

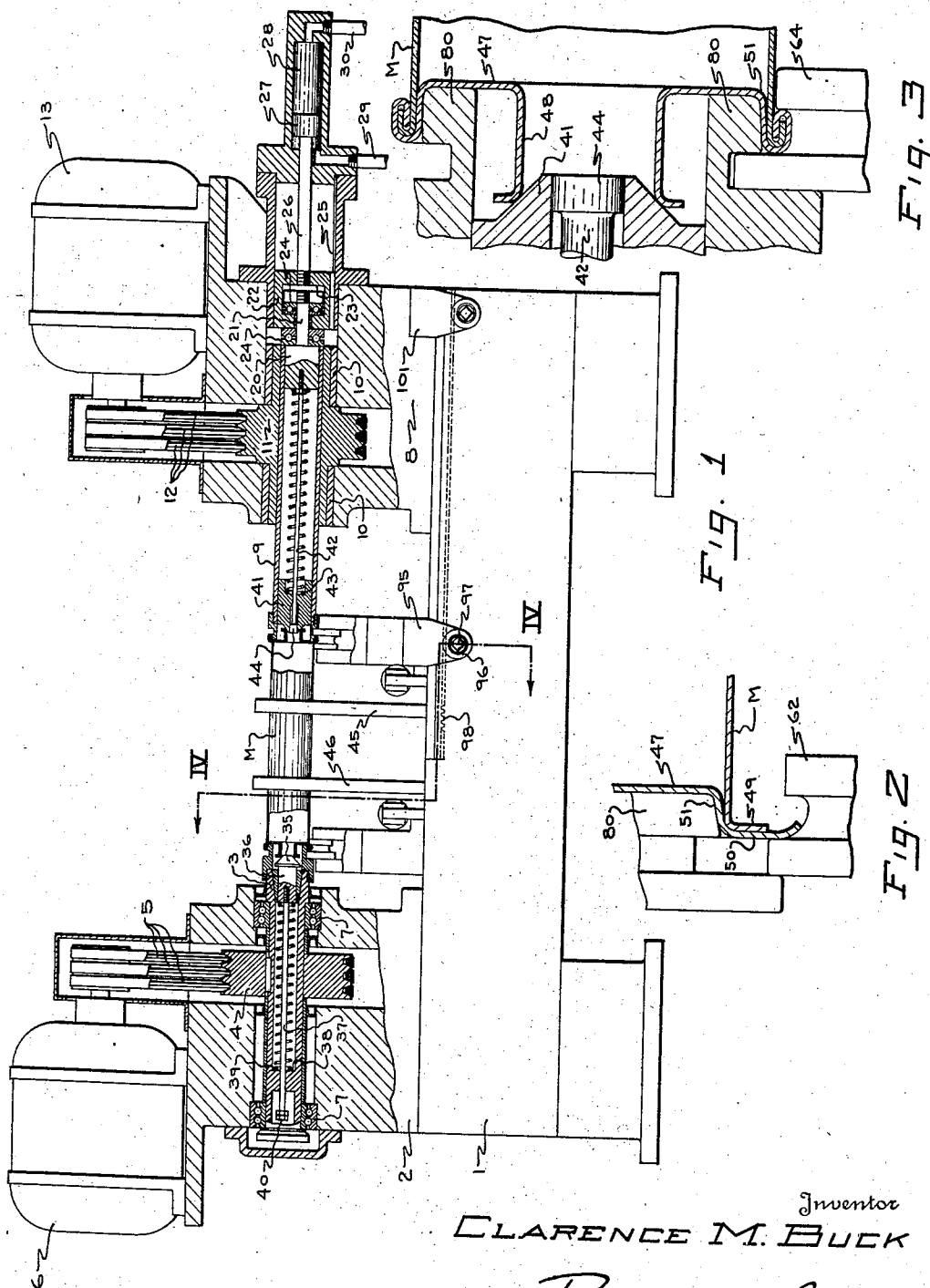
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C. M. BUCK

2,228,651

MACHINE FOR ROLLING HEADS ON MUFFLERS

Original Filed Feb. 10, 1938 2 Sheets-Sheet 1



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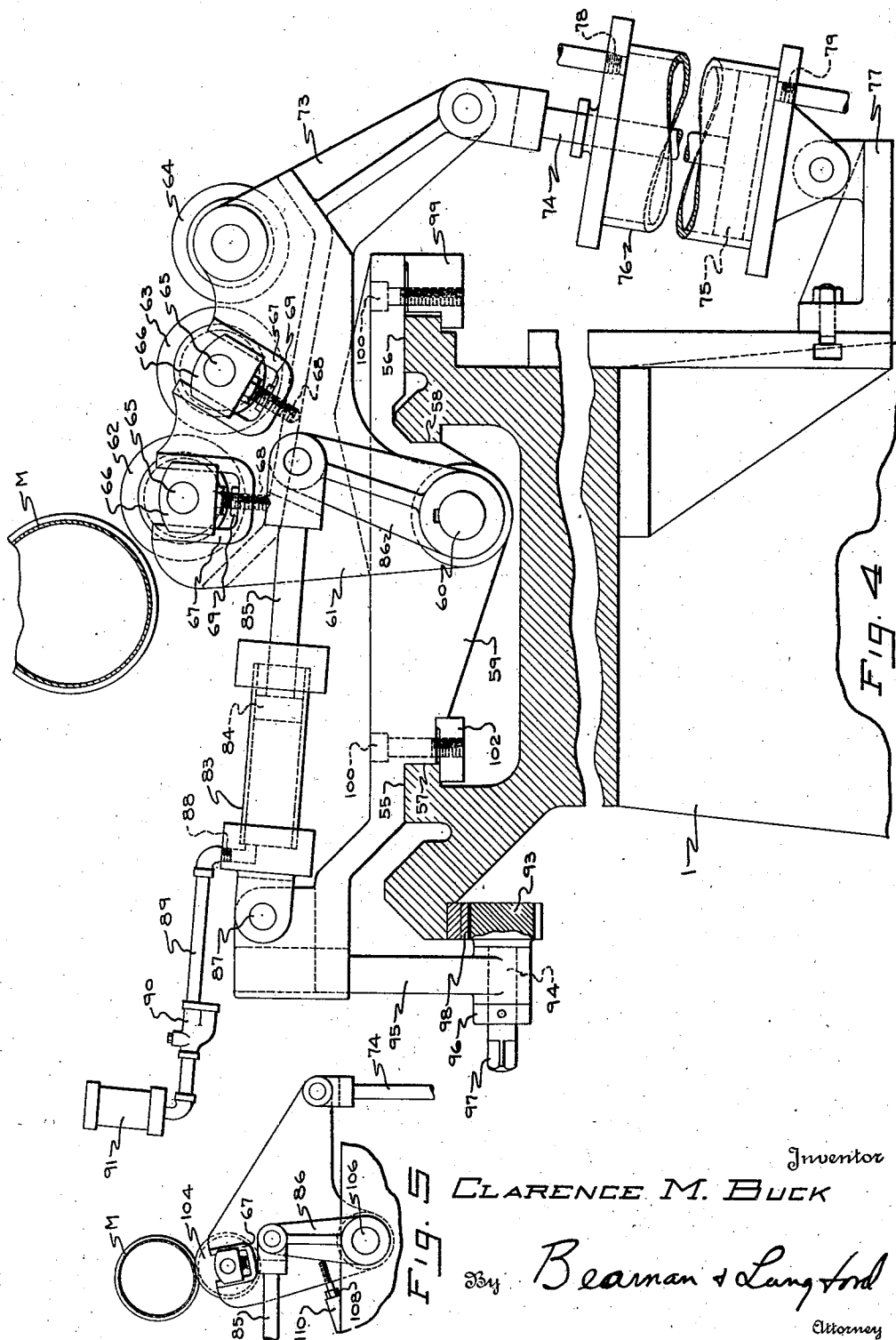
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UNITED STATES PATENT OFFICE

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MACHINE FOR ROLLING HEADS ON
MUFFLERS

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poration of Michigan

Original application February 10, 1938, Serial No.
189,751. Divided and this application Novem-
ber 28, 1938, Serial No. 242,678

3 Claims. (Cl. 113—23)

This invention relates to a machine for attach-
ing sheet metal heads to sheet metal bodies, the
machine having been especially developed for
simultaneously attaching a pair of muffler heads
to the muffler body and the manufacture of mufflers
for internal combustion engines. This applica-
tion is a division of my copending application
Serial No. 189,751, filed February 10, 1938.

The present invention contemplates the rapid
chucking of a sheet metal body, such as that of
a muffler, rotating the same about its longitudinal
axis and with the heads in position, simultaneously
attaching heads at opposite ends of the body by
rolling together radially projecting flanges upon
the edge of the body, the machine in its pre-
ferred form embodying structural features per-
mitting chucking of the muffler body for rotation
with the muffler heads in position at opposite ends
of the muffler body simultaneously rolling the
heads at opposite ends of the body so as to provide
a substantially gas-proof connection seam.

An object of the present invention is to provide
a machine for securing heads on muffler bodies
and similar articles by rolling together radially
extending flanges on the heads and on the muffler
bodies.

Another object of the invention is to provide a
machine for connecting muffler heads and the like
to muffler bodies and the like by performing one
step, whereby radially extending adjacent flanges
from the head and the body are partially rolled
together while not backed up and by another step,
whereby the flanges are rolled together while the
flanges are backed up to complete the connection.

A further object of the invention is to provide a
machine having a head stock and a tail stock,
between which the muffler is clamped, and rela-
tively movable dies for cooperation with the
muffler to lock the head thereon.

A still further object of the invention is to pro-
vide mechanism for controlling the rate of the
rolling of the flanges of the body and the head
together.

A still further object of the invention is to pro-
vide a machine for attaching heads to muffler
bodies and the like by locking flanges on the heads
and bodies together by dies cooperating with the
muffler body.

A still further object of the invention is to pro-
vide a machine for rotating a muffler by driving it
from each end.

A still further object of the invention is to pro-
vide a machine of the foregoing character for
securing sheet metal parts other than muffler
parts together.

These and other objects will be apparent from
the following description when taken with the
accompanying drawings.

Fig. 1 is a side elevation partially in vertical
section showing the machine having a muffler
clamped between the head and tail stock thereof
and the dies for performing the first connecting
step, in engagement with the muffler.

Fig. 2 is a partial section showing the beginning
of the first connecting step.

Fig. 3 is a partial section showing the comple-
tion of the last connecting step.

Fig. 4 is a section on the line IV—IV of Fig. 1
showing the connecting dies and the mechanism
for adjusting the same longitudinally of the ma-
chine to accommodate mufflers of different sizes,
and

Fig. 5 is a fragmentary side elevational view of
a modified form of the machine employing a single
roller.

Referring particularly to the drawings, the ref-
erence character 1 indicates a base on which is
mounted a head stock 2, having a rotatable head
center 3. The head center 3 has keyed thereto a
pulley 4, which is driven by belts 5 from an electric
motor 6. The head center 3 is mounted for rota-
tion in suitable bearings 7. On the base 1 is
also mounted a tail stock 8, having rotatably
mounted therein a tail center 9. The tail center
9 is also arranged for axial movement and slides
axially and rotates in sleeve bearings 10. The tail
center 9 is provided, like the head center 3, with
a pulley 11, which is driven through the belts 12
from a motor 13. The motors 6 and 13 should be
identical so that the head center 3 and the tail
center 9 will be driven at the same speed. The
tail center 9 is provided with an end piece 20, which
has extending axially therefrom a spindle 21
which projects into a head 22 having a hollow
interior 23. Secured to the spindle 21 at each
side of one side of the head 22 are thrust bearings
24, by means of which axial movement of the head
22 is imparted through the spindle 21 to the tail
center 9. The head 22 is splined into a slideway
25 and has connected thereto a rod 26, which is
in turn connected to a piston 27 in a cylinder 28.
The cylinder is provided at one end thereof with
a port 29 and at the other end thereof with a port
30. The ports 29 and 30 are connected to suit-
able valve mechanism to admit air into one end
of the cylinder 28 and to exhaust it from the other
end, and vice versa, to reciprocate the piston 27
in a well-known manner. Thus, as the piston 27
is reciprocated, the tail center 9 is reciprocated.

The head center 3 is provided with a conical

centering nose 35, which has a tail piece 36 connected to a rod 37 slidably mounted in a partition 38 adjacent the rear of the head center 3. Disposed about the rod 37 is a helical spring 39. The spring 39 serves through the tail piece 36 to urge the centering nose 35 to the right, as shown in Fig. 1, the rightward movement being limited by a stop 40 on the left end of the rod 37.

The tail center 9 is likewise equipped with a centering device, which comprises a conical centering nose 41 axially slidable within the tail center 9. Axially slidable in the centering nose 41 is a rod 42, which is anchored at its inner end to the end piece 20 and has disposed thereabout a helical spring 43 for the purpose of urging the centering nose 41 toward the left, as viewed in Fig. 1. The leftward movement of the centering nose 41 is limited by a stop 44 on the outer end of the rod 42.

Projecting upwardly from the base 1 at a point between the head center 3 and the tail center 9 are two cradles 45 and 46, respectively, arranged to receive a muffler body M thereon and to support it substantially in alignment with the centers 3 and 9. When it is desired to place a muffler body in the machine, the piston 27 is moved to its extreme right position, as viewed in Fig. 1, to move the tail center 9 to its extreme right position. A muffler body is then disposed in the cradles 45 and 46. Movement of the piston 27 to the left moves the tail center 9 to the left and clamps the muffler body M between the head center 3 and the tail center 9.

As shown in Fig. 1 and more in detail in Fig. 3, each muffler head 47 is provided with a connecting sleeve 48 of a diameter considerably less than the muffler M. As the tail center 9 is moved outwardly from the tail stock 8 to clamp a muffler between the centers 3 and 9, the conical noses 35 and 41 engage with the sleeves 48 to center the muffler body M with respect to the centers 3 and 9.

Referring particularly to Fig. 2, it will be observed that the muffler body M is provided at each end with a radially extending flange 49 and that the heads 47 are each provided with a radially extending flange 50 and also that the heads 47 are each provided with a portion 51 telescopically engaging with the muffler body M. Prior to placing the muffler body M in the cradles 45 and 46 for the purpose of clamping it between the centers 3 and 9, the heads 47 are fitted into the muffler body M in any suitable manner, although it has been found very satisfactory to use a press for this purpose. The mechanism for locking the flanges 49 and 50 together to connect the heads 47 to the muffler body M is disclosed particularly in Fig. 4.

The base 1 is provided with horizontal shoulders 55 and 56 and vertical shoulders 57 and 58. Disposed on said shoulders 55 and 56 and between said vertical shoulders 57 and 58 is a slide 59. The slide 59 has rotatably supported therein a pin 60, to which is connected a rocker 61. The rocker 61 has mounted therein freely rotatable rolling dies 62, 63 and 64. The dies 62 and 63 are adjustable, being rotatable about pins 65, in turn mounted in guides 66 slidable in ways 67. The adjustment of the rolls 62 and 63 is provided by threaded rods 68 and nuts 69 thereon.

The rocker 61 is provided with an arm 73 which is pivoted to a piston rod 74 connected to a piston 75 in a cylinder 76. The cylinder 76 is pivoted about one end to a bracket 77 connected to the base 1, and is provided with ports 78 and 79 communicating with the opposite ends thereof. The

ports 78 and 79 are connected to suitable valve mechanism for admitting air to one end of the cylinder and exhausting it from the other, and vice versa, to reciprocate the piston 75 in a well-known manner. It will be clear that as the piston 75 is moved from one end of the cylinder 76 to the other, the rocker 61 will be rocked about the axis of the pin 60. The rocker 61, together with the rolling dies 62, 63 and 64 thereon, is arranged with respect to the muffler body M in such a manner that the rolling dies will move into operative relation with the muffler M as the piston 75 is moved from the position shown in Fig. 4 upwardly, to act upon the flanges 49 and 50 to lock them together.

As shown particularly in Fig. 2, when the rolling die 62 engages the flanges 49 and 50, the flanges 49 and 50 begin to bend and thus perform the first step in the locking of such flanges together. The rolling die 62 is adjusted by the nuts 69 and the threaded rod 68 to such a position with respect to the axis of the muffler body M that as the rocker 61 is rocked to the left, as viewed in Fig. 4, by the piston 75, the rolling die 62 will pass completely under the muffler body M, at the same time deforming the flanges 49 and 50 a predetermined amount. As shown in Fig. 2, the die 62 has a working face that deflects the flanges 49 and 50 sidewise and inwardly. The rolling die 63 is provided to perform a second step in the locking of the flanges 49 and 50 together. However, if preferred, the rolling die 63 may be entirely dispensed with and its work performed by the rolling die 62.

The rolling die 64 does not pass beneath the muffler body M as do the rolling dies 62 and 63, but moves up against the side of the muffler body M to roll the partly deformed flanges 49 and 50 into interlocking engagement, the rolling action by the rolling dies 64 being backed up and assisted by the arbor 80 and comprising a part of each center 3 and 9. The flanges 49 and 50 are thus firmly locked together.

It is desirable to limit the speed with which the rolling dies 62, 63 and 64 move under the action of the piston 75, not only for the purpose of assuring the proper action of the dies against the flanges 49 and 50, but also to insure that the dies 62 and 63 will not pass completely under the muffler before the entire peripheries of the flanges 49 and 50 have been acted upon. To limit such speed there is provided a cylinder 83 in which is disposed a piston 84 connected to a piston rod 85. The piston rod 85 is pivoted to an arm 86 keyed to the pin 60. The cylinder 83 is pivoted by means of a pin 87 to a portion of the slide 59. Thus, as the piston 75 moves to rock the rocker 61 about the axis of the pin 60, the arm 86 moves the piston rod 85, which in turn moves the piston 84 within the cylinder 83. The cylinder 83 is filled with a liquid, such as oil or the like of a desired viscosity, which as the piston 84 moves from the right to left, as viewed in Fig. 4, passes out through the port 88 in the cylinder 83, through the pipe 89, through the check valve 90 having a restricted orifice, into the reservoir 91. The check valve may be of any standard design. Thus, the passing of the liquid in the cylinder 83 through the restricted orifice in the check valve 90 limits the speed at which the rocker 61 may rock to the left, as viewed in Fig. 4. However, when the rocker 61 is rocked to the right, as viewed in Fig. 4, and the piston 84 in the cylinder 83 moves to the right, the liquid in the reservoir 91 flows freely through the check valve 90 back

into the cylinder 83. It will be understood, of course, that the check valve 90 may be adjusted or originally selected to permit a flow of the liquid from within the cylinder 83 at such a rate as to result in the desired speed of the rocker 61.

The machine as described thus far is set for work upon a muffler having a fixed length. In order to adapt it to mufflers of different lengths, there is provided mechanism disclosed in Figs. 1 and 4 for adjusting the rolling dies 62, 63 and 64 associated with the tail center 9 of the machine toward and away from the head stock 2 of the machine. This adjustment is accomplished by a pinion 93 mounted on a pin 94 rotatable in an arm 95 depending from the slide 59. The pin 94 is secured to the arm 95 by a collar 96 and is provided with a squared outer end 97. The pinion 93 engages with a rack 98 secured to the base 1. Therefore, when a crank is applied to the squared end 97 of the pin 94 to rotate the pinion 93, the slide 59 is moved longitudinally of the base 1 sliding on the horizontal shoulders 55 and 56 in a direction depending upon the direction of rotation of the pinion 93. When the proper adjustment of the slide 59 has been made, the adjustment is fixed by clamps 102 and 99 secured to the base 1 by socket head cap screws 100. A similar adjustment of the tail stock longitudinally of the base 1 may be provided by similar adjusting mechanism 101.

While the rolling dies 62, 63 and 64, above described and particularly shown in Fig. 4, are those associated with the tail center 9 of the machine, it is to be understood that identical rolling dies and structure are associated with the head center 3 of the machine for the purpose of locking together the flanges of the head 47 and the muffler body M disposed at the head stock 2 end of the muffler body M. It is also to be understood that there is a cylinder 83 and associated structure at each end of the muffler body M, one for each set of rolling dies.

While the dies associated with the head center 3 are shown in the drawings as not adjustable longitudinally of the base 1, these dies may be adjustable longitudinally of the base 1, or not, as desired.

As shown, the head center 3 and the tail center 9 are driven by belt connections from electric motors 6 and 13. It will be understood that instead of belt connections, gear connections may be provided. Instead of using separate electric motors to drive the head center 3 and the tail center 9, they may be driven simultaneously from a single source of power. Moreover, when separate electric motors are used to drive the head center 3 and the tail center 9, they should be operated from the same switch so that they will start simultaneously. Pneumatic power has been disclosed as the means for actuating the pistons 27 and 75. It is considered that these pistons may be operated hydraulically or the movement be obtained electrically within the scope of the present invention. The foregoing description has been confined to one particular form of interlocking connections between the adjacent flanges of the head and muffler body. It will, of course, be understood that the invention is not necessarily limited to the particular type of connection, and other types of connection involving a different specific overlapping structure might be used. In such a case, of course, the dies would have to be different.

In Fig. 5 is shown a modified form of the invention in which a single rolling guide 104, which

may be identical to the die 62, is employed for carrying out the several steps performed by the rolling dies 62, 63 and 64 of the form of the invention illustrated in Figs. 1 to 4, inclusive. At this point it might be as well to state that it has been found that the number of rolling dies required depends primarily upon the shape of the seam. For muffler construction, for example, it has been found that a satisfactory seam between the muffler body and the muffler heads of the general character of the seam shown in Fig. 3 may be rolled by means of a single roller with the arrangement shown in Fig. 5. The rolling die 104, having been swung about its pivot 106, first engages the radial flanges of the muffler body M and forms the initial rolling operation illustrated in Fig. 2. When the rolling die has been swung to the left to the position shown in Fig. 5, the seam is completely formed into the construction shown in Fig. 3. Preferably a stop 108 engages with the abutment 110, which prevents the roller 104 from passing beneath the muffler in the manner of the rolling die 62. In practice, the stop 108 is adjusted so that the advancement of the rolling die 104 is arrested when the point of contact between the rolling die and the muffler is aligned in a plane through the axes of rotation of the muffler and the rolling die 104. The operation of the machine is so regulated that there will be a dwell with the roller 104 in this position, which is the position shown in Fig. 5, whereby the roller 104 has an opportunity to function as a sizing die in the manner of the die 64. It should become apparent from the foregoing description that the die 104, by being bodily swung through an arc and permitted to dwell to size the rolled seam of the muffler, has the combined function of the group of rolling dies 62, 63 and 64 of the modification shown in Fig. 4. It is to be understood, however, that in commercial practice the shape of seam desired will render it unfeasible in some cases to attempt to perform the entire rolling operation of a single rolling die, and it will become advisable to resort to the more elaborate arrangement illustrated in Fig. 4.

While certain structural features of the machine herein illustrated are particularly adapted to muffler construction and have been designed for that specific purpose, it is intended and anticipated that the invention has wide application in the connecting of sheet metal bodies and parts; and for this reason it is not my intention to limit the appended claims to muffler construction but to include in general sheet metal bodies and associated parts as well.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. In a machine for rolling apertured flanged connector heads of mufflers for internal combustion engines upon opposite ends of cylindrical shells having flanged ends, the combination of a chucking, driving and backing structure comprising a pair of opposed cylindrical hollow arbors shaped to snugly fit within the flanged connector heads to back up the rolling operation between the outer flanges of the connector heads and the flanged ends of the shell, means supporting said arbors for rotation and for relative axial movement to clamp the shell between the connector heads, concentrically located centers disposed in each arbor and having enlarged tapered heads, means for resiliently projecting said enlarged heads into centering relation with the apertures of the connector heads with the shell clamped between the connector heads, and rolling dies spaced approximately the length of the shell and sup-

ported for transverse movement for engagement with the flanged portions of the shell and connector heads, with the shell clamped between the connector heads and said flanged portions backed up by said arbors.

2. In a machine for rolling apertured flanged connector heads of mufflers for internal combustion engines upon opposite ends of cylindrical shells having flanged ends, the combination of a chucking, driving and backing structure comprising a pair of opposed cylindrical hollow arbors shaped to snugly fit within the flanged connector heads to back up the rolling operation between the outer flanges of the connector heads and the flanged ends of the shell, means supporting said arbors for rotation and for relative axial movement to clamp the shell between the connector heads, concentrically located centers disposed in each arbor and having tapered heads, means for resiliently projecting said tapered heads into centering relation with the apertures of the connector heads with the shell clamped between the connector heads, and rolling dies supported for transverse movement for operative engagement

with the flanged portions of the shell and connector heads for rolling said flanges together while backed up by said arbors.

3. In a machine for rolling apertured flanged connector heads of mufflers for internal combustion engines upon opposite ends of cylindrical shells having flanged ends, the combination of a chucking, driving and backing structure comprising a pair of opposed cylindrical hollow arbors shaped to snugly fit within the flanged connector heads to back up the rolling operation between the outer flanges of the connector heads and the flanged ends of the shell, means supporting said arbors for rotation and for relative axial movement to clamp the shell between the connector heads, concentrically located centers disposed in each arbor and having tapered heads, means for resiliently projecting said tapered heads into centering relation with the apertures of the connector heads with the shell clamped between the connector heads, and means for rolling said flanges together while backed up by said arbors.

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