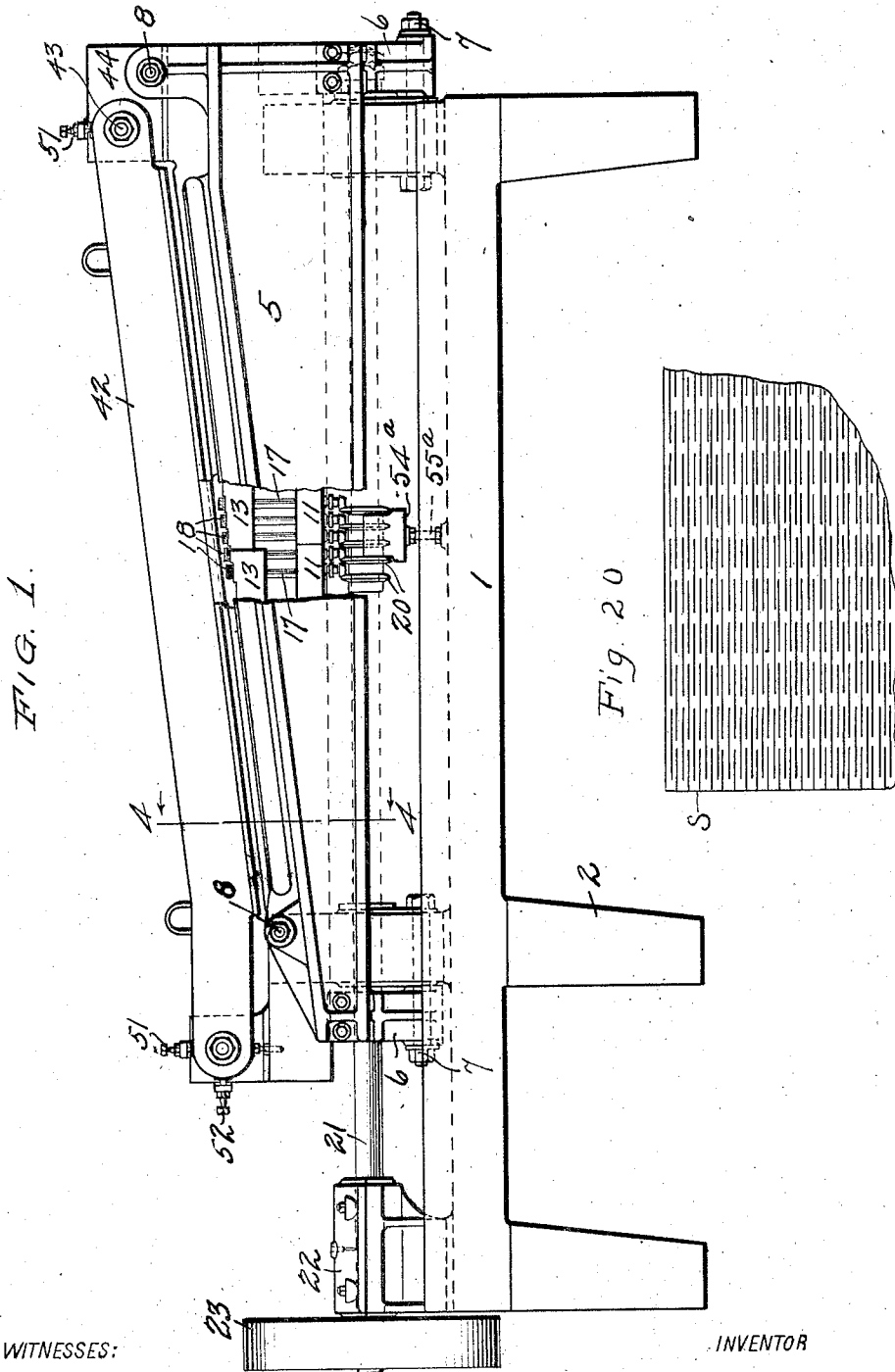


H. E. WHITE.
METAL EXPANDING MACHINE.
APPLICATION FILED JUNE 4, 1912.

1,061,953.

Patented May 13, 1913.

8 SHEETS—SHEET 1.



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8 SHEETS—SHEET 2.

FIG. 2

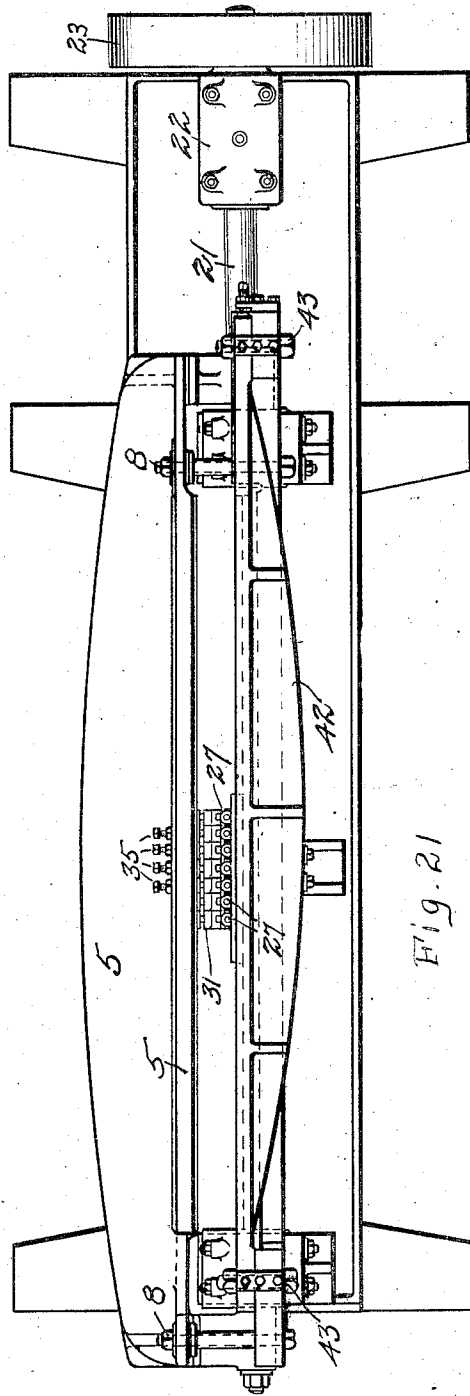
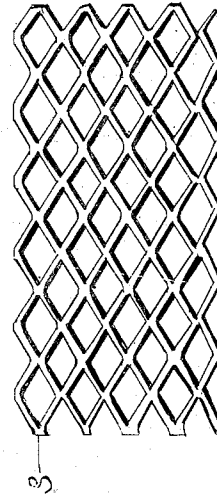


Fig. 21



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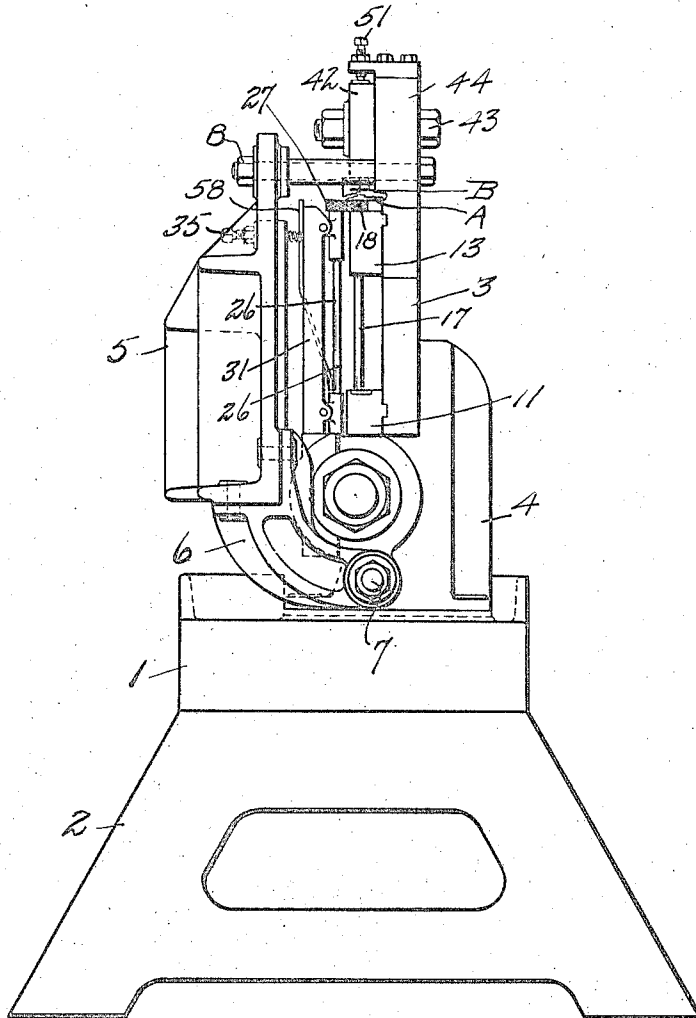
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8 SHEETS—SHEET 3.

FIG. 3.



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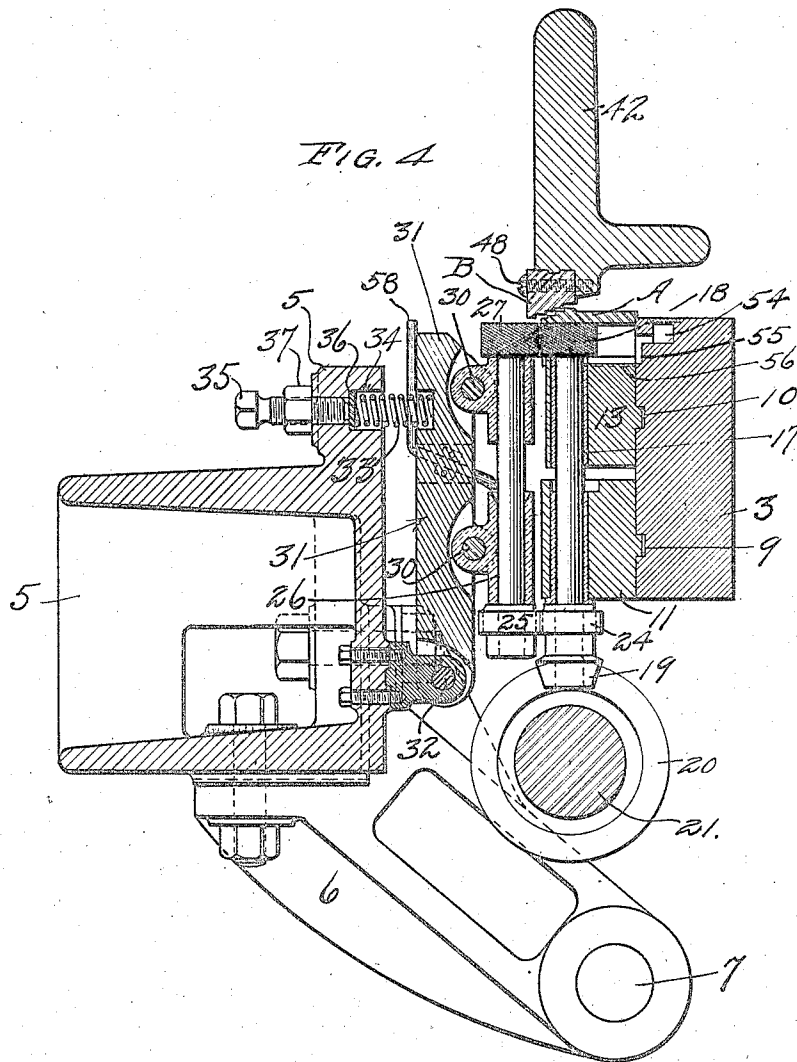
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8 SHEETS—SHEET 4.



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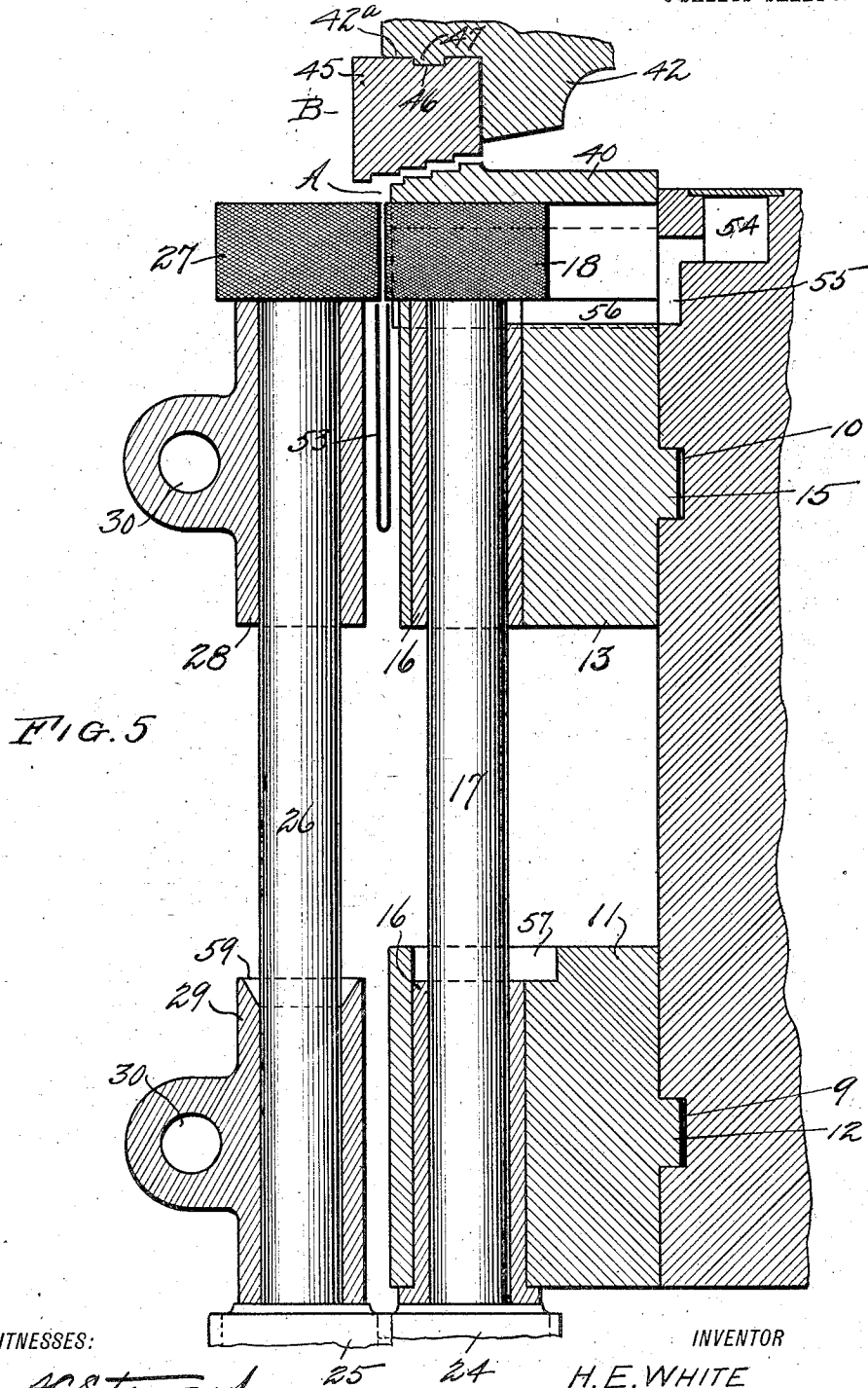
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METAL EXPANDING MACHINE.
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1,061,953.

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8 SHEETS—SHEET 5.



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1,061,953.

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8 SHEETS—SHEET 6.

FIG. 6

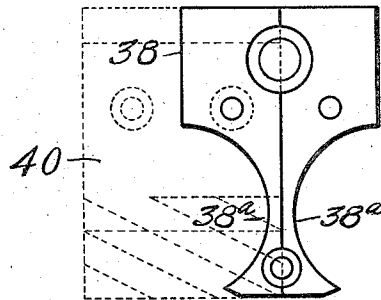


FIG. 7

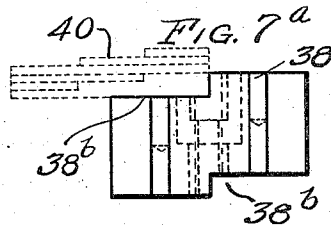
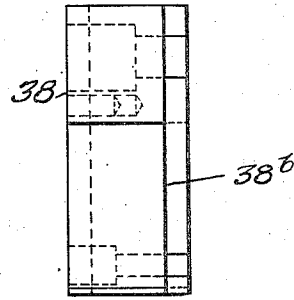


FIG. 8.

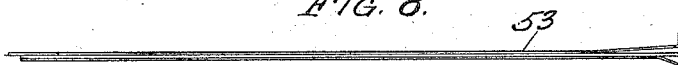


FIG. 11



FIG. 9

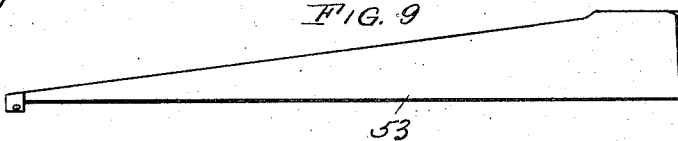


FIG. 10



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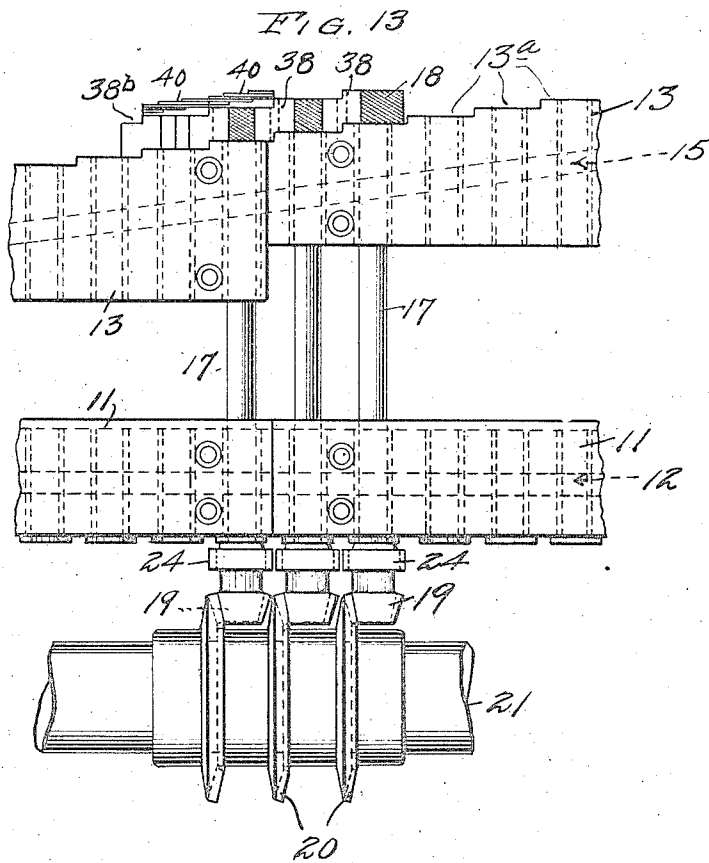
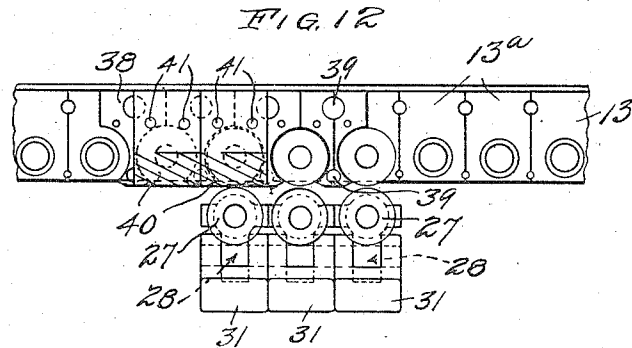
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METAL EXPANDING MACHINE.
APPLICATION FILED JUNE 4, 1912.

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Patented May 13, 1913.

8 SHEETS—SHEET 7.



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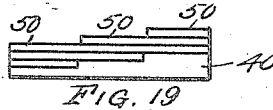
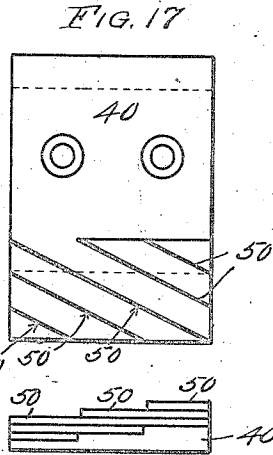
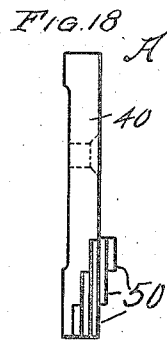
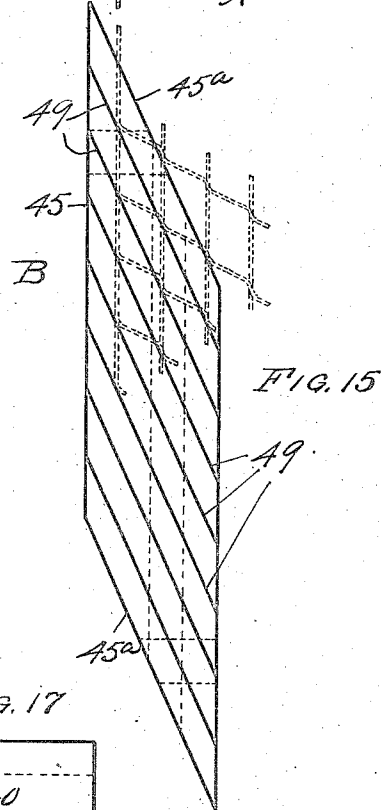
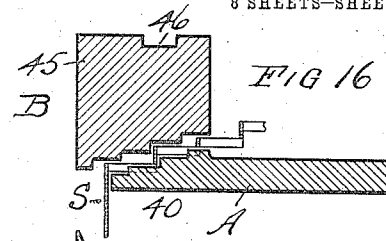
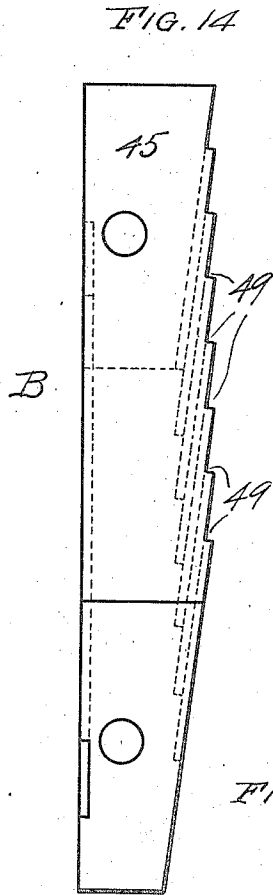
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APPLICATION FILED JUNE 4, 1912.

1,061,953.

Patented May 13, 1913.

8 SHEETS—SHEET 8.



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UNITED STATES PATENT OFFICE.

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METAL-EXPANDING MACHINE.

1,061,953.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed June 4, 1912. Serial No. 701,634.

To all whom it may concern:

Be it known that I, HERBERT E. WHITE, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvements in Metal-Expanding Machines, of which the following is a specification.

The present invention relates in general to the art of expanding slitted metal sheets, and more particularly to certain improvements upon the apparatus for expanding slitted metal as disclosed in my prior Patent No. 895,923 which was granted August 11, 1908.

Among the objects of the invention is to improve upon the construction of my prior machine and to provide a novel and efficient apparatus by means of which previously slitted metal sheets can be rapidly and uniformly expanded by a continuous operation as they are passed through the machine.

The invention also aims to provide a metal expanding machine in which the various parts are so mounted that they can be readily adjusted as may be required to produce the best results, and in which the expanding dies are removably mounted so as to be replaced by other dies should it be necessary to operate upon slitted sheet metal in which the slits are of a different length.

With these and other objects in view, the invention consists in certain novel combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a side elevation of a metal expanding machine constructed in accordance with the invention, a portion of one side thereof being broken away to show a few of the feed rollers. Fig. 2 is a top plan view of the machine, only a portion of the feed rollers being shown. Fig. 3 is an elevation showing the feed end of the machine. Fig. 4 is an enlarged detail sectional view on the line 4—4 of Fig. 1. Fig. 5 is an enlarged sectional view showing the mountings for the feed rollers and the arrangement of the expanding dies with respect thereto. Figs. 6, 7, and 7^a are detail views

of the filler blocks which project between the feed rollers and have the lower expanding die member mounted thereon. Figs. 8, 9, 10, and 11 are detail views of the guide member along which the lower edge of the slitted metal sheet slides as it passes through the machine. Fig. 12 is a fragmentary plan view of a portion of the feed rollers and the mountings therefor, two of the lower expanding die sections being shown in position. Fig. 13 is a detail view showing a few of the driven feed rollers and the mountings therefor. Fig. 14 is a side elevation of one of the upper expanding die sections. Fig. 15 is a diagrammatic plan view of one of the upper die sections, a portion of a slitted metal sheet being shown by dotted lines in the position assumed when passing through the dies and being expanded thereby. Fig. 16 is a detail transverse sectional view through the upper and lower expanding dies and the slitted metal sheet, the upper edge of the metal sheet being shown as passing through the dies and expanded thereby. Figs. 17, 18, and 19 are detail views of one of the lower die sections. Fig. 20 is a plan view of a slitted metal sheet before expanding, and Fig. 21 is a similar view showing the same sheet after it has been acted upon by the expanding dies and properly expanded.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Specifically describing the present embodiment of the invention, the numeral 1 designates a bed plate or base upon which the expanding mechanism is mounted, the said base being shown for convenience as mounted in an elevated position upon the standards 2. A rigid frame member 3 is supported upon the base 1 and held in an elevated position by means of the brackets 4. An adjustable or swinging frame member 5 which normally assumes a spaced and opposed relation to the rigid frame member 3 is also carried by the base 1, the lower edge of the swinging frame member being provided with the arms 6 which are pivotally mounted upon the bolts or pins 7. The upper or swinging edge of the adjustable frame member 5 is shown as connected to the rigid frame member 3 by means of the bolts or fastening members 8 which serve

to hold the swinging member in proper position during the operation of the machine.

The inner face of the rigid frame member 3, which in the present instance is disposed in a substantially vertical plane, is provided with a lower longitudinal groove 9 and an upper longitudinal groove 10. The lower groove 9 is substantially horizontal, while the upper groove 10 is inclined downwardly away from the feed end of the machine. A series of lower bearing blocks 11 which are provided with suitable tongues or ribs 12 adapted to fit within the lower groove 9 are secured to the inner face of the frame member 3 along the lower edge thereof, while a series of upper bearing blocks 13 which are formed with inclined ribs or tongues 15 adapted to fit within the inclined upper groove 10 are secured to the frame member 3 along the upper edge thereof. These bearing blocks 11 and 13 are provided with corresponding bearings 16 within which the vertical shafts 17 are mounted, the said vertical shafts 17 being provided at the upper ends thereof with the feed rollers 18. As is shown more clearly by Fig. 13, the upper faces of the upper bearing blocks 13 have a stepped formation and are inclined downwardly and away from the feed end of the machine. Each of the feed rollers 18 overlies one of the steps 13^a of one of the upper bearing blocks, and since all of the feed rollers 18 are of the same thickness, the tops of the feed rollers have a stepped relation to each other corresponding to the steps of the bearing blocks.

The lower ends of the vertical shafts 17 are provided with beveled pinions 19 which mesh with beveled gears 20 upon a longitudinal drive shaft 21 which extends the full length of the machine and is journaled in suitable bearings 22 at opposite ends thereof, one end of the drive shaft being provided with a pulley 23 by means of which power can be transmitted to the same from any suitable source. The lower end portions of the vertical shafts 17 are also provided with the pinions 24 which mesh with corresponding pinions 25 upon countershafts 26 which are carried by the adjustable frame member 5 and are provided with the feed rollers 27 corresponding to the feed rollers 18 and adapted to cooperate with the same to force a slitted metal sheet through the machine.

Each of the countershafts 26 is journaled in an upper bearing 28 and a lower bearing 29, the said bearings being pivoted at 30 upon a swinging support 31 which is carried by the adjustable frame member 5 and is held yieldingly in normal position. The lower edge of the swinging support 31 is pivotally connected at 32 to the adjustable frame member 5, while springs 33 are interposed between the upper portion of the

swinging support 31 and the upper portion of the adjustable frame member 5. The ends of these springs 33 are received within suitable positioning recesses 34, the tension in the springs being adjustable by means of screws or bolts 35 which are threaded in the swinging frame member 5 and enter the bases of the recesses 34 in the said swinging frame member. If necessary, plates 36 may be interposed between the ends of the adjusting screws 35 and the springs 33, and jam nuts 37 may be utilized for holding the adjusting screws 35 against accidental turning. It will thus be obvious that the tension in the springs 33 can be adjusted as desired, the said springs normally tending to force the supporting member 31 away from the frame member 5 so as to hold the feed rollers 27 in operative position. It will also be obvious that when the main drive shaft 21 is rotated all of the feed rollers 18 and 27 will be operated so as to grip a slitted metal sheet and carry the same through the machine after the said metal sheet has once been fed into the machine.

Only a few of the feed rollers 18 and 27 have been shown, although it will be understood that they extend continuously from one end of the machine to the opposite end, and are gradually stepped downwardly away from the feed end of the machine.

Stepped filler blocks 38 project between the various driven feed rollers 18 and are secured to the stepped portions of the upper bearing blocks 13 by suitable fastening members 39. The forward ends of the filler blocks 38 have opposite sides thereof suitably recessed at 38^a to fit around the feed rollers 18 and provide a clearance space therefor, although the rollers project slightly beyond the filler blocks so as to grip the slitted metal sheets and move the same continuously through the machine without interference by the filler blocks.

The lower expanding die A is formed in a number of sections or units 40, as shown clearly by Figs. 17, 18 and 19, which are secured to the top of the filler blocks 38 by suitable fastening members such as the screws 41 and project over the driven feed rollers 18. The top of the stepped filler blocks 38 forms a downwardly inclined series of steps 38^b corresponding to the steps 13^a of the bearing blocks 13 and one of the lower die sections or units 40 is mounted upon each of these steps. The upper expanding die B is arranged over and in cooperative relation to the lower expanding die A, and is supported by a beam 42 which is mounted over the rigid frame member 3 and is secured by means of the bolts 43 to arms or ears 44 projecting upwardly from the said rigid frame member 3. This upper expanding die B is formed in a series of sections or units 45, as shown by Fig. 14, the

said upper die sections fitting in a rabbeted or recessed edge 42^a of the beam 42. The upper faces of the upper die sections 45 are grooved at 46 to receive a corresponding rib 47 formed in the rabbeted portion of the beam 42, and the said upper die sections are held in position by means of suitable fastening members such as the screws 48 which pass through overlapping ends of the die sections. In this connection, it will be observed by reference to Figs. 14 and 15 that the ends of the upper die sections 45 are cut off as at 45^a at an angle so as to overlap each other. In a manner similar to that set forth in my prior Patent No. 895,923, the sections or units of the upper expanding die B are formed with a series of laterally and diagonally extending steps 49, while the sections or units of the lower expanding die are formed with similar steps 50. The relation of these steps is shown clearly by Fig. 16, and it will be observed that the upper expanding die B projects outwardly beyond the lower expanding die A so as to successively interpose the various shoulders formed by the inclined steps in the paths of the unslitted portions of metal sheet as it is forced through the machine. The vertical distance between the opposing faces of the upper and lower expanding dies B and A is slightly greater than the width of the strands, while the space between the corresponding inclined shoulders, in a horizontal direction, is slightly greater than the thickness of the metal sheet. Provision is made for adjusting these distances, however, as may be required to obtain the best results. For this purpose the ends of the supporting beam 42 are shown as engaged by the adjusting screws 51 which admit of an accurate vertical adjustment thereof, while one end of the beam is engaged by an adjusting screw 52 for an accurate horizontal adjustment of the bearing. When the machine is assembled, the two expanding dies A and B are inclined downwardly away from the feed end of the machine, and that edge of the upper expanding die B which projects laterally beyond the edge of the lower expanding die A presents a series of shoulders formed by the end portions of the steps 49.

The metal sheets S are slitted before being fed to the machine, the said slits extending longitudinally of the metal sheets and being arranged alternately with respect to each other in adjacent rows. The slitted metal sheets are fed into the machine in a vertical position, the lower edge of the metal sheets engaging a suitable guide member 53 which is arranged under the pass between the various feed rollers. As the slitted metal sheets are carried through the machine, the unslitted portions of the sheet successively engage the shoulders formed by the steps 49 of the upper expanding die B and are

deflected thereby laterally and substantially horizontally between the two expanding dies A and B. The unslitted portions of the metal sheet beginning at the top of the sheet and progressing toward the lower edge thereof are thus successively engaged by the shoulders of the upper die section and laterally deflected between the two die sections. As shown by Figs. 15 and 16, this deflecting of the unslitted portions of the metal sheets serves to expand the metal, the slitted metal sheet being gradually deflected, as a whole into a new plane during the expanding action. In other words, the slitted metal sheet is fed into the machine in a vertical plane and is gradually deflected into a substantially horizontal plane. It will be obvious, however, that by a slightly different arrangement of the parts slight variations could be produced in this action. The amount of expansion brought about can be varied by changing the angle of the steps 49 and 50 with relation to the path of the slitted metal sheet, and different die sections can be substituted for different lengths of slits and different widths of the strands between the slits. It will thus be obvious that the action of the machine is continuous and that a uniform expansion of the slitted metal plate can be accomplished, since the various longitudinal rows of unslitted portions are acted upon successively and practically independent of each other.

The top of the rigid frame member 3 is provided with a channel 54 adapted to receive a lubricant, passages 55 being provided which lead from the channel 54 to lubricant channels 56 in the upper bearing blocks 13. These channels 56 convey the lubricant to the bearings 16. In a somewhat similar manner, it will be observed that the lower bearing blocks 11 are provided with lubricant receiving pockets 57 which serve to convey the lubricant to the bearings therein. For the purpose of lubricating the lower pivoted bearings 29 of the shafts 26, lubricant conveying tubes 58 are applied to the swinging support 31, the lower ends of the said tubes 58 being arranged to discharge into pockets 59 formed in the upper ends of the bearings and surrounding the shafts. Any suitable means may be provided for supplying lubricant to the upper pivoted bearings 28, such as the provision of the upper end of the shafts 26 with lubricant receiving openings which discharge laterally at the lower ends into the bearings.

Referring to Fig. 1 of the drawings, it will be observed that a structural detail which may be employed consists of an under-support 54^a arranged at the under side of the central part of the shaft 21 so as to provide a center support therefor, the said support being probably sustained by an adjustable set screw 55^a.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A machine for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, cooperating feed rolls carried by the adjustable frame member, and a pair of stationary co-acting expanding dies adapted to receive the slitted metal sheet from the feed rolls and constructed to engage and deflect the unslitted portions of the metal sheet to expand the same.

2. An apparatus for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, a hinged support mounted upon the adjustable frame member, cooperating feed rolls carried by the hinged support, yielding means engaging the hinged support for holding the feed rolls in operative position, and a pair of stationary co-acting expanding dies adapted to receive the slitted metal sheet from the feed rolls and constructed to engage and deflect the unslitted portions of the metal sheet to expand the same.

3. An apparatus for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, means for holding the adjustable frame member in operative position, a movable support carried by the adjustable frame member, feed rolls carried by the movable support and adapted to cooperate with the before mentioned feed rolls of the rigid frame member, yielding means engaging the support for holding the feed rolls in operative position, and a pair of stationary co-acting expanding dies receiving the slitted metal sheet and constructed to engage and deflect the unslitted portions of the metal sheet to expand the same.

4. A machine for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, a support movably mounted upon the adjustable frame member, bearing members loosely mounted upon the support, shafts journaled in the bearing members, feed rolls carried by the shafts and adapted to cooperate with the before mentioned feed rolls, yielding means engaging the movable support for holding the feed rolls in cooperative relation to each other, means for driving the feed rolls, and a pair of stationary co-acting expanding dies adapted to receive the slitted metal sheet from the feed rolls and constructed to engage and deflect the unslitted portions of the metal sheet to expand the same.

5. An apparatus for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, a support movably mounted

upon the adjustable frame member, two sets of bearings movably mounted upon the support, shafts journaled in corresponding bearings, feed rolls upon the shafts for cooperation with the before mentioned feed rolls of the rigid frame member, means for driving the feed rolls, yielding means engaging the movable support for holding the feed rolls in cooperative position, and a pair of stationary co-acting expanding dies adapted to receive the slitted metal sheets from the feed rolls and constructed to engage and deflect the unslitted portions of the sheets to expand the same.

6. An apparatus for expanding slitted metal sheets, including a rigid frame member, feed rolls carried thereby, an adjustable frame member, means for holding the adjustable frame member in position, a swinging support pivoted upon the adjustable frame member, two sets of corresponding bearings pivoted upon the swinging support, shafts journaled in the pivoted bearing members, feed rolls carried by the shafts and arranged to cooperate with the before mentioned feed rolls of the rigid frame member, means for driving the feed rolls, yielding means engaging the swinging support for holding the feed rolls normally in operative position, and a pair of stationary co-acting expanding dies adapted to receive the slitted metal sheet from the feed rolls and constructed to engage and deflect the unslitted portion of the sheet to expand the same.

7. An apparatus for expanding slitted metal sheets including a fixed frame member, a series of rolls carried by the fixed frame member and having a stepped relation to each other, filler blocks arranged between adjacent feed rolls, a second set of feed rolls mounted in cooperative relation to the first set of feed rolls, means for driving the feed rolls, a lower expanding die member mounted upon the filler blocks, and an upper expanding die member mounted over the lower die member in cooperative relation thereto and formed with stepped shoulders adapted to engage and deflect the unslitted portions of the metal sheets to expand the same, the stepped relations of the shoulders corresponding to the stepped relation of the feed rolls.

8. An apparatus for expanding slitted metal sheets including a stepped series of feed rolls, a second series of cooperating feed rolls, supporting means for the feed rolls, means for driving the feed rolls, a lower expanding die member arranged over the first mentioned set of feed rolls, an upper expanding die member arranged over the lower die member and formed with stepped shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same, means for supporting the upper die member, means for adjusting the upper die member toward and away from the lower

die member, and means for longitudinally adjusting the upper die member.

9. An apparatus for expanding slitted metal sheets including a rigid frame member, bearing blocks mounted thereon and formed with stepped faces, shafts journaled in the bearing blocks, feed rolls mounted upon the shafts and arranged upon the stepped face of the bearing block so as to have a stepped relation to each other, a second set of cooperating feed rolls, means for driving the feed rolls, stepped filler blocks arranged between the feed rolls, an expanding member mounted upon the filler blocks, and a co-acting expanding die section formed with stepped shoulders adapted to engage and deflect the unslitted portions of the metal sheets to expand the same, the stepped relation of the shoulders corresponding to the stepped relation of the feed rolls.

10. An apparatus for expanding slitted metal sheets including a rigid frame member, bearing blocks applied to the rigid frame member, the said bearing blocks and frame member being provided with cooperating positioning means to insure the proper placing of the bearing blocks, shafts journaled in the bearing blocks, feed rolls carried by the shafts and arranged in a stepped relation to each other, a second set of feed rolls mounted in cooperative relation to the first set of feed rolls, means for driving the feed rolls, filler blocks between the feed rolls of the first series, an expanding die member mounted upon the filler blocks and extending over the first series of feed rolls, and a co-acting expanding die member formed with stepped shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same, the stepped relation of the shoulders being similar to the stepped relation of the feed rolls.

11. An apparatus for expanding slitted metal sheets, including a rigid frame member, one set of bearing blocks mounted thereon, a second set of bearing blocks mounted thereon and formed with stepped faces, shafts journaled in the corresponding bearings of the two sets of bearing blocks, feed rolls applied to the shafts and arranged upon the stepped face of the second set of bearing blocks so as to have a stepped relation to each other, a second set of cooperating feed rolls, means for driving the feed rolls, an expanding die member mounted over the first set of feed rolls, and a cooperating expanding die member arranged adjacent to the first mentioned die member and formed with inclined stepped shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same, the stepped relation of the shoulders corresponding to the stepped relation of the feed rolls.

12. An apparatus for expanding slitted metal sheets including a rigid frame mem-

ber formed with longitudinal grooves, two sets of bearing blocks applied to the rigid frame member and formed with positioning ribs adapted to fit within the before mentioned longitudinal grooves, shafts journaled in corresponding bearings of the two sets of bearing blocks, feed rolls applied to the shafts and arranged in a stepped relation to each other, a second set of feed rolls mounted in cooperative relation to the first set of feed rolls, means for driving the feed rolls, an expanding die member mounted over the first set of feed rolls, and a co-acting expanding die member mounted adjacent to the first mentioned die member and formed with stepped inclined shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same, the stepped relation of the shoulders corresponding to the stepped relation of the feed rolls.

13. An apparatus for expanding slitted metal sheets including a set of feed rolls arranged in a stepped relation to each other, a second set of cooperating feed rolls, supporting means for the feed rolls, means for driving the feed rolls, an expanding die member arranged over the first set of feed rolls and formed in independent removable sections, and a co-acting die member arranged in an opposed relation to the first mentioned die member and formed with stepped inclined shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same.

14. An apparatus for expanding slitted metal sheets including a set of feed rolls arranged in a stepped relation to each other, a second set of cooperating feed rolls, supporting means for the feed rolls, means for driving the feed rolls, stepped filler blocks projecting between the adjacent feed rolls of the first set and providing a stepped surface, a die member formed in independent sections which are detachably applied to the steps of the surface provided by the filler blocks, the said die sections being formed with stepped inclined shoulders and corresponding shoulders on adjacent die sections registering with each other, and a co-acting die member mounted in opposed relation to the first mentioned die member and formed with corresponding stepped inclined shoulders adapted to engage and deflect the unslitted portions of the metal sheet to expand the same.

15. An apparatus for expanding slitted metal sheets including a set of feed rolls arranged in a stepped relation to each other, a second set of cooperating feed rolls, supporting means for the feed rolls, means for driving the feed rolls, a die member arranged over the first set of feed rolls, a support, a second die member carried by the support and having an opposed relation to

the first mentioned die member, the said second die member being formed in independent sections with overlapping portions and being constructed with stepped inclined shoulders adapted to engage and deflect unslitted portions of the metal sheet and expand the same.

16. An apparatus for expanding slitted metal sheets including a set of feed rolls arranged in a stepped relation to each other, a second set of cooperating feed rolls, supporting means for the feed rolls, means for driving the feed rolls, a die member arranged over the first set of feed rolls, a support formed with a recessed portion, a cooperating die member formed in independent sections which are positioned within the recessed portion of the support, the said cooperating die member being formed with stepped inclined shoulders adapted to engage and deflect unslitted portions of the metal sheet to expand the same.

17. In an apparatus for expanding slitted metal sheets, a series of pairs of feed rollers arranged in stepped relation, a pair of stationary co-acting dies having a stepped relation corresponding to that of the feed rollers, and each consisting of a plurality of similar units provided with inclined

stepped shoulders, the shoulders of the separate dies being disposed in opposing relation and forming a pass therebetween that lies in a different plane from the axis of the feed rollers.

18. In an apparatus for expanding slitted metal sheets, opposing sets of feed rollers, means for yieldingly pressing one set of said rollers toward the other, and a pair of stationary co-acting dies provided upon their opposing faces with inclined stepped shoulders and forming passes therebetween which lie in a different plane from the axis of the rollers.

19. In an apparatus for expanding slitted metal sheets, feeding elements arranged in stepped relation, and a pair of stationary co-acting dies having a stepped relation corresponding to that of the feeding elements, and each of which dies consists of a plurality of similar, separately attached, units provided with inclined stepped shoulders.

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

HERBERT E. WHITE.

Witnesses:

H. R. GLENN,
O. D. KAISER.