Nov. 29, 1938. C. W. DAKE 2,138,268

BRAKE DRUM MACHINE

Filed Aug. 17, 1936 2 Sheets-Sheet 1

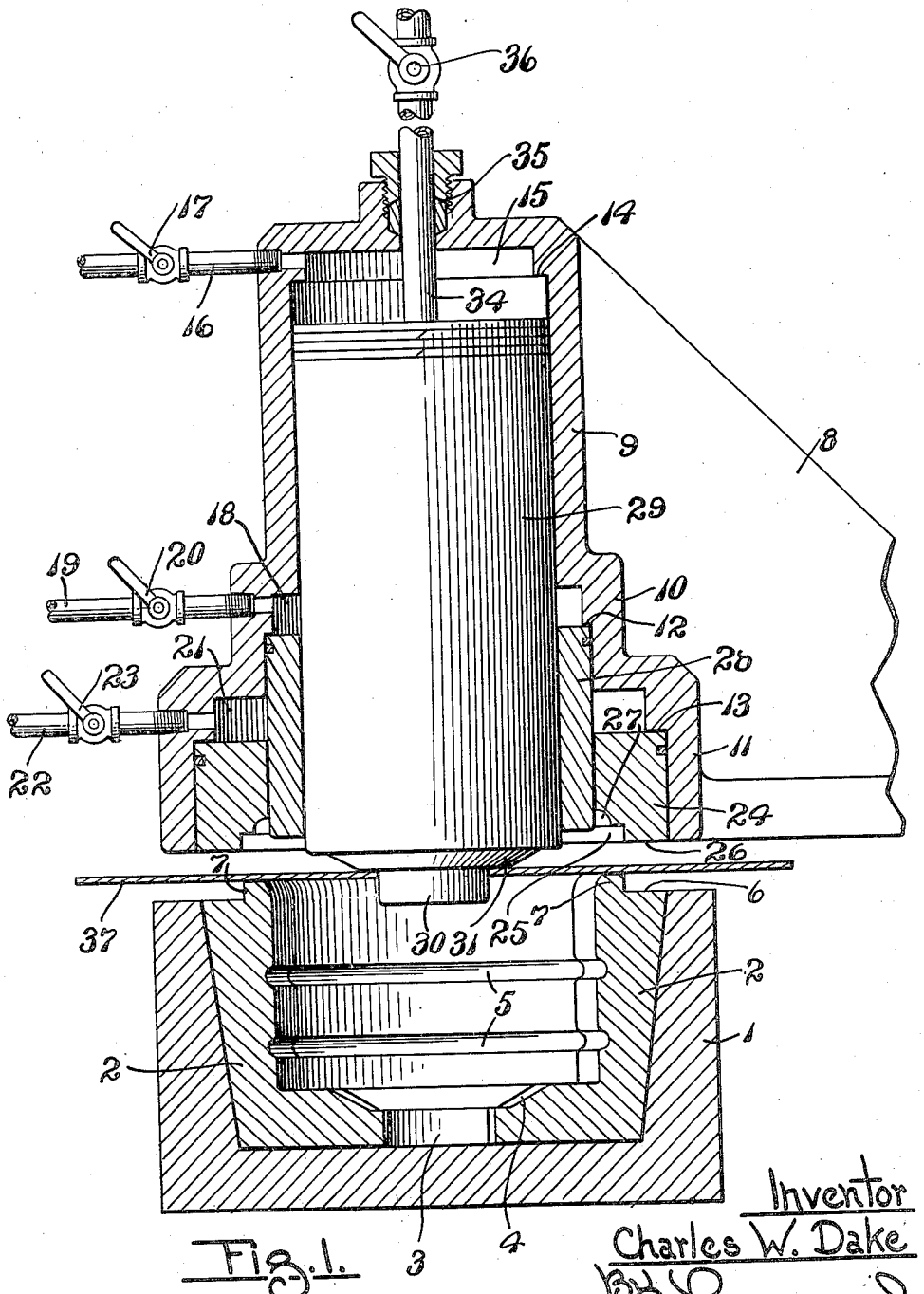



Fig. 1.

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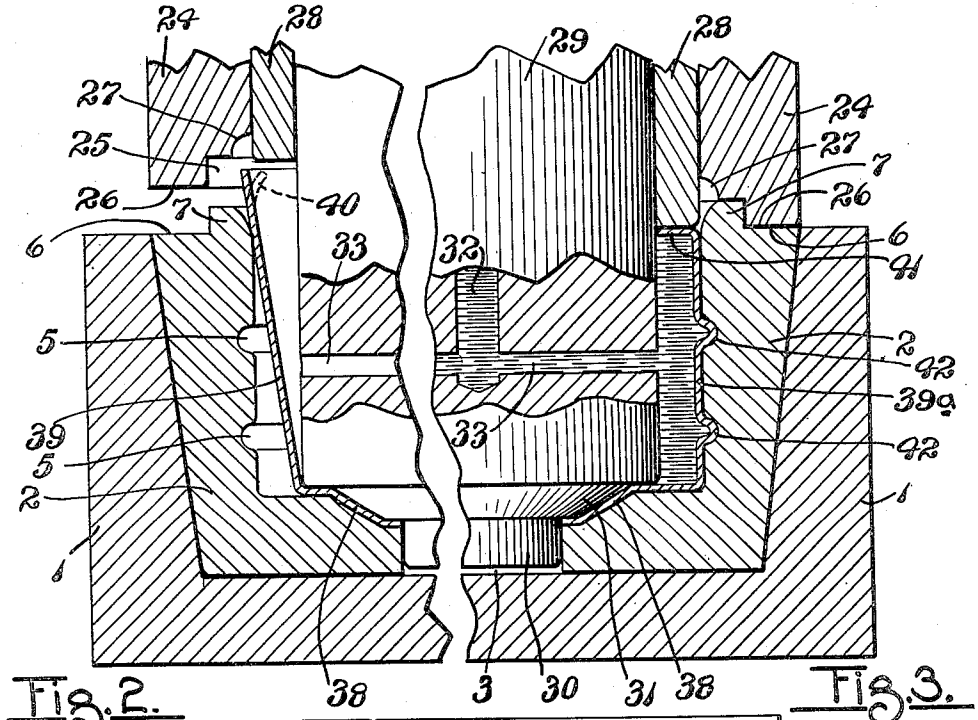



Fig. 2. Fig. 3.

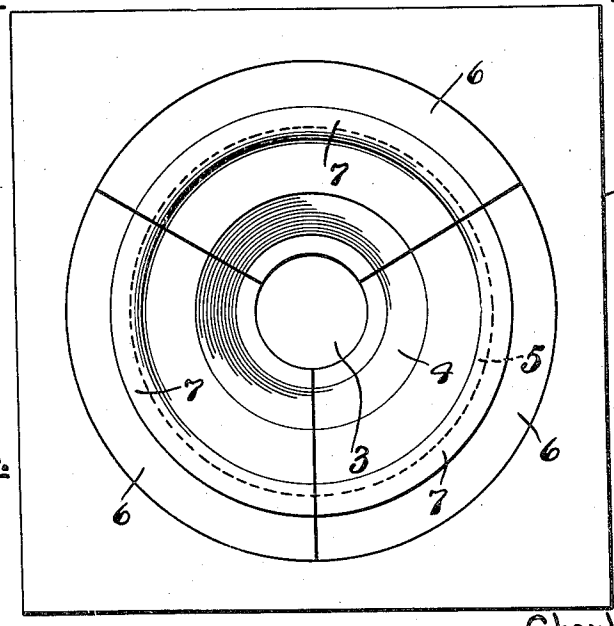



Fig. 4.

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# UNITED STATES PATENT OFFICE

2,138,268

## BRAKE DRUM MACHINE

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Application August 17, 1936, Serial No. 96,417

8 Claims. (Cl. 113—43)

This invention relates to mechanism or apparatus used in the manufacture of brake drum shells and particularly those shells which, after they are formed, may be lined with a braking lining of a different material than the shell. Brake drums of a composite character wherein there is a steel outer supporting shell and a cast iron braking lining fused to the shell at its inner sides are well known, and the present invention is directed to a novel apparatus for producing a shell of steel from a flat plate and preferably so that two finished brake drums may ultimately be produced from the shell which is made.

I have heretofore made application for the method of producing said steel brake drum shells in an application, Serial No. 69,020, filed March 16, 1936. The method of manufacture is therein fully shown and disclosed and the present invention discloses substantially the fundamental apparatus illustrated in said pending application. The present application may be considered a continuation in part of such prior application.

It is a primary object and purpose of the present invention to provide a relatively simple, practical and useful apparatus for readily forming flat circular plates of sheet metal into the brake drum form, and preferably in a length such that after the drum shell made has been lined with a cast iron liner, two finished brake drums may be produced, though it will be evident that a shell for one completed brake drum only might be made without departing from my invention.

An understanding of the invention, and one form of apparatus embodying the same, may be had from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a central vertical section through an apparatus embodying my invention.

Fig. 2 is a fragmentary vertical section illustrative of the first forming movement of the apparatus.

Fig. 3 is a similar section showing the completion of the brake drum shell forming, and

Fig. 4 is a plan view of the die into which the metal is pressed to form the shell.

Like reference characters refer to like parts in the different figures of the drawings.

The die which is used includes a die support 1 having a die receiving recess therein preferably with downwardly and inwardly tapered side walls. The die is made up of a plurality of sections 2, three of the sections being shown and inserted into the support 1, thereby providing a die having a substantially cylindrical interior recess at the bottom of which is a pilot opening 3. Around the pilot opening is an annular depression 4 and in the vertical walls of the cylindrical recess, spaced apart continuous grooves 5 are provided as shown. The upper sides of the die sections 2 at their outer peripheral portions have horizontal ledges 6 in the same plane with the upper side of the die support 1. Within the horizontal ledges 6 are upwardly extending ribs 7, the three ribs 7 of the three die sections make a continuous upwardly extending rib entirely around the vertical cylindrical recess in the assembled die.

On a support 8 a hydraulic cylinder apparatus is positioned. It includes an upper cylindrical section 9, at the lower end of which is a somewhat larger and shorter cylindrical section 10, and below which is a still larger cylindrical section 11. The inner wall of the section 10 is machined out at its lower portion providing an annular shoulder 12. Likewise the inner wall of the section 11 is provided with a similar shoulder 13 while the upper cylinder 9 has a continuous shoulder 14 at its upper end. Above the shoulder 14 is a relatively short cylindrical recess 15 to which an inlet pipe 16 leads having a control valve 17 in its length. Similarly, above the shoulder 12 is a cylindrical recess 18 with a pipe 19 leading thereto and a control valve 20 in said pipe. Above the shoulder 13 is a cylindrical recess 21, a pipe 22 with a control valve 23 therein leading thereinto as shown.

Within the lower section 11 a die punch 24 is mounted having a cylindrical outer surface received within the section 11 and having a central cylindrical opening therethrough. Around the lower end of the central opening the metal is cut away to provide a surrounding annular recess 25 at the upper part of which, and around the central opening through the punch 24, is a continuous annular recess 27, the walls of which are of upwardly and inwardly concave form as shown. By cutting the annular recess 25 there is left a downwardly projecting rib having a horizontal underside 26 which, when the punch 24 is moved downwardly, seats upon the ledge 6 of the assembled die, with the rib 7 received within the recess 25.

A second die punch 28 in the form of a sleeve has its upper end portion received within the section 10 below the annular shoulder 12 and extends downwardly through the central opening

of the outer punch 24. Within the sleeve 28 is a central punch 29 of substantially solid construction. At its lower end it is equipped with a downwardly extending pilot 30 of a diameter such as to be received within the opening 3 of the assembled die and with an annular surrounding tapered section 31 complementary to the annular recess 4 around the opening 3 in the die. All of the cylindrical positions or sleeves 29, 28 and 24 may be equipped with suitable sealing rings so as to retain oil which is pumped under pressure into the recesses 15, 18 and 21 above the several punches.

The inner punch 29 has an opening 32 from its upper end downwardly therethrough to within a short distance of its lower end and with horizontal branches 33 extending radially outward from the lower end of the opening 32 to the walls of the punch. A pipe 34 is connected with the upper end of the punch 29 in conjunction with the opening 32 and passes through a suitable stuffing box packing construction 35 at the closed upper end of the upper cylindrical section 9. A control valve 36 is located in the length of the pipe 34. It is to be understood that as the punch 29 is moved downwardly, as will be later described, the pipe 34 moves with the punch through the packing at 35 and that the valve 36 is located sufficiently high that it will not come to the stuffing box when the punch is in its lowermost position.

In the operation of the apparatus, a flat circular plate 37 of suitable material such as a low carbon steel is laid over the annular rib 7. The plate has a central opening to receive the lower reduced end 30 of the punch 29 as shown in Fig. 1 to thereby properly locate the plate. The first operation is to open the valve at 17 whereupon oil or other liquid under pressure is forced into the upper section 9 above the punch 29, moving the same downwardly until the pilot end 30 enters the opening 3 in the die assembly. When this occurs the central portion of the plate 37 is shaped into a web or back 38 (Figs. 2 and 3) while the outer portions of the plate provide an upwardly and outwardly inclined continuous wall 39, the upper edges of which extend above the ribs 7.

The next operation is to open the valve at 23 whereupon the outer punch 24 is moved downwardly, the ribs 7 of the die assembly entering the annular recess 25 and the lower side 26 of the punch seating on the ledge 6 to make a tight sealing contact. At the same time the upper edge portions of the annular side walls 39 are moved inwardly by their engagement with the concaved walls of the annular recess 27, thereby turning the metal inwardly to the position indicated in dotted lines at 40 in Fig. 2.

The next operation is to open the valve 20 whereupon the intermediate sleeve punch 28 moves down to the position shown in Fig. 3. This engages the incurved annular portions indicated at 40 and bends the same inwardly to make a continuous inwardly extending annular flange 41.

After these operations have been performed the valve at 36 is opened and oil under very heavy pressure passed through the passages 32 and 33 draws to press the metal against the walls of the die and into the grooves 5 thereof as shown in Fig. 3. The inclined wall 39 thereupon becomes substantially vertical as at 39a in Fig. 3 with continuous annular ribs 42 pressed into the grooves 5. This completes the shaping of the plate 37 into the form desired and provides a drum shell which, in accordance with previous practice, may be heated to a high degree of temperature, rotated in a suitable fixture and have molten iron at a very high degree of temperature deposited in the continuous annular trough between the flange 41 and the back 38, after which the composite structure produced may be divided between the ribs 5 and a suitable back welded or otherwise secured to the flange 41, making two complete brake drums as fully described in my previous application to which reference has been made.

After the formation of the shell the support for the die block 1 may be moved, that is lowered so as to draw the die support and the assembled dies and the shell therein away from the forming mechanism. The oil which has been introduced under pressure may be withdrawn by a suitable pumping apparatus which forms no part of the present invention and the various punches returned to their initial position ready for a succeeding operation. The die assembly with the shell therein may then be removed from the supporting block 1 and the sections of the die disassembled from the drum shell to release the formed shell.

The apparatus described is an effective apparatus for readily producing sheet metal drum shells in accordance with the method disclosed in my earlier application. While a hydraulic operation of the punches has been shown and described, the invention is not to be limited thereto as there are many other ways in which the movements of the punches may be attained.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In an apparatus of the class described, a die having a substantially cylindrical recess therein over which a flat plate of metal of greater diameter than the diameter of the recess is to be placed, a punch, means for operating the punch to press the plate of metal into the die, with the outer portions of the metal extending upwardly, in more or less spaced relation to the sides of the recess, and having edge portions extending above the upper side of the die, a second punch outside of the first punch, means for operating the same to engage against the upper edge portions of said metal and curve the same inwardly, a third punch located between the first and second punches, means for operating the same to engage said incurved edges of the metal to bend the same into a flange, and means for exerting pressure against the metal thus formed to conform it to said die recess, substantially as described.

2. An apparatus for forming brake drum shells from plates of flat metal comprising, a die having a recess of a desired shape over which a plate of flat metal is adapted to be located, a punch for forcing the metal into the die so that a portion of the plate will be spaced from the sides of said recess, a second punch located around the first punch for seating against the upper end of the die and sealing the same, a third punch surrounding the first punch and between the same and the second punch for turning inwardly an annular flange on the metal forced into the die, and means connected with the first punch for pumping liquid under pressure into the die recess between said first punch and the metal which has been forced into the die.

3. In a construction of the class described, a

die having a recess therein, a punch adapted to engage with a flat plate of metal placed over said die for forcing the metal into the recess so that the plate will be spaced from the sides thereof and with the sides of said plate extending at their upper edges above the upper side of the die, means for inwardly turning the upper edge portions of said metal into a continuous flange, and hydraulic means connected with and extending through said punch for conducting liquid under pressure to act upon the metal and force the same into conformity with the walls of the recess of the die.

4. Apparatus of the class described comprising, a die having a recess therein over which die and recess a flat plate of metal is adapted to be placed, a punch to engage the central portion of said plate of metal and carry the same into said recess, said plate being more or less spaced from the sides of the recess, additional punches to engage the upper edges of the metal and shape them into an inturned annular continuous flange, and also seat against the upper side of the die to form a seal thereagainst, and means for hydraulically exerting pressure upon the metal to conform the same to the walls of said die recess.

5. In an apparatus for forming brake drum shells comprising among its elements a die having a recess therein conforming to the outer periphery and supporting back of a brake drum shell over which a metal blank from which to form the said brake drum shell is placed, a punch for forcing a portion of said blank into the recess of the die, a second punch engaging the edge of said blank after the said first punch has forced the said blank into said die, for turning the side edge inward and sealing the die against leakage of pressure therefrom, a third punch of circular form interposed between the said first and second punches for engaging the said inturned edge and forming the same into an inward radially extending flange and means whereby fluid pressure is admitted around the periphery of the first named punch for forming the shell to conform with the interior of the die.

6. In an apparatus for forming brake drum shells comprising among its elements a die having a recess therein conforming to the outer periphery, a brake drum shell over which a metal blank from which to form the said brake drum shell is placed, a punch for forcing a portion of said blank into the recess of said die, a second punch engaging the edge of said blank after the said first punch has forced the said blank into said die, for turning the said edge inward and sealing the die against leakage of pressure therefrom, a third punch of circular form interposed between the said first and second punches for engaging the said inturned edge and forming the same into an inward radially extending flange and means whereby fluid pressure is admitted around the periphery of the first named punch for forming the shell to conform with the interior of the die.

7. In an apparatus for forming brake drum shells, the said apparatus including a die having an annular recess therein and an annular wall conforming to the outer periphery of the brake drum shell, a punch having its axis concentric with the axis of the said die, a second punch surrounding the first named punch in spaced relation thereto, and engaging the said die for preventing leakage of pressure therefrom, and bending inward the edge of a partly formed brake drum shell, a third punch surrounding the first named punch for forming an inwardly extending flange at one side of said shell and means for producing fluid pressure within the said die and around the first named punch for expanding the said partly formed shell within the die.

8. In an apparatus for forming brake drum shells from a metal plate, the said apparatus including a die having an annular recess therein and an annular wall conforming to the outer periphery of the brake drum shell, a punch having its axis concentric with the axis of the said die, a second punch surrounding the first named punch in spaced relation thereto to inwardly curve the upwardly extending edge of said plate and engaging the said die for preventing leakage of pressure therefrom, a third punch surrounding the first named punch for forming an inwardly extending flange from said inwardly curved portion at one side of said shell and means for producing fluid pressure within the said die and around the first named punch.

CHARLES W. DAKE.