No. 887,718. PATENTED MAY 12, 1908.

G. H. BENJAMIN.

EXTRUSION MACHINE.

APPLICATION FILED NOV. 22, 1907.

3 SHEETS—SHEET 1.

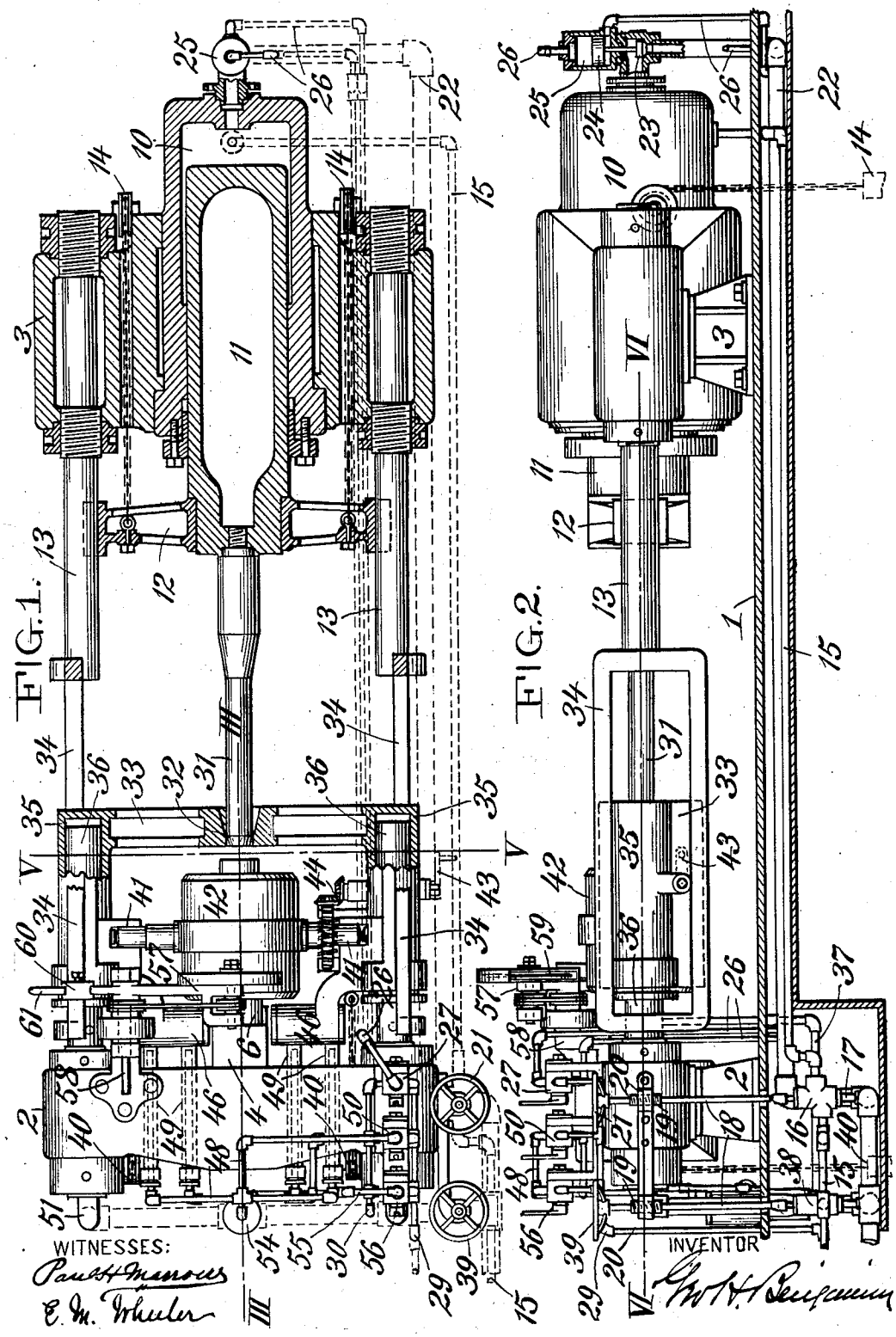


FIG. 1.

FIG. 2.

WITNESSES:

Paul H. Maroney

E. M. Wheeler

INVENTOR

Geo. H. Benjamin

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3 SHEETS—SHEET 2.

FIG. 3.

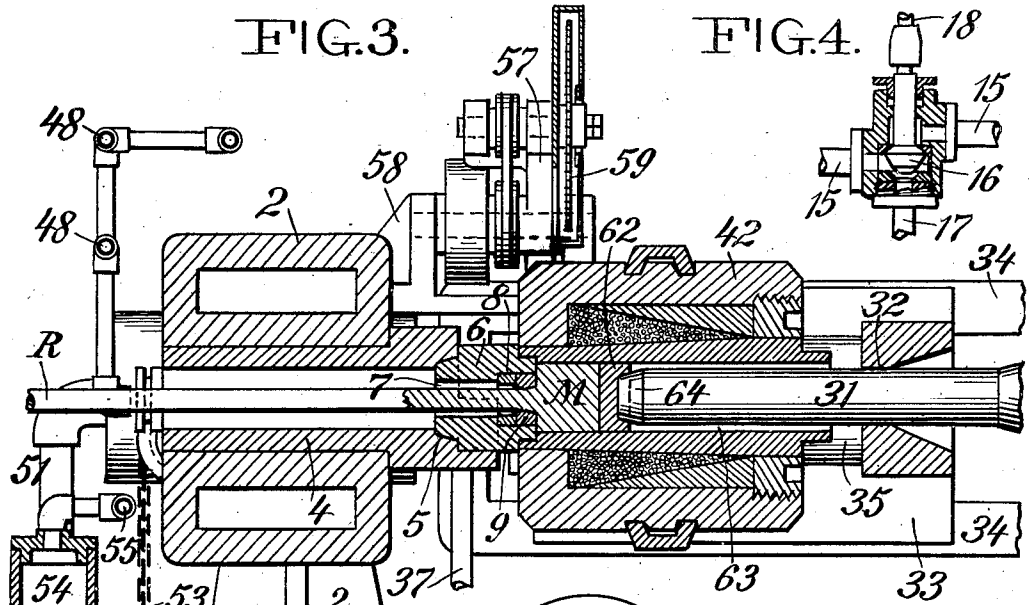
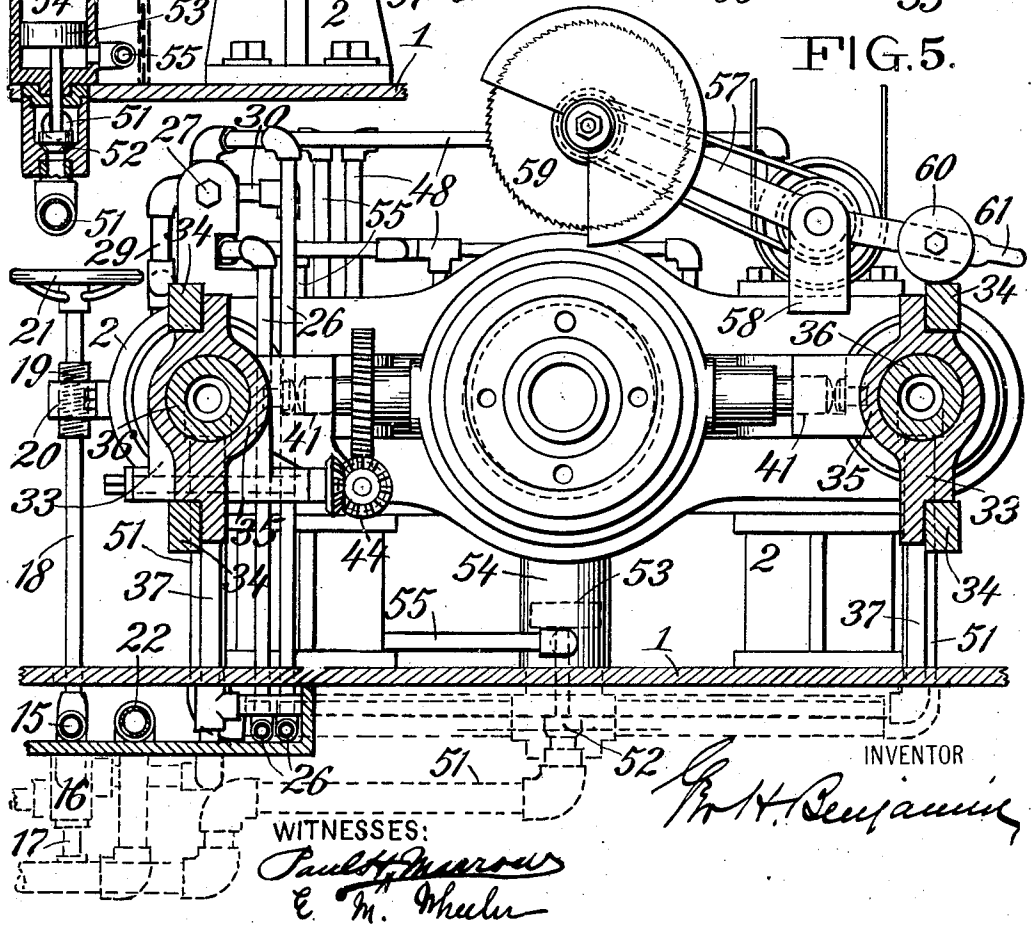


FIG. 4.

FIG. 5.



WITNESSES:

Paul Hamerow

E. M. Wheeler

INVENTOR

G. H. Benjamin

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3 SHEETS—SHEET 3.

FIG. 6.

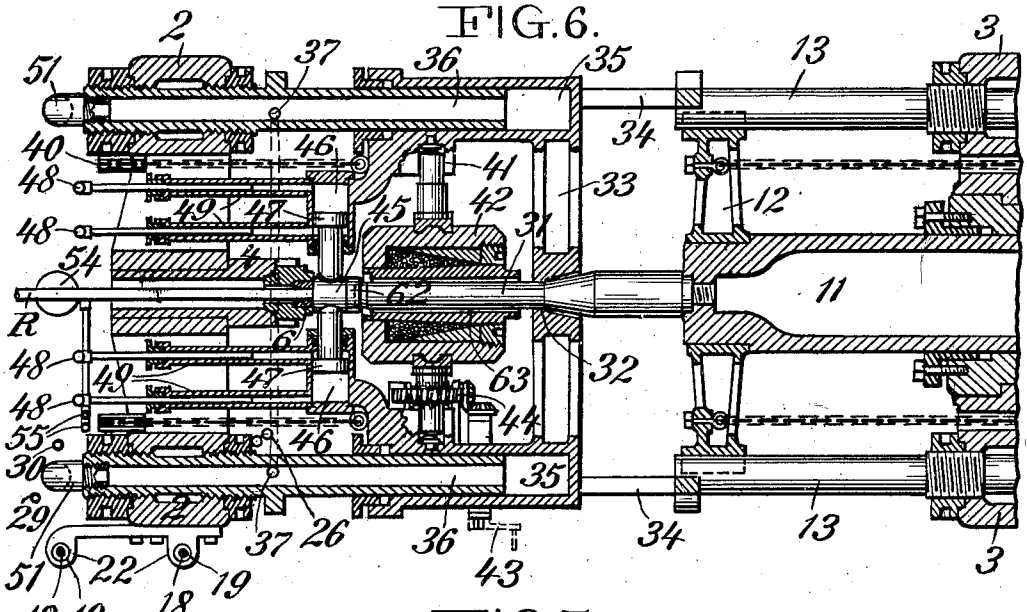


FIG. 7.

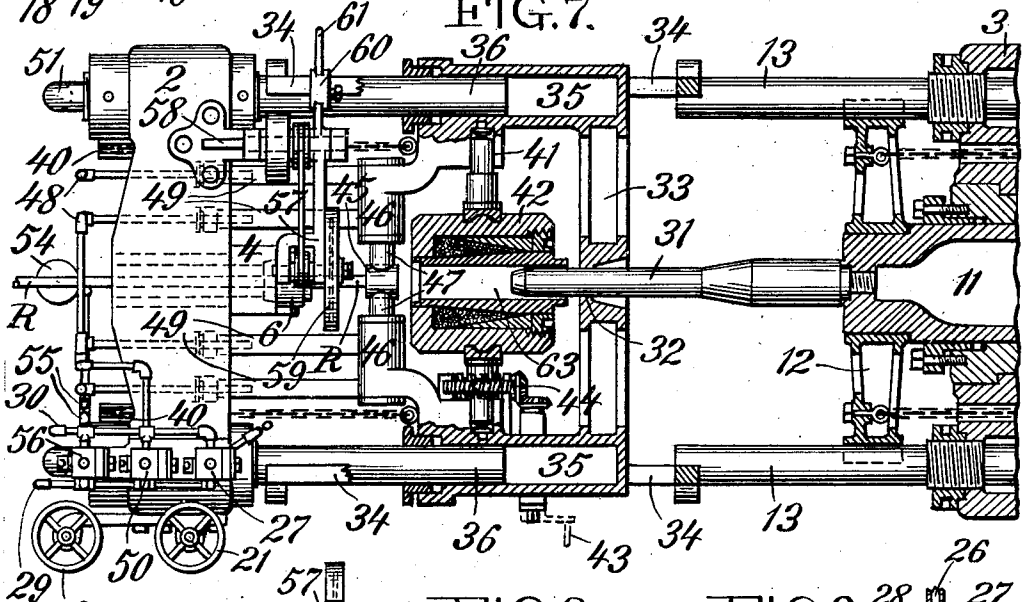


FIG. 8.

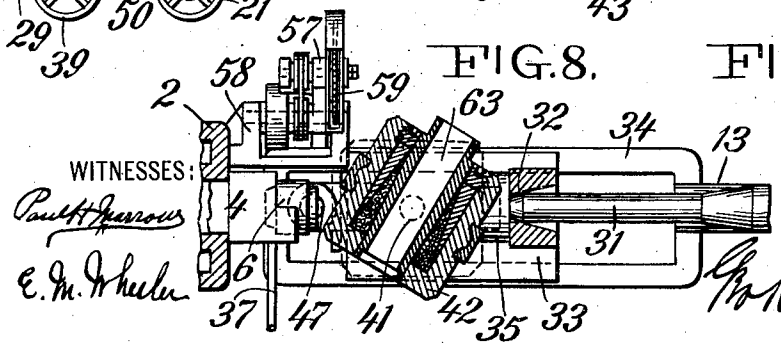
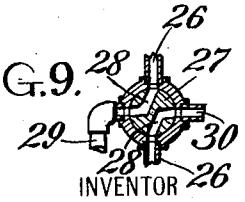


FIG. 9.



WITNESSES:

Paul H. Sparrow

E. M. Wheeler

INVENTOR

G. H. Benjamin

UNITED STATES PATENT OFFICE.

GEORGE H. BENJAMIN, OF NEW YORK, N. Y., ASSIGNOR TO COE BRASS MANUFACTURING COMPANY, A CORPORATION OF CONNECTICUT.

EXTRUSION-MACHINE.

No. 887,718. Specification of Letters Patent. Patented May 12, 1908.

Application filed November 22, 1907. Serial No. 403,382.

To all whom it may concern:

Be it known that I, GEORGE HILLARD BENJAMIN, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Extrusion-Machines, of which the following is a specification.

My invention relates to certain improvements in machines for extruding heated metal, and has for its purpose, to decrease the space occupied by the machine, to increase the output of the machine, to decrease the number of men required to operate the machine, and to provide means for controlling all of the operations of the machine from a given point.

In general construction, the machine resembles that described in patent of W. A. Wood, No. 819,261, but differs in the features which I will now proceed to point out.

The accompanying drawings will serve to illustrate the invention, in which—

Figure 1 is a plan view of the front end and a horizontal section of the middle and rear end of the machine. Fig. 2 is a side elevation. Fig. 3 is a vertical section taken through the front end of the machine on the line III—III of Fig. 1. Fig. 4 is a vertical section of one of the main controlling valves. Fig. 5 is a transverse section taken on the line V—V of Fig. 1 looking fro n the right. Fig. 6 is a horizontal section taken on the line V′—V′ of Fig. 2 at the forward end of the machine showing the pusher in its forward position and the parts in the position which they will occupy after extrusion has taken place with the container moved away from the dieholder. Fig. 7 is a partial plan and horizontal section illustrating the pusher in a retracted position and the billet head moved away from the die. Fig. 8 is a partial elevation and longitudinal section illustrative of the container in the position to receive a heated billet. Fig. 9 is a horizontal section through one of the auxiliary controlling valves.

In the drawings, 1 represents any suitable base upon which are secured the end frames 2, 3. Forming a part of the end frame 2 is a tube 4, open at both ends, and provided at its rear end with a socket 5, adapted to receive the dieholder 6. The dieholder 6 has a central bore 7, and is provided with a seat 8 for the die 9. Forming a part of the rear end frame 3 is a hydraulic cylinder 10, in which is located a piston 11. The forward end of the piston 11 is supported by a carriage 12, adapted to slide horizontally upon guides 13.

Connected to the carriage 12 are counterweights 14, which normally serve to retract the piston 11 into the cylinder 10. Forward movement of the piston 11 is caused by water under pressure admitted through pipe 15, Figs. 1, 2, controlled by a valve 16, which also controls a bypass outlet 17, Fig. 4. The stem 18 of valve 16 is provided with a screw 19 carried in a thread 20 attached to the end frame 2. On the upper end of the valve stem 18 is a hand wheel 21 for controlling the valve. Return movement of the piston 11 is permitted by the escape of water from the cylinder 10 through a pipe 22 controlled by a valve 23, actuated by a piston 24, in a cylinder 25, Fig. 2. The piston 24 is controlled by water under pressure admitted through pipe 26, by means of a manually-operated auxiliary valve 27, Fig. 9, having two passages 28, adapted to admit the water from a supply pipe 29 to each side of the piston, or to permit its escape from the cylinder 25 through an exhaust pipe 30.

The pipe and valve system employed is such as is common with hydraulic apparatus and will be fully understood by engineers without giving any further description. Any system of pipes and valves which will effect manipulation of the parts will be within the intent of my invention.

Secured to the forward end of piston 11 is a pusher 31, which moves through a guide 32, forming part of a second carriage 33. The carriage 33 is supported in guides 34 on each side of the machine. The guides 34 form part of the guides 13, and these guides on each side of the machine serve selectively as ties for securing the end frames 2, 3 together.

Situated on each side of the carriage 33 are hydraulic cylinders 35, in which are fitted fixed tubular pistons 36, connected at their forward ends through pipes 37 to a source of water supply controlled by a main valve 38, similar to valve 16 and having attached thereto a controlling wheel 39.

Connected to the forward end of the carriage 33 are the counterweights 40, which normally tend to move the carriage 33 forward to the position shown in Figs. 1 and 3.

Mounted on trunnions 41 in the carriage 33 is a container 42, and means are provided consisting of a crank 43 and gears 44 for rotating the container from the position shown in Fig. 1 to the position shown in Fig. 8, *i. e.*, from the extruding to the charging position. Mounted also on the carriage 33 is a hydraulic holder for the unextruded end 45, Fig. 6, of the billet, that has been subjected to the extruding process. This holder consists of a pair of opposed hydraulic cylinders 46 having pistons 47. These pistons are controlled by water under pressure admitted through the pipes 48 and telescopic connections 49, connecting with opposed ends of the cylinder 46, by means of a manually-operated valve 50, similar to valve 27, having two passages adapted to permit the water from supply pipe 29 to enter each side of the pistons 47, or to permit its escape from the cylinder 46 through the exhaust pipe 30.

Movement of the carriage 33 toward the rear of the machine is effected by water under pressure admitted through pipes 37 and fixed tubular pistons 36 to movable cylinders 35, and return movement toward the front of the machine is permitted by the escape of water from the cylinders 35 through pipes 51 controlled by a valve 52, actuated by a piston 53, in a cylinder 54, Fig. 3. The piston 53 is controlled by water under pressure admitted through pipes 55, by means of a manually-operated valve 56, similar to valve 27, having two passages adapted to admit the water from supply pipe 29 to each side of the piston 52, or to permit its escape from the cylinder 54 through the exhaust pipe 30.

Journaled in an arm 57, pivotally mounted in a suitable support 58, attached to the forward end frame 2 of the machine, is a power driven saw 59. On the opposite end of the arm 57 is an adjustable counterweight 60, which normally carries the saw to the position shown in Fig. 5. The end of the arm 57 provided with a counterweight 60, has a handle 61, by means of which the saw may be depressed and brought into contact with the body R extruded through the die 9, substantially as shown in Fig. 7.

It will be clear from the drawings and foregoing description, that by manipulating the wheel 21 and valve 27, the piston 11 is caused to move horizontally forward and backward, and by manipulating the valve 50 that the pistons 47 can be moved in or out to hold or release the extruded end 45 of the billet; and further, by manipulating the wheel 39 and the valve 56, the carriage 33 may be caused to move forward and backward to alter the position of the container.

The general operation of the machine is as follows: The heated billet to be extruded is introduced into the upper end of the cavity of the container when it occupies the position shown in Fig. 8. A pushing block 62, having a diameter equal to the cylindrical bore 63, of the container, is then placed in the cavity above the billet. The pushing block 62 has a recess in its rear end shaped to receive the tapered end 64 of the pusher 31. After the introduction of the heated billet and the pushing block 62, the container is moved into a horizontal position, as illustrated by the dotted lines, Fig. 8. By manipulating the valve 56 and relieving the water pressure behind the carriage 33, the counter-weights 40 will move the carriage 33 forward until the container abuts against the dieholder 6, as shown in Figs. 1 and 3. At this time the pistons 47 will be retracted within the cylinders 46, the carriage, container and cylinders 46 occupying the position shown in Fig. 2. The hand wheel 21 will then be manipulated and water pressure will be exerted back of the piston 11, thereby causing the pusher 31 to enter the container and drive the heated metal M through the die 9 to form the rod or shape R.

When the position of the extruded body shown in Fig. 3 is reached, that is, when such portion of the body to be extruded as experience has shown is profitable to extrude, has been extruded, hand wheel 39 is manipulated, which opens valve 38, thereby causing water pressure to be exerted against the cylinders 35 and the carriage 33 carrying the container and cylinders 46 backward from the position shown in Figs. 1 and 3 to the position shown in Fig. 6. As the position of the pusher 31 has not been changed, this backward movement of the carriage 33 causes the unextruded end or head 45 of the billet M to be forced out of the container, or otherwise to occupy the position shown in Fig. 6. In this position the cylinders 46 occupy a position alongside of the billet head 45, and by manipulating the valve 50, the pistons 47 can be caused to engage the billet head. By now manipulating the wheel 21, the pusher 31 may be advanced sufficiently to push the pushing block out of the forward end of the container and causing it to drop to the base. If now, further water pressure be exerted against the cylinders 35, the carriage 33, cylinders 46, pistons 47, billet head 45 and extruded rod R will be carried backward to the position shown in Fig. 7. When the parts are in this position, by manipulating the handle 51, the saw 59 can now be brought down to cut off the billet head 49 from the extruded rod R. The extruded rod R is then drawn out of the machine, the pistons 47 retracted into the cylinders 46, releasing the billet head, which will fall to the base 1. The valve 56 is then manipulated to permit water to escape from the cylinders 35,

whereupon the carriage 33 will be moved forward by means of the counterweights 40, until the container is free from the end of the pusher 31 and in a position to be turned to receive a new billet, Fig. 8.

It will be seen from the foregoing description, that but three men are required to operate the machine,—one man introducing the heated billet, manipulating the saw and removing the extruded body, a second man, on the other side of the machine, assists in introducing the billet into the container and controls the position of the container through the crank 43, and a third man, on the same side of the machine, manipulates the hand wheels 21, 39, and through them the valves 27, 50 and 56. It will, therefore, be observed that the mechanism for performing the necessary operations is contained wholly within the machine frame between the end frames 2 and 3, thereby rendering the machine much more compact, and thus doing away with all the additional frames and carriages commonly employed with extrusion machines.

I wish it understood that many changes may be made in the construction of the various parts illustrated and described without departing from the intent of my invention, which, as before stated, is to provide a self-contained machine, in which all the manipulations necessary to extrude a body may be performed within the machine without the employment of other apparatus which does not form a part of the machine.

Having thus described my invention, I claim:

1. An extrusion machine comprising a frame, a container movable longitudinally therein, means for controlling the movement of the container, a pusher also movable longitudinally in the frame, and means for controlling the movement of the pusher at all times independently of that of the container.

2. An extrusion machine comprising a frame, a carriage movable longitudinally therein and carrying a container, means for holding the extruded end of the billet, means for effecting movement of the carriage, a pusher movable longitudinally in the frame, and means for controlling the movement of the pusher at all times independently of that of the container.

3. An extrusion machine comprising a frame, a die mounted in one end of the frame, a container, means for moving the container to and from the die, a pusher, means for moving the pusher into and out of the container, and said means adapted to effect control of the movement of the pusher independently of that of the container.

4. An extrusion machine comprising a frame, two carriages mounted in said frame, one of said carriages carrying a container and the other a pusher, together with separate means for effecting independent movement of said parts.

5. An extrusion machine comprising a frame, two carriages mounted in said frame, one of said carriages carrying a container and the other a pusher, together with separate hydraulic means for independently controlling the movement of said parts.

6. An extrusion machine comprising a frame, said frame consisting of two end pieces connected by tie rods which form guides, two carriages mounted upon said guides, a pivoted container mounted in one carriage, and a reciprocating pusher mounted in the other carriage, together with separate means for controlling the movement of the carriage carrying the container and that of the carriage carrying the pusher.

7. An extrusion machine comprising a frame, a removable die mounted in the forward end piece of the frame, a pusher adapted to reciprocate in the rear end piece of the frame, a carriage carrying a container adapted to be moved between the end frames, together with separate means for controlling the forward and backward movement of the carriage and the forward and backward movement of the pusher.

8. An extrusion machine comprising a frame, a carriage mounted in the frame carrying a container and a holding device for the billet head; a pushing device adapted to be moved backward and forward, and separate means for controlling the movements of the carriage and pushing device.

9. An extrusion machine comprising a frame, a removable die situated in the forward end piece of the frame, means for moving the carriage, a container, a holding device for the billet head carried by the carriage, a power-driven saw pivotally mounted on the frame in front of the container, a pushing device adapted to co-act with the container, and means for controlling the movements of the pushing device.

10. In an extrusion machine the combination of a longitudinally movable carriage, a container pivotally mounted in said carriage, a holding device for the billet head carried by the carriage, means for effecting movement of the carriage, means for effecting movement of the container in the carriage, and means for controlling the action of the holding device.

11. In an extrusion machine the combination of a removable die, a container, means for moving the container to and from the die, a pusher, means for controlling the movement of the pusher relative to the container, together with means for effecting longitudinal backward movement of the extruded body after extrusion has ceased.

12. In an extrusion machine the combination of a die, a container movable to and

from the die, a pusher movable into and out of the container, a pushing block situated in front of the pusher in the container, means for seizing such portion of the billet head as has not been extruded and for moving the extruded body rearward in the machine, and means for separating the billet head from the extruded body.

13. In combination with an extrusion machine and the hydraulic cylinders thereof for effecting movement of the various parts, of controlling valves located at one side of the machine, one of said controlling valves serving as an actuating valve for a main controlling valve at a cylinder, together with interposed pipe system between such hydraulic cylinders and the source of water supply.

14. In combination with an extrusion machine, a pivotally mounted power-driven saw mounted on the forward end of the machine and adapted to be brought in contact with the extruded metal in the machine for the purpose of separating said metal from the unextruded billet head.

15. In an extrusion machine the combination with the main frame of a container and a pusher, together with separately controlled hydraulic means for effecting movement of said parts in an opposite direction.

16. In an extrusion machine, the combination of a pivoted container and hydraulically controlled means for determining the position of the container within the machine and independently of the position of the other movable parts of the said machine.

17. In an extrusion machine, means for gripping the non-extruded billet head, consisting of opposed cylinders having pistons, with hydraulic means for controlling the position of said pistons.

18. In an extrusion machine the combination of a container and a pusher, together with means for effecting longitudinal movement of the container along the pusher without moving the pusher.

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

GEO. H. BENJAMIN.

Witnesses:
M. TURNER,
PAUL H. MORROW.