April 5, 1932. F. J. MOORE 1,852,534

SHEET METAL CUTTING MACHINE

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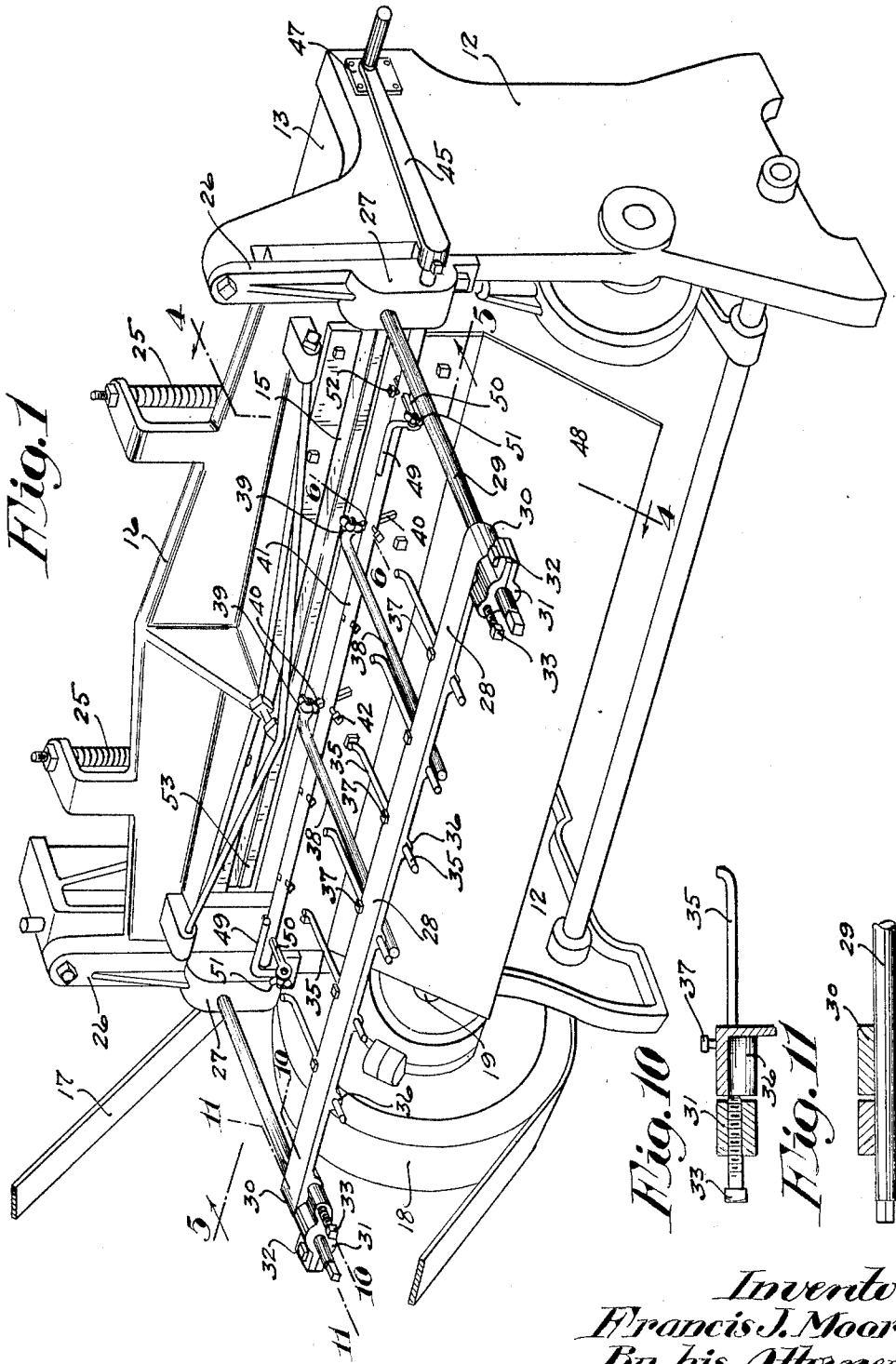

Fig. 1

Fig. 10

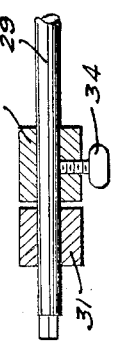

Fig. 11

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Fig. 2

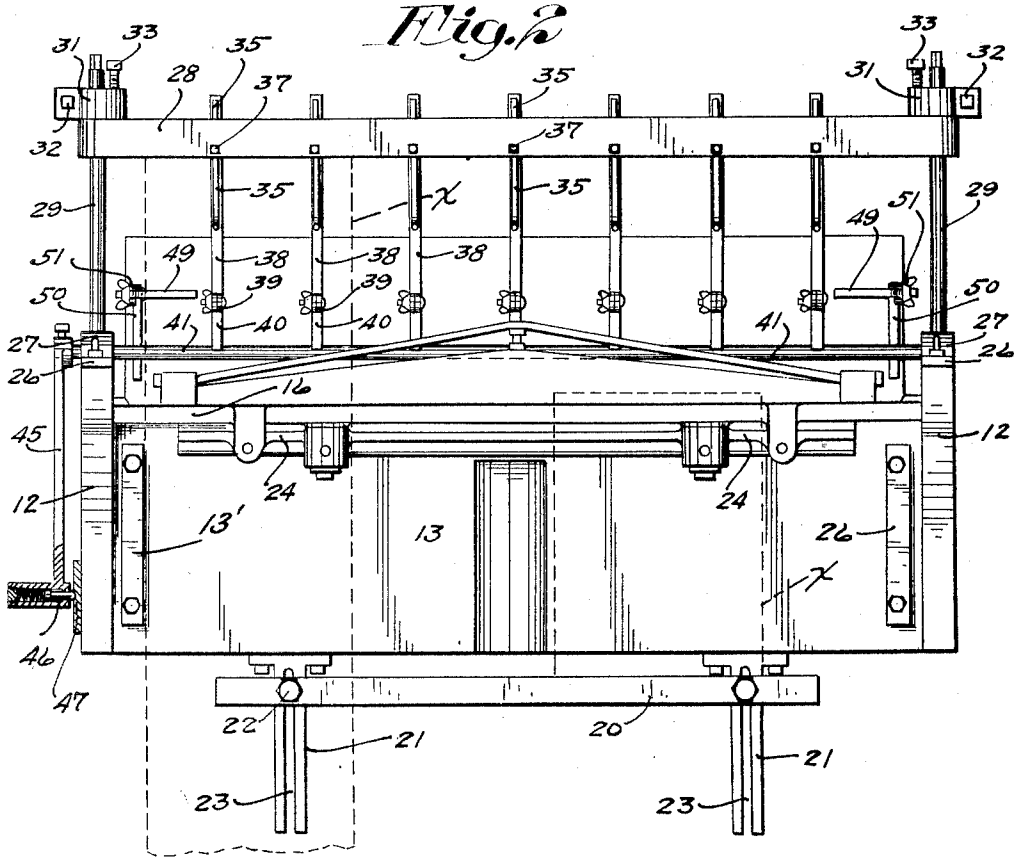


Fig. 9

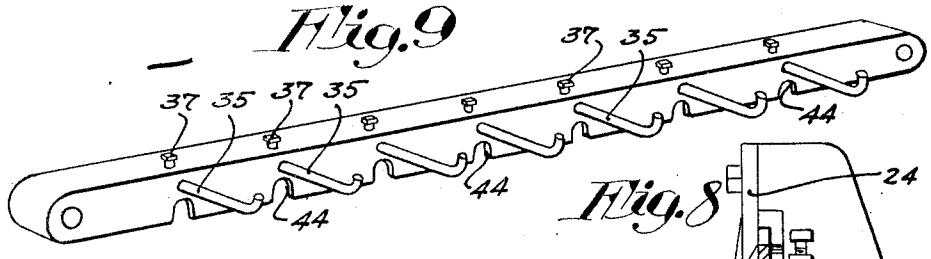


Fig. 8

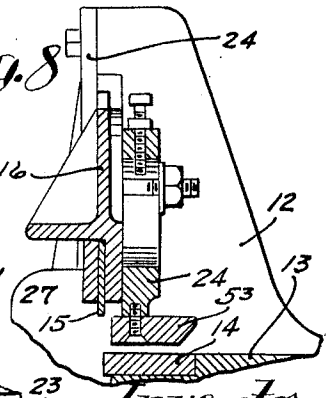
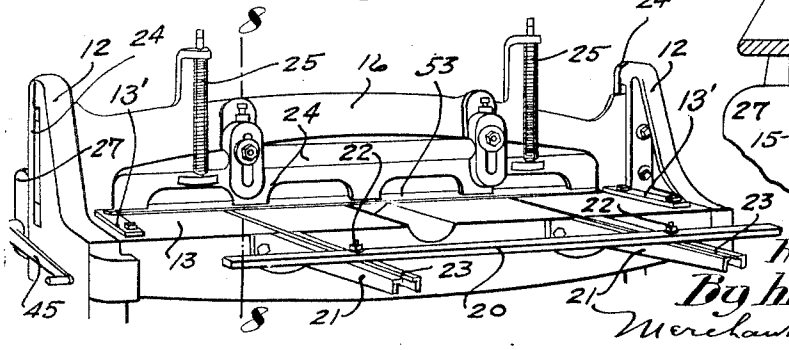


Fig. 3



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SHEET METAL CUTTING MACHINE

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Fig. 4

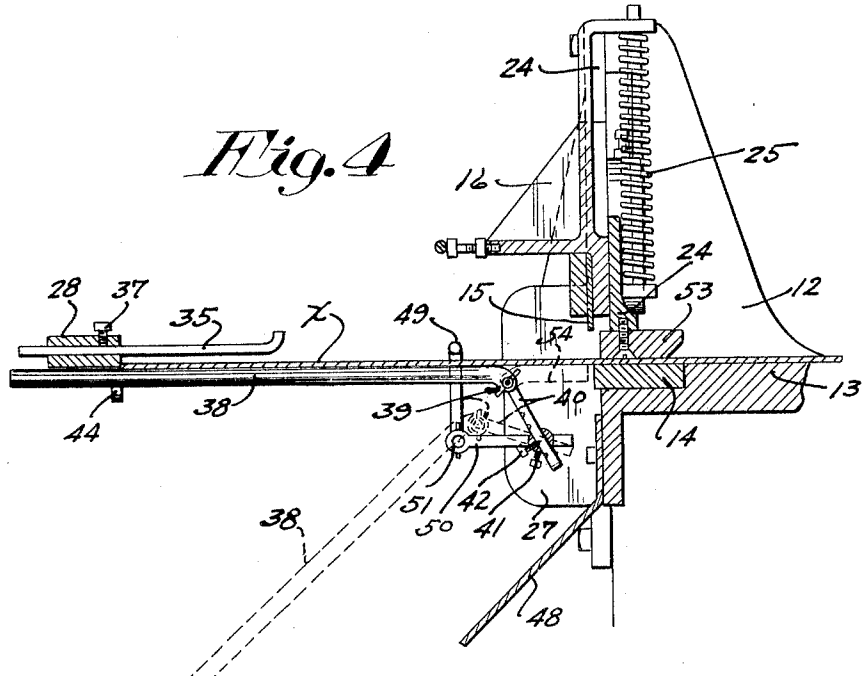


Fig. 5

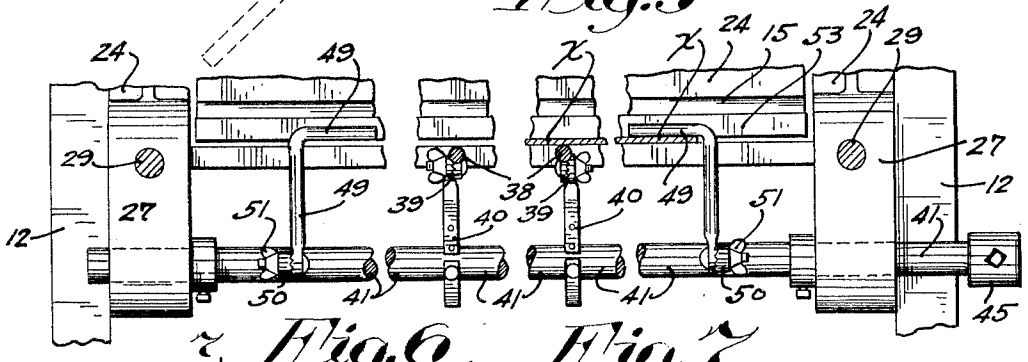


Fig. 6

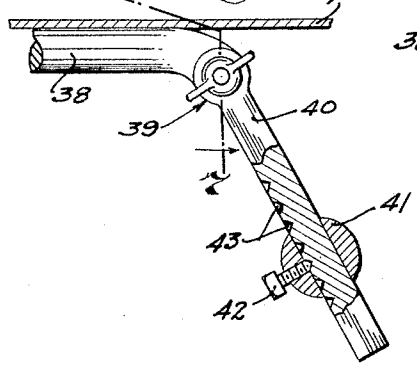
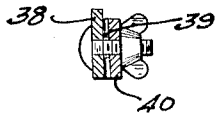


Fig. 7



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UNITED STATES PATENT OFFICE

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SHEET METAL CUTTING MACHINE

Application filed September 26, 1929. Serial No. 395,292.

My present invention relates to sheet metal work machines and more particularly shearing machines and has for its object the provision of a simple and highly efficient supporting, gauging, and releasing mechanism therefor, and to such ends the invention consists of the novel devices and combination of devices hereinafter described and defined in the claims.

In the acompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective rear view of a shearing machine having the invention embodied therein;

Fig. 2 is a plan view of the same;

Fig. 3 is a fragmentary perspective front view of the shearing machine, on a reduced scale;

Fig. 4 is a fragmentary detail view principally in section taken on the line 4—4 of Fig. 1, with some parts shown in different positions by broken lines;

Fig. 5 is a fragmentary view principally in rear elevation, with some parts sectioned on the line 5—5 of Fig. 1;

Fig. 6 is a detail view partly in side elevation and partly in vertical section taken on the line 6—6 of Fig. 1, on an enlarged scale;

Fig. 7 is a detail view principally in section taken on the line 7—7 of Fig. 6;

Fig. 8 is a detail view principally in section taken on the line 8—8 of Fig. 3, on an enlarged scale;

Fig. 9 is a perspective view of the rear gauge removed from the machine;

Fig. 10 is a detail view with some parts sectioned on the line 10—10 of Fig. 1, on an enlarged scale; and

Fig. 11 is a detail view with some parts sectioned on the line 11—11 of Fig. 1, on an enlarged scale.

For the purpose of illustrating the invention, as applied to a shearing machine, there is illustrated in the drawings such a machine and of the parts thereof, it is only necessary to note the frame end members 12, bed 13, lower shearing knife 14 and cooperating upper shearing knife 15 carried by a reciprocating bar 16 mounted in vertical ways on said end members. This upper knife bar 16 is reciprocated by power actuated connections including a belt 17, which runs over a pulley 18 on a shaft 19 journaled in the end frame members 12. For the purpose of this case it is not thought necessary to show the operating connections from the shaft 19 to the knife bar 16.

A front gauge 20, mounted on a pair of brackets 21 on the front of the bed 13 is adjustably secured thereto by nut-equipped bolts 22, which extend through slots in said gauge and are anchored in T-slots 23 in said brackets for adjustment toward or from the knives 14—15.

A work hold-down 24 is adjustably mounted on the face of the knife bar 16 and has formed in its lower longitudinal edge portion a multiplicity of long notch-like openings, through which the cutting line for the knives may be seen. This type of hold-down 24 only engages the work at a plurality of longitudinally spaced points and between said points the work is loose. The hold-down 24 is yieldingly held pressed on the work by coiled springs 25, which permit the hold-down to come in contact with the work and thereafter remain stationary and hold the work while the upper knife 15 continues its downward movement for cooperation with the lower knife 14 to produce a shearing action.

A pair of side gauges 13′ are detachably secure to the bed 13, adjacent to each side frame member 12, and extend at right angles to the shearing edge of the lower knife 14. The parts thus far described are of standard and well-known construction.

Referring now in detail to the invention:

As previously stated the knife bar 16 is mounted in ways and which ways are in the form of long notches, in the rear vertical edge portions of the frame end portions 12, that are covered by castings detachably secured by bolts to said members. When the invention is applied to a shearing machine as an attachment, these castings will be removed and castings of the type shown substituted therefore and indicated by the numeral 26. Said castings 26 are provided, at their lower end portions, with rearwardly projecting bosses 27. In actual embodiment of the invention in a shearing machine at the time of manufacture, the castings 26 will be a part of the standard equipment.

A rear gauge 28 is mounted on a pair of horizontal rearwardly projecting guide rods 29, the front ends of which are rigidly secured in the bosses 27 which are on relatively fixed parts on the machine and are always stationary. This rear gauge 28 is in the form of an angle bar, the horizontal flange of which extends rearward, and the vertical flange of which extends downwards, see Fig. 10. On the ends of this gauge 28 are bossed bearings 30 slidably mounted on the guide rods 29 and support said gauge for horizontal adjustment toward and from the knives 14—15. Attached to the guide rods 29, rearwardly of the gauge 28, is a pair of split clamp-acting abutments 31 for said gauge and are frictionally secured thereto by screws 32. Micrometer screws 33, mounted in the abutments 31, impinge against the gauge 28 and hold the same adjusted in respect to the knives 14—15.

Obviously, by adjusting the abutments 31 on the guide rods 29, the gauge 28 may be set different distances rearward of the knives 14—15 and by operating the micrometer screws 33, said gauge may be angularly adjusted to set the same parallel to said knives. After the gauge 28 has been adjusted by the micrometer screws 33, the same is rigidly secured to the guide rods 29 by thumb screws 34, which have threaded engagement with the bearings 30 and impinge against said rods.

A plurality of forwardly projecting fingers 35 are mounted in bossed bearings 36 on the underside of the gauge 28 for endwise adjustment toward or from the knives 14—15 and are held where positioned by set-screws 37, which have threaded engagement with the gauge 28 and impinge against said fingers. The forward end portions of these guide fingers 35 are curved upwardly and forwardly to direct a piece of sheet metal thereunder as the same is moved rearwardly for contact with the gauge 28 and hold the same on a support, as will presently appear.

A combined supporting and releasing device is provided for holding a sheet of metal X in the machine, positioned against the gauge 28 to be cut by the knives 14—15 and thereafter release the same. This combined supporting and releasing device includes a plurality of rearwardly projecting horizontal arms 38, the front end portion of which are curved forwardly and downwardly and attached by adjustable locking joints 39 to the upper ends of forwardly and rearwardly inclined levers 40. These levers 40 are square in cross-section, mounted in correspondingly formed diametrically extended seats in a rock shaft 41 for radial adjustment and are held where adjusted by set-screws 42 having threaded engagement with said shaft and project into any one set of a plurality of longitudinally spaced seats 43 in the levers 40. The joints 39 include half hubs, on the adjacent ends of the arms 38 and levers 40, the opposing faces of which have serrated interlocking engagement, are pivotally connected and held interlocked by thumb-nut equipped bolts, see Fig. 7. The rock shaft 41 is journaled in the bosses 27 below the guide rods 29.

In the adjustment of the arms 38, as shown, their upper faces are in the plane of the bed 13, and their free rear end portions extend under the gauge 28 and in notches 44 formed in the vetrical flange thereof. The rock shaft 41 is held against rotation, with the arms 38 in operative positions as shown in the drawings, by a hand-crank 45 secured to the left-hand end of said rock shaft and having in its hand-piece a spring projected lock plunger 46, which extends into a seat in a lock plate 47 on the adjacent frame end member 12.

To release a piece of metal, cut from the sheet X by the knives 14—15, the hand-crank 45 is operated to rock the shaft 41 into a position to swing the arms 38 downward, as shown by broken lines in Fig. 4, and permit said piece of metal to slide from the arms 38 under the action of gravity.

By reference to Fig. 4, it will be noted that the rock shaft 41 is rearwardly spaced from the machine to leave a gap therebetween for the escape of short pieces of metal cut by the knives 14—15. A deflecting plate 48, attached to the rear end of the machine, is provided for directing these short pieces of metal from the machine as they are precipitated from the bed 13.

For holding the sheet X on the arms 38 at the forward end portions thereof and for causing the same to move with said arms, when released, there is provided a pair of upright fingers 49 having laterally bent upper end portions that project toward each other over the sheet X, see Fig. 5. For narrow sheets only one of the fingers 49 will be used. These fingers 49, at their lower ends, are attached to the outer ends of levers 50, which are similar to the levers 40, by joints 51 which are similar to the joints 39. Said arms 38 are mounted in diametrically extended seats

in the rock shaft 41, project parallel to the arms 38 for radial adjustment and are held in their adjusted positions by set-screws 52, which have threaded engagement with the rock shaft 41 and impinge against said levers.

To cause the hold-down 24 to engage the sheet X throughout its full width and press the same flat onto the bed 13 in front of the knife 14, a presser bar 53 is detachably secured by screws to the underside of said hold-down, see Fig. 4, and thereby close the long notches therein.

The operation of the above described machine may be briefly described as follows: the sheet X is first placed on the bed 13 with one of its longitudinal edges against one of the side gauges 13′ to square the same with knives 14—15, and the upper knife 15 operated to trim the inner end portion of said sheet, as shown, at the left by dotted lines in Fig. 2. The sheet is then moved rearwardly between the knives 14—15, onto the arms 38, under the fingers 49 and 35 and into engagement with the gauge 28, which is set the proper distance from the knives 14—15 for the length of the piece of metal to be cut from the sheet. The fingers 49 and 35 hold the sheet flat on the arms 38 and take the warp or twist out of the same so that said sheet is flat the full distance between the knives and gauge. By thus holding the sheets flat between the knives and gauge, successive pieces, as they are cut from the sheet, are accurately measured and all of the same size. During the rearward movement of the sheet, the upwardly curved ends of the finger 35 direct said sheet thereunder and onto the underlying arms 38 for engagement with the gauge 28.

The fingers 49, in addition to holding the sheet flat on the arms 38 at the front end thereof cause the piece cut from the sheet to move with the arm 38 as they are moved into inoperative positions to release said piece. The tendency of the piece cut from the sheet is to cling to the gauge 28 and not follow the arms 38 as they are moved into inoperative position and thereby interfere with its discharge from the combined supporting and releasing device but the fingers 49 draw said piece downward and out of engagement with the gauge 28.

The last piece to be cut from the sheet X is removed from the machine, turned end for end, positioned against the front gauge 20 and one of the side gauges 26 to square the same with the knives 14—15 and thereafter the upper knife 15 is operated to trim the waste therefrom. For this class of work, the front and rear gauges must be set the same distance from the cutting line, on which the knives 14—15 operate.

The vertical adjustment of the fingers 49 is such that a sheet will freely pass thereunder when being fed to the gauge 28. To vary the vertical adjustment of the fingers 49, for sheets of different thicknesses and when several sheets are supported, the one upon the other to be simultaneously cut, the rock shaft 41 is turned about its longitudinal axis to raise or lower the levers 50 at the joints 51 and said joints adjusted to position the fingers 49 in upright positions.

To adjust the rock shaft 41, on its longitudinal axis, the set-screw, which secures the hand crank 45 to the rock shaft 41, is loosened and said shaft adjusted in respect to the hand crank 45 which is held by the lock 46—47, and thereafter said set-screw is again tightened to secure the hand crank 45 to the rock shaft 41. This adjustment of the rock shaft 41 throws the arms 38 out of adjustment and to re-adjust the same, the joints 39 are loosened to permit said arms to be set in horizontal positions and the levers are radially adjusted in the rock shaft 41 to position the upper faces of the arms 38 in the plane of the bed 13. After the arms 38 are properly adjusted, the joints 39 are again locked, and the shafts 40 secured by the set-screws 42 to the rock shaft 41.

In case it is desirable to support a short piece to be cut from a sheet or in other words a piece that is too short to be supported on the arms 38, said arms are removed from the levers 40 and short arms 54 substituted therefor, as indicated by broken lines in Fig. 4. These short arms 54 project forward from the levers 40 with their free ends terminating close to the knife 14 and when operated to release a piece of work thereon, are moved by said levers into upwardly inclined positions.

What I claim is:

1. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a work supporting and releasing device between the cutting mechanism and gauge and operable to discharge a piece of work between said device and gauge, and means for operating said device to discharge a piece of work therefrom.

2. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a work support between the cutting mechanism and gauge, a plurality of forwardly projecting guide members on the gauge overlying the support for directing a piece of work to the gauge and holding the same on the support, and means for causing a piece of work on said device to move therewith when operated to discharge said piece therefrom.

3. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a work support between the cutting mechanism and gauge, and a plurality of guide members on the gauge for directing a piece of work to the gauge and holding the same on the support, a retaining member mounted on said device to overlie a piece of work thereon and cause said piece to move with the device when operated to discharge the piece of work therefrom.

4. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a work support between the cutting mechanism and gauge, and a plurality of guide members on the gauge for directing a piece of work to the gauge and holding the same on the support, a retaining member mounted on said device to overlie a piece of work thereon and cause said piece to move with the device when operated to discharge the piece of work therefrom, said retaining member being adjustable to vary the distance between said member and device.

5. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft rearward of the cutting mechanism, operating means for the rock shaft normally holding the same in a predetermined position, and rearwardly projecting arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge the piece of work therefrom.

6. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft rearward of the cutting mechanism, operating means for the rock shaft normally holding the same in a predetermined position, and rearwardly projecting arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge the piece of work therefrom, said arms being mounted on the rock shaft for vertical adjustment.

7. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge the piece of work therefrom, and guide members on the gauge for directing a piece of work thereto and holding the same on the arms.

8. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge the piece of work therefrom, and a retaining member on the rock shaft for causing a piece of work on the arms to move therewith when operated to release said piece therefrom.

9. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge the piece of work therefrom, and a retaining member on the rock shaft for causing a piece of work on the arms to move therewith when operated to release said piece therefrom, said retaining member being vertically adjustable in respect to the arms.

10. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, levers mounted on the rock shaft for radial adjustment, arms for supporting a piece of work between the cutting mechanism and gauge, and adjustable joints securing the arms to the levers for angular movement in respect thereto.

11. In a machine of the class described,

the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined work supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, levers mounted on the rock shaft for radial adjustment, arms for supporting a piece of work between the cutting mechanism and gauge, and adjustable joints securing the arms to the levers for angular movement in respect thereto, said joints being operable to hold the arms in either a forwardly or rearwardly projecting position.

12. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge a piece of work therefrom, and a retaining member on the rock shaft for causing the piece of work on the arms to move therewith when operated to release said piece therefrom.

13. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, a combined supporting and releasing device comprising a rock shaft, operating means for the rock shaft normally holding the same in a predetermined position, arms on the rock shaft for supporting a piece of work between the cutting mechanism and gauge, said rock shaft being operable to move the arms into a position to discharge a piece of work therefrom, a lever mounted on the rock shaft for radial adjustment, a retaining member for causing a piece of work on the arms to move therewith when operated to release said piece therefrom, and an adjustable joint rigidly connecting the retaining member to the lever for angular adjustment in respect thereto.

14. In a machine of the class described, the combination with a main frame and cutting mechanism, of a guide on the main frame and held stationary thereby in respect to the cutting mechanism, a rear gauge mounted on the guide, and a work support between the cutting mechanism and gauge and pivoted at one end for dumping the work after the severing operation by the cutting mechanism.

15. The structure defined in claim 14 in further combination with a forwardly projecting guide overlying the support for directing a piece of work to the gauge and holding the same on the support.

16. The structure defined in claim 14 in further combination with a plurality of forwardly projecting guide members on the gauge overlying the support for directing a piece of work to the gauge and holding the same on the support.

In testimony whereof I affix my signature.

FRANCIS J. MOORE.