with the high points 56 and 57 of the cams 49, and arranged to swing the guide 40 upward so as to carry the blade or bar 44 of the fold turner over the lip or flange of the folding form 13 when the fold turner is advanced by the cams 49 obliquely through the opening 25 in the bed 2. When the guide 40 is lifted by the projections 58 and 59 of the cams 55, the upper face of the fold turner 42 engages with and is guided by rollers 60, which are journaled in openings in the bed 2 and project slightly below the same adjacent to the opening 25.

As shown in Figs. 1 and 3, a transverse driving shaft 61, having bearings in the side members 1 of the frame parallel with the shaft 12, is provided with a pinion 62 fixed thereon and meshing with a gear 63 loosely mounted on the shaft 12. The three cam shafts 12, 32 and 50 are connected with one another by gears 64, 65 and 66, as indicated by dotted lines on Fig. 1, the several gears being shown in Figs. 2, 3 and 4. The hub of the loose gear 63 is formed or provided, as indicated in Fig. 3, with a clutch member 67, while the gear 64 is provided with a spring actuated clutch pin or dog 68, adapted when released, to engage with the clutch member 67 and thus connect the gear 64 with the gear 63. A clutch releasing and tripping rod 69, connected with a treadle or lever within convenient reach of the operator, normally holds the pin or dog 68 out of engagement with the clutch member 67. When the rod 69 is withdrawn by the operator from the pin or dog 68, the latter is thrust by its spring into engagement with the clutch member 67, thereby starting the machine. The rod 69 being released and returned by a spring or other means, not shown, to its normal position, engages with the pin or dog 68 and withdraws it from the clutch member 67, thereby automatically stopping the machine at the end of a complete revolution of the gear 64. The clutch mechanism above described is like or similar to that employed in machines of this class in which a complete operation or cycle of operations is performed with each revolution of the clutch shaft, after which the machine is automatically stopped and such operation or cycle of operations is repeated.

The several gears 64, 65 and 66 being of the same size, are turned in directions indicated by arrows on Fig. 1, one revolution to each revolution of the gear 63, when the gear 64 is connected therewith by the clutch pin or dog 68.

In the operation of the machine, the several parts being in their normal positions as shown in Figs. 1 and 5, the operator places a sheet on the bed 2, thrusting the edge to be jointed underneath the work holder or clamp 3, between the blades 19 and 20, and against the stop 38, as shown in Fig. 5, holding one of the adjacent edges of the sheet snugly against the side gage 37. He then starts the machine by withdrawing the rod 69 and releasing the clutch pin or dog 68. The work holder or clamp 3 is thereupon drawn down upon the sheet, clamping it firmly in place on the bed 2, and the folding form 13 is simultaneously ad-

vanced with the sliding frame or support 14 toward the trimming blade 19, as shown in Fig. 6, by the action of the cams 11 and the rocker arms 8 and 15. Simultaneously with the foregoing operations, the blades 19 and 20 are brought together by the action of the cams 31 which operate the cross heads 21 and 22, thereby trimming the edge of the sheet to be jointed at right angles to the edge held against the gage 37. As the trimming blades are brought together, the pivoted stop 38 is engaged by the upper blade 19 and yields downward against the tension of the upper spring 39, which returns it to its normal position following the upward movement of said blade, the blades being immediately separated and returned to their original positions after the sheet has been trimmed, to permit the fold turning blade or bar 44 to advance between them.

Immediately following the trimming of the sheet the projections 56 of the cams 49 engaging with the rollers 48, thrust the blade or bar 44 obliquely upward through the opening 25 in the bed, between the separated blades 19 and 20 and underneath the projecting edge of the sheet, whereupon the projections 58 of the cams 55 engaging with the rollers 54, lift the oscillatory guide 40, carrying the upper face of the fold turner 42 against the guide rollers 60. The stop 38 yields upwardly against the tension of the lower spring 39 and permits the blade or bar 44 in its elevated position to pass over the form 13. The blade or bar 44 being still farther advanced by the projections 56 of the cams 49, folds the edge of the sheet over the edge and upon the upper beveled or inclined face of the folding form 13, as shown in Fig. 7. The rollers 48 passing into the depressions between the projections 56 and 57 of the cams 49, and the rollers 54 passing into the depressions between the projections 58 and 59 of the cams 55, withdraw the blade or bar 44 to the position in which it is shown in Fig. 8. Simultaneously with, or immediately succeeding the last mentioned operations, the cams 11 acting through the rollers 18 and rocker arms 15, withdraw the frame or support 14 with the form 13 back to its original position relative to the work holder or clamp 3, as shown in Fig. 8. Simultaneously with, or immediately following this operation, the blade or bar 44 is advanced by the engagement of the projections 57 with the rollers 48 into engagement with the overhanging and previously folded edge of the sheet, whereupon the engagement of the projections 59 of the cams 55 with the rollers 54, lifts said blade or bar, which by its continued advance movement turns another fold in the sheet over the edge and upper face of the form 13, as shown in Fig. 9.

In the formation of the second fold by the farther advance of the blade or bar 44, which on account of the obliquity of its path to the plane of the bed is somewhat farther above the bed than it was when it formed the first fold, the folds are not closed upon the form 13 and against each other, but are left open, as shown in Figs. 9 and 10, so that the edges of two correspondingly folded sheets may be readily interlocked by inserting the folds of one sheet lengthwise into the folds of the other. After the second fold has been thus formed, the work holder or clamp 3, the frame or support 14 and the folding form 13, are raised bodily to their original position, as shown in Figs. 1 and 10, by the action of the cams 11 on the rollers 10 and rocker arms 8, and the oscillatory guide 40 with the fold turner 42 and its blade or bar 44 are withdrawn by the action of the cams 49 and 55 on the rollers 48 and 54 and rocker arms 45 and 52. The folded sheet being thus released by the clamp 3, is pushed slightly forward to disengage the folded edge from the lip or flange of the form 13, and is then withdrawn by the operator from the machine.

The several parts of the machine being now in their original and normal positions, in which they are arrested by the automatic disengagement of the clutch members after every complete revolution of the cam shafts, another sheet is placed in the machine, and the several operations as hereinbefore described, are repeated.

During the trimming and folding operations performed on each sheet, the sheet is held by the clamp 3 in one position on the bed 2, the successive folds being formed by the movements of the form 13 and bar 44, as above explained, without moving the sheet. To overcome the tendency of the folds after they are formed to spring up or out at the center away from the body of the sheet, the blade or bar 44 is curved or bent slightly downwardly at or adjacent to the center, as shown in Fig. 1, so that each fold, and particularly the first fold, when it is left by said blade or bar, will be substantially straight.

After the folded edges of two or more sheets are interlocked or assembled, as above stated, the folds are closed in a bumping press or otherwise, and any desired number of sheets so joined together may be wound into compact rolls for convenience in storage and transportation.

Each of the cams 11 and 31 is double or in effect two cams, which may be made separate from each other, although for economy and convenience they are made in one piece as shown. The cams 49 and 55 may also be formed together, as shown, or separately.

Various changes in the details of construction and arrangement of parts of the ma-

chine may be made without materially affecting its principle and mode of operation, and without departing from the scope of the invention as defined in the following claims.

I disclaim the following, as I am not the first inventor thereof:

1. In a sheet metal jointing machine the combination of a bed, means for clamping a sheet thereon, and automatic means adapted to successively form folds in the sheet, one within the other, while the sheet is immovably held in one position by said bed and clamping means.

2. In a sheet metal jointing machine the combination of a bed, means for holding the work in place thereon, a folding form movable lengthwise of the bed into different positions on the work for making successive folds thereon, and means for bending the work over said form in its different positions.

I claim:

1. In a sheet metal jointing machine the combination of a bed, a clamp for holding a sheet in place thereon, a form movable into different positions upon the sheet for forming successive folds, and a reciprocating fold turner for bending successive folds over said form.

2. In a sheet metal jointing machine the combination of a bed, a clamp movable transversely to the bed for holding a sheet in place thereon, a form carried by the clamp and movable transversely thereto into different positions on the sheet for forming successive folds, and a reciprocating fold turner adapted to bend successive folds in the sheet, one within another, over said form.

3. In a sheet metal jointing machine the combination of a work supporting bed, guides having bearings in the bed perpendicular thereto, a clamp yieldingly mounted on said guides and movable toward and from the bed, cams adapted to actuate said guides and to move said clamp into position to hold the work in place on the bed, a folding form movable transversely to the movement of said clamp into different positions on the work for successively forming folds therein, and means for bending the work over said form into successive folds one within another.

4. In a sheet metal jointing machine the combination of a bed, means for determining the position of a sheet on the bed, means for holding the sheet in place on the bed, means for trimming one edge of the sheet, a folding form movable lengthwise of the bed into different positions on the sheet parallel with its trimmed edge for making successive folds therein, and means for bending the sheet over said form in its different positions.

5. In a sheet metal jointing machine the combination of a bed, means for holding a sheet in place on the bed, a folding form movable laterally into different positions on the sheet parallel with one of its edges for making successive folds therein, a reciprocating fold turner movable obliquely to the plane of the bed and adapted to engage the sheet on the opposite side from and adjacent to the folding form in its different positions, and means for deflecting the fold turner to bend the sheet over the folding form.

6. In a sheet metal jointing machine the combination of a bed, a clamp movable toward and from the bed for holding a sheet in place thereon, a folding form, mounted on said clamp and movable toward and from the same transversely to its movement, a cam shaft provided with two sets of cams, one for operating said clamp and the other for moving the folding form into different positions on the sheet for making successive folds therein, and means for bending the sheet over said form in its different positions.

7. In a sheet metal jointing machine the combination of a bed, means for holding a sheet in place thereon, a folding form movable into different positions on the sheet for making a number of parallel folds therein, an oscillatory guide, a reciprocatory fold turner movable in said guide and adapted to bend the sheet over said form in its different positions, and a cam shaft provided with two sets of cams, one for rocking said guide and the other for reciprocating said fold turner.

8. In a sheet metal jointing machine the combination of a bed provided with a side gage, means for holding a sheet in place on the bed, reciprocating blades arranged at right angles to said gage, a stop located between and on the opposite side of the blades from the gage, means for bringing said blades together and separating them at the proper time to trim the edge of the sheet next to the stop at right angles to the edge against said gage, and means for forming successive folds adjacent to and parallel with the trimmed edge of the sheet while it is held in one position on the bed.

9. In a sheet metal jointing machine the combination of a bed, a clamp movable toward and from the bed for holding a sheet in place thereon, a folding form mounted on the clamp and movable relative thereto into different positions on the sheet, reciprocating trimming blades parallel with the folding form, an oscillatory guide, a reciprocatory fold turner mounted in said guide and movable in a plane oblique to and intersecting the plane of the bed, and cams for operating said clamp, folding form, trimming blades, guide and fold turner in proper order to clamp the sheet on the bed,

trim one edge of the sheet and successively form a number of folds in the sheet while it is held in one position on the bed.

10. In a sheet metal jointing machine the combination of a work supporting bed, a folding form above the bed, a reciprocatory fold turner movable obliquely to the plane of the bed and adapted to bend one edge of a sheet held between the form and bed into a fold over the form, and vertically movable trimming blades, arranged when separated to permit the fold turner to pass between them to and from said form.

11. In a sheet metal jointing machine the combination of clamping means for immovably holding a sheet in place and automatic means adapted to successively form folds in the sheet, one within the other, adjacent to and parallel with one edge of the sheet while it is immovably held in one position by said clamping means, said folding means being also adapted to form the second fold at a greater angle to the sheet than the first fold.

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

PHILLIPP F. FLAGGE.

Witnesses:
CHAS. L. GOSS,
FRED PALM.

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