Dec. 6, 1932. K. S. CLAPP ET AL 1,889,822

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Filed May 10, 1930 2 Sheets-Sheet 1

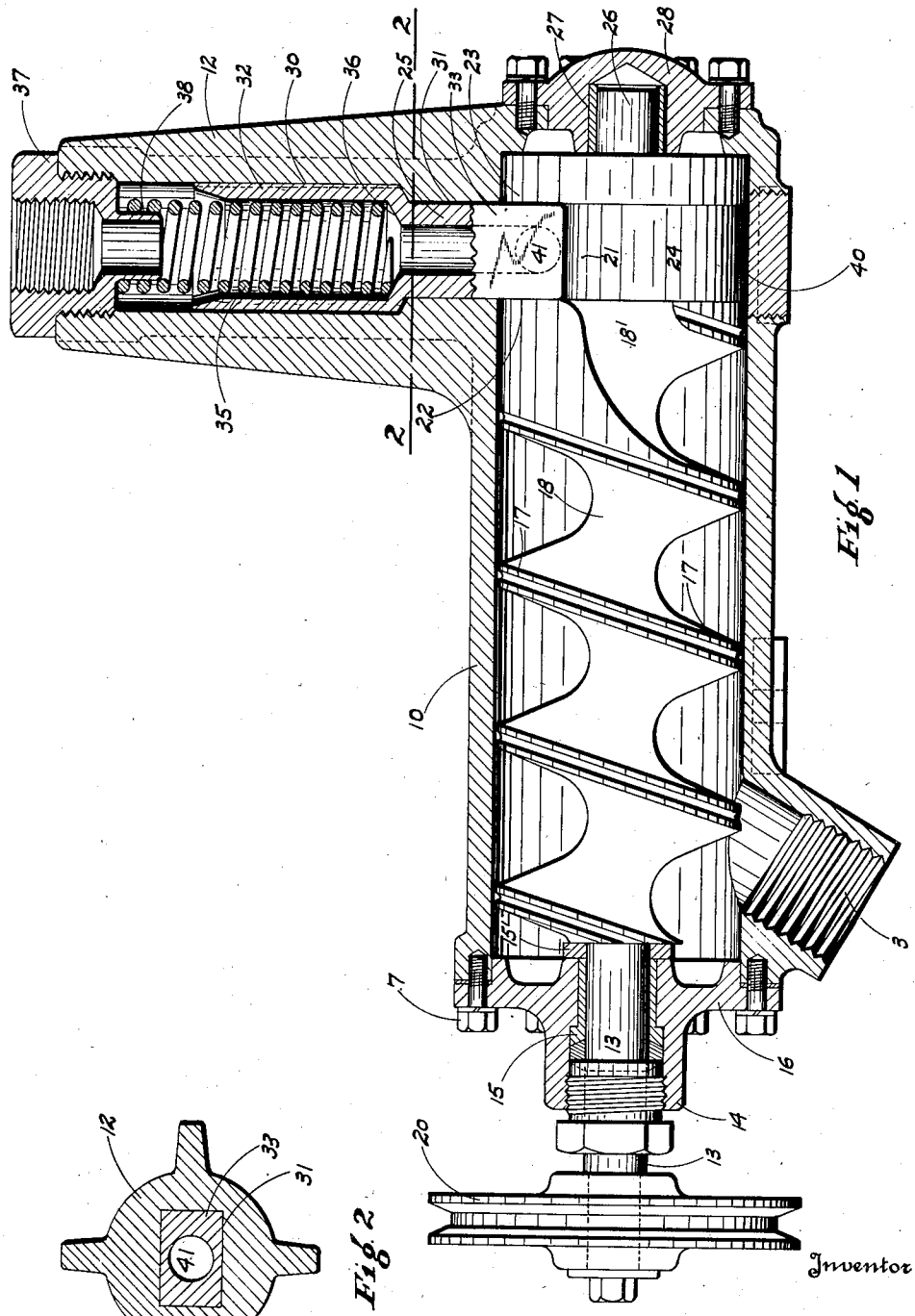


Fig. 1

Fig. 2

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Fig. 3

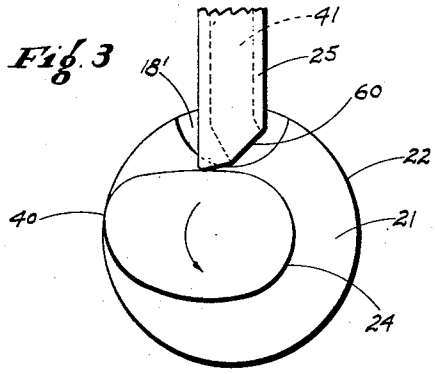


Fig. 4

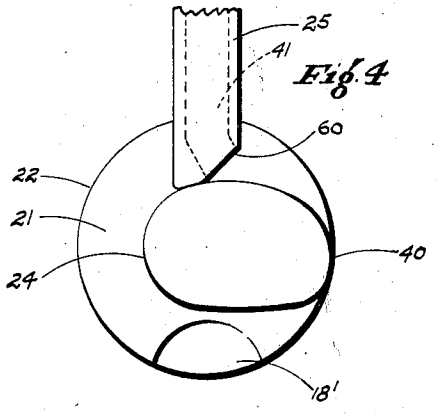


Fig. 6

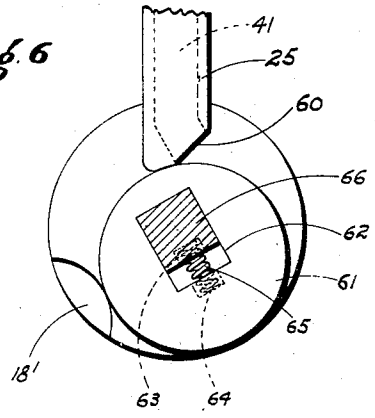


Fig. 5

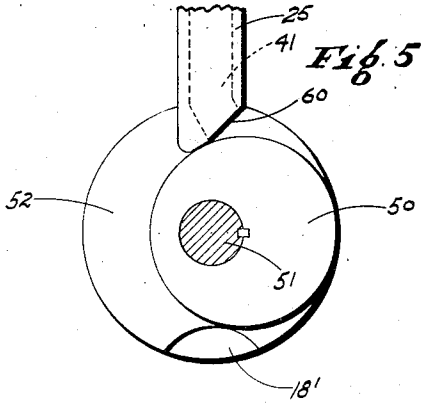
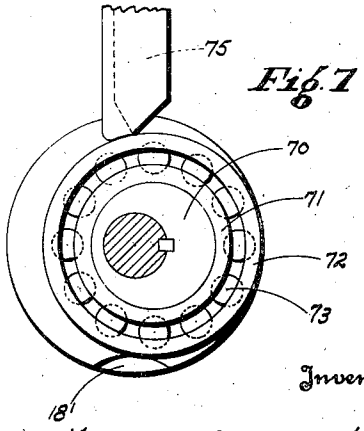


Fig. 7



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PUMP

Application filed May 10, 1930. Serial No. 451,298.

This invention relates to improved mechanism for dispensing material and more particularly relates to a mechanism for dispensing fluent or semi-plastic materials.

Prior to the inception of this invention various types of pumps or impellers have been used to cause fluent materials or the like to flow in a pipe line or to draw fluent materials from a reservoir and dispense the same through flexible or other conduit. However, all of the devices heretofore known in the art are subject to various imperfections. In dispensing the semi-plastic or fluent materials such as heavy grades of lubricants and greases, it has been found that there is a tendency for the pumping mechanism to become, what is commonly termed "airbound". It has also been found that in many types of dispensing devices particularly those which are dependent upon a piston to pump the fluid, difficulty may be encountered in maintaining an efficient seal between the reciprocating parts which actually cause the material to flow. Many other disadvantages might be enumerated but are apparent to those versed in the art.

One of the objects of the invention, is to provide a mechanism comprising an association of various parts for pumping fluent materials, which is characterized by the extreme simplicity of construction, the number of moving parts being reduced to a minimum.

Another object of the invention is to provide a mechanism for dispensing viscous materials of different viscosities.

Another object of the invention is to provide a mechanism which is compact and the efficiency of which is not impaired in its operation by the position or placement thereof.

Another object of the invention is to provide a pumping mechanism the working parts of which are readily accessible for replacement.

Another object of the invention is to provide a mechanism of the class described which will automatically handle sudden increases in pressure and wherein the usual valvular elements ancillary to by-passing materials subjected to high pressure to prevent strains or bursting of parts are eliminated.

Another object of the invention is to provide a pumping mechanism which will not become air bound after a continuous period of operation while dispensing the heavier types of fluent material.

Still other objects of the invention and the invention itself will become more apparent from the following description.

Briefly the device includes a pump which may be interposed between a storage reservoir and a dispensing outlet. The pump itself includes a housing which contains a primary conveying means, in the form of a screw conveyor, and a secondary pressure means cooperating with the primary conveying means to provide the ultimate pressure by which this material is dispensed at the nozzle or the like. The secondary means includes a means which has electively been called a wiper and is adapted to receive the material from the conveyor screw, literally wiping the material off of the end of the screw and squeezing the material into a dispensing conduit.

To further illustrate and describe the specific apparatus in some specific embodiments thereof, recourse is had to the accompanying drawings together with the appended description which form a part of this specification.

In the drawings:

Fig. 1 is a view mostly in longitudinal medial section with certain parts shown in elevation of a pumping unit embodying the elements of the invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking from a plane indicated by the arrows;

Figs. 3 and 4 are diagrammatic views illustrating certain parts of the squeezing or ultimate pressure mechanism during different periods of a cycle.

Fig. 5 is a diagrammatic view similar to that of Fig. 3 of another embodiment of the invention;

Figs. 6 and 7 are diagrammatic views of other embodiments of the invention.

Referring now more particularly to the figures of the drawings throughout which like parts are designated by like reference characters; the casing which is adapted to

house the mechanism, includes a horizontally disposed tubular portion 10, in which a screw conveyor is rotationally mounted. An upstanding portion 12 is disposed, adjacent the end of the tubular portion, and provides an outlet which partially houses the mechanism and co-operates with the screw conveyor to pick up the materials advanced thereby, and subjects the same to pressure.

An inlet 3 is provided at one end of the tubular portion 10 into which a material may flow, where it is conveyed by the screw longitudinally through the housing. The end of the housing 10 is closed by a plate 16 secured to the housing by suitable cap screws 7. The screw may comprise a helix or worm having a grooved land 17 disposed in close proximity to the inner walls of the housing. The land provides a material carrying groove 18 between the convolutions. A shaft 13 is disposed on the end of the screw and extends through a packing gland 14 of a centrally disposed boss on the plate 16. The shaft is rotatably journaled in a flanged bearing 15, and a suitable thrust bearing 15′ is interposed between the plate 16 and the screw.

A pulley 20 is secured on the end of the shaft and provides a means for rotating the screw, being driven by motor and belt not shown. The other end of the screw terminates in a channel 21 of varying depth which together with the casing wall provides a crescent shaped chamber. The flanges 22 and 23 bordering the channel are adapted to provide a running fit with the inner wall of the housing. The flange 23 is circular and the flange 22 may be formed by the termination of the screw being substantially convolute on one side and having a groove 18′ which is a continuation or neck of the groove 18 providing an entrance into the crescent chamber, having a vertical wall on the side bordering the chamber.

The bottom 24 of the channel is adapted to provide a cam upon which the plunger or wiper 25 is resiliently pressed. One portion of the channel bottom, which acts as the apex 40 of the cam, provides a running fit with the inner wall of the housing and the channel gradually increases in depth in both directions from the apex. A short shaft 26 is disposed on the extremity of the screw member and is adapted to be journaled in a bearing 27 disposed in an end cap 28 which is bolted on the end of the housing.

The outlet which extends through the boss 12 on the end of the tubular housing, comprises a cylindrical bore 30, the upper portion of which is threaded, and which communicates with the interior of the housing by a channel 31 of rectangular cross section.

The wiper 25 which is reciprocable in the bore 30 includes a relatively large tubular upper portion 32, which may be fluted to prevent the formation of an air pocket by the enlarged portion, and a lower portion 33 of rectangular cross-section. The fluted upper portion is guided by the cylindrical wall of the bore 30 and the rectangular portion 33 extends through the rectangular channel 31 into the housing and into the crescent chamber and bears against the cam 24. A helical spring 35 is partially disposed within the end 32 of the wiper, with the end of the spring abutting a shoulder 36 inside the wiper. A threaded plug 37 is screwed in the upper end of the bored boss 12 and is provided with a downwardly extending annular flange 38 about which the other end of the spring 35 is disposed. The portion 32 of the wiper, into which the spring is telescoped, together with the flange 38, retain the spring in its proper position wherein the spring is adapted to press the wiper into resilient engagement with the cam shaped bottom of the crescent chamber.

The free end of the wiper 25, as best shown in Figs. 3 to 7 inclusive, is formed to provide a substantially fluid tight seal with the cam periphery. The cam is adapted to rotate in a counter clockwise direction as viewed in the figures and the portion of the wiper which faces against the direction of rotation is dubbed off to provide a slanting face 60. An outlet duct 41 opens through the face 60 and leads upward through the wiper.

It may thus be seen that when the wiper rides on top or on the apex 40 of the cam that there is substantially only one crescent shaped chamber. However as the screw rotates and the wiper rides on the periphery of the cam the wiper divides the crescent chamber into two chambers, each of which is substantially falciform, and is of continuously increasing area on the side toward the direction of rotation and diminishing area on the opposite side.

In operation the material to be dispensed enters the housing 10 through the inlet 3 the screw conveyor being rotated by a motor belted to the pulley 20, and is moved by the screw conveyor in the channel 18 thereof, longitudinally along the housing. It is then discharged, partially through the effort of the screw and partially through the suction in the falciform chamber.

The discharge from the channel 18 through the neck 18′ into the falciform chamber is substantially continuous throughout most of the cycle of operation. As viewed in Fig. 3 the neck 18′ which might also be called an inlet port, has passed the side of the wiper 25. As the operation continues it will be noted that the chamber to the left of the wiper is increasing in area. This causes the material to rush through the port or neck 18′ being pushed from behind by the screw and drawn from the front by the suction due to the increasing volume of the chamber. How-

ever, on the other side of the wiper the chamber decreases in volume as the other chamber increases in volume. The material cannot escape past the apex of the cam hence it is forced out through the duct 41 which opens through the slanting face of the wiper. When the wiper again rides on top of the apex 40 the material will have been discharged from the chamber and the chamber will have been filled again on the left side of the wiper. The material has thus been positively forced through the duct 41 in the wiper, with a substantial increase in pressure, through the bored plug 37 disposed in the end of the boss 12. The plug 37 is internally threaded to receive therein a coupling to which a conduit not shown may be attached.

Should the outlet conduit become clogged preventing escape of the fluent material the pressure exerted upon the face 60 of the wiper will cause the same to be lifted from contact with the cam allowing the excess pressure to escape from the pressure chamber into the suction side preventing rupture of conduits or unnecessary strain upon the various parts.

Although the screw conveyor and all of the elements rotating therewith, namely the parts which make up the crescent chamber, are shown in Fig. 1 to be constructed in one integral piece, it is contemplated that the screw might be formed separate from the parts which make up the chamber portion, that is, the end of the screw may terminate in an axially extending shaft. The cam and side walls which form the crescent chamber could be formed separately and each keyed upon the shaft. Such a procedure is partially illustrated in Figures 5 and 7.

In Fig. 5 there is illustrated another embodiment of the invention which contemplates providing a disc 50 eccentrically disposed on such a shaft 51 to form a crescent shaped chamber 52, the end flange 23 not being shown. This provides a cam the periphery of which is eccentric but in which the operation is substantially the same as that previously described.

In Fig. 6 there is illustrated another form wherein the shaft 66, which is an axial extension on the end of the screw conveyor, has been squared. The cam 61 is provided with an eccentrically disposed rectangular aperture 62 therethrough. Oppositely disposed recesses 63 and 64 are provided in the shaft and the end wall of the aperture 62 respectively. A helical spring 65 is seated in the recesses substantially as shown, and maintains the high point of the eccentric in resilient engagement with the walls of the housing. With the device as shown in Fig. 6, the operation is substantially the same as in the other embodiments, except that should the conduit become plugged by some extraneous material as previously described, instead of causing a great strain upon the various parts and possible bursting of the conduit due to the high pressure, the cam being resiliently pressed against the side of the wall, allows the material under pressure to escape past the apex of the cam into the suction side chamber.

In Fig. 7 there has been illustrated another modification of the invention wherein the eccentric portion 70 is of a substantially reduced diameter, and a ball bearing comprising an inner and outer race 71 and 72 with the balls 73 interposed therebetween has been disposed upon the eccentric. The outer race will not tend to rotate relative to the plunger thus eliminating wear and adding to ease of operation due to the elimination of friction. Another slight change in construction is shown in Fig. 7 involving the plunger. In this instance, the duct has been replaced by a channel 75 into which the material may be squeezed. It is also possible that the plunger might be made solid and the duct disposed in the housing adjacent to the plunger. In this instance the plug 37 could be solid if desired and a separate outlet provided for the duct.

The degree of eccentricity of the cam and hence the depth of the chamber will depend upon the size of the eccentric, those shown being for the purpose of illustration, and in actual practice the proportions throughout the device may be varied. Further the flanged bearing 15 may be replaced by suitable anti-friction bearings with a ball thrust bearing or the like replacing the thrust bearing 15'.

Having thus described the invention it is not our intention to limit the same should it be discovered that the mode of operation departs from that of the description. We are further aware that numerous and extensive departures may be made from the device as illustrated but such departures cannot be made without falling within the scope of the appended claims.

It is claimed:

1. In a mechanism for handling viscous material, a tubular housing, a screw conveyor enclosed in said housing, means to rotate the conveyor and means operable by the conveyor to subject the material to increased pressure.

2. In an apparatus for handling fluent material, a housing, a conveyor to move the material through the housing, means associated with said conveyor to subject the material to increased pressure, said conveyor being provided with a helical land the channel bounded by the convolutions of the land terminating in a circumferentially channeled cam adapted to operate the increased pressure means.

3. In an apparatus for dispensing fluent materials, a housing, an inlet, and an outlet, a conveyor for moving the material in the

housing from the inlet to the outlet, means associated with the conveyor to discharge the material from the housing under pressure, said conveyor including a screw, a peripheral channel providing a terminus for the end of the screw, the bottom of the channel forming an eccentric cam, said discharge means including a hollow plunger extending into the channel and resiliently held against the cam.

4. In an apparatus for dispensing fluent materials, a housing, an inlet and an outlet in said housing, a screw adapted to move material from the inlet, the end of the screw terminating in a peripheral channel, the bottom of the channel being a cam, a wiper extending into the channel and bridging the space between the parallel walls thereof, a duct in the wiper adapted to allow the material to flow therethrough, means to urge the end of the wiper into contact with the cam.

5. In an apparatus for dispensing fluent materials, a tubular housing, a rotatable screw longitudinally disposed within the housing, driving means for the screw, a channel having substantially parallel side walls, the bottom of said channel forming a cam, spring-pressed wiping means extending into the channel in resilient contact with said cam and actuated thereby, said wiping means adapted to impede the progress of the material, and allow the material to escape from the confines of the channel.

6. In an apparatus of the class described including a tubular housing, an inlet port in one end of said housing, a helical conveyor mounted for rotational movement in said housing with the lands of the helix in close proximity to the walls thereof and adapted to move a material through the housing, an annular channel formed on the end of the conveyor, a duct connecting said channel and the groove of the conveyor, the sides of the channel providing a running fit with the wall of the housing, an outlet leading from the end of the housing adjacent the terminus of the screw, a hollow spring-pressed reciprocable plunger disposed in said outlet and provided with an end adapted to extend into the tubular housing against the bottom of the annular channel to impede the progress of material carried in the channel, said plunger formed to allow the material to escape therethrough.

7. In an apparatus of the class described including a tubular housing, an inlet port in one end of said housing, a helical conveyor mounted for rotational movement in said housing with the lands of the helix in close proximity to the walls thereof and adapted to move a material from the inlet port through the housing, means to rotate said conveyor, the groove of the conveyor terminating in a channel, the periphery of the channel walls providing a running fit with the wall of the housing, the bottom of the channel forming the periphery of a cam, an outlet leading from the end of the housing above the channel, a spring-pressed reciprocable plunger disposed in said outlet and provided with an end adapted to extend into the tubular housing and into the annular channel to bear against the cam, said plunger bridging the space between the side walls of the channel to impede the progress of material carried in the channel, the channel in said plunger formed to allow the material to escape through the plunger.

8. In an apparatus of the class described including a tubular housing, an inlet port in one end of said housing, a helical conveyor mounted for rotational movement in said housing with the lands of the helix in close proximity to the walls thereof and adapted to move a material through the housing, means to rotate said conveyor, an eccentric channel formed on the end of the conveyor, a duct connecting said channel and the groove of the conveyor, the walls forming the sides of the channel providing a running fit with the wall of the housing, the bottom of the channel being the periphery of an eccentric, an outlet leading from the end of the housing aligned with the channel, a hollow spring-pressed reciprocable plunger disposed in said outlet and provided with an end adapted to extend into the tubular housing into the annular channel and adapted to bear against the eccentric to impede the progress of material carried in the channel, a port in said plunger to allow the material to escape through the plunger.

9. In a mechanism for dispensing fluent materials the combination of a housing, inlet and outlet ports in the housing, a cylindrical bore extending longitudinally through the housing, a rotatable screw disposed in said bore, a channel disposed on the end of the screw and co-operating with the walls of the housing to form a crescent shaped chamber, means reciprocable in the outlet and extending into the chamber to pick up the material in the chamber and conduct it through the outlet.

10. In a mechanism for dispensing fluent materials, the combination of a housing, inlet and outlet ports in the housing, a conveyor longitudinally disposed in the housing, the end of the conveyor being shaped and cooperative with the walls of the housing to form a circumferential chamber, means reciprocable in the outlet and extending into the chamber to decrease the capacity of the chamber upon rotation of the conveyor, means cooperating with the first mentioned means to pump material from the chamber.

11. In a mechanism for dispensing fluent materials, the combination of a housing, inlet and outlet ports in the housing, a screw

conveyor lengitudinally disposed in the housing, a channel in the end of the conveyor in communication with the groove of the screw, a plunger reciprocable in the outlet and provided with an end extending into the housing adapted to block the channel to intercept the progress of the material therein, means cooperating with the first mentioned means to pump material from the chamber.

12. In a pump, a casing, a screw conveyor mounted therein, said screw terminating in a pair of spaced discs, a cam separating the discs to form a chamber therebetween, a port leading from the groove in said screw conveyor to said chamber, a wiper cooperating with the same for entrapping the material being conveyed in said chamber and delivering the same therefrom under pressure.

13. In a pump, a casing, a pair of discs and a cam separating the discs to form a chamber in said casing, means to deliver a material into said chamber and a wiper cooperating with the same for entrapping said material in said chamber and delivering the same therefrom under pressure.

14. Means for moving fluent material comprising a screw conveyor, a chamber into which a material is delivered by said conveyor, a cam in said chamber, a wiper for said cam actuated by the cam laterally of the screw, an outlet port in said wiper through which the material in said chamber is forced by said wiper.

15. In a device for dispensing viscous materials, a housing, a screw conveyor rotatably mounted in the housing, a channel formed at the end of the screw and in communication therewith, means supported by the housing and extending into the channel to divide the same into two separate chambers, one of said chambers during operation being of diminishing volume and the other of increasing volume, and an outlet in said chamber of diminishing volume.

16. In a device for dispensing viscous materials, a housing, a screw conveyor rotatably mounted in the housing, a channel formed at the end of the screw and in communication therewith, the walls of the channel and the wall of the housing defining a crescent shaped chamber, means supported by the housing and extending into the channel to divide the same into two separate falciform chambers, one of said chambers during operation being of diminishing volume and the other of increasing volume, and an outlet in said chamber of diminishing volume.

17. An apparatus for dispensing fluent material, a housing, a screw conveyor disposed in the housing, comprising a land and groove for moving material through the housing, the last convolution of the land and groove forming a cam, booster means co-operable with the cam to subject the material to increased pressure.

18. An apparatus for handling fluent material comprising a housing, a screw conveyor disposed in the housing, the end of the screw terminating in a cam, means operable by the cam for subjecting the material to increased pressure.

In testimony whereof we hereunto affix our signatures this 7th day of May, 1930.

KENNETH S. CLAPP.
THEODORE H. EICKHOFF.