Aug. 17, 1948. H. LORANT 2,447,129

EXTRUSION PRESS

Filed Sept. 11, 1945

4 Sheets-Sheet 1

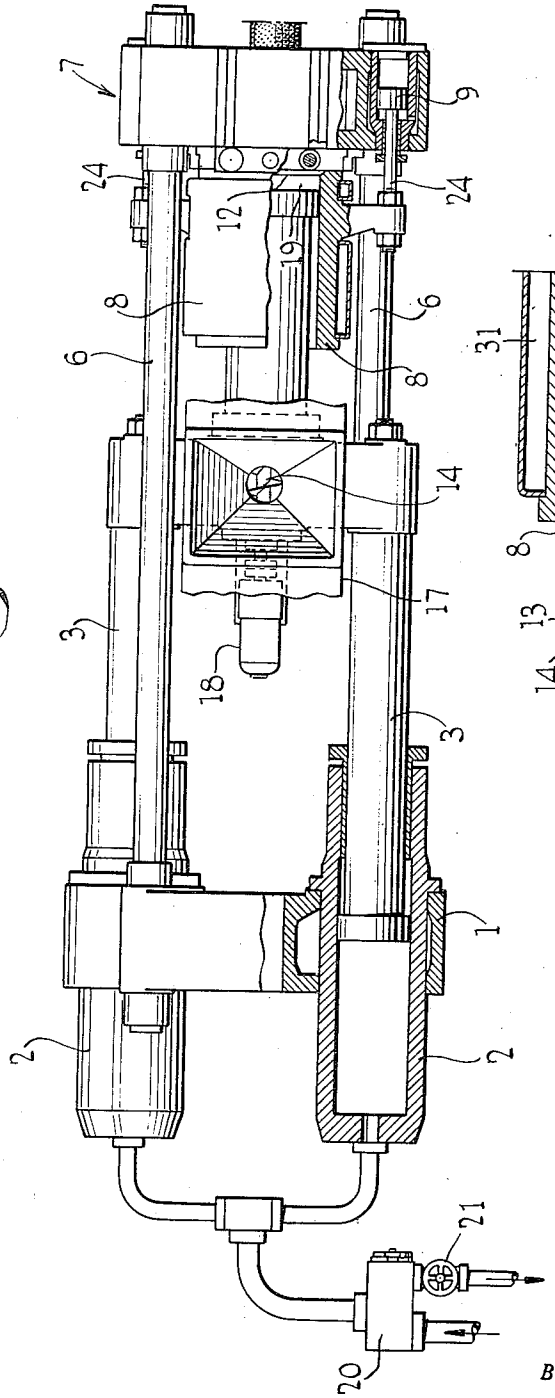


Fig. 1.

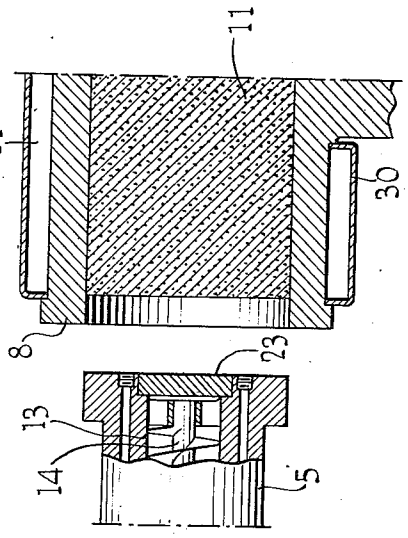


Fig. 4.

INVENTOR.
HUGO LORANT
BY
Hammond & Littell
ATTORNEYS

Aug. 17, 1948. H. LORANT 2,447,129

EXTRUSION PRESS

Filed Sept. 11, 1945

4 Sheets-Sheet 2

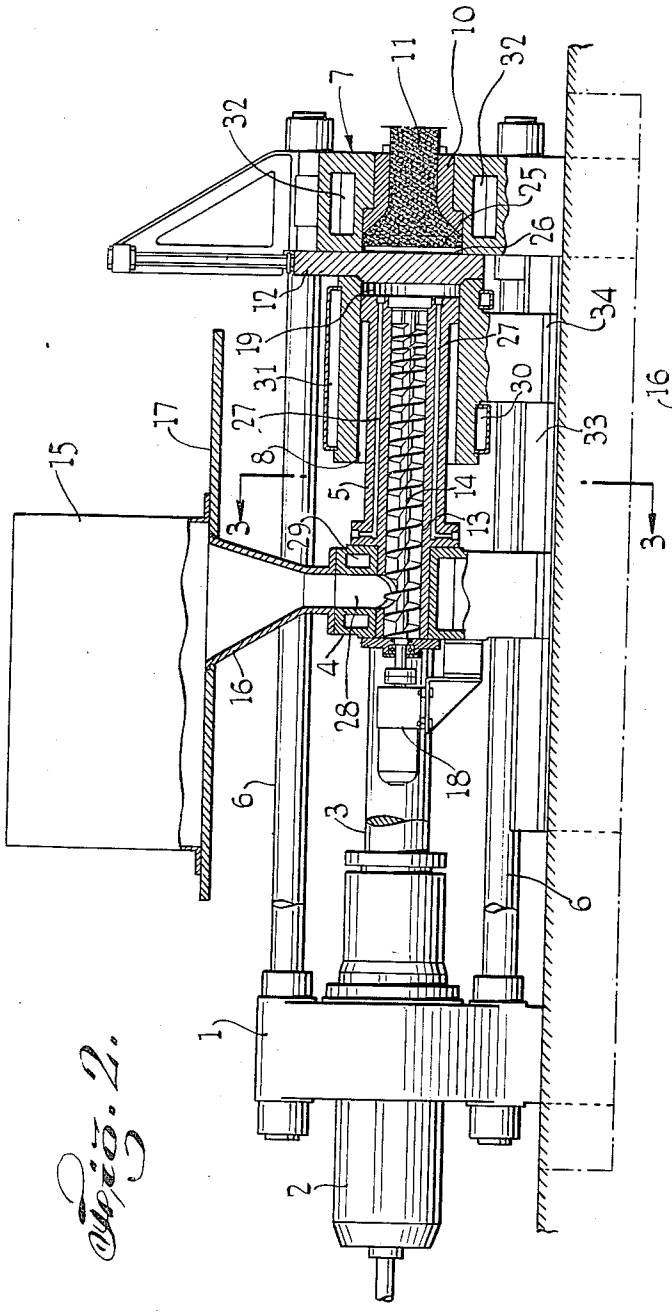


Fig. 2.

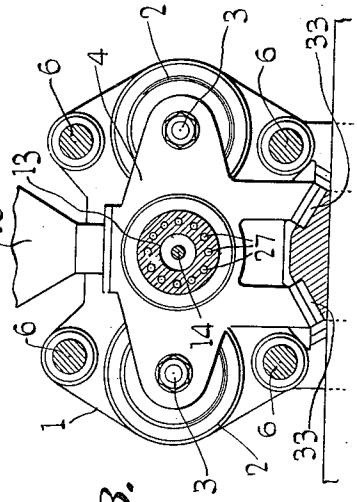


Fig. 3.

INVENTOR.
HUGO LORANT
BY
Hammond & Littell
ATTORNEYS

Aug. 17, 1948. H. LORANT 2,447,129

EXTRUSION PRESS

Filed Sept. 11, 1945 4 Sheets-Sheet 3

Fig. 5.

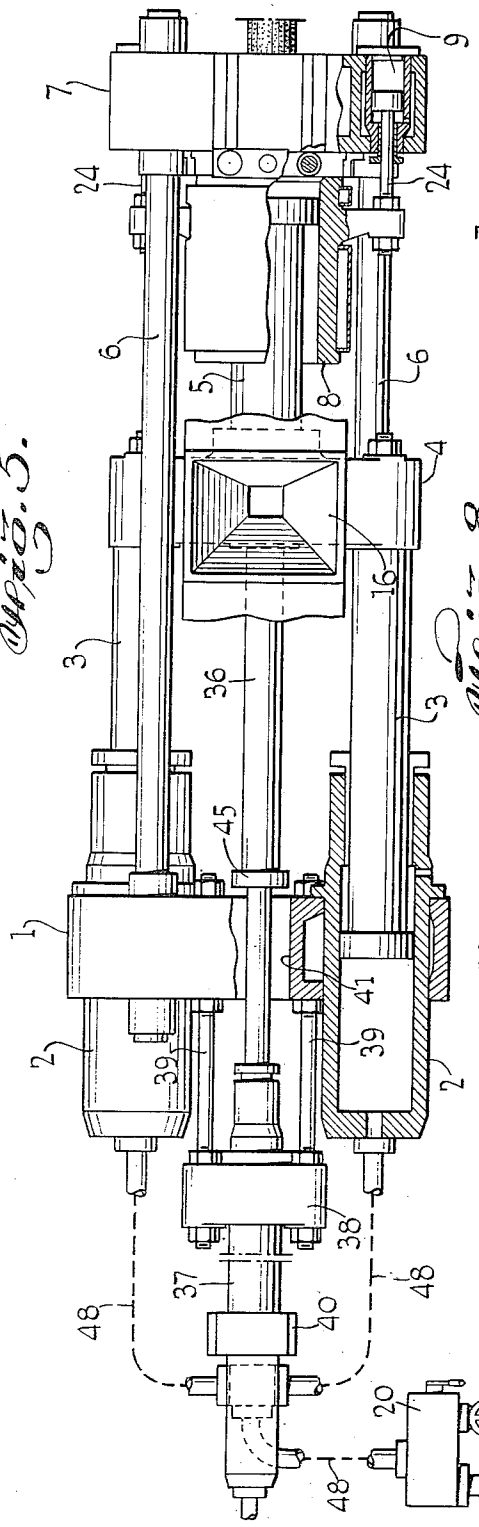
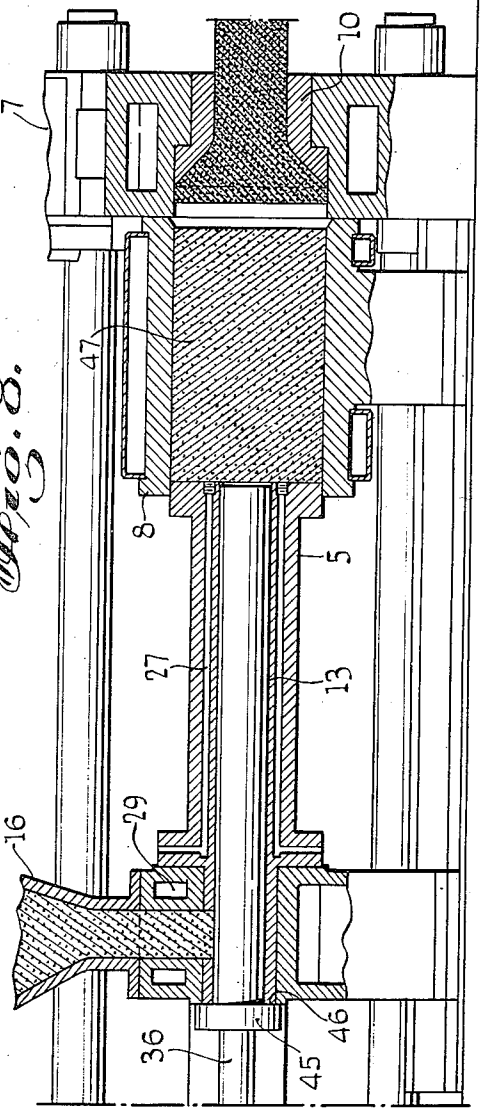


Fig. 8.



INVENTOR.
HUGO LORANT
BY
Hammond & Littell
ATTORNEYS

Aug. 17, 1948. H. LORANT 2,447,129

EXTRUSION PRESS

Filed Sept. 11, 1945 4 Sheets-Sheet 4

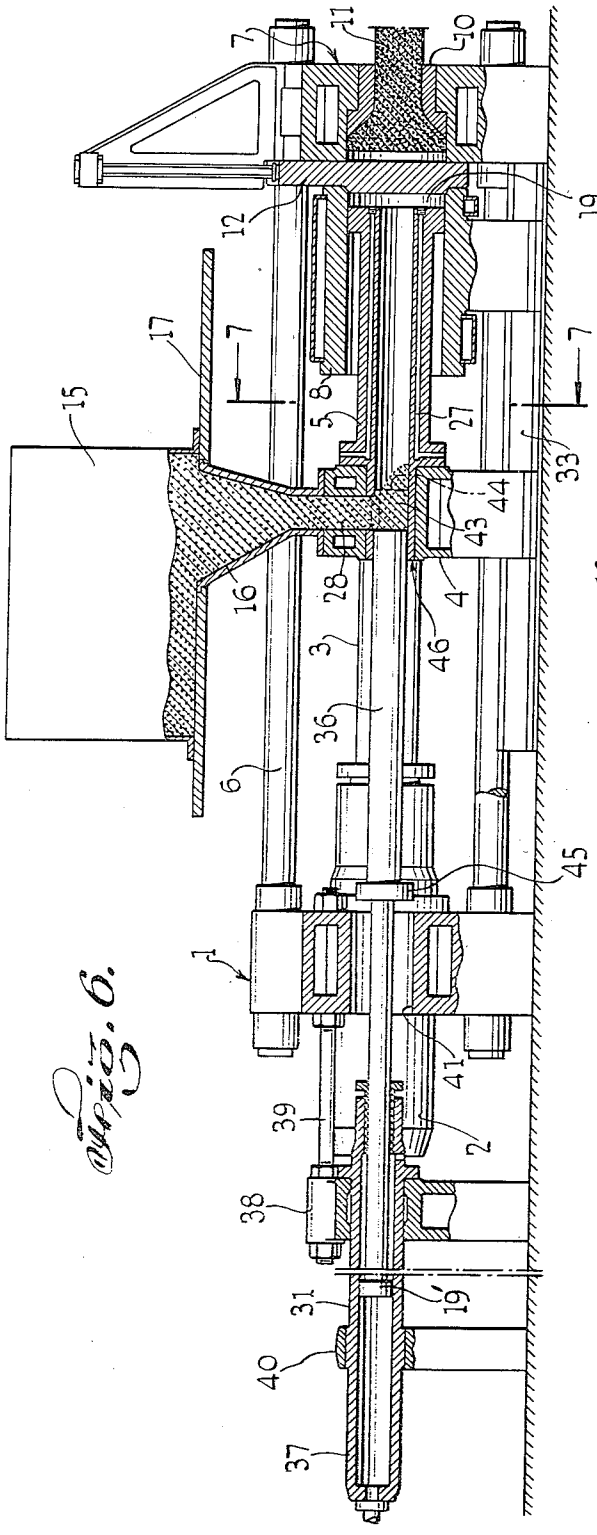


Fig. 6.

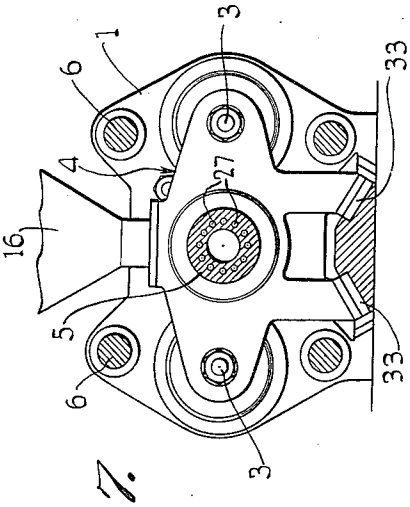


Fig. 7.

INVENTOR.
HUGO LORANT
BY
Hammond & Littell
ATTORNEYS

Patented Aug. 17, 1948

2,447,129

UNITED STATES PATENT OFFICE

2,447,129

EXTRUSION PRESS

Hugo Lorant, New York, N. Y.

Application September 11, 1945, Serial No. 615,559

16 Claims. (Cl. 18—12)

1

This invention relates to a machine for compressing and extruding substances such as carbon electrodes, or other mixtures of granular material and binder substance, or the like.

It is desirable to compact such materials in a container before being extruded therefrom, and one of the objects of the present invention is to compress the material in a press, and thereafter extrude the compressed material from the same press and container. By previous methods, the material has been compacted by beating in a container outside the press or compacted in other manners in separate apparatus. Such methods require a relatively long time, particularly the beating procedure, and it has been difficult to obtain uniform density of the material. When an exterior compacting press has been used, it has been difficult to properly clean the same after the material has been removed to the extrusion press.

In the present invention, the container is filled gradually under pressure, the container being closed during the filling operation, an adjustable uniform pressure being applied throughout the filling step so that the required uniform density of the material is obtained with absolute certainty and is not dependent upon the person operating the machine.

Another advantage is that in the apparatus described herein the material may be passed through heated parts during the entire filling step and extruded from the same container so that the desired temperature can be maintained.

Another object is to use the same apparatus for placing a uniform pressure on the material as it is fed into a container and for thereafter forcing the compressed material through an extrusion die. These and other objects of the invention will become apparent from the following description and drawings which are merely exemplary.

In the drawings:

Fig. 1 is a plan view, partially in section, of one form of the invention.

Fig. 2 is an elevation, partially in section, of the press shown in Fig. 1.

Fig. 3 is a cross section taken along the line 3—3 of Fig. 2.

Fig. 4 is generally similar to Fig. 2 with the exception that the feeding plunger is shown in withdrawn position and the container closure member has been raised.

Fig. 5 is a plan view partially in section of a modified form of the invention.

2

Fig. 6 is an elevation partially in section of the form shown in Fig. 5.

Fig. 7 is a cross section view taken along the line 7—7 of Fig. 6.

Fig. 8 is a fragmentary sectional view generally similar to Fig. 6 with the exception that the press is ready for the extrusion operation.

In general, the device comprises a press wherein the material to be extruded is fed into a container and compacted to a predetermined density as it is fed therein, the container during this operation having one end closed. The closure for the container is then removed and the feeding stem is employed for the purpose of extruding the compacted material from the container through an extrusion die.

The material to be extruded is fed into hopper 15, the bottom 17 of hopper 15 being slidable thereunder, said bottom plate having a conduit 16 for the material. Conduit 16 and bottom plate 17 are mounted on movable crosshead 4, said crosshead carrying the feeding or extrusion stem or piston 5. Movable crosshead 4 is connected by means of piston rods 3 with two main hydraulic cylinders 2, said cylinders being mounted in the stationary crosshead 1. A plurality of tie rods 6 connect the stationary crosshead 1 to the platen 7 of the press.

Container 8 is movable by means of hydraulic cylinders 9 (Fig. 1), being connected therewith by rods 24. The foot 34 of container 8 is slidable on ways 33 of the press as also is movable crosshead 4. The container is pressed against platen 7 during the extrusion operation by said hydraulic cylinders. An extrusion die is located at 10 through which material 11 may be extruded, the material shown in Fig. 2 being recessed at 25 from the face 26 of the platen as it was left after completion of the previous extrusion operation. The extrusion end of container 8 is pressed against closure plate 12 by hydraulic cylinders 9 during the container filling and compacting step. Container closure plate 12 is shiftable vertically by any suitable means so that it can be removed from the end of container after filling thereof and before the extrusion step is commenced.

The feeding stem or extrusion piston 5 has a bore 13 extending therethrough. The stem is insertable into the bore of the container from the end opposite to the closure before feeding so that a small space 19 remains.

Heating elements of any suitable description may be arranged around the bore which can take the form of hollow passages 27. Passages 29, 30, 31, and 32 also may be provided for conveying

heating or cooling fluid to maintain correct temperature of the material in various parts of the press.

The carbon, or other material, is fed from storage container 15 through conduit 16 and passage 28 to the helical conveyor 14, the conduit 16 and slide plate 17 being attached to the movable crosshead so that they will reciprocate therewith. Slide plate 17 serves to keep the bottom of hopper 15 closed.

Helical conveyor 14 is operated by a suitable means such as the motor 18 mounted on the movable crosshead 4. The pitch of the feed screw may gradually decrease so that the material is compressed and forced into spaced 19 of container 8 under an initial pressure.

The container is closed by plate 12 (Fig. 2) and as the material is first deposited in small space 19 and accumulates therein the feeding piston or extrusion stem 5 will be forced backwards, or outwardly relative to the container, and carry the filling conduit 16 and slide plate 17 therewith. This backward movement is allowed by connection of hydraulic cylinders 2 through controlling valve 20 (Fig. 1) and adjustable relief valve 21, the backward movement of the movable crosshead thus being opposed by an adjustable pressure in the main hydraulic cylinders 2 so that the material in the container is deposited under uniform pressure.

After completion of the filling operation, container 8 and extrusion piston 5 are shifted backwards by means of hydraulic cylinders 9 and 2 to the position shown in Fig. 4, and plate 12 then can be removed. If desired, a closure element 23 can be placed in the piston aperture so that when the piston 5 is again advanced, the helical screw will not be exposed to the extrusion pressure although this is not absolutely necessary. The container 8 is then moved against the die 10 and pressure thereafter is admitted to hydraulic cylinders 2 which will cause the movable crosshead to move forward and extrude the carbon-like material through die 10 so that the rod-like shape indicated at 11 will be formed.

It is, of course, to be understood that other shapes may be extruded and other material used, carbon for electrodes being merely an example. It also is possible to use one main cylinder instead of the two hydraulic cylinders 2 and have a central bore through the main cylinder through which the filling piston could extend.

A modified form of the invention is shown in Figs. 5 to 8 inclusive, similar parts being identified with the same numbers. In the modified form, a reciprocating plunger is substituted for the helical feed screw of Figs. 1 to 4. In Figs. 5 to 8, as in Figs. 1 to 4, the stationary crosshead 1 supports main hydraulic cylinders 2 which are connected by rams 3 with the movable crosshead 4. Hopper 15 is provided with bottom slide plate 17 having a conduit 16 connected therewith. Container 8 is slidable on ways 33 of the press by means of hydraulic cylinders 9 acting through rods 24. Tierods 6 are provided for holding platen 7 of the press stationary relative to fixed crosshead 1. The extrusion or filling piston 5 can be placed within container 8, said piston being supported on movable crosshead 4. Extrusion die 10 is mounted in platen 7. Closure plate 12 may be raised in any suitable manner and serves to close the end of container 8 while the container is being filled.

Material is fed into container 15 and passes down conduit 16 to bore 13 of the extrusion piston 5. Reciprocating plunger 36 is operable by hydraulic cylinder 37 by a double acting piston 19' therein, cylinder 37 being stationary and mounted in crosshead 38 which is connected by tierods 39 to the main stationary crosshead 1. An additional support 40 may be provided for cylinder 37, the length of cylinder 37 being determined by the stroke of the reciprocating plunger 36 as well as the movement of the extrusion piston 5. The main cylinder crosshead has an aperture 41 to permit reciprocation of plunger 36 therethrough. The main hydraulic cylinders are connected through control valve 20 with a source of pressure 42 and an exhaust relief valve 21 in a manner similar to that shown in Figs. 1 to 4, the piping being schematically shown in dashed lines 48.

When the filling operation starts, the parts are in the position shown in Figs. 5 and 6, the carbon, or other similar material, entering bore 13 from the hopper as indicated at 43. The crosshead 4 is at this time in its position to the right, the end of the piston leaving a small space 19 in the container between the end thereof and closure plate 12. Reciprocating plunger 36 will be given a short stroke as indicated by dotted lines 44 to advance the first batch of material toward container 8. The reciprocating plunger then moves to the left and a second batch of material enters the stem bore 13 and during the next forward stroke of the reciprocating plunger, the second batch will be advanced and at the same time will push the first batch forward toward the container.

Suitable control means, which can be of conventional design, and not shown, may be provided to cause the feeder to perform continuous short strokes. The bore of stem 13 will become filled, and thereafter the new material coming in will cause a corresponding amount of material to leave the forward end of the stem bore, into the space 19. The extrusion piston 5 will be forced back gradually as material is fed into the container, closure 12 being in place, and will cause the movable crosshead to move to the left as viewed in Fig. 2, the main cylinder being connected through control valve 20 to adjustable relief valve 21. There is thus an adjustable pressure in the main cylinders so that the material will be deposited in container 8 under a uniform pressure. The controls for the reciprocating plunger are arranged conventionally in such a way that its forward strokes will have the same length regardless of the gradual backward movement of the filling piston and the movable crosshead, this not being a part of the present invention.

The short reciprocating movements of the plunger 36 may be stopped when the amount of material remaining to be pressed into the container equals the amount in the piston bore 13. The controls then can be adjusted to permit a long stroke of the reciprocating plunger said plunger being advanced until shoulder or collar 45 contacts the end 46 of the movable crosshead as shown in Fig. 8.

When the filling is completed, container 8 and piston 5 are shifted backwards so that closure plate 12 may be lifted. The filling piston and container are then shifted towards the platen 7 into extruding position as seen in Fig. 8, the material to be extruded being indicated at 47. The main hydraulic cylinders are then energized and the movable crosshead moved to the right

carrying therewith piston 5 and extruding the compressed material through die 10.

Instead of completing the filling of the container in the manner just described, short repetitive strokes of the reciprocating plunger may be continued until the container 8 is charged to the desired degree. In this case, a long stroke of the reciprocating plunger will not be made and piston bore 13 remains filled with material during the extrusion, this material being gradually fed into the container when the next filling operation is begun.

By the invention herein described, the material to be extruded is deposited into a container under pressure so that a uniform and homogeneous charge is obtained and following this the compacted material is extruded in the same press through an extrusion die. The apparatus used is simple and easy to incorporate into the general structure of a press. It is to be understood that various modifications may be made in the forms illustrated and described without departing from the spirit of the invention or the scope of the appended claims.

What is claimed:

1. In an extrusion press, a material container, a removable closure member for closing one end of said container, an extrusion piston having a feed passageway therein insertable into said container from the end of said container opposite to said closure member and movable outwardly therein away from said closure member against a predetermined force as material is fed into said container between said piston and said closure member through said passageway so as to compress said material, an extrusion die arranged to be engaged against the end of said container in place of said closure member after the container has been filled, and means including said extrusion piston for thereafter extruding said compressed material through said die.

2. In an extrusion press, a material container having a bore therethrough, removable closure means for one end of said bore, an extrusion piston having a feeding means therein insertable into said bore from the end opposite to said closure member and movable outwardly therein away from said closure member against a predetermined force as material is fed into said container between said piston and said closure member, an extrusion die arranged to be engaged against the end of said container after said closure member has been removed following filling of said container with material, and means including said piston for thereafter extruding said compressed material through said die.

3. In an extrusion press, a material container having a bore therethrough, a removable closure member for closing one end of said bore, an extrusion piston having a feed passage therein insertable into said bore from the end opposite to said closure member, operating means connected to said piston yieldable in a direction away from said closed bore end as material is fed into said bore between said piston and closure member through said feed passage so as to compress material as it is fed therein, an extrusion die engageable against the end of said container after said closure member has been removed following filling of said container with material, and means including said piston for thereafter extruding said compressed material through said die.

4. In an extrusion press, the combination comprising a material container having a bore therethrough, a removable closure member engageable with one end of said bore for closing the same, an extrusion piston insertable into said bore from the end opposite said closure member to a point adjacent said closure member, means to feed material into said bore between said piston and closure member when the piston is in said bore and the closure member is at one end of said bore, reciprocable means connected to said piston, means connected to said reciprocable means controlling movement of said piston and allowing said piston to move as material is fed into said container so that said piston member moves away from said closure member and compresses the material as it is fed into said bore, an extrusion die adapted to be engaged with the end of said bore after said closure member has been removed following filling of the bore with material, and means connected to said piston operable thereafter to move said extrusion piston to extrude said compressed material through said die.

5. In an extrusion press, a material container having a bore therethrough, a removable closure member for closing one end of said bore, an extrusion piston insertable into said bore from the end opposite to said closure member and movable outwardly therein away from said closure member as material is fed into said bore, said piston having a material feeding passage therein, a conveyor in said passage, a feed inlet conduit connected to said passage and mounted on said piston for movement therewith, a stationary hopper connected to said conduit, said conduit being slidable relative thereto, an extrusion die for said bore and moving means connected to said piston, said moving means being yieldable as material is fed into said bore and operable thereafter to extrude said compressed material through said die.

6. In an extrusion press, a material container having a bore therethrough, a removable closure member for closing one end of said bore, an extrusion piston having a feed passage therein insertable into said bore from the end opposite to said closure member and movable outwardly therein away from said closure member as material is fed into said bore between said closure member and said piston through said passage, an extrusion die arranged to be engaged by the end of said bore after said closure member has been removed following filling of said bore with material, a hydraulic means connected to said piston, and control means for said hydraulic means for exerting a predetermined force on said piston so as to compress the material as it is fed into said bore and thereafter for operating said piston for extruding said compressed material through said die.

7. In an extrusion press, a material container having a bore therethrough, a removable closure member for closing one end of said bore, an extrusion piston insertable into said bore from the end opposite to said closure member and movable outwardly therein away from said closure member as material is fed into said bore between said piston and closure member, a material feed conduit for said piston, an extrusion die arranged to be engaged against the end of said bore after said closure member has been removed following filling of said bore with material, a hydraulic mechanism connected to said piston, and a hydraulic mechanism fluid con-

trol means regulating the flow of fluid from said hydraulic mechanism so as to exert a predetermined force on said extrusion piston to compress said material as it is fed into said bore and operable to control the flow of fluid to said hydraulic mechanism for thereafter operating said extrusion piston for extruding said compressed material through said die.

8. In an extrusion press, a material container having a bore, a removable closure member for one end of said bore, an extrusion piston insertable into said container said piston having a helical conveyor therein, said piston being slidable within said bore and movable outwardly therein against a predetermined force as material is fed into said container by said helical conveyor between said piston and closure member, an extrusion die arranged to engage the end of said bore after said closure member has been removed, and means including said piston and conveyor for thereafter extruding said compressed material through said die.

9. In an extrusion press, a material container having a bore, a removable closure member for closing one end of said bore, an extrusion piston insertable into said container and slidable in the bore thereof, said piston having a passage therethrough, a rotatable decreasing pitch helical conveyor mounted in said passage, said extrusion piston being movable outwardly in said bore against a predetermined force as material is fed into said container between said piston and closure member by said conveyor, and an extrusion die arranged to engage the end of said bore after said closure member has been removed, and means including said extrusion piston for thereafter extruding said compressed material through said die.

10. In an extrusion press, a material container having a bore, a removable closure member for closing one end of said bore, an extrusion piston insertable into said bore, said piston having a material passageway therein, a rotatable helical conveyor in said passage, a material feed conduit connected to said passage and carried by said piston, a movable piston support, and an actuator for said piston support yieldable as material is fed into said closed container between said piston and closure member and operable after said container is full and the closure member removed to extrude said compressed material through an extrusion die arranged to be engaged against the end of said bore.

11. In an extrusion press, an extrusion die support, a material container movable relative to said die, a closure member insertable between said container and die, means for moving said container relatively toward and away from said die and closure member, an extrusion piston insertable into said container, a material feeder in said piston, and piston reciprocating means yieldable as material is fed into said container between said piston and closure member so that said piston can move outwardly therein as material is fed and operable thereafter, upon removal of said closure member and movement of said container against said die, for extrusion of material through the die.

12. In an extrusion press, an extrusion die support, a die, a material container movable relative to said die, said container having a bore therethrough, a closure member insertable between said container and die for closing one end of said bore, means for moving said container relatively toward and away from said die and closure member, an extrusion piston insertable into said bore from the end opposite to the closure member, a material feeder in said piston, piston reciprocating means yieldable as material is fed into said container through said piston between said piston and closure member so that said piston is movable outwardly away from the closed end of said container as material is fed therein, and means to operate said piston thereafter to extrude the compressed material through said die after removal of said closure member and movement of said container against said die.

13. In an extrusion press, an extrusion die support, a die in a material container movable relative to said die, said container having a bore therethrough, a closure member insertable between said container and die for closing one end of said bore, means for moving said container relatively toward and away from said die and closure member, an extrusion piston insertable into said container toward said closure member, said piston having a material feeding passageway therein, a helical conveyor mounted in said passageway, piston operating means yieldable outwardly away from the closed end of said bore as material is fed into said container between said piston and closure member to compress material therein as it is fed, and means to move said piston through said bore after removal of said closure member and movement of said container against said die for extrusion of compressed material through said die.

14. In an extrusion press, a material container having a bore, a removable closure member for one end of said bore, an extrusion piston slidably insertable into said bore and movable outwardly in said bore as material is fed therein between said piston and closure member, a reciprocable plunger in said piston for feeding material into said bore, an extrusion die arranged to be engaged against one end of said bore after material has been fed thereto and said closure member removed, and means including said piston for thereafter extruding said compressed material through said die.

15. In an extrusion press, a material container having a bore, a removable closure member for closing one end of said bore, an extrusion piston insertable into said container and slidable in the bore thereof, said piston having a passage therethrough, a reciprocating feed plunger in said passage, said piston being movable outwardly in said bore against a predetermined force as material is fed into said container between said piston and closure member by said reciprocable feed plunger, an extrusion die arranged to engage against the end of said bore after said closure member has been removed, and means including said extrusion piston for thereafter extruding said compressed material through said die.

16. In an extrusion press, an extrusion die support, a material container movable relative to said die, said container having a bore therethrough, a closure member insertable between said container and die for closing one end of said bore, means for moving said container relatively toward and away from said die and closure member, an extrusion piston insertable into said container toward said closure member, said piston having a material feeding passageway therein, a reciprocable feeding plunger mounted in said passageway, piston operating means yieldable outwardly away from the closed end of said

bore as material is fed into said container between said piston and closure member to compress material therein, and means to move said piston through said bore against compressed material therein after removal of said closure member and movement of said container against said die for extrusion of compressed material through said die.

HUGO LORANT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,007,974	Rees	Nov. 7, 1911
2,061,918	Nanfeldt	Nov. 24, 1936
2,121,635	Knapp	June 21, 1938
2,286,501	Narten	June 16, 1942
2,295,823	Banigan et al.	Sept. 15, 1942
2,388,558	Loewy	Nov. 6, 1945