E. S. KEYES.

MANIPULATOR.

APPLICATION FILED OCT. 11, 1912.

1,066,627.

Patented July 8, 1913.

3 SHEETS—SHEET 1.

FIG. 1.

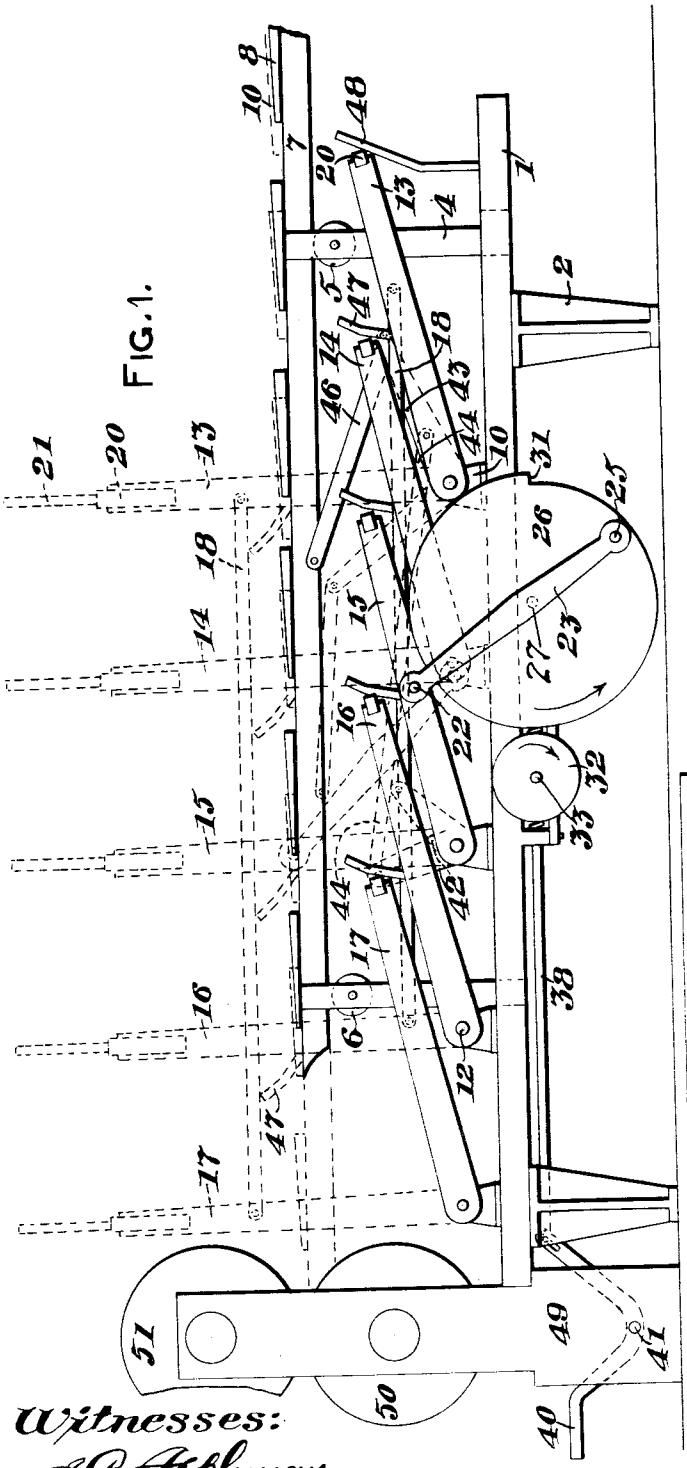
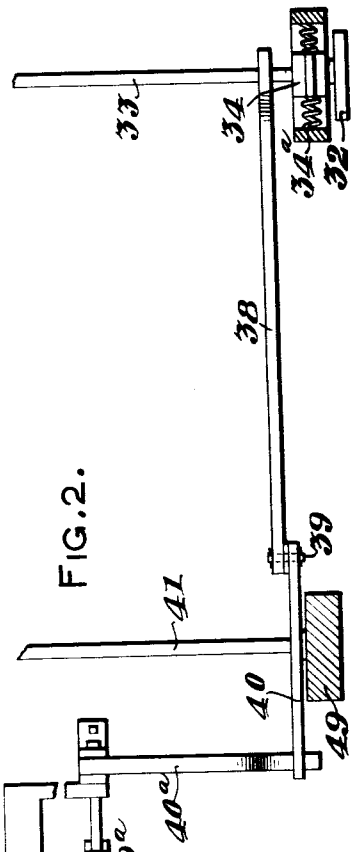


FIG. 2.



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3 SHEETS—SHEET 2.

FIG. 3

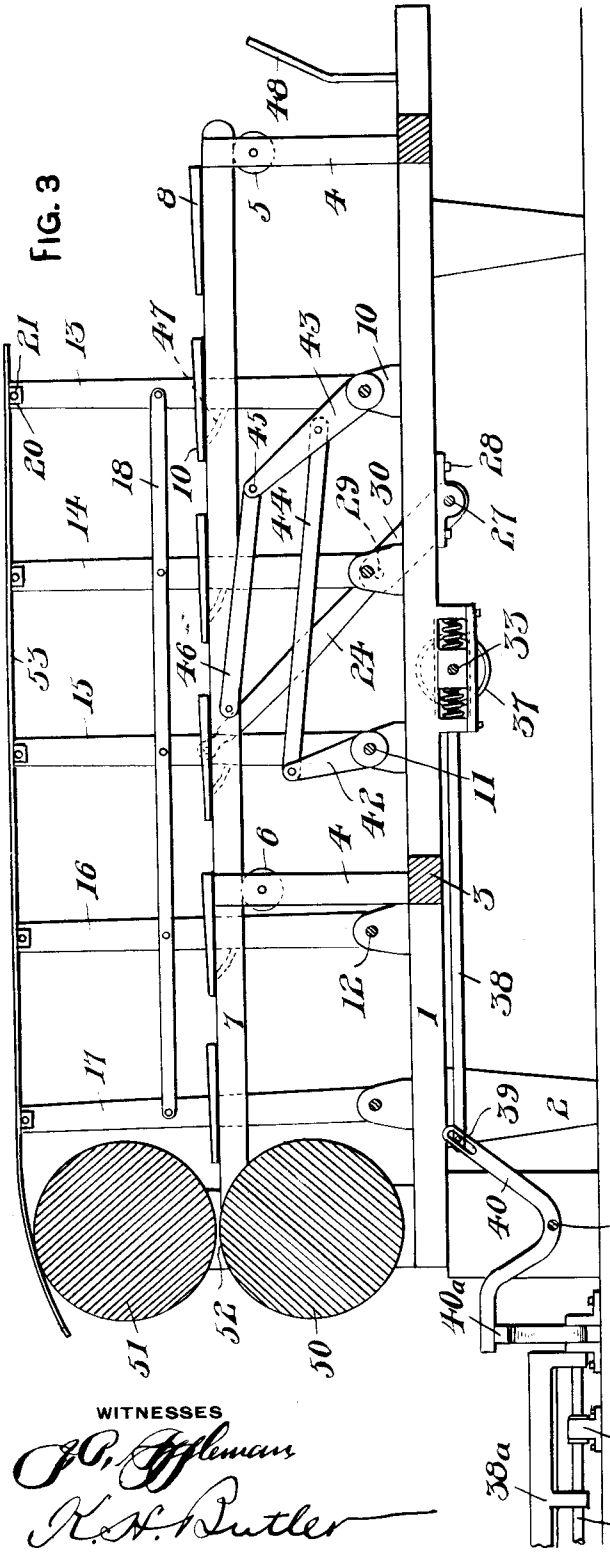
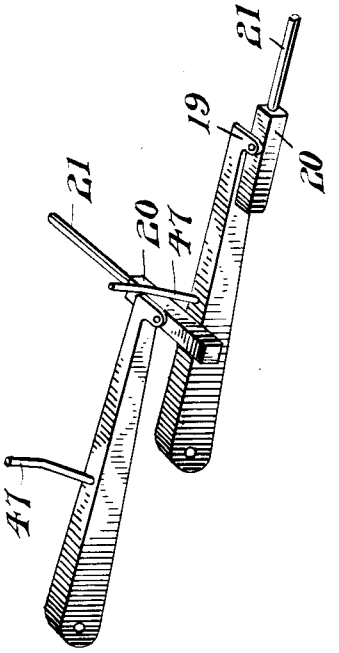


FIG. 8



WITNESSES

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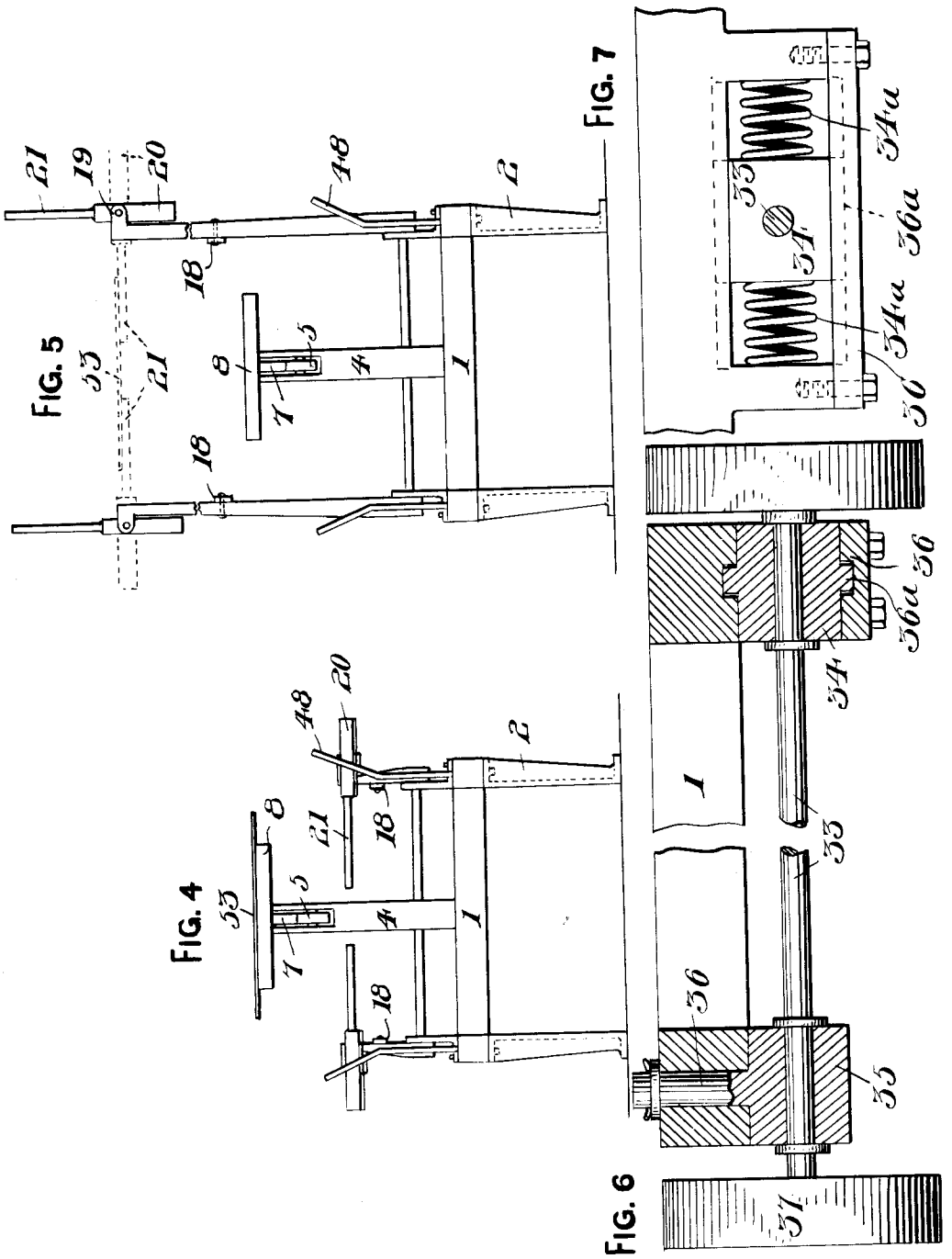
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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MANIPULATOR.

1,066,627. Specification of Letters Patent. Patented July 8, 1913.

Application filed October 11, 1912. Serial No. 725,197.

To all whom it may concern:

Be it known that I, EARL S. KEYES, a citizen of the United States of America, residing at Parnassus, in the county of Westmoreland and State of Pennsylvania, have invented certain new and useful Improvements in Manipulators, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to manipulators, and the objects of my invention are:—First, to provide a manipulating device for handling various kinds of work, for instance metal sheets, bars or unfinished material; lumber in various forms, and any material that is ordinarily manipulated or handled by hand. Second, to provide a manipulator that can be advantageously used in connection with rolling mill rolls, planing mill planers, and machines of various types where pieces of work are returned to be further operated upon. Third, to provide a manipulator that saves considerable time and labor, particularly in a sheet rolling mill where sheets in an unfinished condition are manually manipulated numerous times before being finished. Fourth, to provide a manipulator consisting of comparatively few parts, inexpensive to manufacture, durable and easy to assemble, and comparatively inexpensive to set up. Fifth, to provide a manipulator that facilitates an expeditious and economic production of sheet metal and eliminates a laborious task in connection with the manufacture of the same.

The above objects are attained by a novel combination of mechanical elements that will be hereinafter specifically described and then claimed, and reference will now be had to the drawings, wherein like numerals denote corresponding parts throughout the several views, in which:—

Figure 1 is a side elevation of the manipulator showing the pivoted arms and gravity carriers in elevated position by dotted lines, Fig. 2 is a plan of a treadle actuated mechanism, Fig. 3 is a longitudinal sectional view of the manipulator, showing a piece of work supported in an elevated position, Fig. 4 is an end view of the manipulator, showing the counter-balanced supports in a lowered position, Fig. 5 is a similar view showing the same in an elevated position, Fig. 6 is an enlarged elevation of a portion of the operating mechanism partly broken away and partly in section, Fig. 7 is a cross sectional view of the same, and Fig. 8 is a perspective view of detached arms and gravity carriers.

A manipulator in accordance with this invention comprises a foundation or base frame 1, which in the present instance, is rectangular in plan and is held in an elevated position by legs 2 or other supports. The base frame 1, as it will be hereinafter termed, has transverse braces 3 provided with longitudinally alining uprights 4. The upper ends of the uprights 4 are slotted or bifurcated, as at 5 and revolubly mounted in the inner ends of said slots are rollers or wheels 6. Movably mounted upon the rollers or wheels 6 is a longitudinal work support 7 that is guided in its movement by the side walls of the slots 5. The work support 7 has a plurality of platforms 8 that are equally spaced throughout the length of said work support, said platforms having the upper surfaces thereof beveled, as at 10 in the direction from which a piece of work is received, thereby allowing a piece of work to easily pass onto the platforms of the support.

The sides of the base frame 1 are provided with a plurality of equally spaced transversely alining angle bearings 10, and movably mounted in said bearings are transverse rock shafts 11 and 12. Mounted upon the outer ends of the rock shafts 11 and 12 are sets of supporting arms 13, 14, 15, 16 and 17, the arms of each set being pivotally connected to longitudinal connecting bars 18 arranged at the inner sides of said arms, whereby all of said arms can move in unison.

The outer or upper ends of the arms are provided with right angular bifurcated extensions 19 protruding from the outer sides of said arms and serving as bearings for counter-balanced supports 20 that have the upper ends thereof reduced, as at 21, whereby said supports will remain in longitudinal alinement with the arms 13 to 17 inclusive until otherwise shifted.

The outer sides of the arms 15 are pro-

vided with wrist pins 22 and loosely mounted upon said pins are pitmen 23 and 24, the former being loosely mounted upon an eccentric wrist pin 25, carried by the outer side of a driven wheel 26 mounted upon the end of the shaft 27, journaled in bearings 28, carried by the bottom side of the base frame 1. The pitman 24 is pivotally connected, as at 29 to a crank 30 mounted upon the opposite end of the shaft 27.

The driven wheel 26 has the periphery thereof provided with a shoulder 31 and adapted to frictionally engage the driven wheel 26 is a small friction wheel 32 mounted upon one end of a shaft 33, journaled in bearings 34 and 35. The bearing 34 is slidably mounted in a housing 36 carried by the bottom side of the base frame 1, at one side thereof, said bearing having tongues 36^a to prevent lateral displacement, said tongues extending into the grooves provided therefor in the housing 36 and the frame 1. The bearing 34 is retained normally intermediate the ends of the housing by coiled compression springs 34^a, these springs shifting the bearing to an intermediate position after having been actuated. The bearing 35 has a stem 36 rotatably mounted in the opposite side of the base frame, the bearings 34 and 35 permitting of the wheel 32 being shifted into engagement with the driven wheel 26. The shaft 33 has a drive wheel 37 that permits of said shaft being driven from a suitable source of power.

Loosely connected to the shaft 33, adjacent to the bearing 34 is a reach rod 38 that extends longitudinally beneath the base frame and is loosely connected, as at 39 to a lever 40 pivotally mounted upon a rod 41 carried by a roll housing 49. The lever 40 engages the curved end of a crank 40^a, carried by the end of a shaft 41^a, journaled in bearings 39^a. The shaft 41^a is provided with a longitudinal treadle 38^a, best shown in Fig. 2.

The rock shafts 11, intermediate the ends thereof, are provided with cranks 42 and 43, the former being of less length than the latter and said cranks are pivotally connected together by a link 44, the end of the link 44 being pivotally connected to the crank 43, intermediate the ends thereof. The upper end of the crank 43 is pivotally connected, as at 45 to one side of the support 7 by a bar 46, whereby when the shafts 11 are rocked, the support 7 will be reciprocated upon the rollers or wheels 6 in the upper end of the uprights.

The arms 13 to 16 inclusive are provided with cam members 47, said members being positioned to be engaged by the counter-balanced supports 20 as the arms 13 to 17 are lowered, as shown in Fig. 1. The end of the base frame 1 has cam members 48 adapted to be engaged by the counter-balanced supports 20 of the arms 13, said cam members coöperating with the cam members 47 and for the same purpose.

As an instance of the use of the manipulator, the base frame 1 has been illustrated in proximity to a roll housing 49 having revoluble rolls 50 and 51 that are operated in opposite directions, said rolls providing a pass 52 for a piece of work 53, as a sheet of metal. Assuming that the manipulator is in the position shown in Fig. 3, a piece of work passes onto the platforms 8, while the piece of work 53 is being removed from the counter-balanced supports 20. As the piece of work 53 is removed from the supports 20 of the arms 13, said supports assume a vertical position and this is true of the other counter-balanced supports 20, which successively assume a similar position. During the time required for the piece of work 53 to pass off of the counter-balanced supports 20, another piece of work is sliding onto the platforms.

After the sheet of material, which is designated 53, passes off all of the counter-balanced supports 20, the arms 13, 14, 15, 16 and 17 are lowered by gravity and when so doing, owing to the manner in which the arms 15 are connected to the wheel 26 and crank 30, that is by the pitmen 23 and 24, the wheel 26 will be shifted to the position shown in Fig. 1 of the drawing and spaced from the wheel 32, as the wheel 32 is in an inactive position. When the arms 13 to 17 are lowered, the counter-balanced supports, are carried therewith and move in the path of the cam members 47 and 48 whereby said counter-balanced supports are shifted to the position shown in Fig. 4, that is to say, to extend below the plane of the platforms 8 whereby when the said arms 13 to 17 are elevated, the counter-balanced supports 20 will engage the sheet of metal carried by the platforms 8 and elevate the same. The weight of the sheet of metal maintains the counter-balanced supports 20 at right angles with respect to the arms 13 to 17 until the sheet of metal is pulled off of all of said counter-balanced supports. The arms 13 to 17 are connected together whereby when the arms 15 are elevated, all of the arms will move in unison. The arms 13 to 17 are elevated when the wheel 26 moves in the direction of the arrow Fig. 1 and which in turn shifts the shaft 27, the latter carrying the crank 20 therewith. When the wheel 26 moves in the direction of the arrow Fig. 1, the pitman 23 is shifted and also the pitman 24, this will elevate the arms 13 to 17. The wheel 26 is driven from the wheel 32 and said wheel 32 is moved into frictional contact with the wheel 26 by the operator depressing the treadle 38^a, which causes the operative connection between the treadle 38^a, and the lever 40, to shift the lever 40, where-

by the reach rod 38 is moved longitudinally in a direction to cause the wheel 32 to frictionally engage the wheel 26 and drive the latter. When the wheel 32 passes off the shoulder 31, it will cause a jarring of the treadle 38ª and indicate to the operator that the arms 13 to 17 have been raised the necessary distance and pressure is then released from the treadle 38ª. After the sheet passes off the counter-balanced supports 20, the arms 13 to 17 lower by gravity.

As the arms 13 to 17 inclusive are lowered the supports 20 are shifted inwardly at right angles to said arms by the cam members 47 and 48, said supports 20 assuming this position at the same time the work support starts toward the rolls. As the supports 20 are elevated they pass between platforms and engaging under the piece of work, raise the piece of work from the platforms and carry it upwardly as the work support moves into position at the rolls to receive another piece of work. The end of the piece of work 53 is projected onto the uppermost roll and is removed from the supports 20 as fast as another piece of work is fed onto the shiftable work support.

From the foregoing it will be observed that I have devised a work manipulating device that embodies a reciprocatory work support and that coöperating with said support there are arms and supports 20 for removing a piece of work from the support and shifting the same into position to be removed from the support 20, the supports 20 successively assuming a position that permits of the arms being restored to their normal position without interfering with another piece of work passing onto the support. The means employed for restoring the counter-balanced supports to their normal position are carried by the arms in the majority of instances and with the arms operating in unison, a large piece of work can be evenly carried to a position to be removed from the counter-balanced supports.

The manipulator eliminates the labor heretofore resorted to for receiving pieces of work from the pass 52 and transferring the same over the uppermost roll 51 to again be placed in position.

It is thought that the operation and utility of the manipulator will be apparent without further description, and while in the drawings there is illustrated a preferred embodiment of the invention, it is to be understood that the structural elements are susceptible to such variations as fall within the scope of the appended claims.

What I claim is:—

1. A manipulator comprising a base frame, a reciprocatory work support carried by said frame, and counter-balanced supports movable simultaneously with said support for removing work therefrom.

2. A manipulator comprising a base frame, a reciprocatory work support carried by said frame, arms movable simultaneously with said work support, and counter-balanced supports carried by said arms and adapted to remove work from said work support.

3. A manipulator comprising a base frame, a reciprocatory work support carried thereby, and arms pivotally supported by said base frame and movable simultaneously with said support, counter-balanced supports carried by said arms and adapted to remove a piece of work from said support, and means carried by said frame for operating said arms and said work support.

4. A manipulator comprising a base frame, a reciprocatory work support carried thereby, and means carried by said base frame whereby a piece of work can be elevated from said work support to permit of said work support receiving another piece of work.

5. A manipulator comprising a base frame, a reciprocatory work support carried thereby, and gravity carriers movable simultaneous with said work support for removing a piece of work from said support and shifting the same into position to be removed from said counter-balanced supports.

6. A manipulator comprising a reciprocatory work support, arms movable simultaneously with said work support, and counter-balanced supports carried by said arms and adapted to remove a piece of work from said support and shift the same into position to be removed from said counter-balanced supports.

7. A manipulator comprising a base frame, a reciprocatory work support carried thereby, counterbalanced supports movable with said work support and adapted to remove a piece of work therefrom and shift said piece of work to an elevated position to be removed from said counter-balanced supports, and means for restoring said counter-balanced supports to a normal position to again remove a piece of work.

8. A manipulator comprising a work support, arms movable relatively to said support, and counter-balanced supports pivotally supported by the ends of said arms and adapted to be positioned to remove pieces of work from said support.

9. A manipulator comprising a base frame, a work support carried thereby, pivoted arms carried by said frame, counter-balanced supports movable with said arms, and means for maintaining said counter-balanced supports at right angles to said arms whereby a piece of work can be removed from said support.

10. A manipulator comprising a base frame, a work support carried thereby, pivoted arms carried by said frame, counter-

balanced supports movable with said arms, means for maintaining said counter-balanced supports at right angles to said arms whereby a piece of work can be removed from said support, and means supported by said frame for operating said arms.

11. A manipulator comprising a work support, counter-balanced supports held in position relatively to said support to remove a piece of work therefrom, means for elevating said counter-balanced supports to remove a piece of work from said support, and shift said piece of work to be removed from said counter-balanced supports, said counter-balanced supports successively assuming a position whereby said counter-balanced supports can be restored to a normal position.

12. A manipulator for work in connections with rolls, comprising a reciprocatory work support movable to and from said rolls, and gravity arms movable simultaneously with said work support for removing work therefrom and shifting the work over said rolls.

13. A manipulator for pieces of work operated upon by rolls, comprising a reciprocatory work support movable to and from the pass of said rolls, pivoted arms movable with said work support, and means carried by said arms for removing a piece of work from said support and shifting the same to the top of said rolls.

14. A manipulator for pieces of work operated upon by rolls, comprising a work support, pivoted arms adjacent to said support, and counter-balanced supports movable with said arms and adapted to remove a piece of work from said support and shift the same over the top of said rolls, said counter-balanced supports assuming a position to provide clearance for said supports as said arms assume a normal position.

15. A manipulator for pieces of work operated upon by rolls, comprising a work support, pivoted arms adjacent to said support, carriers movable with said arms and adapted to remove a piece of work from said support and shift the same over the top of said rolls, said carriers assuming a position to provide clearance for said supports as said arms assume a normal position, and means in connection with said arms for shifting said carriers into position to remove another piece of work from said supports.

16. A manipulator for pieces of work operated upon by rolls, comprising a reciprocatory work support movable to and from said rolls, counter-balanced supports held at right angles to said support and movable relatively to said support whereby a piece of work can be removed from said support and shifted over said rolls, said counter-balanced supports assuming a position to provide clearance for said support as said counter-balanced supports are restored to normal position, and means impinged by said counter-balanced supports to position said counter-balanced supports at right angles to said support.

17. A manipulator for pieces of work operated upon by rolls, comprising a base frame, a work support carried thereby, arms movably supported by said frame and movable relatively to said work support, means carried by said arms and held at right angles thereto for removing a piece of work from said support as said arms are elevated, said means assuming a position to provide clearance for said work support as said arms are restored to normal position, and means for restoring the first mentioned means to normal position.

18. A manipulator for pieces of work operated upon by rolls, comprising a base frame, a movable work support carried thereby, sets of arms movable in unison with said work support, counter-balanced supports carried by said arms at right angles to said work support and adapted to remove a piece of work from said support as said arms are elevated, said counter-balanced supports assuming a position when relieved of said piece of work to provide clearance for said work support as said arms are restored to normal position, and means impinged by said counter-balanced supports for restoring said counter-balanced supports to normal position.

19. A manipulator for pieces of work operated upon by rolls, comprising a base frame, a movable work support carried thereby, sets of arms movable in unison with said work support, counter-balanced supports carried by said arms at right angles to said work support and adapted to remove a piece of work from said support as said arms are elevated, said counter-balanced supports assuming a position when relieved of said piece of work to provide clearance for said work support as said arms are restored to normal position, means impinged by said counter-balanced supports for restoring said counter-balanced supports to normal position, and means carried by said base frame whereby said support and said arms can be moved.

20. A manipulator for pieces of work operated upon by rolls, comprising a base frame, a movable work support adapted to receive work from said rolls, sets of arms movable simultaneously with said work support, counter-balanced supports carried by said arms and held at right angles thereto to engage under a piece of work carried by said support and shift said piece of work from said rolls, said counter-balanced supports successively assuming a position to provide clearance for said work support as said arms are restored to normal position,

and means carried by said arms and impinged by said counter-balanced supports for positioning said counter-balanced supports at right angles to said arms.

21. A manipulator for pieces of work operated upon by rolls, comprising a base frame, a movable work support adapted to receive work from said rolls, sets of arms movable simultaneous with said work support, counter-balanced supports carried by said arms and held at right angles thereto to engage under a piece of work carried by said support and shift said piece of work over said rolls, said counter-balanced supports successively assuming a position to provide clearance for said work support as said arms are restored to normal position, means carried by said arms and impinged by said counter-balanced supports for positioning said counter-balanced supports at right angles to said arms, and means carried by said frame whereby said arms and said support can be moved.

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

EARL S. KEYES.

Witnesses:
J. P. APPLEMAN,
MAX H. SROLOVITZ.