

May 2, 1944.

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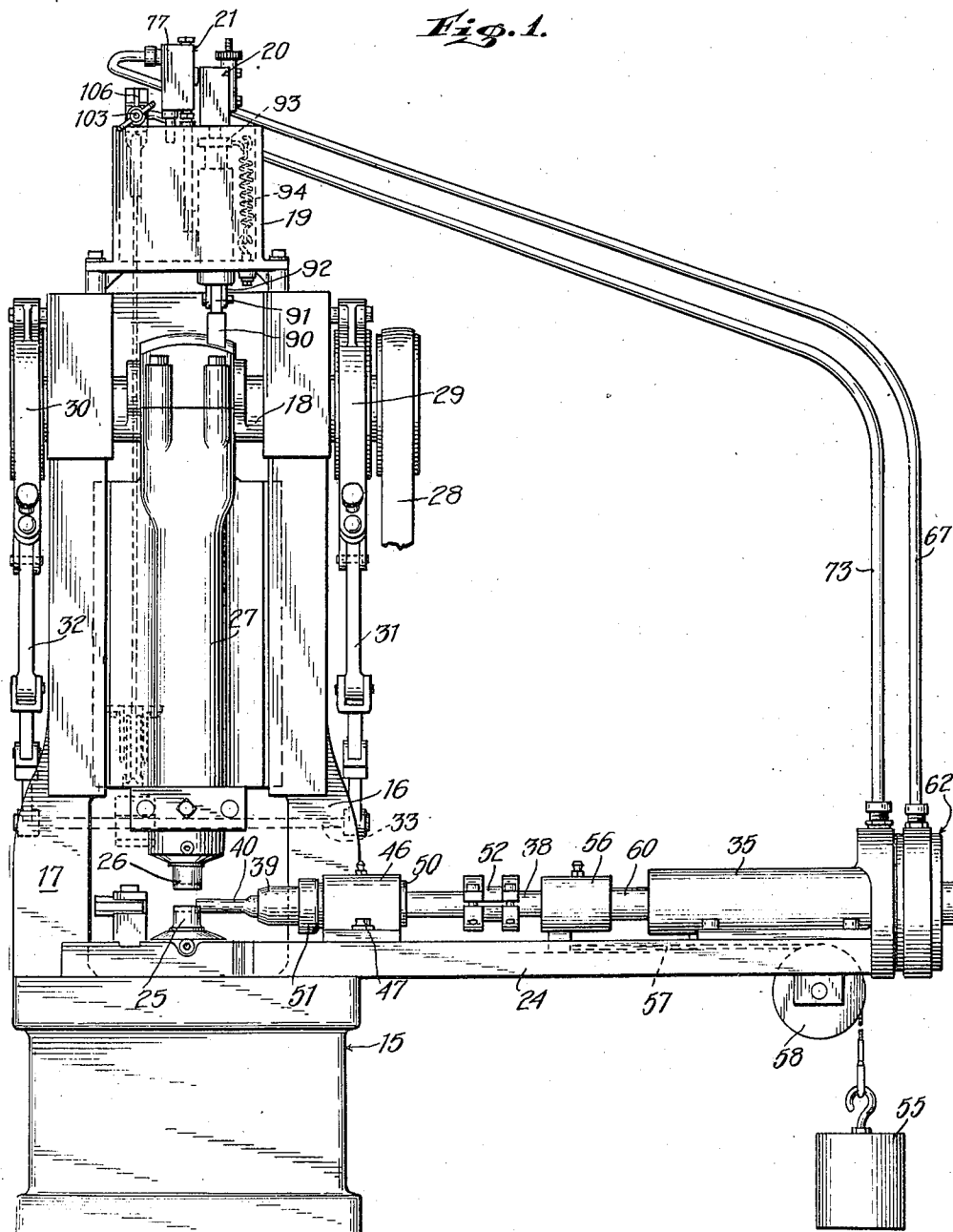
2,347,875

METALWORKING MACHINE

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5 Sheets-Sheet 1

Fig. 1.



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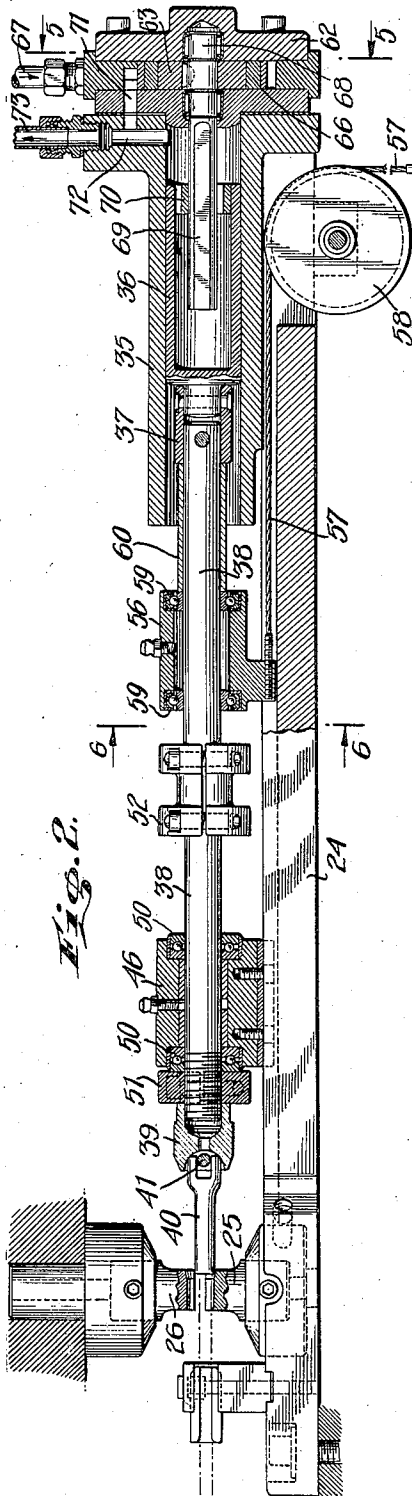


Fig. 2.

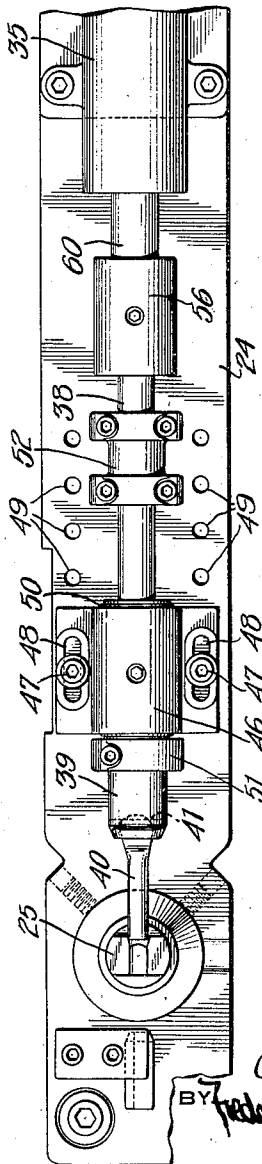


Fig. 3.

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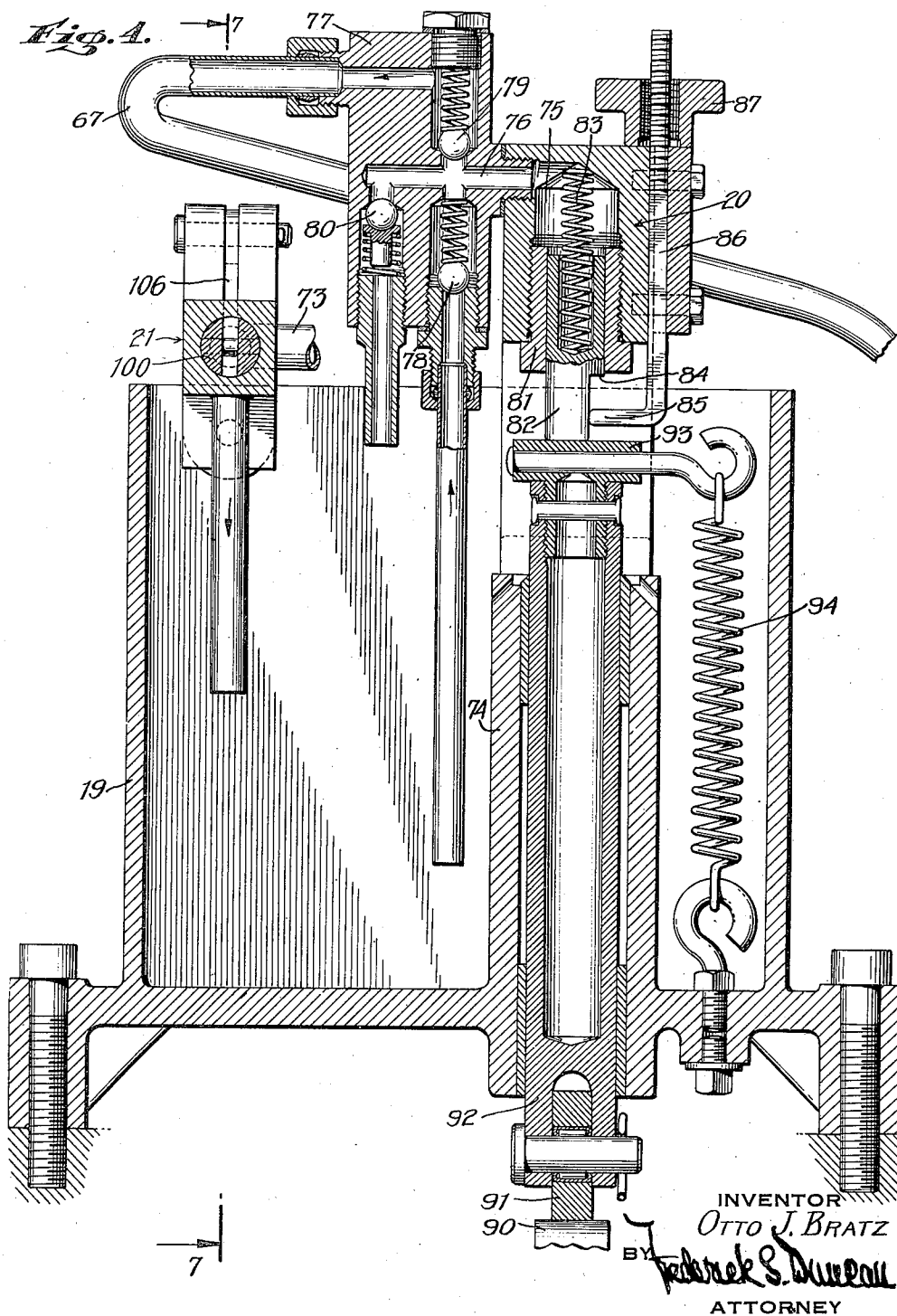
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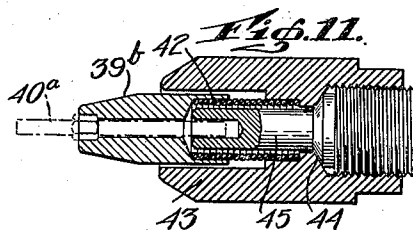
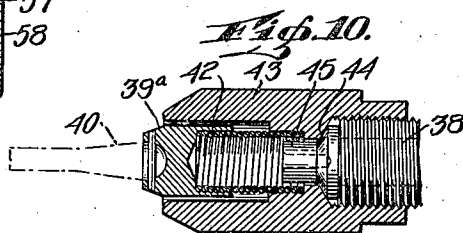
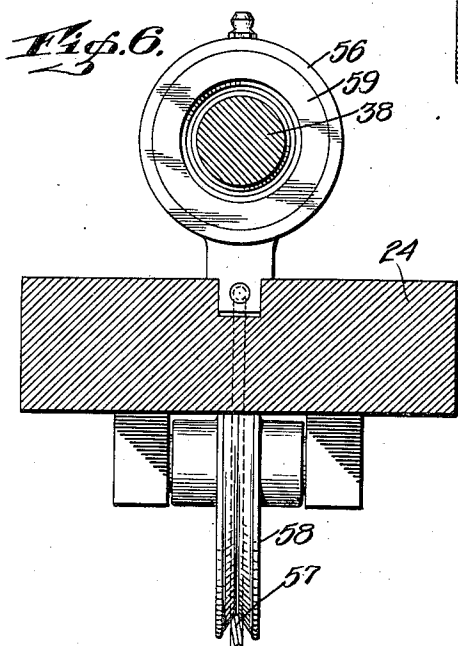
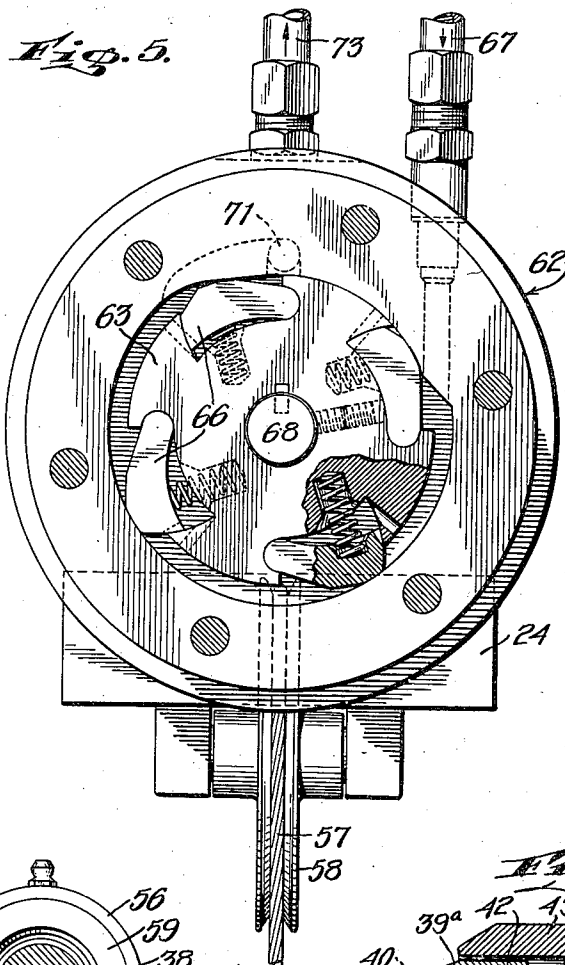
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METALWORKING MACHINE

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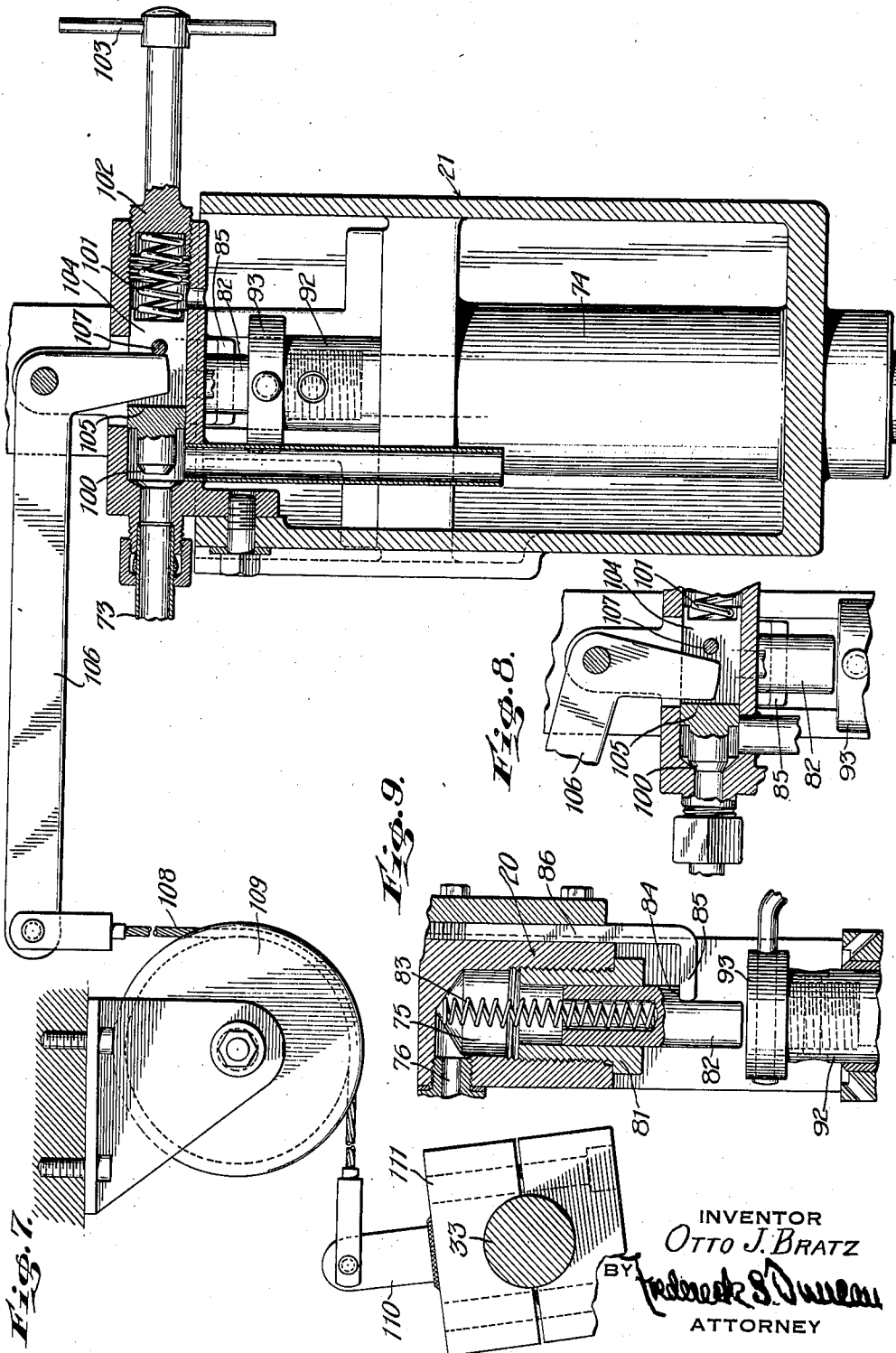
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METALWORKING MACHINE

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UNITED STATES PATENT OFFICE

2,347,875

METALWORKING MACHINE

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14 Claims. (Cl. 78—98)

This invention relates to improvements in metal working machines.

Among the objects of this invention are improvements applicable to metal working machines generally, and more particularly to swaging machines including relatively movable swaging dies and means for feeding and rotating an article to be swaged between the dies, such improvements comprising improved means for determining the initial position of the forward end of the article in the bell-mouth of swaging dies; improved means for adjustably controlling the forward and rearward limits of feeding movement of the article to be swaged; improved means for feeding and rotating the article to be swaged; and improved means for controlling the amount of rotation and feed of the article to be swaged, and improved means for varying the amount of feed with relation to the amount of rotation, for permitting the rotation of the article to continue and the swaging dies to continue their operation to perform a predetermined number of swaging operations after the forward feeding movement of the article has been arrested.

Other objects of this invention will appear from the following description taken in connection with the drawings in which—

Fig. 1 is a front elevational view of a standard press swaging machine showing attachments embodying the principles of my invention;

Fig. 2 is a side view partly in vertical section showing my improved feeding and rotating means and the dies;

Fig. 3 is a top plan view of a portion of the mechanism disclosed in Fig. 2;

Fig. 4 is a vertical section through the fluid pressure supply pump mechanism;

Fig. 5 is a vertical section on the line 5—5 of Fig. 2;

Fig. 6 is a vertical section on the line 6—6 of Fig. 2;

Fig. 7 is a vertical section on the line 7—7 of Fig. 4, showing a valve mechanism for controlling the pressure of the fluid against the feeding piston;

Fig. 8 is a view similar to Fig. 7 showing the valve in closed position at the beginning of an operation of the machine;

Fig. 9 is an enlarged view of the pump disclosed in Fig. 4;

Fig. 10 shows an improved fitting holder for one type of fitting;

Fig. 11 shows an improved fitting holder for another type of fitting.

I have disclosed my invention in connection

with a standard vertical press type swaging machine which includes a frame Fig. 1 provided with a base 15 on which are supported standards 16 and 17 in which is journaled a press operating crank shaft 18. Supported on the standards is an oil reservoir 19 Fig. 4 which supports a pump mechanism 20 Figs. 4 and 9, and a valve control mechanism 21, Figs. 7 and 8. Also supported on the base 15 Fig. 1 and projecting to the right thereof is a platform 24 Figs. 2 and 3 on which is supported a fixed swaging die 25 and the mechanism for feeding and rotating the article to be swaged which is disclosed in Figs. 1, 2, 3, 5, and 6.

The movable swaging die indicated at 26 Fig. 1 is supported as usual on a rod suitably guided in the frame for operation by a vertically reciprocable pitman 27 mounted on the crank shaft 18. The shaft 18 may be driven by a motor not disclosed through a belt 28 as indicated. Braking means indicated at 29 and 30 is provided for releasing and stopping the machine and this may be operated from a foot pedal (not disclosed) through linkage connections 31 and 32 from a shaft 33 (see also Fig. 7).

Supported on the right-hand end of the platform 24 Figs. 1 and 2 is a fluid cylinder 35 in which reciprocates and rotates a hollow piston 36 connected by a universal connection 37 to a sliding rod 38, on the end of which is threaded a fitting holder 39 provided with a recess to receive the head of a fitting 40 and with a transverse pin 41 to hold the fitting in the recess. The fitting holder may take the form disclosed in Figs. 10 and 11 as indicated at 39a and 39b. The fitting holders 39a and 39b are supported on closely coiled helical springs 42 which in turn are supported in sleeves 43 threaded on the sliding rod 38. These springs are secured in position by being compressed radially and then permitted to expand into the fitting holders and sleeves and they are coiled in a direction to cause them to expand into greater frictional contact with the holder and sleeve in case rotation of the fitting is opposed. The sleeves may be provided with tapered interior shoulders 44 to engage the tapered base of a fitting aligning member 45 recessed to receive the end of a turnbuckle type fitting 40a Fig. 11. The outside dimensions of the fitting holders 39a and 39b are smaller than the interior diameters of the sleeves 43 to permit of transverse movement of the holders within the sleeves to permit automatic minor adjustments to compensate for irregularities in the fittings.

The left-hand end of the sliding rod 38 is slidably supported in an adjustable stop block 46 which is held in adjusted position on the platform 24 by means of threaded bolts 47 passing through slots 48 in flanges on the block and threadedly engaging any one of a series of holes 49 in the platform 24. This block is provided for the purpose of adjusting the home position of the fitting holder and also the most forward position of the fitting holder. Each end of the block is provided with a rotatable ring or disc 50 of ball bearing construction against which the sliding rod 38 is stopped.

The forward end of the sliding rod 38 is provided with a stop member 51 threaded thereon for engagement with the ring or disc 50 on the left hand end of the block 46 to stop the sliding rod in its home or rearward position. Mounted on the sliding rod for cooperation with the disc 50 on the right hand end of the block 46 is an adjustable stop member 52 which may be secured in adjusted position on the sliding rod to limit the forward feeding movement of the sliding rod 38 and the fitting holder 39. By adjusting the stop block 46 and the stop member 52 the forward and rearward limits of movement of the sliding rod and fitting holder may be fixed. In setting the block 46 for a series of operations on fittings of the same size the block is so adjusted that the small end of the fitting, that is, the end of the fitting into which the cable is inserted, will extend half way into the bell mouth of the dies. This has the advantage that the first one or two swaging operations on the fitting will reduce the fitting less than if the end of the fitting were extended into the cylindrical portions of the dies.

As disclosed in Figs. 1 and 2, see also Figs. 5 and 6, a weight 55 may be provided for returning the sliding rod 38 to the right into its home position as determined by the position of the block 46. For this purpose there is provided a sleeve 56 which is mounted for movement with the sliding movement of the sliding rod 38 and to which the weight 55 is connected by means of a cable 57 passing over a pulley 58. Each end of the sleeve 56 is provided with a ball bearing 59 through the inner rings of which passes the sliding rod 38, permitting free relative rotation of the sliding rod. The sleeve 56 is moved forwardly by the piston 36 by means of a sleeve 60 interposed between the universal connection 37 and the inner ring of the adjacent ball bearing 59.

For the purpose of rotating the sliding rod 38 there is provided a rotary pump construction including a housing 62 Figs. 1 and 2 which is secured to an end of the cylinder 35 and constitutes the closed end or head of the cylinder. Inside of the housing 62 is a rotor 63 Fig. 5 which may be provided with spring pressed hinged paddles 66 constructed as disclosed in Fig. 5 to rotate clockwise as fluid under pressure is forced into the housing through a pipe 67. Supported in the end walls of the housing 62 is a shaft 68 to which the rotor is keyed. This shaft extends into the cylinder 35 and is provided with a non-circular end 69 Fig. 2 non-rotatably and slidably extending through a hole in the outer end wall 70 of the hollow piston 36. By means of this construction the piston may slide with respect to the shaft 68 as the rotor communicates rotational movement to the piston and to the sliding rod 38. As disclosed in Fig. 2, the fluid under pressure will leave the rotor through a

port 71 extending through one wall of the rotor casing and intersecting a radial port 72 in the cylinder 35 through which the fluid passes into the cylinder to move the piston and sliding rod 38 forwardly at the same time that these parts are rotated by the rotor. Connected to the outer end of the port 72 is a pipe 73 through which the fluid under pressure is permitted to escape after the arrest of the forward movement of the piston and rod 38 which permits the piston and rod to be rotated after their forward movement has been arrested. The pipe 73 directs the fluid to a valve mechanism for conditioning the piston for operation and for controlling the amount of forward movement of the piston on each stroke of the fluid supplying mechanism.

For purposes of supplying fluid under pressure there is provided, Figs. 4 and 9, a pump mechanism 20 which as disclosed in Fig. 4 may be supported on the fluid reservoir 19. Projecting upwardly from the bottom of the reservoir 19 is a hollow cylindrical guiding member 74. The pump cylinder block of the pump mechanism 20 is provided with a cylindrical opening 75 in communication with a port 76 in a detachable valve block 77 which port 76 is in communication with the fluid in the reservoir 19 through an intake valve 78, and with the pipe 67 leading to the rotor through an outlet valve 79 and with the reservoir through an adjustable safety relief valve 80. This latter valve is made adjustable so that no damage will be done to the pump mechanism or the rotor by excessively high pressures that might otherwise be developed by the pump.

Threaded in the lower end of the cylindrical opening 75 in the pump block is a long sleeve 81 which constitutes in effect the body of the pump cylinder and in which operates a pump piston 82 against a return spring 83 between the piston and the end of the cylinder. One side of the outer end of the piston 82 is cut away to provide a shoulder 84 to engage a stop 85 on a vertically adjustable slide 86 mounted on the outer face of the pump block and made adjustable by means of a threaded nut 87. By means of this adjustment the downward movement of the piston may be limited to control the amount of fluid delivered by the pump on each stroke which in turn controls the amount of angular rotation and forward movement given to the sliding rod 38 Fig. 2 and to the fitting 49.

The piston is operated in its upward stroke by the upward movement of the pitman 27 Fig. 1 which operates the movable die 26. As disclosed in Fig. 1 and also Fig. 4 the cap of the pitman 27 is provided with a block 90 which engages a roller 91 supported on a rod 92 slidable within the cylinder 74. The upper end of the rod is provided with a head 93 adapted to engage and operate the pump piston 82. The roller 91 is held in contact with the block 90 by means of a spring 94 connected between the head 93 and the bottom wall of the reservoir 19. By means of this construction the pump is operated during every operation of the movable die after it has disengaged the work and as it is being moved toward its upper home position so that in all cases the work or fitting is free to be rotated and moved forward as the pump is operated.

At the beginning of a swaging operation no fluid must be permitted to flow through the return pipe 73 in order that the fluid which rotates the rotor and the sliding rod 38 may also move

the sliding rod 38 Fig. 2 forwardly to feed the fitting into the dies. When the forward movement of the sliding rod 38 and fitting has been stopped the fluid entering the pump must be discharged through the pipe 73 in order that the sliding rod 38 and fitting may be rotated to apply several additional swaging operations on the fitting.

Also supported on the reservoir 19 is the valve mechanism 21 Figs. 4, 7, and 8 which comprises a sliding valve 100 spring pressed by a spring 101 bearing on an adjustable member 102 which may be turned by a manipulative means 103 to adjust the compression of the spring 101 and therefore the pressure required to move the valve 100 from the closed position disclosed in Fig. 8 to an open position permitting the fluid in the pipe 73 to by-pass the valve and to pass into the reservoir 19. This valve may be adjusted to control the pressure of the fluid on the piston 36 and therefore to control the amount of forward feed for a given amount of fluid discharged into the cylinder 35. By this means the amount of forward feed of the fitting may be varied from zero to that produced by a capacity delivery from the pump and for any amount of fluid delivered by the pump.

The body of the valve 100 is slotted as shown at 104 and into the space between the end 105 of the slot and a pin 107 which extends through the walls of the slot projects the short arm of a bell crank 106. The long arm of the bell crank is connected by means of a cable 108 passing over a pulley 109 with an arm 110 on a block 111 clamped to the brake operating shaft 33. As the brakes are applied to stop the machine, the bell crank 106 is rocked counterclockwise into the position shown in Fig. 7 opening the valve 100 which permits the weight 55 to return the sliding rod 38 to its home position. When the brakes are released the bell crank 106 is moved clockwise into the position shown in Fig. 8 which permits the valve 100 to seat and close the end of the pipe 73. As the press operates, the pumping mechanism will be operated on each upward stroke of the upper die and the fitting to be swaged will be simultaneously rotated and moved forward. When the forward movement of the fitting is arrested by the stops 46 and 52, then the pressure of the fluid in the pipe 73 will open the valve 100 and discharge the fluid into the reservoir 19.

Prior to the swaging operation the machine is adjusted for the particular type of work to be swaged. The block 46 which controls the movement of the sliding rod 38 to the right is adjusted so that the small end of the fitting extends half way into the bell mouth of the dies. The stop 52 is then adjusted on the sliding rod 38 to control the length of the swaged portion of the fitting. The stroke of the pump 20 is adjusted to control the amount of fluid delivered to the rotor 63 to control the amount of rotation given to the fitting between successive strokes of the press. The fluid discharged from the rotor is discharged against the piston 36 and will move this piston forwardly and feed the fitting into the dies an amount in proportion to the amount of fluid delivered against the piston. The amount of movement of the piston may be controlled by adjusting the valve 100 Figs. 7 and 8 which controls the pressure of the fluid operating on the piston. This valve may be adjusted so that there will be no forward movement of the piston or so that there will be any amount of forward movement of the

piston up to the amount of movement that would be produced if all of the fluid discharged by the rotor displaced the piston.

When the machine is at rest and the brakes are applied the valve 100 Figs. 7 and 8 will be in the position indicated in Fig. 7. When the brakes are released the valve will be permitted to close as indicated in Fig. 8 causing the fluid discharged from the rotor into the cylinder 35 to move the piston forwardly and feed the article to be swaged between the dies, in amounts dependent upon the compression of the valve spring 101 which controls the amount of fluid discharged through the pipe 73 past the valve 100. When the adjustable stop 52 engages the adjustable block 46 Figs. 1 and 2 the forward feeding movement of the sliding rod 38 and fitting 40 is arrested, the fluid discharged from the rotor discharging through the pipe 73 past the valve 100 into the oil reservoir. When the brakes are applied, the valve 100 is moved into the position shown in Fig. 7 permitting the free discharge of the fluid through the pipe 73 which permits the weight 55 to return the sliding rod 38 into its right hand home position.

While I have disclosed a standard form of press swaging machine to which my invention has been applied and have also disclosed a preferred embodiment of my invention and described the same with particularity, it is to be understood that my invention may take other forms and be embodied in other than standard machines and that therefore I reserve the right to all such changes and modifications as fall within the principles of my invention and the scope of the appended claims.

I claim:

1. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, and means for supplying fluid under pressure to said rotor.

2. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, and means for supplying fluid under pressure at spaced intervals to effect step by step operations of said piston and rotor.

3. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying at spaced intervals equal quantities of fluid under pressure to said rotor, and means for controlling the amount of fluid in each quantity of fluid supplied.

4. In a metal working machine, the combination of a movably mounted work support, a metal

working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying at spaced intervals equal quantities of fluid under pressure to said rotor, and means for regulating the pressure of the fluid supplied to the rotor.

5. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying fluid under pressure to said rotor, means for arresting the forward movement of said piston, a return pipe connected to the conduit between said rotor and said piston and a relief valve in said return pipe operable by the fluid passing through the rotor and diverted through the return pipe by said arrested piston.

6. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying fluid under pressure to said rotor, means for arresting the forward movement of said piston, a return pipe connected to the conduit between said rotor and said piston, a relief valve in said return pipe operable by the fluid passing through the rotor and diverted through the return pipe by said arrested piston, means for stopping the machine, and means operated as an incident to the operation of said stopping means for opening said relief valve.

7. In a metal working machine, the combination of a movably mounted work support, a metal working element, means for moving said metal working element toward and away from the work, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying fluid under pressure to said rotor, means for arresting the forward movement of said piston, a return pipe connected to the conduit between said rotor and piston, a spring pressed relief valve in said return pipe moved into open position by the fluid passing through the rotor and diverted through the return pipe by said arrested piston, control means for starting and stopping the operation of said metal working element, and a connection between said control means and relief valve for opening said relief valve as said control means is operated to stop the operation of said working element and to permit said valve to close as said control means is operated to start the operation of said working element.

8. In a metal working machine, the combina-

tion of a movably mounted work support, a metal working element, means for moving said metal working element toward and away from the work, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying fluid under pressure to said rotor, means for arresting the forward movement of said piston, a return pipe connected to the conduit between said rotor and piston, a relief valve in said return pipe operable by the fluid passing through said rotor and diverted through the return pipe by said arrested piston, means for starting and stopping the operation of said metal working element, means operated by said last mentioned means when operated to stop the operation of said working element for opening said relief valve, and automatic means for returning said work support into its home position upon cessation of the operation of said metal working element.

9. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid pressure operated piston for moving said work support to feed the work to said working element, a fluid operated rotor for rotating said work support to rotate the work with respect to said metal working element, a fluid conduit for carrying fluid discharged from said rotor to the working side of said piston, means for supplying fluid under pressure to said rotor, means for arresting the forward movement of said piston, a return pipe connected to the conduit between said rotor and piston, a relief valve in said return pipe operable by the fluid passing through said rotor and diverted through the return pipe by said arrested piston, and means for adjusting said relief to predetermine the distance of feed of the work effected by the fluid discharged from said rotor.

10. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid cylinder, a piston in said cylinder for moving said work support, a rotary pump for rotating said work support, a conduit connection between said rotary pump and cylinder, means for supplying fluid under pressure to said rotary pump, said rotary pump including a rotor, and a rotor mounting shaft projecting into an opening in said piston and slidably and non-rotatably engaging said piston.

11. In a metal working machine, the combination of a movably mounted work support, a metal working element, a fluid cylinder, a piston in said cylinder for moving said work support, a rotary pump for rotating said work support, a conduit connection between said rotary pump and said cylinder, means for supplying fluid under pressure to said rotary pump, said rotary pump including a rotor, a rotor mounting shaft projecting into an opening in said piston and slidably and non-rotatably engaging said piston, an adjustable stop on said frame through which said piston extends, a cooperating stop on said piston between said adjustable stop and said metal working element and an adjustable stop on said piston on the other side of said adjustable stop, said adjustable stops being adjustable to determine the forward and return limits of the strokes of said piston.

12. In a machine of the class described, the combination of rotatable and slidable work sup-

port, a fluid rotor for rotating said support, a fluid operated piston for sliding said work support, a conduit for carrying the fluid discharged by the rotor against said piston, means for supplying predetermined quantities of fluid under predetermined pressures to said rotor, and means for controlling the pressure of the fluid discharged against said piston for controlling the amount of movement of said piston effected by the fluid discharged from said rotor.

13. In a swaging machine the combination of a movably mounted work support, a swaging die, means for reciprocating said die for effecting swaging of the work, fluid pressure operated means for rotating said work support to rotate said work relatively to said die, fluid pressure operating means for moving said work support to feed the work to said die, a fluid conduit connecting the discharge side of the first fluid pressure

operated means to the intake side of the second fluid pressure operated means and means operated during the return stroke of said reciprocating means for supplying fluid under pressure to said first mentioned fluid pressure operated means.

14. In a metal working element the combination of a movably mounted work support, a metal working element, fluid pressure operated means for rotating said work support to rotate the work with respect to said metal working element, fluid pressure operated means for moving said work support to feed the work to said working element, a fluid conduit for carrying fluid discharged from the first fluid pressure operated means to the second fluid pressure operated means, and means for supplying fluid under pressure to said first fluid pressure operated means.

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CERTIFICATE OF CORRECTION.

Patent No. 2,347,875.

May 2, 1944.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 33, claim 6, strike out the words "with respect to said metal working element, a" and insert the same after "work" in line 34, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of June, A. D. 1944.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.