Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 1

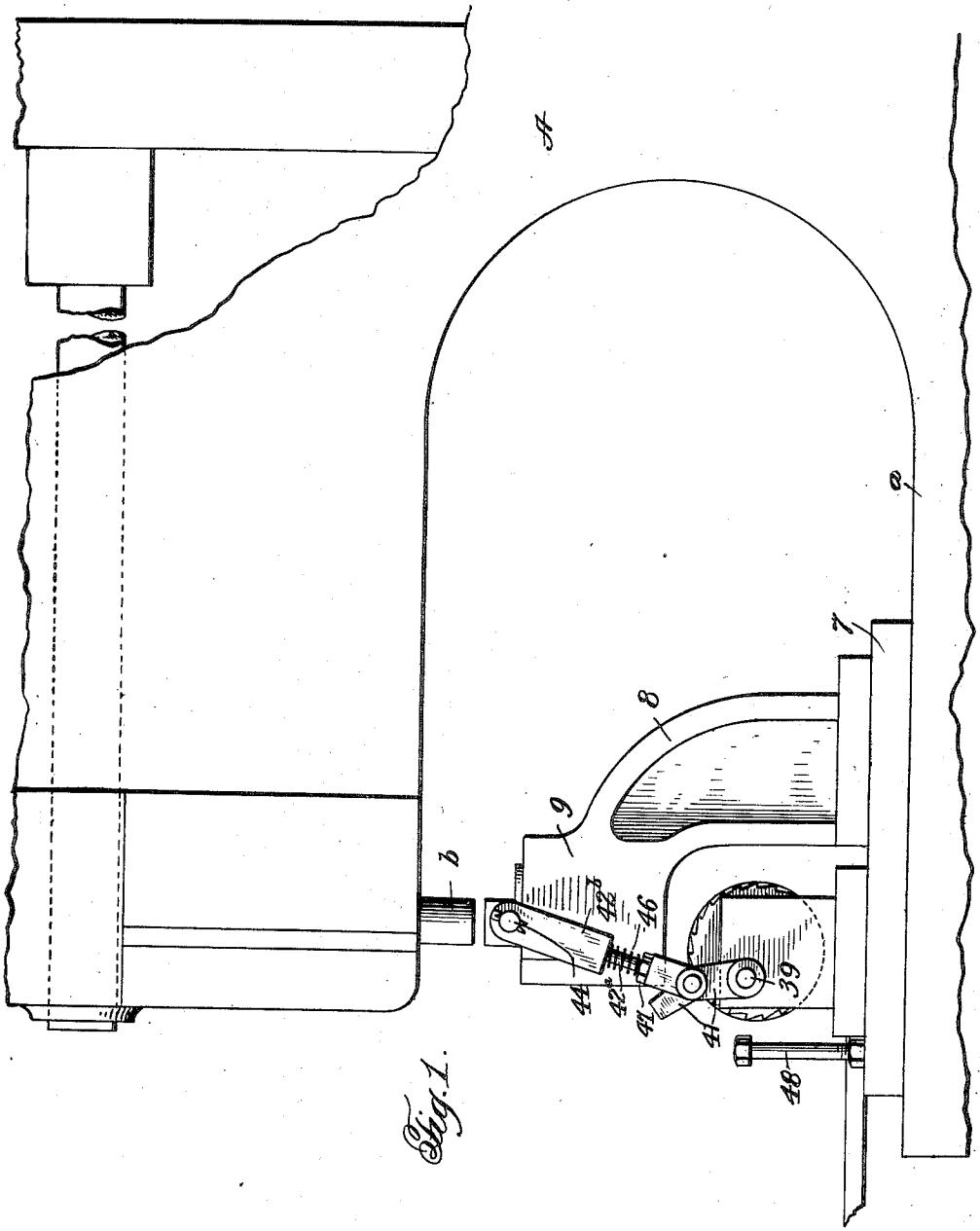


Fig. 1.

Inventor:

Witness:
Jas. E. Hutchinson.

Wm. A. Rowe,
By
Milans & Milans
Attorneys.

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 2

Fig. 15.

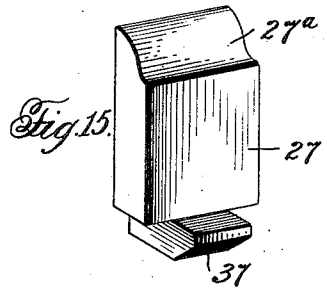


Fig. 16.

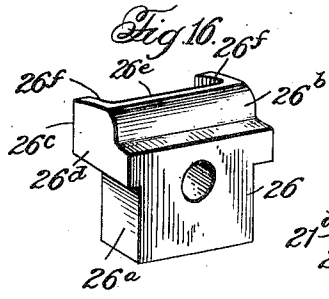


Fig. 17.

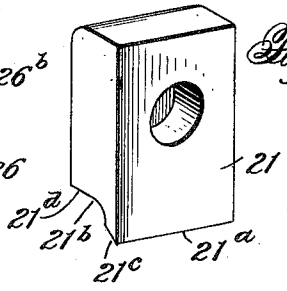


Fig. 18.

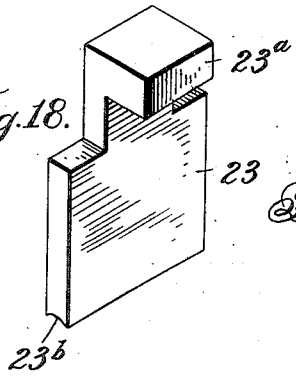


Fig. 2.

Inventor:

Witness:

Jas. E. Hutchinson.

Wm. A. Rowe,

By

Milans & Milans Attorneys.

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 3

Fig. 19.

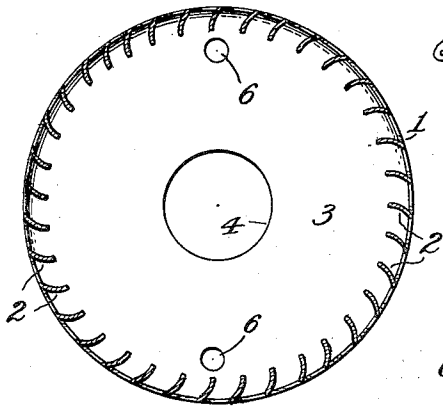


Fig. 3

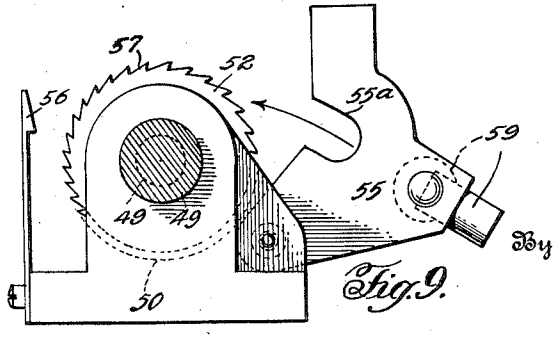


Fig. 9.

Inventor:

Wm. A. Rowe,

By Milans & Milans Attorneys

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 4

Fig. 20.

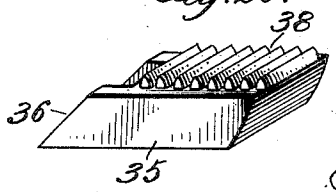


Fig. 21.

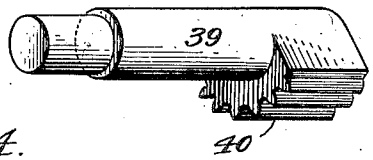


Fig. 4.

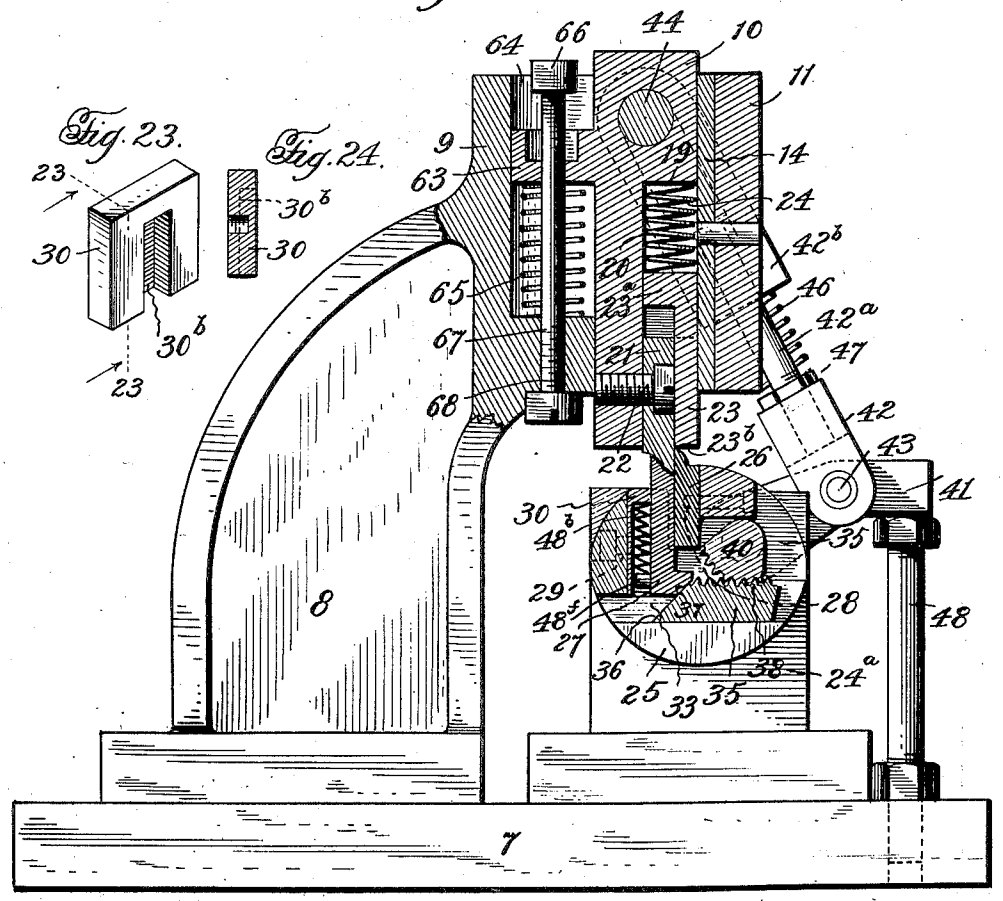


Fig. 23.

Fig. 24.

Inventor:

Witness:

Jas. E. Hutchinson.

Wm. A. Rowe,

By Milans & Milans Attorneys.

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 5

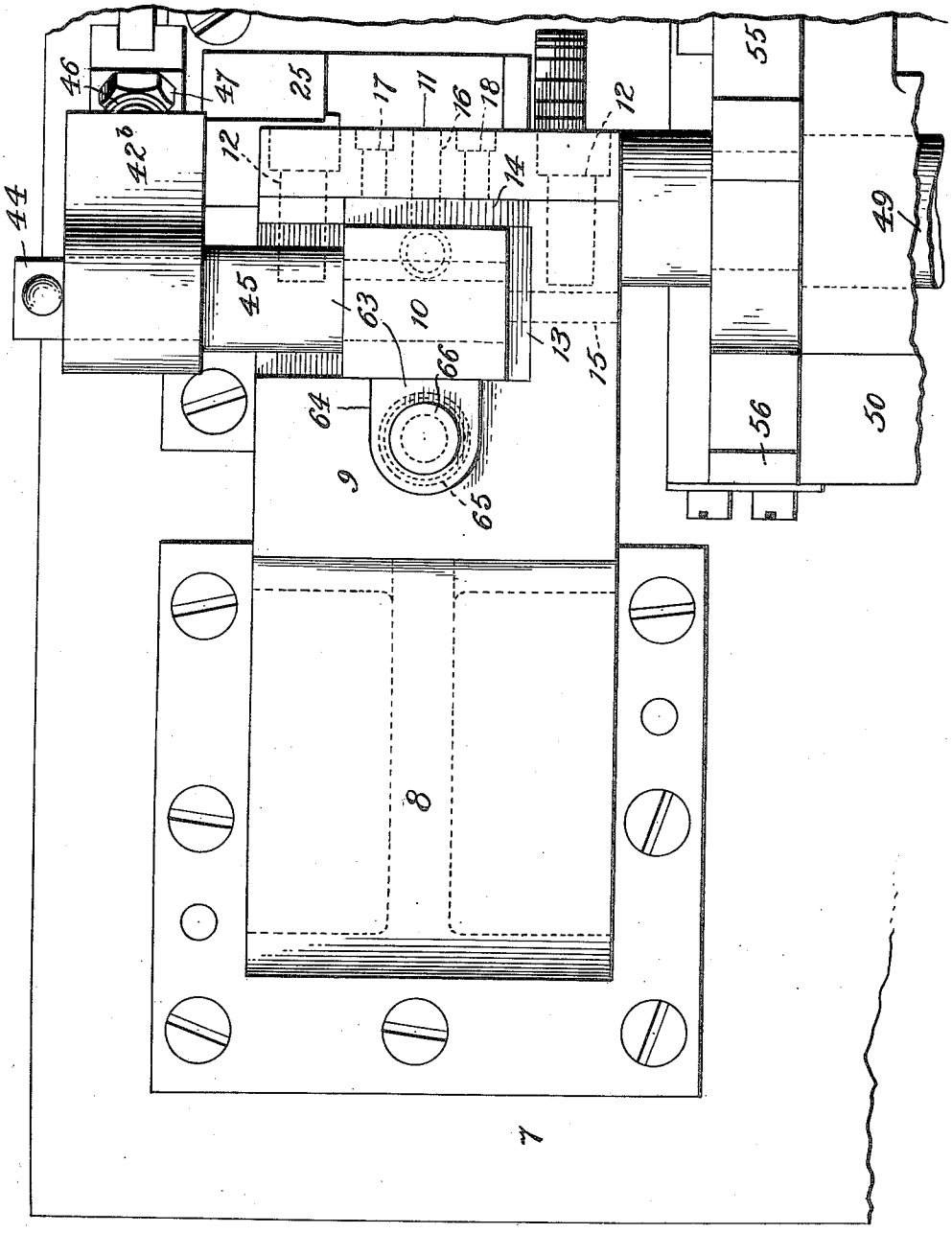


Fig. 5.

Inventor

Wm. A. Rowe,

By

Milans & Milans Attorney

Witness:

Jas. E. Hutchinson.

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 6

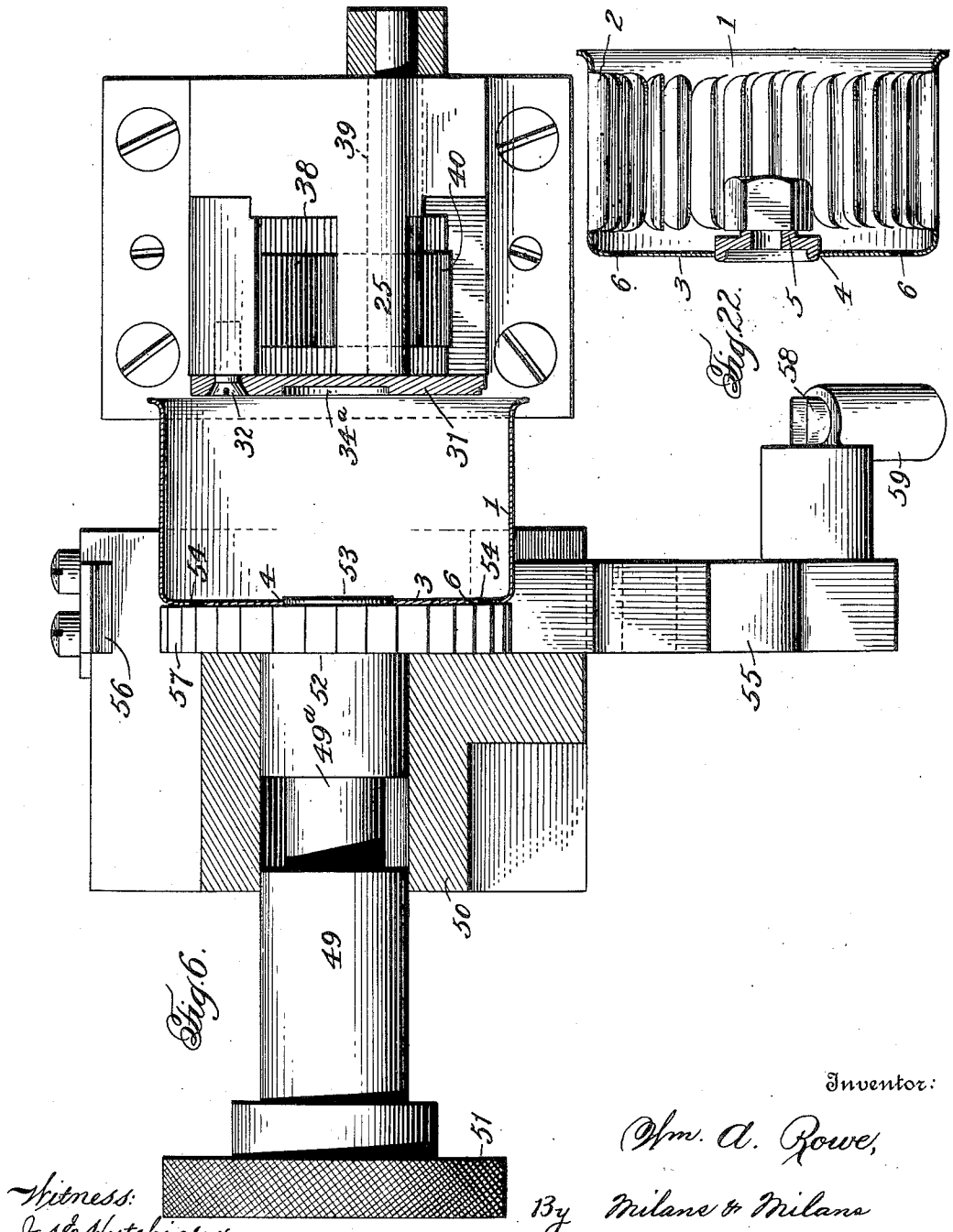


Fig. 22.

Fig. 6.

Witness:
Jas. E. Hutchinson.

Inventor:
Wm. A. Rowe,
By Milans & Milans
Attorneys

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 7

Fig. 7.

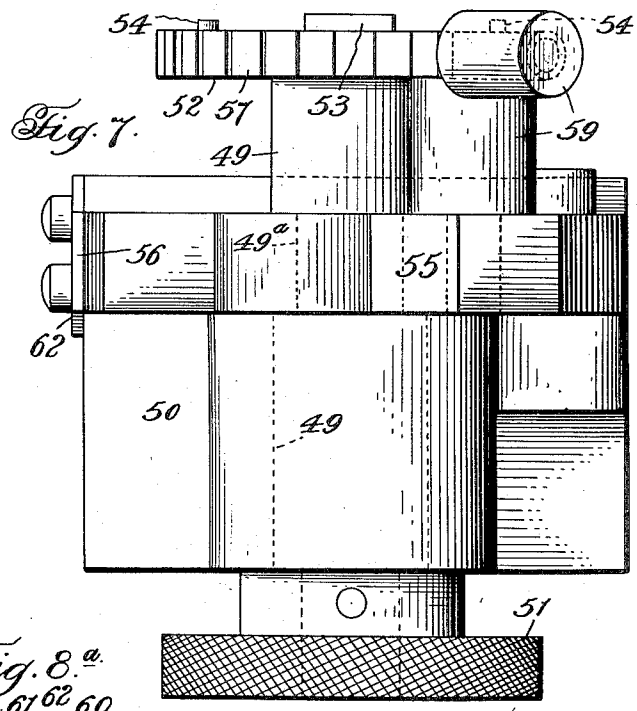


Fig. 8.a.

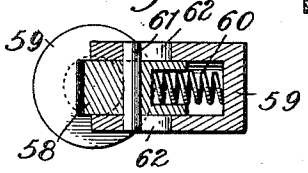
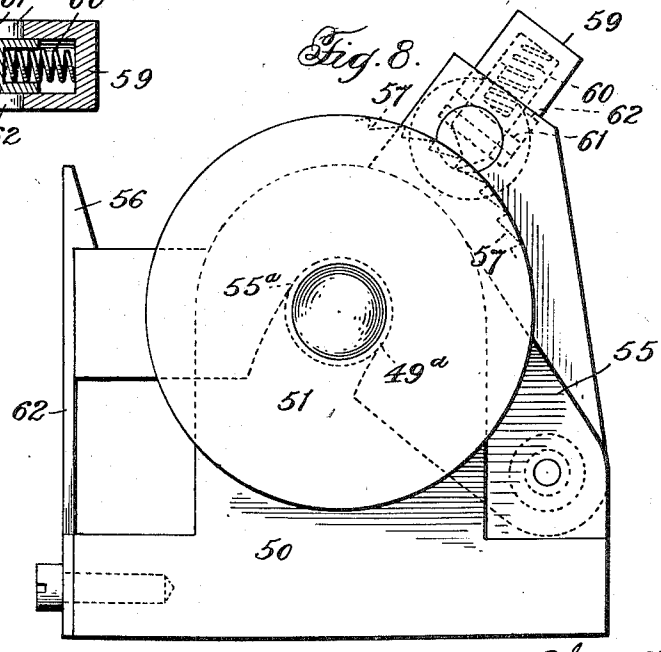


Fig. 8.



Inventor:

Wm. A. Rowe,

Witness:

Jas. E. Hutchinson.

By

Milans & Milans

Attorneys

Nov. 8, 1927. 1,648,060

W. A. ROWE

MACHINE FOR MAKING SHEET METAL FAN WHEELS

Filed April 16, 1925 8 Sheets-Sheet 8

Fig. 10.

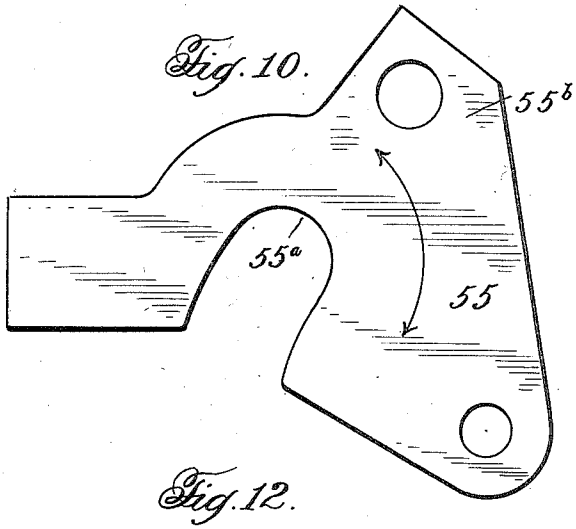


Fig. 11.

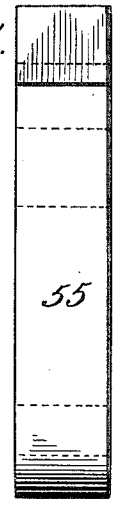


Fig. 12.

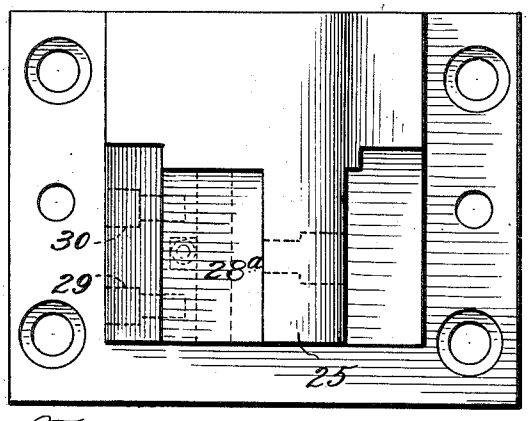


Fig. 13.

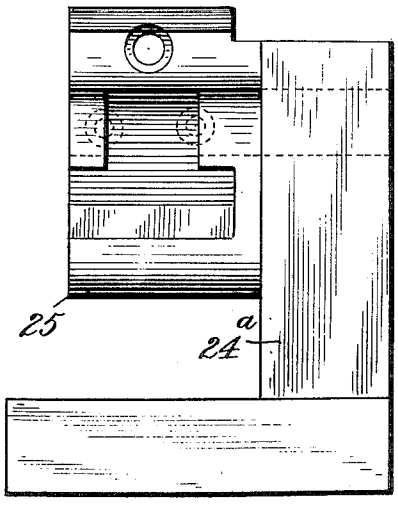
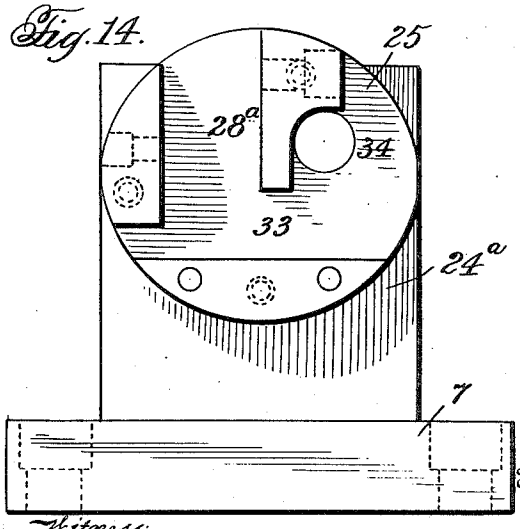


Fig. 14.



Witness:
Jas. E. Hutchinson.

Inventor.

Wm. A. Rowe,

By

Milans & Milans Attorneys.

Patented Nov. 8, 1927. 1,648,060

UNITED STATES PATENT OFFICE.

WILLIAM A. ROWE, OF DETROIT, MICHIGAN, ASSIGNOR TO AMERICAN BLOWER COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF NEW YORK.

MACHINE FOR MAKING SHEET-METAL FAN WHEELS.

Application filed April 16, 1925. Serial No. 23,740.

This invention relates to improvements in machines for making sheet metal fan wheels and the like of the smaller centrifugal type having a multiplicity of relatively long narrow blades arranged in drum formation and formed integral with the body part of the wheel, and more particularly has to do with an improved machine for cutting and forming the blades of such wheels from the sheet metal wheel body.

Heretofore in the art it has been proposed to first cut or slit the sheet metal body of the wheel and afterwards punch out and shape up the blades, and to perform these separate operations of cutting the body and forming the blades therefrom while the body part of the wheel is in the form of a flat sheet, which afterwards is curled to cylindrical or similar drum form and the ends secured together to form the wheel.

The object of the present invention is to provide an improved machine for the purpose referred to; to provide an improved machine adapted to cut and form the blades from the wheel body when the same is in its finished form of a cylindrical shell or similar drum formation, to the ends that a more perfect wheel is produced, the work of cutting the wheel body and shaping of the blades is simplified and more rapidly accomplished, and the time and cost of manufacture considerably reduced.

A further object of the invention is to provide an improved machine of the character referred to of simple, efficient, compact construction adapted to be readily associated with and operated by the ram of a conventional type of punch press.

The invention, with other objects and advantages thereof, and the particular construction, combinations and arrangements of parts comprising the same, will be understood from the hereinafter contained detailed description when considered in connection with the accompanying drawings, forming part hereof, and illustrating one embodiment of the invention.

In the drawings:

Figure 1 is a side elevation of a machine constructed in accordance with the present invention, the machine being shown associated with a punch press.

Fig. 2 is a front elevation of the machine.

Fig. 3 is a side elevation of the body cutting and blade forming mechanism, parts being shown in vertical section, and the forming member being shown in its retracted position out of engagement with the work.

Fig. 4 is a similar view, the parts being shown in the positions of the same at the completion of a body cutting and blade forming operation.

Fig. 5 is a top plan view.

Fig. 6 is a detail plan view with parts shown in horizontal section, of the indexing mechanism and the supporting head for one of the cutting and forming members, the indexing device being shown in its outermost position removed from the cutting and forming mechanism and engaging a fan wheel body.

Fig. 7 is a detail top plan view of the indexing mechanism.

Fig. 8 is a detail end elevation of the same.

Fig. 8[a] is a detail section of the pawl of the indexing mechanism.

Fig. 9 is a detail end elevation of the indexing mechanism, the latch of the indexing device being shown swung to outward position.

Figs. 10 and 11 are detail views of the latch of the indexing mechanism.

Fig. 12 is a top plan view of the head in which the lower former member is mounted.

Figs. 13 and 14 are detail end elevations and side elevations of the same.

Fig. 15 is a detail perspective view of the lower former member.

Fig. 16 is a detail perspective view of the cutter associated with the lower former member.

Fig. 17 is a detail perspective view of the upper combined cutting and forming member.

Fig. 18 is a detail perspective of the stripper associated with the upper cutting and forming member.

Fig. 19 is a transverse section of a fan wheel structure which the machine is adapted to make.

Fig. 20 is a detail perspective of the operating slide associated with the lower former member.

Fig. 21 is a detail perspective view of part of the operating mechanism for the slide which actuates the lower forming member.

Fig. 22 is a section of a fan wheel which the machine is adapted to make, the wheel

being here shown in complete form equipped with a hub part that is applied after the forming of the blades by the machine.

Fig. 23 is a detail perspective view of the gib and spring retainer associated with the lower former member.

Fig. 24 is a detail vertical transverse section of the gib illustrated in Figure 23.

The invention comprehends an improved machine including body cutting and blade forming mechanism in combination with means for supporting a fan wheel body of drum form and for the indexing or rotary adjustment of the fan wheel body providing for the uniform spacing of the blades about the wheel, the cutting and blade forming mechanism being adapted to provide the proper clearance for the blades struck from the wheel body during the rotary adjustment thereof in the successive body cutting and blade forming operations. More particularly the invention contemplates cutting and blade forming mechanism comprising cooperating members, one of said members being mounted for reciprocation on a carrier or slide arranged to operate from the exterior of the wheel body, and the other member being supported for sliding movement in a head, which is adapted to be disposed interiorly of the hollow wheel body, means for transmitting movement from said carrier or slide to the last mentioned member for operating the same in timed relation with the operation of the member on the slide, in combination with indexing mechanism adapted to engage a fan wheel body of cylindrical or similar drum formation at one end thereof and effect a rotary adjustment of the same. The invention further comprehends a machine of the character outlined that is adapted to be associated with a punch press and to be operated through engagement of the ram of the press with said tool carrier or slide.

While in the drawings is illustrated a specific embodiment of the invention, which has proven satisfactory in use, it will of course be understood that changes and variations in the particular construction and arrangements of parts shown, and the embodiment of the invention in other forms as will appeal to those skilled in the art and falling within the scope of the appended claims, may be practiced without departing from the spirit of the invention.

In Figures 19 and 22 of the drawings is shown one example of a sheet metal fan wheel structure upon which my improved machine is adapted to operate to cut the body and form the blades therefrom, as shown. In these views 1 designates the cylindrical body part of the wheel, 2 the blades struck out therefrom and 3 the back plate, the latter in the particular construction shown being integral with the cylindrical body part 1. The back plate 3 has the usual central opening 4 in which to secure the usual hub part 5, my improved machine being adapted to operate upon the fan wheel structure (as shown in Figure 19) prior to the application of the hub part. The back plate 3, in addition to the central opening 4, is provided with apertures 6 for a purpose which will be later explained.

Referring to a detail description of the particular embodiment of the invention illustrated in the drawings, 7 designates a suitable base upon which the body cutting and blade forming mechanism, and the work holding means is mounted. Turning now to the body cutting and blade forming mechanism (see particularly Figures 2, 3, 4 and 15 to 18) 8 designates a supporting arm on the base 7 having a head 9 at its upper end, in which is mounted a vertically reciprocating slide or carrier 10. The head 9 is slotted as shown to provide a guide channel or bearing extending vertically through the same from top to bottom for the slide 10, and is shown provided with a separate front plate or wall 11 detachably secured to the main portion of the head by screws 12. 13, 14, designate gibs supported by pins 15, 16, and 17, 18 are adjusting screws for the gibs. The slide 10 at its front side is cut away, as shown, to provide a recess with an upper end wall 19 and a vertical back wall 20. Mounted on the lower end of the slide 10 is a combined cutting, punching and blade forming member 21 fixedly secured to the vertical wall 20 within the recess of the slide by a screw 22. The cutting and blade forming member 21 is oblong shape in cross section and has cutting edges 21^a, 21^b, along its lower front end and sides (see Figure 17). Its bottom, in this particular instance, is formed by a front rearwardly inclined face portion 21^c extending from its front edge 21^a, and an adjoining upwardly curved face portion 21^d, the latter corresponding to and the shape of the same depending upon the curvature or shape it is desired to give to the blade.

Mounted on the slide 10 within the recess thereof at one side of the cutting and blade forming member 21 is a spring pressed sliding stripper comprising a main body part 23 having at its upper end a lateral extension 23^a extending rearwardly over the upper end of the cutting and blade forming member 21. 24 designates a coiled compression spring interposed between the upper end wall 19 of the recess of the slide and the upper end of the stripper 23, said spring acting to force the stripper 23 outwardly, the outward movement of the stripper 23 being limited by its lateral extension 23^a engaging the upper end of the cutting and forming member 21. The stripper 23, which is of a length to project a short distance be-

yond the lower end of the cutting and forming member 21 when in its outermost position, has a lower work engaging face 23^b transversely concaved to correspond to the curvature of the fan wheel body.

Located on the base 7 forwardly and to one side of the supporting arm 8 is a vertical arm 24^a having mounted thereon at its upper end a head 25 extending horizontally beneath the head 11, and in which is mounted for vertical reciprocation a former member 27, and a rigidly held cutter member 26 to cooperate with the cutting and blade forming member 21 on the head 11. The lower supporting head 25, which is in the form of a block of general cylindrical shape, is slotted at one end, as shown in Figures 13 and 14, to provide a channel 28^a in which the former member 27 is arranged to slide. The cutter member 26, which is fixedly secured to the head 25 by a screw 28, has a lower part 26^a rectangular shape in cross section, and an upper substantially U-shaped part 26^b having a front wall 26^c and sides 26^d, which are provided with cutting edges 26^e, 26^f, the front cutting edge 26^e at its ends merging in a gradual curve, into the side cutting edges 26^f. The former member 27 is rectangular shape in cross section and is provided with a curved top face 27^a formed complementary to the curved bottom face of the cutting and forming member 21, said former member 27 being arranged to slide along one side of the cutting member 26 within the U-shaped upper end part 26^b of said cutter member. 29 designates holding screws for a spacer plate or gib 30, at one side of the former member 27. The head 25 is provided with a removable end plate 31 secured thereto by screws 32. Means is provided for transmitting movement from the vertical slide or carrier 10 to the forming member 27, to reciprocate the same in timed relation with the operation of the cutting and forming member 21 on the slide 10. The means for this purpose comprises the following parts: The head 25 is cut away (see Figures 12–14) to provide a transversely extending channel way 33 and an adjoining chambered part 34. Arranged to slide transversely in the channel way 33 is a slide 35 having at one end a beveled face 36 adapted to engage a beveled face 37 on the lower end of the former member 27, and provided with a rack 38. 39 designates a horizontal rock shaft journaled on the support 35, said rock shaft 39 which extends longitudinally to the outer side of the supporting arm 24^a, has at its inner end a gear sector 40 meshing with the rack 38 of the slide 35, and at its other end has fixed thereto an arm 41, which latter is connected to the vertical reciprocating slide 10 by a link comprising an end clevis part 42 connected to the arm 41 by a pin 43 and having a rod portion 42^a which slidably engages a tubular end part 42^b, the latter engaging a pivot pin 44 on a lateral extension 45 of the vertical slide 10. 46 designates a coiled compression spring on the rod portion 42^a interposed between the end of the tubular part 42^b and a nut 47 on the rod portion 42^a, said nut being adjustable on the rod portion 42^a and serving as a lock nut locking 42 to 42^a after same have been adjusted so as to have the former come to position before the cutting and forming member 21 has finished its downward stroke. The spring 46 serves to compensate for any extra downward motion of the vertical slide 10 and also as a safety device should the cutting and forming member 21 be set too deep. In order to limit the downward movement of the rock arm 41 and the upward stroke of the former member 27 a vertical stop pin 48 is provided arranged to contact with the outer end of the rock arm 41. The pin 48 has a threaded connection 48^c with the base 7 providing for the vertical adjustment of the stop pin to regulate the extent of the upward stroke of the forming member 27. As will be understood the spring pressed telescoping link construction serves to compensate for any extra downward movement of the vertical slide 10 in excess of that necessary to move the forming member 27 on its upward stroke, the spring 46 being of sufficient strength to hold the cutting and forming members 26 and 27 up to the work against the resistance encountered in operating upon the work, the telescoping yieldable link in combination with the adjustable stop pin providing for the nice adjustment and operation of the forming member 27 from the vertical slide 10. 48^b is a coiled compression spring interposed between a part 30^a of the spacer plate or gib 30 and a pin 48^f projecting laterally from the lower part of the former member 27, said spring serving to retract the forming member 27, moving the same downwardly when the horizontal slide 35 moves back away from the lower end of the former member 27 on the upward movement of the vertical slide 10. The spacer plate or gib 30 is shown provided with a vertically extending recess 30^b intermediate its sides to receive the spring 48^b.

Referring particularly to Figures 2, and 6 to 11 of the drawings, the indexing mechanism comprises a shaft 49 supported horizontally for rotation and bodily endwise movement on a support 50, the shaft 49 having at one end a hand wheel 51. Fixedly secured on the other end of the shaft 49 to rotate therewith is a ratchet disk 52. The ratchet 52 is provided with centering and fan wheel holding means comprising a central cylindrical projecting part 53 adapted to engage the central opening 4 in the back

plate 3 of the fan wheel (see Figures 6 and 19), and with pin projections 54 disposed at diametrically opposite points near the peripheral portion of the plate adapted to engage correspondingly located apertures 6 provided in the fan wheel back plate 3. The support 50 for the shaft 49 is located to one side of the body cutting and forming mechanism, and the shaft 49 is in axial alignment with the lower supporting head 25, the indexing device being adapted to be adjusted to the position illustrated in Figure 6 of the drawings clear of the lower supporting head 25 and to be moved inwardly to the position shown in Figures 2 and 6 with the fan wheel over the lower supporting head 25 and the back plate 3 of the fan wheel fitting against the end plate 3 of the head 25, the engagement of the end of the head 25 with the back plate 3 of the fan wheel assisting in supporting the fan wheel and holding the end plate 3 thereof in engagement with the holding pins 54 and central projection 53 of the disk 52, and the contact between the parts being a sliding one that does not interfere with the rotary adjustment of the fan wheel relative to the end plate 31 of the head 25, the indexing device being adapted for rotary adjustment to present different portions of the fan wheel body thereabout to the cutting and blade forming mechanism in the successive cutting and blade forming operations. The shaft 49 of the indexing device is limited in its outward movement from the cutting and blade forming mechanism by the engagement of the disk 52 with one side of the support 50. The length of the central projecting part 53 on the disk 52 is slightly longer than the thickness of the back plate 3 of the fan wheel, and in the position of the parts just described, enters a central depression 34^a provided in the end cover plate 31 of the head 25 for this purpose. Means is provided for locking the indexing device in this position against longitudinal movement while permitting rotary adjustment of the same. The means for this purpose is shown as consisting of a latch member 55 pivoted at one end to one side of the support 50 and provided with an intermediate part 55^a adapted to embrace an annular notch or reduced portion 49^a of the shaft 49. 56 designates a spring catch at one side of the support 50 adapted to engage the free end of the latch member 55 and retain the same in locking engagement with the annular notched part 49^a of the shaft 49. 58 designates a spring pressed pawl cooperating with the ratchet disk 52. The pawl 58 is carried by the latch 55 at 55^b so that as the latch is swung back to release the shaft 49 for movement away from the cutting and blade forming mechanism, the pawl 58 will be moved out of engagement with the ratchet disk 52, said pawl 58 being suitably mounted in a lateral extension 59 of the latch member 55. 60 designates the spring for the pawl, and 61 is a pin on the pawl working in a slot 62 and limiting its sliding movement. As will be understood the teeth 57 of the ratchet disk 52 are equally spaced to provide for the nice rotary adjustment of the work to the cutting and blade forming mechanism, the indexing device being turned through the hand wheel 51 a single tooth of the ratchet each time in the successive cutting and forming of the blades about the fan wheel body.

The slide or carrier 10 at its rear side near its upper portion is provided with a lateral extension 63 projecting and adapted to slide in a chamber 64 in the head 9, and interposed between the lateral extension 63 and the bottom wall of the chamber 64 is a compression spring 65, which forces the slide upwardly, actuating the same on its upward stroke. The slide or carrier 10 is limited in its upward movement by a stop 66 on the upper end of a vertical rod 67 adapted to engage the lateral extension 63 of the slide, the rod 67 slidably engaging an opening in said lateral extension and having an adjustable threaded connection 68 at its lower end with the head 9 providing for adjusting the position of the stop 66. Any suitable means may be employed for operating the vertically reciprocating slide 10, but the machine is particularly adapted to be clamped to the frame of a power punch press within the throat thereof, as illustrated in Figure 1 of the drawings, and operated by the ram of the press. In this view, Figure 1, A designates a conventional form of power press, *a* the lower die supporting plate thereof, and *b* the ram adapted on its downward stroke to contact with the upper end of the vertical slide 10 of the machine and actuate the same through the body cutting and blade forming operation.

A fan wheel having been engaged with the centering and holding means of the ratchet disk 52, and the shaft 49 moved inwardly to position the fan wheel over the head 25, the operation of the machine is as follows: The ram *b* of the power press A on its downward stroke hits the upper end of the slide 10 and forces the same down, the cutting and forming member 21 and the stripper 23 being carried downwardly and the forming member 27, being forced upwardly to the position indicated in Figure 4 of the drawings, the member 21 cooperating with the cutting member 26 to first pierce and cut the wheel body and then with the forming member 27 shaping the blade. The slide 10 is returned or moved upwardly by the spring 65, the slide being limited in its upward movement by the stop 66. In the

downward movement of the slide 10 the stripper 23 first engages the work, increased pressure being applied to the stripper 23 through its spring 24 as the slide continues through its down stroke. On the upward stroke of the slide 10, the stripper 23 holds the wheel body firmly until the cutting and forming member 21 is disengaged from the work, the stripper 23 being then carried up with the slide 10. As the vertical slide 10 ascends and the horizontal slide 35 moves back withdrawing its wedge end from the lower end of the former member 27, the former member 27 is retracted by the spring 48^b. The shaft 49 of the indexing device is then turned through one tooth of the ratchet disk 52 and the operation repeated. When the former member 27, is retracted, it occupies the position illustrated in Figure 3 of the drawings, the position of the members and the size of the head 25 being such as to afford proper clearance for the formed blades during the indexing or rotary adjustment of the work.

It will be noted that the special construction and arrangements of parts hereinbefore set forth affords a simple efficient machine adapted to cut the wheel body and form the blade in a single operation, and to cut and form the blades when the fan wheel body is in its finished cylindrical form, resulting in the production of a more perfect wheel and a considerable saving in time and the cost of manufacture, the construction of the machine being such as to be advantageously operated by a power press avoiding the necessity of providing separate equipment for this purpose.

What I claim is:

1. In a machine for the purpose set forth, body cutting and blade forming mechanism comprising cooperating members adapted to both cut a wheel body and form a blade in a single operation, in combination with indexing mechanism for rotating a fan wheel body to present different portions of the same to said cutting and blade forming mechanism.

2. In a machine for the purpose set forth, body cutting and blade forming mechanism, indexing mechanism adapted to rotate a fan wheel body to present different portions of the same to the cutting and blade forming mechanism in the formation of the blades about the wheel, and said indexing mechanism being shiftable laterally of the cutting and blade forming mechanism to hold a fan wheel in position to be operated upon by the cutting and blade forming mechanism, and to a position removed therefrom, and means for locking the indexing mechanism in the first mentioned position against lateral shifting movement while permitting rotary adjustment of the same.

3. In a machine for the purpose set forth, cooperating opposed relatively movable blade forming members adapted to operate upon a fan wheel of drum form from the exterior and interior thereof, in combination with means for rotating a fan wheel body to successively present different portions of the same between said blade forming members, said relatively movable blade forming members being operable to provide the proper clearance for the blades struck from the wheel body during the rotary adjustment thereof in the successive blade forming operations.

4. In a machine of the class described, body cutting and blade forming mechanism, in combination with indexing mechanism including a support, a horizontally extending shaft mounted on said support for rotation and for longitudinal sliding movement toward and from the cutting and blade forming mechanism, the shaft being provided at one end with a disk rigid therewith, said disk being adapted to fit against a back plate of a fan wheel and being provided with means for centering and engaging a fan wheel to rotate the same, means on the other end of said shaft for turning and sliding the same longitudinally, said shaft having an annular notched part, and a latch device for engaging the notched part of the shaft and locking the same against longitudinal sliding movement while permitting rotation thereof.

5. In a machine of the class described, body cutting and blade forming mechanism, in combination with indexing mechanism including a support, a horizontally extending shaft mounted on said support for rotation and for longitudinal sliding movement toward and from the cutting and blade forming mechanism, the shaft being provided at one end with a disk rigid therewith, said disk being adapted to fit against a back plate of a fan wheel and being provided with means for centering and engaging a fan wheel to rotate the same, means on the other end of said shaft for turning and sliding the same longitudinally, said shaft having an annular notched part, and a latch member pivoted at one end to said support at one side of the shaft to swing vertically and provided with an intermediate part to embrace the notched part of the shaft and hold the same against movement longitudinally while permiting rotation thereof, and a catch adapted to engage the free end portion of said latch member and hold the same in engagement with the notched part of the shaft.

6. In a machine for the purpose set forth, body cutting and blade forming mechanism, in combination with indexing mechanism including a support, a shaft mounted for rotation and bodily endwise movement, the shaft being provided at one end with a disk rigid

therewith, adapted to fit against the back plate of a fan wheel, said plate having on its outer end a central projection or pilot to engage a central opening in the back plate of a fan wheel and pins projecting from the outer face thereof to engage correspondingly arranged openings in the back plate of the fan wheel.

7. In a machine for the purpose set forth, body cutting and blade forming mechanism, in combination with indexing mechanism including a support, a shaft mounted for rotation and for bodily endwise movement, means on one end of the shaft for turning and sliding the same, a ratchet disk on the other end of the shaft rigid therewith, said disk being adapted to fit against the back plate of a fan wheel and having means thereon to engage the back plate of a fan wheel to rotate the same; and a spring pressed pawl mounted on the support and cooperating with the ratchet of the disk

8. In a machine for the purpose set forth, body cutting and blade forming mechanism, comprising a reciprocating member having an end portion substantially rectangular shaped in cross section, said end portion having cutting edges along three sides thereof and having a blade forming end face, in combination with cooperating opposing means including a cutter member provided with an end portion of general U-shaped form in cross section and having at its outer end a cutting edge extending around the same, and a former member having a blade forming end face shaped complementary to the forming face of the first mentioned cutting and forming member and arranged to reciprocate adjacent the U-shaped end portion of said cutter member

9. In a machine for the purpose set forth, body cutting and blade forming mechanism, comprising a reciprocating member having an end portion substantially rectangular shaped in cross section, said end portion having cutting edges along three sides thereof and having a blade forming end face, in combination with cooperating opposing means including a stationary cutter member provided with an end portion of general U-shaped form in cross section and having at its outer end a cutting edge extending around the same, and a former member having a blade forming end face shaped complementary to the forming face of the first mentioned cutting and forming member and arranged to reciprocate adjacent the U-shaped end portion of said cutter member

10. The combination with a power press having a vertically reciprocating ram, of a machine comprising a supporting base, an upwardly extending supporting arm on the base, a head on said arm, a vertically reciprocating slide mounted in the head, a cutting and blade forming member on the slide, a supporting head extending below the first mentioned head on the base, a vertically reciprocating forming member mounted in the said lower head, means for transmitting movement from the slide to the forming member of the lower head in timed relation with the operation of the cutting and blade forming member on the slide, a compression spring for yieldably maintaining the slide in its uppermost retracted position and acting to move the slide in one direction, means for limiting the upward movement of the slide, said machine being adapted to be positioned within the throat of the punch press and the said slide to be actuated by the ram of the press.

11. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a cutting and blade forming member on the slide, a second supporting head extending below the first mentioned head, a vertically reciprocating and blade forming member mounted in said supporting head opposed to and cooperating with the first mentioned cutting and blade forming member, and means for transmitting motion from said slide to the blade forming member on the second head to operate the same in time relation with the cutting and blade forming member on the slide, said means including a rock arm on said second supporting head, a yieldable link connection between the slide and the rock arm, a vertically extending adjustable stop pin arranged to contact with the rock arm to limit the movement of the rock arm in one direction.

12. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a cutting and blade forming member on the slide, a second supporting head extending below the first mentioned head, a vertically reciprocating forming member mounted in said second supporting head opposed to and cooperating with the first mentioned cutting and forming member, means for transmitting motion from the said slide to the blade forming member on the said head to operate the same in timed relation with the blade forming member on the slide, said means including a member mounted to slide horizontally in said second supporting head and adapted to engage the lower end of said lower blade forming member and actuate the same on its upward stroke, said slide being provided with a rack, a horizontal rock shaft on said head, a gear on said shaft meshing with the rack of said horizontal sliding member, an arm on said shaft, and a link connection between the vertically reciprocating slide and said arm, and operating means for the vertically reciprocating slide.

13. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a cutting and blade forming member on the slide, a second supporting head extending below the first mentioned head, a vertically reciprocating forming member mounted in said second supporting head opposed to and cooperating with the first mentioned cutting and forming member, means for transmitting motion from the said slide to the blade forming member on the said head to operate the same in timed relation with the blade forming member on the slide, said means including a member mounted to slide horizontally in said second supporting head and adapted to engage the lower end of said lower blade forming member and actuate the same on its upward stroke, said slide being provided with a rack, a horizontal rock shaft on said head, a gear on said shaft meshing with the rack of said horizontal sliding member, an arm on said shaft, and a link connection between the vertically reciprocating slide and said arm, a spring for retracting the lower former member, and operating means for vertically reciprocating the slide.

14. In a machine of the class described, blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a blade forming member on the slide, a second supporting head extending below the first mentioned head, a vertically reciprocating forming member mounted in said second supporting head opposed to and cooperating with the first mentioned forming member, means for transmitting motion from the said slide to the blade forming member on the said head to operate the same in timed relation with the blade forming member on the slide, said means including a member mounted to slide horizontally in said second supporting head and adapted to actuate the lower forming member on its upward stroke, the lower forming member having an inclined face at its lower end, and said slide having an inclined face at one end to cooperate with the inclined face of the blade forming member, said slide being provided with a rack, a horizontal rock shaft on said head, a gear on said shaft to mesh with the rack of said horizontal sliding member, an arm on said shaft, and a link connection between the vertically reciprocating slide and said arm, and operating means for the vertically reciprocating slide.

15. In a machine of the class described, blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a blade forming member on the slide, a second supporting head extending below the first mentioned head, a vertically reciprocating blade forming member mounted in said second head opposed to and cooperating with the first mentioned forming member, and means for transmitting motion from the vertically reciprocating slide to the blade forming member on the second head to operate the same in timed relation with the forming member on the slide, said means including a rock arm mounted on said second head, a yieldable link connection between the slide and the rock arm, the link connection including telescoping parts with a compression spring interposed therebetween exerting sufficient pressure to resist the pressure of the forming member in operating upon the work, a stop arranged to contact with the rock arm to limit the movement of the arm in one direction, and operating means for the slide.

16. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating slide mounted in said head, a cutting and blade forming member on said slide, a vertically sliding stripper member mounted on the slide, a spring yieldably maintaining the stripper in outer position to engage the work in advance of the cutting and blade forming member, opposed cooperating vertically reciprocating blade forming means, and operating means therefor and for said slide.

17. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating blade forming member mounted in said head, a second supporting head below the first mentioned head, said second supporting head having a central depression in its outer end, a vertically reciprocating blade forming member mounted in said second head, operating means for the blade forming mechanism, indexing mechanism including a shaft supported horizontally for rotary adjustment and bodily endwise movement in line with said second supporting head of the cutting and punching mechanism, means on one end of said shaft for engaging a back plate of a fan wheel to rotate the same, and a pilot part on said shaft adapted to engage the central depression in the outer end of said second supporting head to center the parts, said second supporting head being adapted to have the fan wheel positioned thereover.

18. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating cutting and forming member mounted in said head, a second supporting head extending below the first mentioned head, a vertically reciprocating blade forming member mounted in said second head, operating means for the cutting and blade forming members, and indexing mechanism including a shaft supported horizontally for rotary adjustment and bodily endwise move-

ment in line with said second supporting head, a vertically disposed plate fixed on one end of the shaft, said plate being adapted to fit against a back plate of a fan wheel and having means thereon for engaging the back plate to rotate the same, said second supporting head being adapted to have a fan wheel body positioned over the same with the back plate of the fan wheel fitting against its outer end face.

19. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating cutting and forming member mounted in said head, a second supporting head extending below the first mentioned head, a vertically reciprocating blade forming member mounted in said second head, operating means for the cutting and blade forming members, indexing mechanism including a shaft supported horizontally for rotary adjustment and bodily endwise movement in line with said second supporting head, a vertically disposed plate fixed on one end of the shaft, said plate being adapted to fit against a back plate of a fan wheel and having means thereon for engaging the fan back plate to rotate the same, said second supporting head being adapted to have a fan wheel body positioned over the same with the back plate of the fan wheel fitting against its outer end face, said shaft being adapted to be shifted bodily longitudinally to carry its plate to a position removed from the lower supporting head, and to position the same close to the end of the lower supporting head with the back plate of the fan wheel against the end face thereof, and means for locking the shaft in the last mentioned position against endwise movement while permitting rotary adjustment of the same.

20. In a machine of the class described, cutting and blade forming mechanism comprising a head, a vertically reciprocating forming member mounted in said head, a second supporting head extending below the first mentioned head and having a central depression in its outer end face, a vertically reciprocating former member mounted in said second head, operating means for the blade forming mechanism, indexing mechanism including a shaft supported horizontally for rotary adjustment and bodily endwise movement in line with said second supporting head, a vertically disposed plate fixed on one end of the shaft, said plate being adapted to fit against a back plate of a fan wheel and having means thereon for engaging the back plate, said means including a central projecting part adapted to engage a central opening in the back plate of a fan wheel, the second supporting head being adapted to have a fan wheel body positioned over the same with the back plate of the fan wheel fitting against its outer end face, and said shaft being adapted to be adjusted longitudinally to a position with its plate removed from the lower supporting head, and to be shifted inwardly close to the end of the lower supporting head with the back plate of the fan wheel engaging the end face thereof and the projecting part on the said plate extending through the back plate into the central depression in the outer end face of the lower supporting head.

21. In a machine for the purpose set forth, cooperating opposed rectilinearly reciprocating blade forming members adapted to operate upon a fan wheel of drum form from the exterior and interior thereof, in combination with means for rotating a fan wheel body to successively present different portions of the same between said blade forming members, said blade forming members being operable to provide the proper clearance for the blades struck from the wheel body during the rotary adjustment thereof in the successive blade forming operations.

22. In a machine of the class described, body cutting and blade forming mechanism comprising a reciprocating combined cutting and blade forming member having a blade shaping end face and a cutting edge, and cooperating opposed means including a stationary cutter member, and a reciprocating blade forming member along side the stationary cutting member and having a blade shaping end face formed complementary to the end face of the first mentioned member.

23. In a machine of the class described, body cutting and blade forming mechanism comprising a reciprocating combined cutting and blade forming member having a blade shaping end face and a cutting edge, a stationary cutting member having a part of channel form provided with a cutting edge, and a reciprocating blade forming member operating adjacent the channel part of the stationary cutting member.

24. In a machine of the class described, blade forming mechanism including a reciprocating slide, a blade forming member on the slide, a second reciprocating blade forming member opposed to and cooperating with the first mentioned blade forming member, operating means for the slide, and means for transmitting motion from said slide to the second reciprocating blade forming member to operate the same in timed relation with the operation of the blade forming member on the slide.

25. In a machine of the class described, blade forming mechanism including a reciprocating slide, a blade forming member on the slide, a second reciprocating blade forming member opposed to and cooperating with the first mentioned blade forming member, operating means for the slide,

means for transmitting motion from said slide to the second reciprocating blade forming member to operate the same in timed relation with the operation of the blade forming member on the slide, said means including a rock arm, a yieldable link connection between the slide and rock arm, and a stop arranged to contact with the rock arm to limit the movement of the same in one direction.

26. In a machine of the class described, blade forming mechanism including a reciprocating slide, said slide being provided with a recess extending inwardly thereof from its forward end, a blade shaping member on the slide, said blade shaping member being arranged with one end portion thereof positioned within the recess of the slide at the lower part thereof and secured thereto, a reciprocating stripper member mounted within the recess alongside said blade forming member for sliding movement relatively thereto, said stripper member having a lateral extension disposed in line with the upper end of said member, and a spring interposed between the upper end of said stripper member and the end wall of the recess, said spring acting to yieldably maintain the stripper member pressed outwardly beyond the outer end of the blade forming member to engage the work in advance thereof, the lateral projection of the stripper member normally being held by the spring against the end of the blade forming member.

In testimony whereof I hereunto affix my signature.

WILLIAM A. ROWE.