

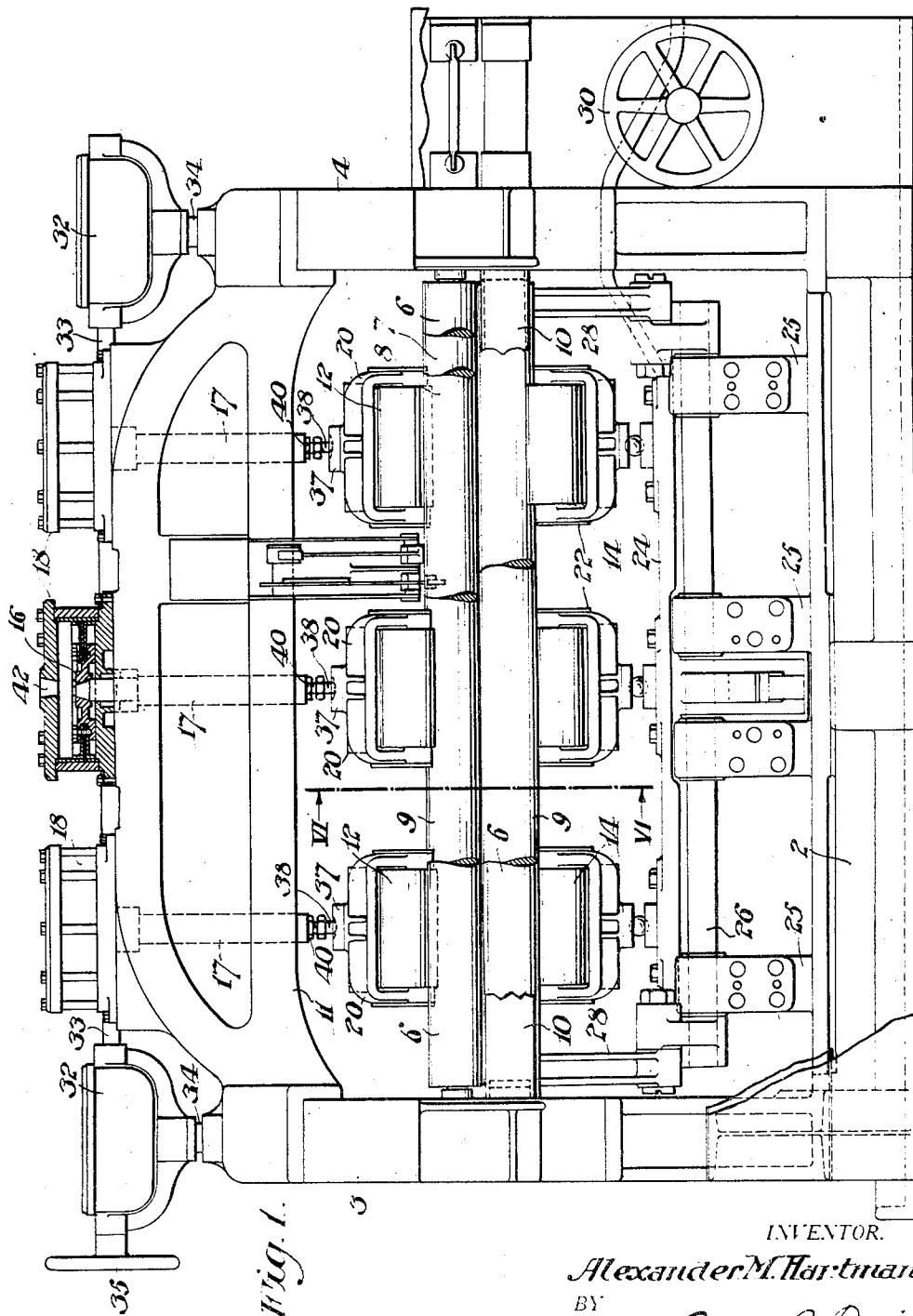
Aug. 21, 1934.

A. M. HARTMANN
METAL WORKING MACHINE

1,970,911

Filed May 19, 1932

2 Sheets-Sheet 1



INVENTOR.

Alexander M. Hartmann,

BY

John P. Parlor
ATTORNEY.

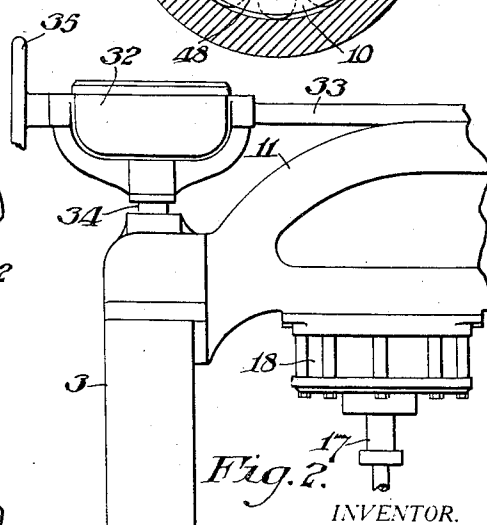
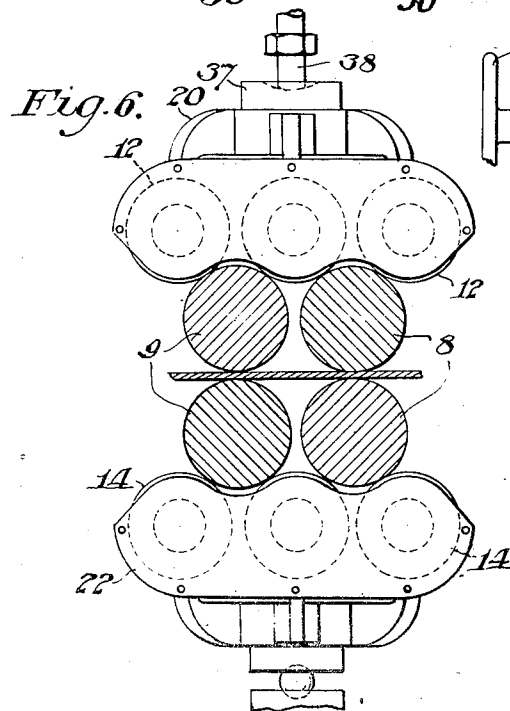
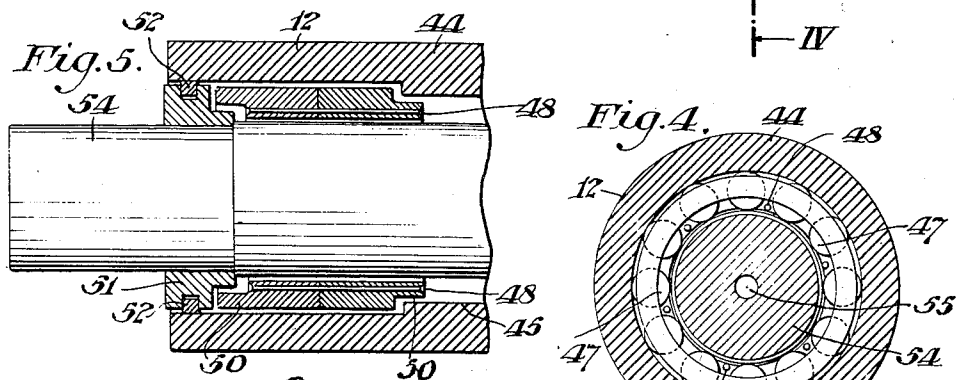
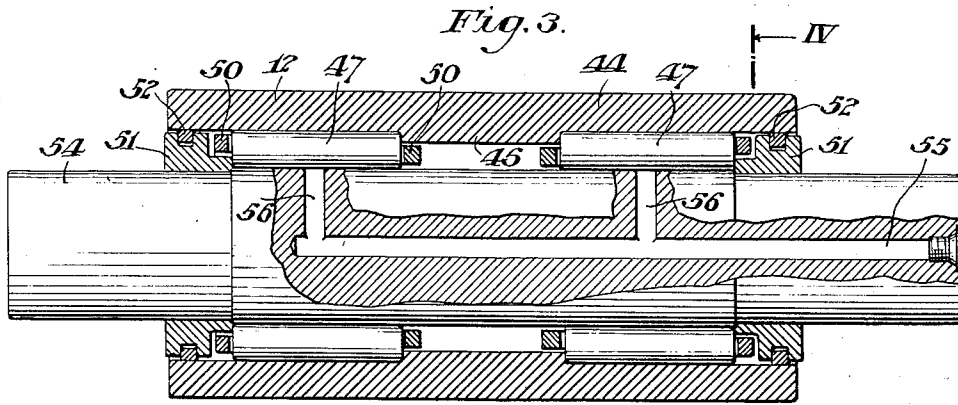
Aug. 21, 1934.

A. M. HARTMANN
METAL WORKING MACHINE

1,970,911

Filed May 19, 1932

2 Sheets-Sheet 2



INVENTOR.
Alexander M. Hartmann,
BY *John P. Parboyl*
ATTORNEY.

UNITED STATES PATENT OFFICE

1,970,911

METAL WORKING MACHINE

Alexander M. Hartmann, Philadelphia, Pa.,
assignor to Edward G. Budd Manufacturing
Company, Philadelphia, Pa., a corporation of
Pennsylvania

Application May 19, 1932, Serial No. 612,221

6 Claims. (Cl. 153-54)

My invention relates to metal working machines and particularly to roller levelers for cold working metal sheets to prevent stretcher strains and for straightening or leveling metal sheets prior to forming operations, such as pressing, drawing and the like.

Objects of my invention are to render the control of the rolls particularly the pinch rolls which are forced together under high pressure to furnish the tractive effort to draw the sheets through the cold working operation, more flexible and effective, to automatically change the pressure exerted by the rolls on the material to be worked in accordance with the particular characteristics or structure of the material, to preclude damage to the rolls by undue pressure thereon when the machine is not in operation and to insure that the pressure exerted by the rolls against the worked material shall be maintained at any selected constant value.

The invention relates to a machine of the type shown in Patent No. 1,649,706, issued November 15, 1927 to George L. Kelley et al., on an application filed May 29, 1925, and assigned to the assignee of this invention, to which reference may be had for a more complete understanding of the device herein described.

In previous devices of this character, it has been usual to mount the so-called equalizer rolls above and below the pinch rolls to prevent lateral bending of the rolls and to permit the use of longer rolls for a given diameter than would otherwise be the case.

The equalizer rolls were biased against the pinch rolls by the use of relatively heavy springs, which exerted a pressure on the order of 20,000 pounds on a machine having pinch rolls of 72 inches in length. This pressure was constantly exerted on certain parts, whether the machine was in operation or not.

These springs were manipulated by hand to vary or adjust the tension thereof and, by reason of the relatively great forces exerted thereby, were individually and separately adjusted by hand-operated gear-reducing means.

Also, in the prior art machine above mentioned, the pressure exerted by the springs varied with variations in thickness of the material being worked.

In practicing my invention, I arrange the parts so that there is never more than the weight of the equalizer rolls and appurtenant parts imposed on parts therebelow when the machine is not in operation; this result being accomplished by substituting fluid actuated pressure means for the

springs of the prior device. There are preferably a plurality of sets of equalizer, or pressure adjusting, elements, spaced along the rolls, for engagement therewith only at local positions therealong and rendering the rolls free from engagement with the pressure means at other positions therealong.

This arrangement simplifies the structure, reduces the amount of material and number of parts, and permits the rolls to be of substantially greater length for a given diameter.

The use of fluid actuated means, for equalizing the pressure on the rolls, facilitates the use of means for simultaneously controlling the separate pressure elements and causes them to automatically adjust the rolls in accordance with the material, and to maintain equal pressures. This is in marked distinction from the machine employing springs, wherein an intermediate spring must be separately adjusted to compensate for greater lateral bending or bowing at the center of a relatively long roll of small diameter.

Fig. 1, of the accompanying drawings, is a view, in front elevation, of a roller leveler embodying my invention, parts being broken away for clearness,

Fig. 2 is a view, similar to the upper left-hand portion of Fig. 1, showing a modified form of the invention,

Fig. 3 is an enlarged detail view, partially in side elevation and partially in longitudinal section, of an equalizer roll, and lubricating structure therefor, embodied in my invention,

Fig. 4 is a view, taken substantially along the line IV-IV of Fig. 3,

Fig. 5 is a view, similar to a portion of Fig. 3, taken along a different section of the equalizer roll thereof, and

Fig. 6 is a view, taken substantially along the line VI-VI of Fig. 1.

Referring particularly to Figs. 1 and 6, the device comprises, in general, a bed-plate 2, side upright or bearing supports 3 and 4, guide rolls 6, a brake roll 7, front and rear pinch rolls 8 and 9, respectively, an apron 10, a top cross brace or main beam 11, upper and lower equalizer rolls 12 and 14, respectively, piston elements 16 and piston rods 17, relatively movable and co-operating between cylinders 18 and carriages 20 of the upper equalizer rolls 12, carriages 22 for the lower equalizer rolls 14, a support 24 for the lower carriages 22, supports 25 for a brake-roll connecting rod 26, brake-roll levers 28, an operating member or handle 30 for adjusting the stroke of the brake roll, gear boxes 32 and shafts

33 and 34 connected, through the boxes 32, between a hand wheel 35 and end bearings in the uprights 3 and 4 for adjusting the stagger rolls.

All of the parts, except as will herein be specifically pointed out, are constructed, and operate as in prior machines and need only be set forth, in general, to the effect that the work object, such as a steel sheet, is fed toward the machine, as viewed in Fig. 1, over the apron 10, to position it between the guide rolls 6, which start the sheet transversely between the other rolls.

From the guide rolls 6, the sheet passes between the pinch rolls 8 and 9 and then, between a series of leveler rolls, not pertinent to this invention. A further feature, not germane to the present invention, but which is mentioned for clearness, resides in the operation wherein, after the leading edge of the sheet has been gripped by the pinch rolls, the sheet is laterally distended or stretched by the brake roll, over which the sheet continues to advance, in the stretching-position of the brake roll, that is controlled by the rod 26 and the lever 28.

Referring to the parts of the machine relating to the present invention, there are two pairs of the pinch rolls 8 and 9, or four rolls disposed in quadrature relation. That is, there are two lower rolls having parallel axes in a horizontal plane and two upper rolls having axes in a horizontal plane but in vertical planes with the axes of the lower rolls.

Although, I have shown three sets of equalizer rolls, there may be only one set, preferably adjacent to the center of the rolls, as viewed in Fig. 1, or any other suitable number, in accordance with the length of the rolls, the diameters thereof and the forces to which they are subjected.

When rolls for similar purpose are journaled and pressed together only at the ends, there is a tendency for them to bend or bow laterally, at the longitudinal center, and they must either be made of sufficient diameter to resist such bending or be supplied with lateral-pressure or equalizer rolls. Machines of this general character have heretofore been employed but it has been usual to employ springs of extraordinary size, weight and strength to force the upper equalizer rolls downwardly.

The springs, as heretofore mentioned, were of such great strength as to require individual control and gear-reducing means to manually effect the control. The adjustment of the springs or rolls was a slow, painstaking process, occasioning much delay and not being certain in its results.

In my invention, the upper equalizer rolls 12, and the carriages or supporting frames 20 therefor, merely rest or float on the upper pinch rolls. Shims of less thickness than the minimum thickness of the sheets to be worked, are disposed between the end bearings of the upper and lower pinch rolls to prevent engagement between these rolls when there is no sheet therebetween.

The equalizer rolls of each upper and lower set, being three in number, engage each pinch roll at spaced position thereabout from the vertical center position. This arrangement of parts serves to prevent bowing of the rolls in a horizontal plane.

The equalizer rolls also, engage the pinch rolls at spaced positions therealong; it being unnecessary to engage the pinch rolls throughout their lengths, because rolls of minimum desirable diameter do not require such engagement. This feature conserves material in the structures of the

equalizer rolls and their carriages, and conduces to a use of a further number of them if desired. A further feature of advantage, resides in the ability to better renew or repair one set of small equalizer rolls than one large set engaging the pinch rolls throughout their lengths.

One of the piston rods 17 is associated with each carriage 20, through the medium of a cup portion 37 having a round bottom recess, and a thrust screw 38 threadably mounted longitudinally in the lower end of the piston rod and held in adjusted position, as by nuts 40.

The pistons 16 are of a suitable type, as are the cylinders 18 which are shown as provided with heads overhanging the side walls and connected by longitudinal bolts; the lower heads being suitably secured to the brace 11.

Apertures 42 provide for connection to a fluid-control conduit leading to a suitable source of fluid pressure and a control valve, whereby the pistons are operated simultaneously.

In this feature, since the pistons are connected to the same fluid source, they exert equal pressures on their several sets of equalizer rolls in a much simpler manner than with springs which, to obtain similar results, would require much careful calibration and machine work, if such results could be obtained at all.

Although the piston elements are simultaneously subject to the same pressure, they may automatically move relatively, by reason of the fluidity of such pressure, to compensate for differences in thickness of the work, at different positions along the rolls, which is another advantage of a plurality of sets of the equalizer rolls over a single long roll.

In Fig. 2, in which corresponding parts are designated by corresponding reference characters, the construction is substantially the same as that of Fig. 1, above described, except that the fluid-pressure cylinders 18 are disposed beneath the brace 11, instead of above it. In this structure, the piston rods 17 are shorter and the reactive pressure operates against the brace 11, instead of from it, in the form of tension in the bolts holding the cylinders to the brace.

Referring to Figs. 3, 4 and 5, one of the equalizer rolls, all of which are constructed alike, comprises an outer cylinder 44 having a mid-portion 45 of reduced internal diameter to provide shoulders for limiting the inward positions of roller bearings 47 at each end thereof. These bearings are connected between adjacent pairs thereof by pins 48 extending through portions of race rings 50 between certain of the roller bearings. End caps 51 are perimetally grooved to receive packing glands 52 and are provided with annular inner shoulders to limit the outward position of the rolls. The equalizer roll, as so far described, is of usual construction.

However, a stationary shaft 54, in the roll, is provided with a lubricant passage 55 opening at one end for connection to a source of lubricant supply and pressure, and extending axially along the shaft, aside the bearing surfaces, to lateral or radial passages 56, leading to the bearings 47.

By this arrangement of parts, the pressure of the lubricant is toward the ends of the roll at the packing glands 52, where it opposes the entry of foreign matter to the bearings, which, in the service for which they are adapted, is of particularly objectionable volume and character.

The device is flexible and rapid in control, free from interruption of service, effective in operation and an improvement generally in its field.

While I have shown and described particular forms of my invention, changes may be effected therein without departing from the spirit and scope thereof, as set forth in the appended claims.

I claim as my invention:

1. In combination, in a metal-working machine, an elongated roll, and backing means therefor comprising a plurality of devices spaced therealong each including fluid-actuated elements relatively movable independently of the relative movement of the corresponding elements of another.

2. In combination, in a metal-working machine, a roll, and a plurality of independently relatively movable means simultaneously-operable for moving the same laterally at spaced positions therealong, one of said means being at a position between the ends of the roll.

3. In combination, in a metal-working machine, parallel pressure rolls for receiving a work object therebetween, a plurality of means for exerting lateral pressure on the rolls at spaced positions therealong including one means embodying an equalizer roll between the ends of the pressure rolls and yieldable independently of the other pressure means, and fluid responsive means for actuating said equalizer roll.

4. In combination, in a metal-working machine, parallel rolls for receiving a work object

therebetween, a plurality of independently relatively yieldable means for exerting lateral pressure on the rolls at spaced positions therealong including an equalizer roll between the ends of the pressure rolls, and means for simultaneously actuating said pressure-exerting means.

5. In combination, in a metal-working machine, a base, uprights thereon, an upper brace, parallel upper and lower rolls for receiving a work object therebetween, a plurality of means for exerting lateral pressure on the upper roll at spaced positions therealong including one means embodying an equalizer roll between the ends of said upper roll and yieldable independently of the other pressure means, and a fluid responsive means mounted on said brace for actuating said equalizer roll.

6. In combination, in a metal-working machine, a base, uprights thereon, an upper brace, parallel upper and lower rolls for receiving a work object therebetween, a plurality of independently relatively yieldable means for exerting lateral pressure on the upper roll at spaced positions therealong including an equalizer roll between the ends of said upper roll, and means for simultaneously operating said pressure-exerting means including means on said brace for operating said equalizer roll.

ALEXANDER M. HARTMANN.

35	110
40	115
45	120
50	125
55	130
60	
65	
70	145
75	150