July 31, 1934. J. M. GUTHRIE 1,968,389

SHEET LEVELER

Original Filed May 27, 1932 2 Sheets-Sheet 1

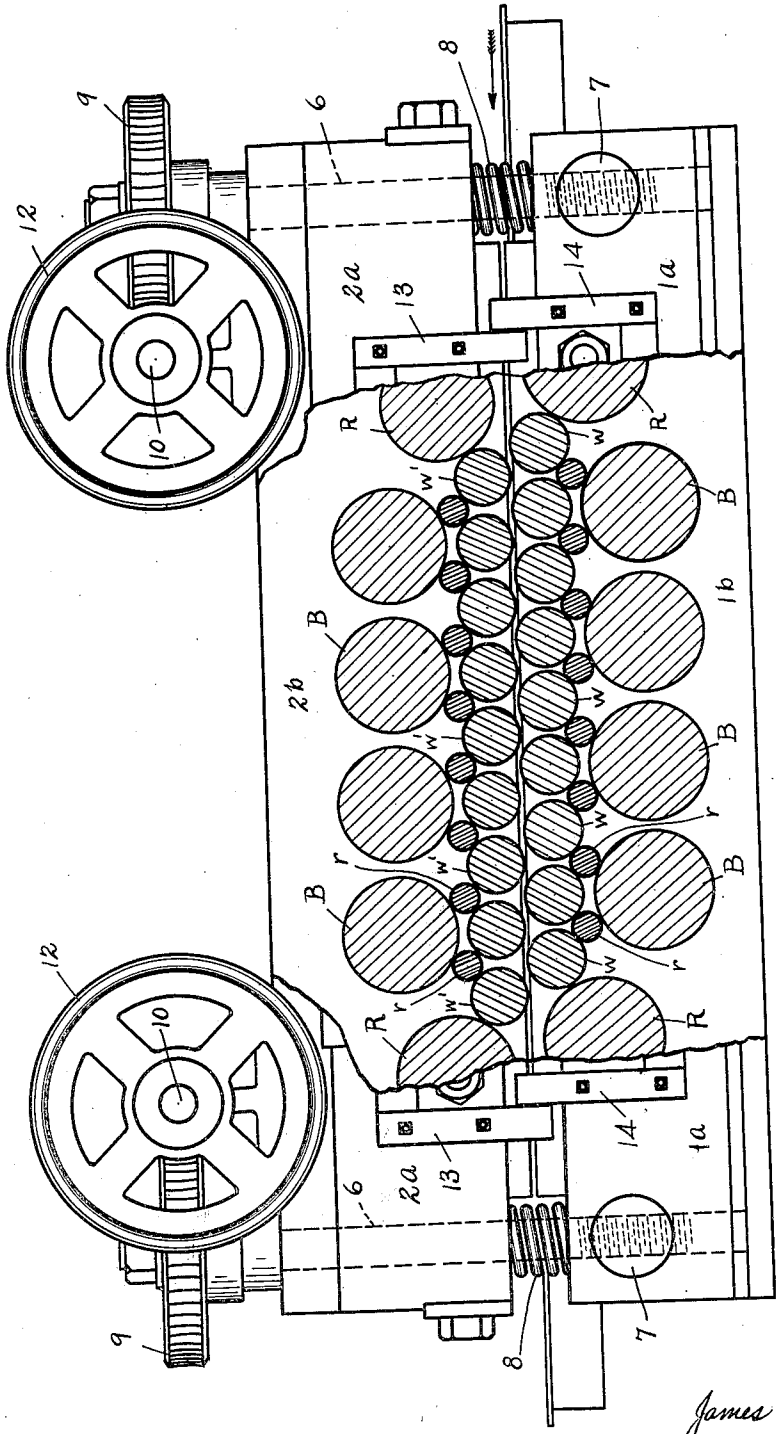


Fig. 1

INVENTOR

James M. Guthrie

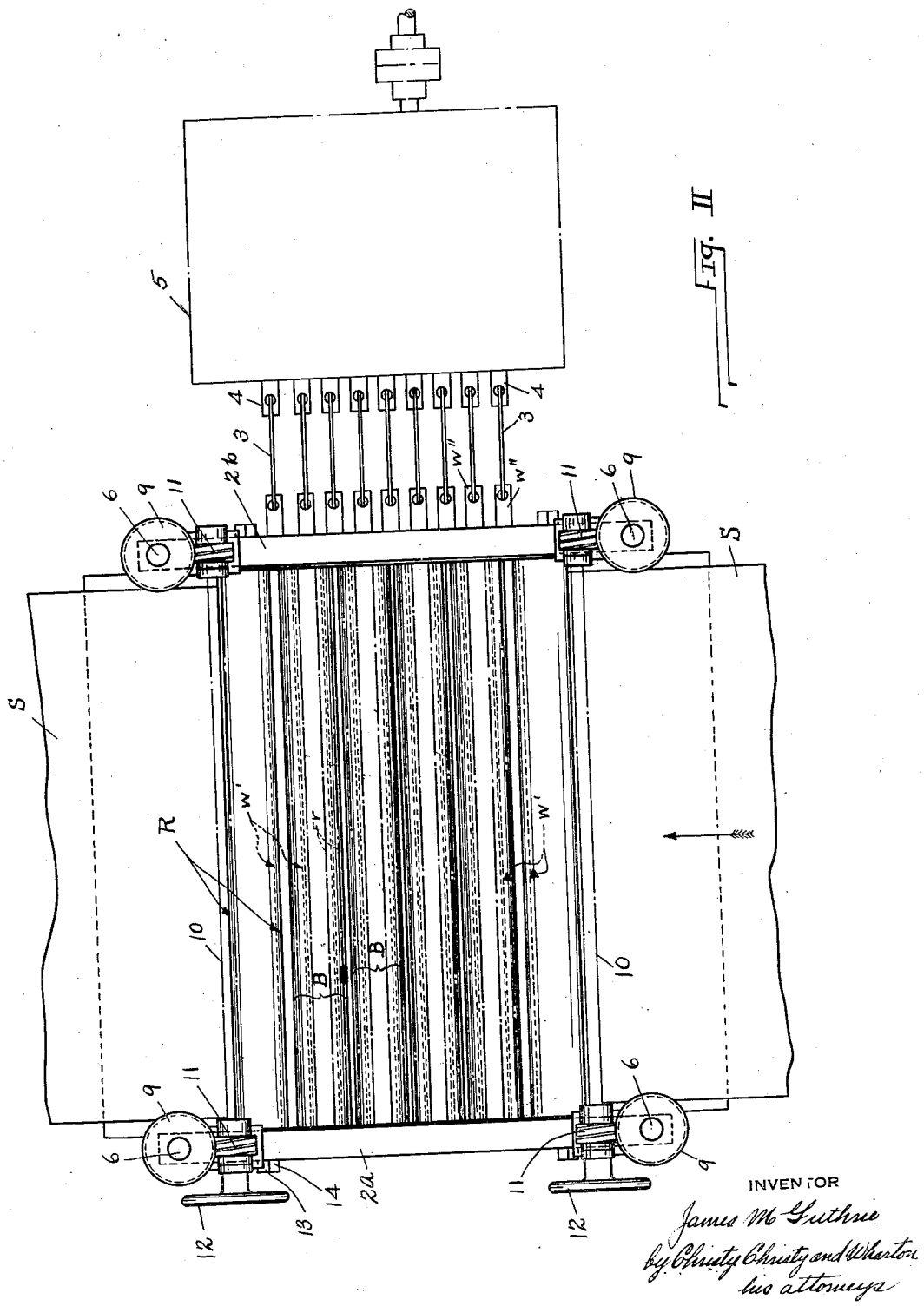
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INVENTOR

James M. Guthrie

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1,968,389

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1,968,389

SHEET LEVELER

James M. Guthrie, Pittsburgh, Pa., assignor to Sutton Engineering Company, a corporation of Pennsylvania

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Renewed December 22, 1933

6 Claims. (Cl. 153—54)

This invention relates to a machine for leveling or flattening metallic sheets. More specifically the invention is directed to a roll arrangement which is particularly, although not exclusively, adapted for such machine.

It is realized that to obtain the most efficient operation of a leveling machine the sheet-engaging rolls must be organized in close center-to-center arrangement. It is sometimes desirable that such rolls be of relatively small diameter, say a diameter as small as one inch and a half, or less. The rolls are in some cases 60 inches or more in length, so it will be understood that in service the rolls tends to bow under the reaction of the sheets being flattened. Accordingly, the problem is to provide reinforcement or backing for the working rolls, and, in providing such reinforcement, to permit of their organization in close center-to-center arrangement.

The object of my invention is to solve this problem. I aim to provide a sheet-leveling machine which is readily adjustable, efficient in service, and economical to construct.

A machine embodying the invention is illustrated in the accompanying drawings, in which Fig. I shows the machine, partly in side elevation and partly in central vertical section, and Fig. II shows the machine in plan from above, and to smaller scale.

The machine comprises a frame including two opposite bed members 1*a* and 1*b*, upon which are organized upper frame elements 2*a* and 2*b* respectively. In the opposite bed members 1*a* and 1*b* a lower train of sheet-flexing rolls *w* is trunnioned, and in the frame elements 2*a* and 2*b* an upper train *w'* of sheet-flexing rolls is borne. The upper and lower rolls *w*, *w'* are staggered, as indicated in Fig. I; the two trains of rolls provide between them a passage through which a sheet S (Fig. II) of metal is passed, and during such passage the sheet is flexed to and fro, with respect to the plane of its expanse. The flexing of the sheet is beyond the elastic limit of the metal, and accordingly, dents, bows, and other irregularities are removed from the sheets and the sheets conditioned for use.

For convenience I term the rolls *w*, *w'* the work-engaging rolls, and in this case all of the work-engaging rolls are positively rotated. Conveniently, the journals *w''* of the rolls are connected by universal couplings 3 (Fig. II) to the driving stems 4 of a gear box 5. The gear box may be connected in familiar manner to a motor or engine, the provision of the gear box and motor being a matter for the engineer. So, the rolls are powerfully rotated, to move a sheet over the lower train and under the upper train of rolls, in the direction of the arrows in the drawings.

It will be understood that the work-engaging rolls are usually of relatively small diameter, and, as shown in Fig. I, the work-engaging rolls in each train are journaled in close center-to-center arrangement. It has been found that the work-engaging rolls must be so reinforced or supported as to prevent them from bowing laterally into contact with one another, and also to prevent them from bending outward, away from the sheet being straightened. My invention includes a system of reinforcing rolls which is particularly effective to the end in view. Between successive work-engaging rolls (*w*, *w'*) in each train, I organize relatively small rolls *r*, and I employ large backing rolls B to support pairs of rolls *r*. It will be perceived that the rolls *r* are thus backed by sturdy supports (rolls B), so that the work-engaging rolls *w*, *w'* are reinforced against bending or bowing along their axes. The reinforced rolls *r* serve both as lateral spacing and as supporting or immediate backing means for the work-engaging rolls *w*, *w'*.

The work-engaging rolls (*w*, *w'*) at the end of each train are outwardly supported by large rolls R, so that all the rolls (*w*, *w'*) of each train are securely supported against the forces produced upon them during service. Manifestly, the group of inter-engaging rolls *w*, *r*, B, R is so organized that the rotation produced by the driven rolls *w* is harmonious to all the rolls of the group.

The rolls B and R associated with the upper train are revolubly borne by the upper frame elements 2*a*, 2*b*, while the lower rolls B and R are borne by the bed members of the machine. I contemplate that the work-engaging rolls *w*, *w'* and the backing rolls may, by means of adjustable bearings known to the art, be severally adjustable in the frame of the machine. Additionally, I provide for group adjustment. That is to say, the upper frame elements 2*a*, 2*b* are each secured to the bed members 1*a*, 1*b* of the machine by means of a pair of shafts 6. The shafts 6 are threaded for engagement with nut blocks 7 in the bed members. Compression springs 8 are organized at each end of the frame elements 2*a*, 2*b* and conveniently are positioned upon the shafts 6; the springs 8 bear upon the bed members and yieldingly support the upper frame elements 2*a*, 2*b* of the machine, together with the rolls carried by such frame elements. Fixed to the upper end of each shaft 6 is a worm gear 9, and two cross shafts 10 carry at or adjacent their ends worms 11,

severally in mesh with the respective worm gears 9, as indicated in Fig. II. Hand wheels 12 are secured to the shafts 10, whereby joint rotation of worm gears 9 and shafts 6 may be effected, to produce, in co-operation with springs 8, the adjustment of frame elements 2*a*, 2*b* with respect to bed members 1*a*, 1*b*. So, group adjustment of the upper train of rolls may be effected relatively to the lower train. It may be added, that co-operating guide blocks 13 and 14 are integrated respectively with the relatively adjustable frame members of the machine, to prevent during a sheet-leveling operation, the shifting of the upper frame elements with respect to the bed members.

I claim as my invention:

1. A roll arrangement comprising the combination of a plurality of work-engaging rolls, spacing and supporting rolls between successive work-engaging rolls, and a backing roll revolubly engaging two of said spacing and supporting rolls.

2. A roll arrangement comprising the combination of a plurality of upper work-engaging rolls, spacing and supporting rolls between successive work-engaging rolls, and a backing roll revolubly engaging two of said spacing and supporting rolls, together with a plurality of lower work-engaging rolls co-operating with said upper work-engaging rolls.

3. A roll arrangement comprising the combination of an upper train of work-engaging rolls and an opposed, co-operating, lower train of work-engaging rolls, each of said trains including spacing and supporting rolls between successive work-engaging rolls, and a backing roll revolubly engaging successive spacing and supporting rolls.

4. A sheet-leveling machine comprising the combination of a frame revolubly supporting a lower train of work-engaging rolls, an upper train of work-engaging rolls opposed to said lower train, spacing and supporting rolls between adjacent work-engaging rolls in said trains of rolls, and backing rolls revolubly engaging pairs of said spacing and supporting rolls.

5. A sheet-leveling machine comprising the combination of a frame revolubly supporting a lower train of work-engaging rolls, an upper train of work-engaging rolls opposed to and adjustable relatively to said lower train, spacing and supporting rolls between successive work-engaging rolls in each train, and backing rolls revolubly engaging successive spacing and supporting rolls in each train.

6. A sheet-leveling machine comprising the combination of a frame revolubly supporting a train of lower work-engaging rolls, an upper train of work-engaging rolls opposed to said lower train of rolls, each train of rolls including spacing and supporting rolls of relatively small diameter between successive work-engaging rolls, and backing rolls of relatively large diameter revolubly engaging pairs of said spacing and supporting rolls.

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