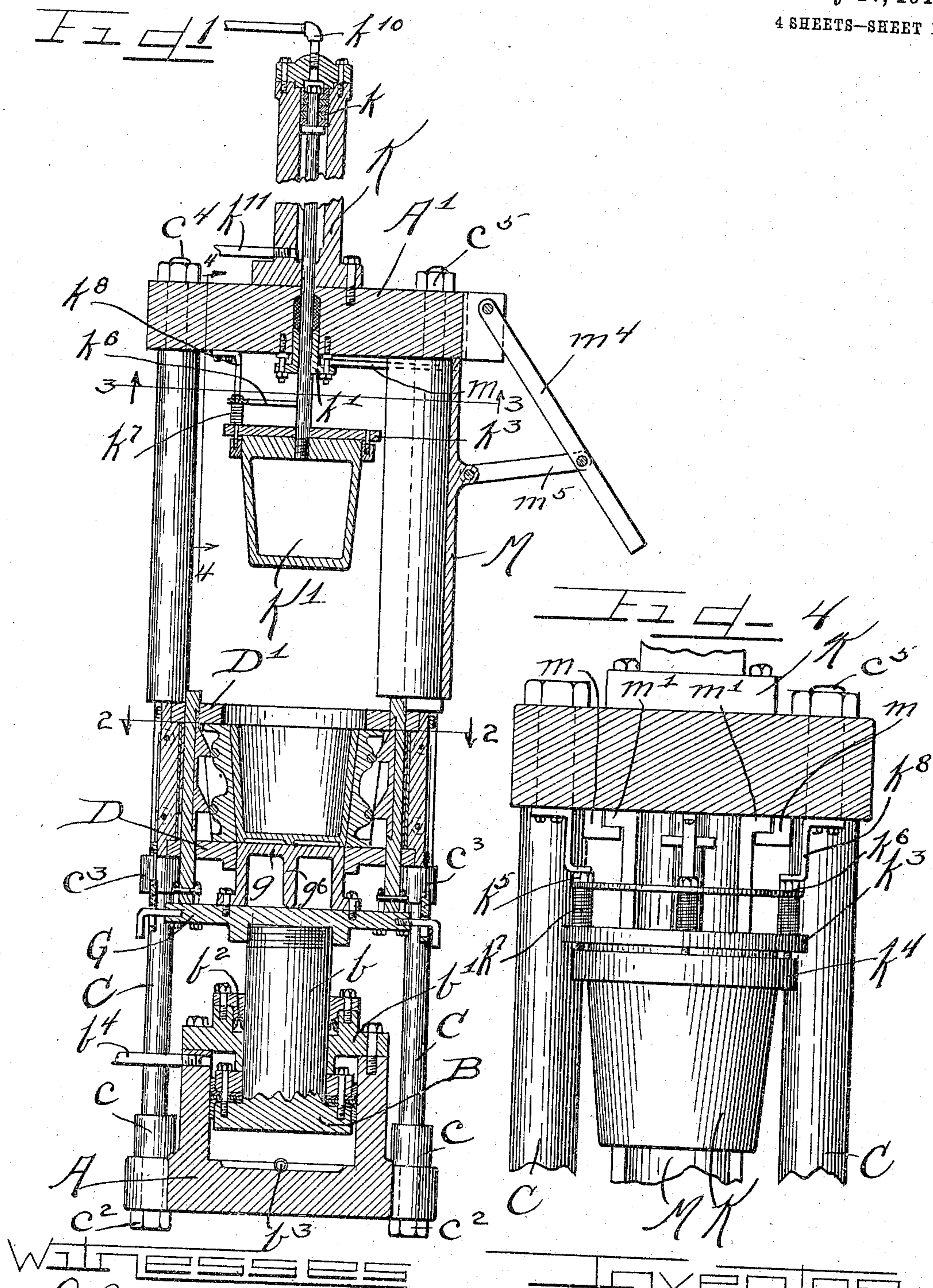


A. SHACKLETON.
MACHINE FOR FORMING ARTICLES FROM PULP AND ANALOGOUS MATERIALS.
APPLICATION FILED JAN. 20, 1909.

958,019.

Patented May 17, 1910.

4 SHEETS—SHEET 1.



Witnesses
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Lawrence Rubenstein

Inventor
Alfred Shackleton.

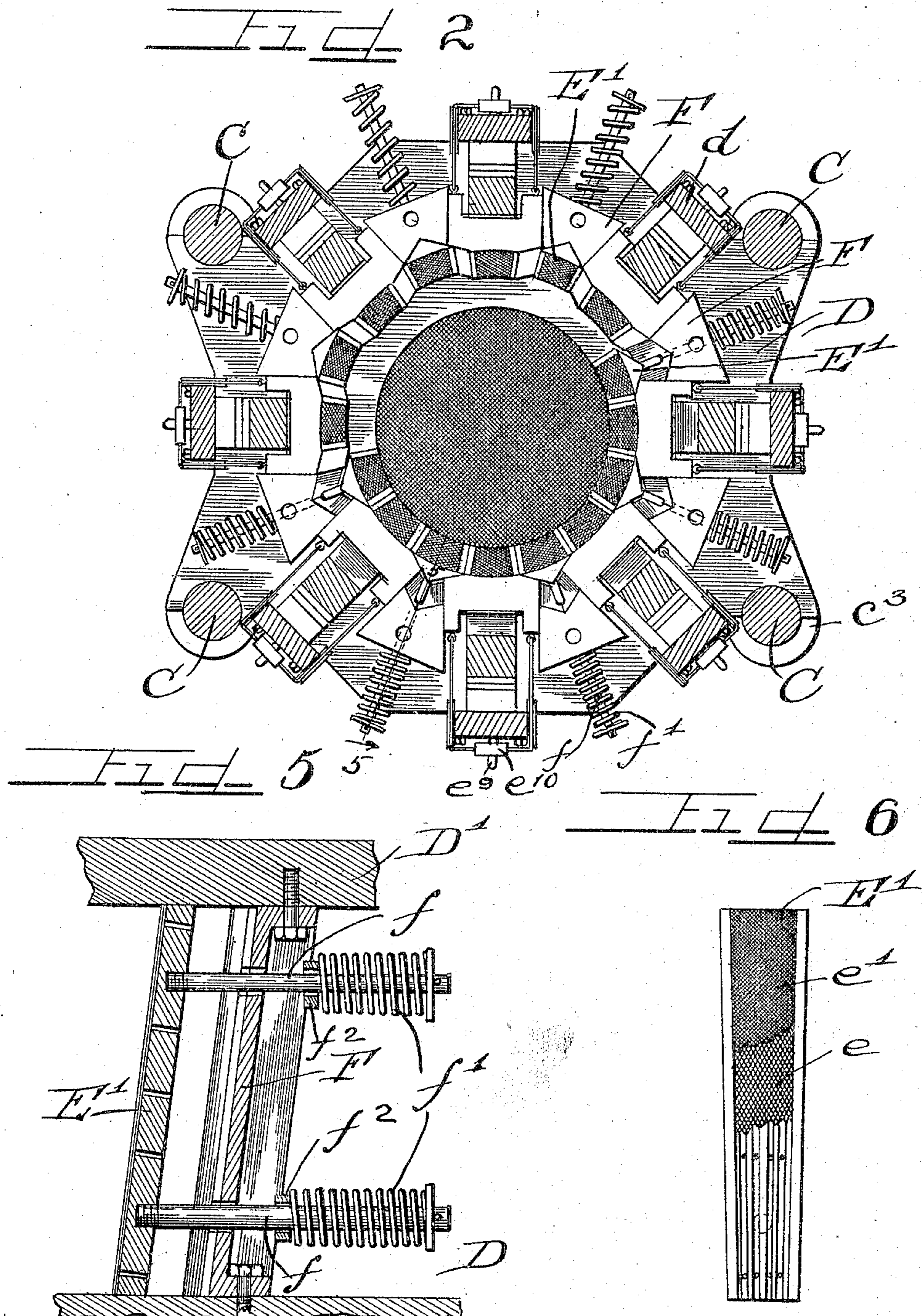
Charles C. Smith
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4 SHEETS—SHEET 2.



WITNESSES

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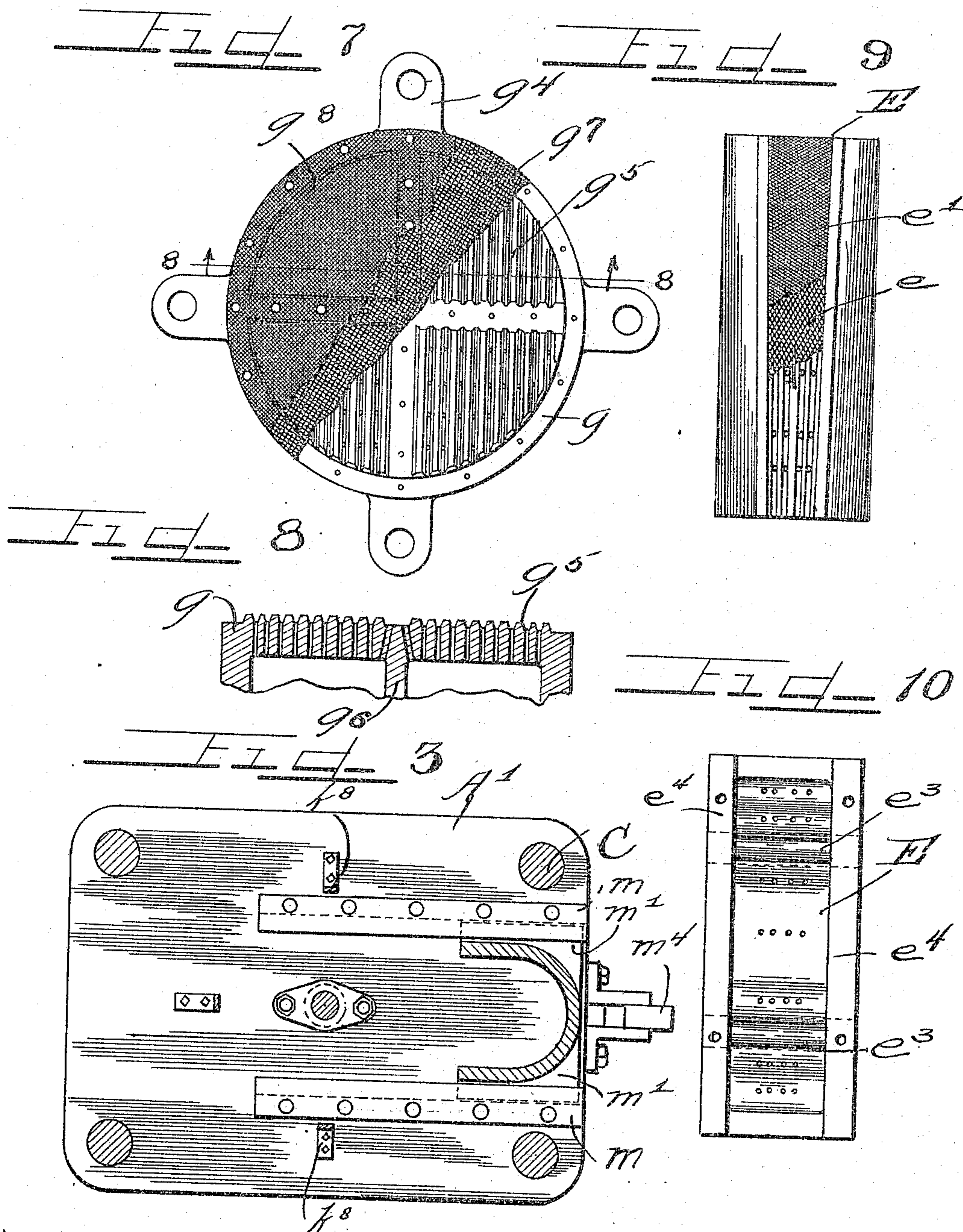
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4 SHEETS—SHEET 3.



WITNESSES
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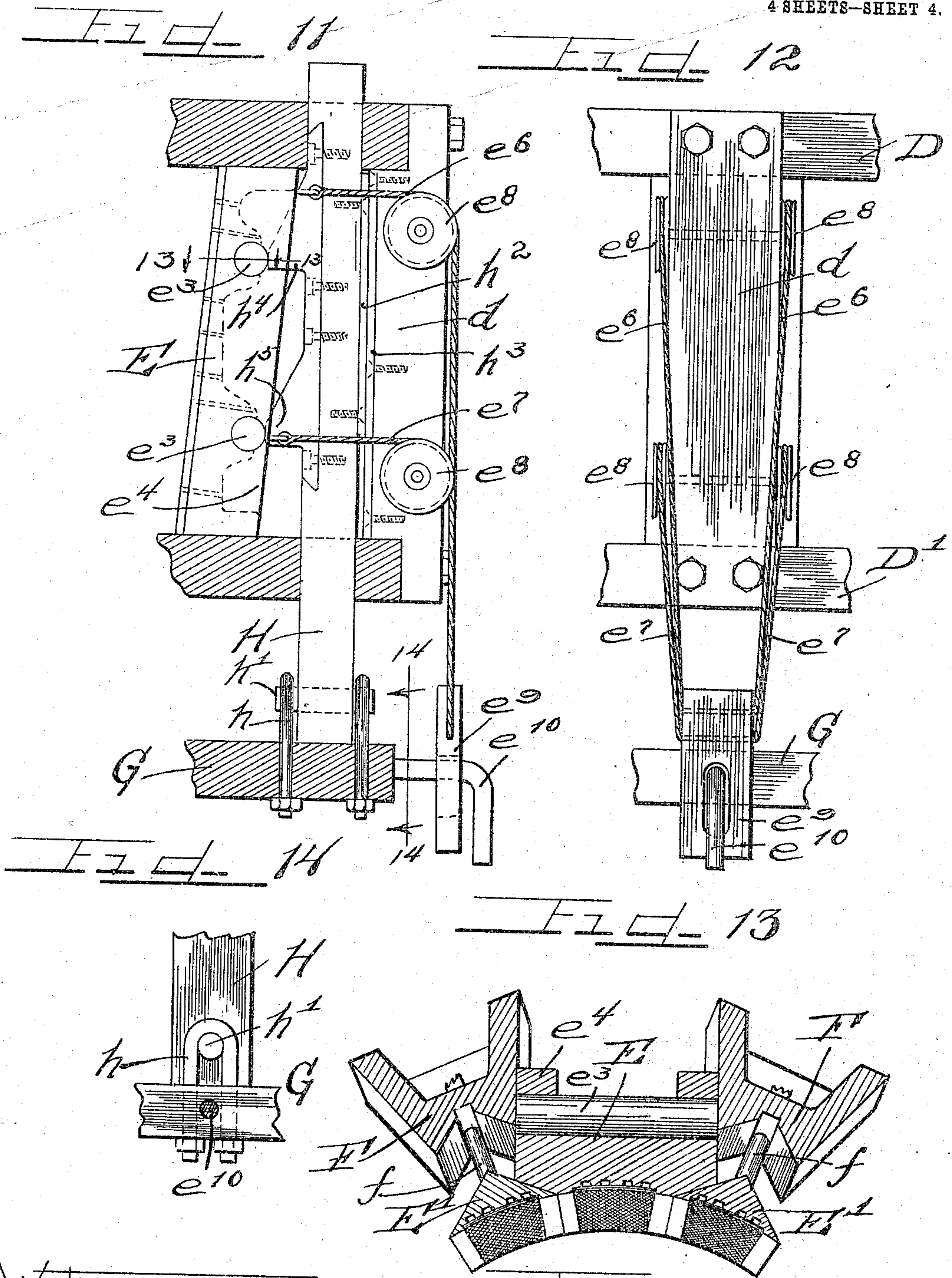
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4 SHEETS—SHEET 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING ARTICLES FROM PULP AND ANALOGOUS MATERIALS.

958,019.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed January 20, 1909. Serial No. 473,282.

To all whom it may concern:

Be it known that I, ALFRED SHACKLETON, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Articles from Pulp and Analogous Materials; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention belongs to the same class of devices as the "apparatus for forming receptacles from pulp", set forth in the application of Christain F. Homburg, for which application for patent was filed on the 5th day of September, 1907, and in which the machine was shown as a hydraulic press adapted for forming receptacles of fibrous material or of pulp.

The object of this invention is to afford a machine in which the plunger or male member is adapted to be actuated in both directions by power and provided with resilient means for stripping the partly finished product from the plunger.

It is also an object of the invention to afford in connection with a machine of the class described a positive and rigid abutment adapted to engage above the male member to rigidly hold the same against the upward pressure of the female member in forming the mold.

It is also an object of the invention to support the female die member upon the reciprocating element of a hydraulic press so constructed as to be quickly shifted in either direction by means of fluid pressure.

It is also an object of the invention to afford a construction in which uniformity is assured in the construction of the articles by affording a contractible female die member having interfitting radially movable segments adapted to be uniformly pressed inwardly in forming the mold.

It is also an object of the invention to afford in connection with a device of the class described slidable engaging segments having inclined lateral complementary faces extending inwardly to the inner or compressing surfaces of the segments and adapt-

ed to slide over each other with the inward movements of the segments, said inclined faces presenting no obstructions or shoulders to prevent maximum compression.

It is also an object of the invention to afford in a device of the class described positively actuated cams adapted to engage alternate segments and to force all the same inwardly to an equal degree and provided with means to afford quick release with the opening of the die.

Furthermore, it is an important object of the invention to afford wearing surfaces on the segments and cams for actuating the same adapted to reduce friction to a minimum and adapted, should wear occur, to compensate for such wear.

Finally it is an object of the invention to afford an exceedingly strong device of the class described adapted to be very positively and rapidly operated for the purpose described, and also adapted when in operation to accuracy and uniformity of movement and pressure exerted on the pulp to afford uniformity of product both as to shape and size and the degree of pressure, and adapted to permit much more rapid operation than has heretofore been possible with devices of the class.

The invention embraces many novel features and consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a central, vertical section of a machine embodying my invention, and showing the cylinder for the male die member broken away. Fig. 2 is an enlarged section on line 2—2 of Fig. 1, and showing approximately half of the segments at the outward limit of their adjustment and the remainder at the inward limit thereof to illustrate operation. Fig. 3 is an enlarged section taken on line 3—3 of Fig. 1, with parts omitted. Fig. 4 is an enlarged section taken on line 4—4 of Fig. 1, with parts omitted. Fig. 5 is an enlarged section on line 5—5 of Fig. 2, with the retracting springs shown in elevation. Fig. 6 is a similar inner face view of one of said segments with the reticulated strainers broken away therefrom to illustrate the drainage. Fig. 7 is an enlarged, top plan view of the bottom plunger for the die with the screens broken

away to illustrate the drainage. Fig. 8 is a section on line 8—8 of Fig. 7. Fig. 9 is an inner face view partly broken away of one of the cam impelled compressing segments. Fig. 10 is a rear elevation thereof. Fig. 11 is an enlarged fragmentary vertical section taken alongside of one of the cam impelled sections illustrated in Fig. 9. Fig. 12 is an enlarged fragmentary side elevation illustrating the means for retracting the cam impelled segments. Fig. 13 is an enlarged fragmentary section taken on line 13—13 of Fig. 11, and illustrates the operation of the segments. Fig. 14 is a fragmentary section on line 14—14 of Fig. 11.

As shown in the drawings, said machine embraces a lower hydraulic press upon which is supported a female die member having inwardly adjustable sides and adapted to receive the pulp, and an upper plunger or male die member adapted to be actuated by means of a hydraulic or other fluid actuated piston into coöperation with the female member to form the whole, said elements being supported in a suitable frame to hold the same at all times in alinement and in operative relation.

As shown, the bed of the machine A, comprises also the bed or base of the cylinder of a hydraulic press having a double acting piston B, therein, the piston or connecting rod *b*, of which extends upwardly through a cylinder head *b'*, and is provided with a suitable hydraulic gland *b*², in a familiar or any suitable manner. Pressure pipes *b*³—*b*⁴, open respectively into the lower and upper ends of said hydraulic cylinder and communicate with any suitable source of pressure to enable the piston to be positively reciprocated in either direction. Extending upwardly from suitable lugs arranged at the four corners of the bed A, of said press are the vertical frame rods or bars C, four in number, and as shown, conveniently turned or formed of a bar or shaft of steel of suitable size to afford an integral collar *c*, near the lower end thereof below which said frame members or posts are reduced in diameter and threaded, and extend through suitable apertures in said lugs and are secured to said bed by means of suitable nuts *c*². Similar collars *c*³, are provided at a point slightly above the upward limit of travel of the upper end of the piston or connecting rod *b*, above which said bars are again reduced to smaller diameter for a length slightly greater than the length of the mold, and thence continue to the larger size to near the upper reduced and threaded extremity *c*⁴. Said threaded upper ends of said bars extend through suitable apertures in the upper frame plate A', which is rigidly engaged in place thereon by means of nuts *c*⁵, engaged on the threaded ends of said

vertical posts or frame bars. Supported upon the collars *c*³, on said vertical posts is a bed plate D, shaped to fit between said posts and provided centrally with an aperture substantially the size of the bottom of the article to be pressed, and secured parallel therewith and above the same at a height therefrom corresponding substantially with the height of the article to be pressed is a top plate D', having a central aperture therein of a size somewhat larger than the top of the article when molded or pressed. Said bed and top plates are spaced apart the desired distance by means of vertical posts *d*, as shown eight in number, and arranged equal distances apart though the number may vary, and each of said posts is shouldered at its top and bottom to fit between said plates and at the ends are rigidly bolted thereto. Slidably arranged between said plates are compressing segments E—E', one of said segments E, being slidably supported in an upright position and inclining at the top slightly outwardly between each of the posts *d*, and the center of the machine and inclining or flaring outwardly at the top. Said segments E, are provided with a central, downwardly tapering compression face longitudinally grooved, as shown in Fig. 9, and provided with apertures opening from the bottom of the grooves therethrough and having engaged on said compression face a coarse reticulated structure, preferably of wire net *e*, on the outer side of which is engaged a finer reticulation *e'* which may also be of wire. The sides of said segments are parallel and from the compression face of each of said segments the top or inner face thereof bevels outwardly affording plain inclined surfaces. The compression face of each of said segments is slightly concave to conform with the surface curvature of the receptacle or body to be molded. Seated in the back of each of said segments in rearwardly projecting ribs having cylindric apertures extending transversely therethrough, are relatively short cylindric sections *e*³, of hardened steel or other suitable material to afford a wearing face and as shown, above and below the outwardly projecting side of said cylindric section the metal affording the segments is cut away or formed to afford recesses. As shown, the side of said segment is provided with a rearwardly directed flange *e*⁴, in which the ends of said cylindric sections are engaged.

Rigidly bolted to the bed plate and top plate and between the segments E, are spacing and guide members F, which taper inwardly, as shown in Figs. 2, 5, and 13, and are each provided with a V-shaped longitudinal recess in the inner face thereof, and the angle of the sides of which corresponds ap-

proximately with the lateral bevel from the compression faces of the segments E. Extending through said guide members F, near the bottom and top thereof and centrally, are rods f , on the inner ends of which are rigidly engaged the segments E'. These, as shown, more fully in Figs. 2 and 13, are shaped to fit in the V shaped groove in the inner face of each of said guide members and to slightly overlap on the inclined faces of the segments E, of each of the same, and affords a longitudinally grooved compression face having apertures opening outwardly therethrough from the bottom of the grooves and as shown, engaged to cover said lateral grooves is a relatively coarse layer e , of wire net or other suitable reticulated material and covering the same is a finer net e' , such as before described with reference to the segments E.

As shown, a strong pulling spring f' , is engaged on each of the rods F, and bears against a plate f^2 , which extends transversely of the back of each of said guide members F, and affords an outer bearing for the rods f , said springs acting to retract the segment E', after each compression. Means are provided for actuating said sliding segments E, and at the same time compressing the bottom of the mold upwardly. For this purpose a plate or head G, is secured transversely on the upper end of the piston rod b , and bolted thereon is a cylindric head g , which extends upwardly above the plate or head G, and through the bed plate D, at the bottom of the female die member.

Rigidly secured by means of U bolts h , which engage over transverse pins h' , set in the lower end thereof, and extend through, and are secured at their ends on the plate or head G, are vertical cam bars H, one for each of the movable segments E. These extend through the bed plate and top plate D, and D', and each of the same is provided on its back with a wear plate h^2 , which slides on a corresponding wear plate h^3 , bolted on the inner face of the post d , as shown in Fig. 11, and as shown, each of said cam bars is shaped on its inner side to positively receive therein and to engage thereto by means of bolts or otherwise the inwardly directed knuckles or cam faces h^4 — h^5 , which are arranged to correspond respectively with the cylindric hardened steel wearing sections secured in the movable segments. As shown, said cam knuckles are shaped to afford inclined planes from the top downwardly and inwardly and are integrally connected to afford strength and may be secured in any suitable way upon the cam bar to afford a rigid and secure connection.

Extending from the lateral flanges e^4 , of each of the segments E, are lines or cables e^6 — e^7 , the ends of which are secured on op-

posite sides of said segments near the top and not far from the bottom thereof respectively, and the bight of each of which is carried over pulleys or sheaves e^8 , secured on the post d , and connected in the bight of each is a plate e^9 , having a longitudinally slotted aperture therein through which extends an arm e^{10} , secured in the plate or head G, as shown in Figs. 1 and 11, and which acts as the piston moves downwardly to retract the movable segments E. As shown, said arm e^{10} , at its extremity is bent downwardly to prevent detachment of said slotted plate therefrom.

The cylindric head g , as shown in Fig. 7, is provided with lugs g^4 , extending radially therefrom and through which extends the bolts which permit engagement to the head G. As shown, the top of said cylindric head is provided with longitudinal ribs g^5 , and as shown, radial webs g^6 , of considerable width extend from the top of said cylindric head downwardly and are supported on the head G, and as shown, closely arranged apertures are provided in the grooves between the ribs g^5 , to permit drainage. Said head is covered with a coarse wire net g^7 , over which is secured a finer wire net g^8 , the mesh of which is sufficiently small as to retain the pulp while permitting the water to pass therethrough. The top plate A', is provided with a central aperture there-through and mounted on said top plate in axial alinement with said aperture is a hydraulic or other fluid cylinder K, of considerable length, and provided with a piston k , therein, the piston rod of which extends downwardly through said cylinder and a suitable gland k' , in the top plate A', and rigidly engaged thereon is the male die member K'. This, of course, is shaped to conform with the interior configuration of the article to be pressed. As shown, however, the press being adjusted for forming pails and the like of pulp, said male die member is shaped as the inverted frustum of a cone, as is usual.

Secured on the top of the die member K', is a plate k^3 , of a greater diameter than the top of said die member and supported on which is a ring k^4 , which fits closely around the periphery of said die member at the top thereof and is normally supported at the upward limit of its adjustment by means of bolts k^5 , which extend through a ring k^6 , and between which and the plate k^3 , on each of said bolts is a strong pulling spring k^7 , as shown in Figs. 1 and 4.

Secured on the under side of the top plate A', are downwardly and inwardly directed arms k^8 , one for each of the bolts k^5 , and against which the upper ends of said bolts engage, as said plunger or die member K', nears the upward limit of its movement. As

shown, pipes k^{10} — k^{11} , are connected in the upper and the lower ends respectively of the cylinder K, and are adapted to admit any suitable fluid under pressure thereinto to

actuate said plunger or male die member.

The operation is as follows: When the piston B, is at the lower limit of its travel, and the plunger or male member K', is at the upper limit of its travel, the segments are all retracted, as shown in the upper portion of Fig. 2, the feather edges, however, of the segments E', are still engaged and partly supported on the inclined faces of the segments E. Fluid under pressure is now admitted from the cylinder k^{10} , into the cylinder K. The male member descends into the female member and, of course, is positioned centrally therein owing to the axial alinement of the dies. At this time the head g , still being at the lower limit of its travel, a space for pulp exists below the male die member approximately equal to the space between said male die members and the lateral segments and the pulp having been filled into the mold, the ring k^4 , on the upper or male die member just fills the aperture in the top plate D'. At this time the male die member is rigidly engaged in place not only by the liquid pressure within its cylinder, but as well by a brace M. This is suspended on the parallel guides m , secured on the under side of the top plate and above which the flanges m' , of said brace engage. The brace, as shown in Figs. 1 and 3, is concave on its inner side to fit around the piston rod for said die member and is of a length to positively engage on the top plate k^3 , of said die member when the die is fully seated. As shown, a lever m^4 , is fulcrumed on the top plate A', and connected by means of a suitable link m^5 , with said brace to permit the same to be quickly swung into and out of operative position. Said brace having been adjusted to firmly hold the mold die member K', down, pressure is admitted below the piston B, of the lower hydraulic cylinder. This acts to force said piston upwardly carrying the head G, therewith and in consequence of the upward movement of the cam bars, said upward movement also acts to move the movable segments E, uniformly inward, said movable segments also drawing the segments E', inwardly until maximum compression is reached, at which time all the segments are disposed uniformly about the male die member in a true circle. The upward pressure is sufficient to necessitate the pulp arranging itself with approximately uniform thickness and density in the mold. The maximum compression having been reached, pressure may be admitted above the piston B. This retracts the bottom of the mold and simultaneously, owing to the downward movement of the

cam bars, the movable segments E, are retracted, the springs f' , causing the segments E', to follow the same outwardly and the molded article is thus suspended upon the male die member. Pressure being admitted now below the piston k , in the cylinder K, said die member is quickly elevated and the arms k^8 , contacting the bolts k^5 , the ring k^4 , is pressed downwardly forcing the molded article from the die, thus preparing the machine for the next operation.

Of course, I am aware that in machines of this type numerous efforts have been made to provide such drainage as will permit the rapid escape of the water from the pulp during the compression. For this purpose it is of the utmost importance that the pulp as a whole should be supported while the compressing walls engaging the same shall be of such construction as to permit the water to very readily flow therethrough. For this purpose, two or more layers of wire net or other suitable reticulated material are employed, and as shown, the outer layer is of such fineness as to prevent the pulp finding its way therethrough. Of course, more than two layers of wire net may be employed, if necessary. This ordinarily, however, will not be required inasmuch as the utmost freedom of drainage is secured by the longitudinal curving of the segments and the numerous perforations extending from the bottom of the grooves outwardly. Not only is this true of the segments but as well of the bottom or cylindric head. In consequence of such complete drainage and the rapid operation possible because of the shape and form of said cams on the cam bars, it follows that the machine may be very rapidly operated as compared with the usual operation of hydraulic presses. Furthermore, should the cylindric wear segments e_3 , ever show wear at any particular point, adjustment may quickly be afforded by simply turning said sections slightly to afford a new surface for engagement by the cam knuckles.

Of course, I am aware that numerous details of the construction may be varied. I therefore do not purpose limiting this application for patent otherwise than necessitated by the prior art.

I claim as my invention:

1. The combination with a vertical frame of a lower hydraulic press, a head secured thereon and movable vertically thereby, parallel plates apertured centrally, inwardly movable segments arranged between said plates about said apertures and affording the side walls for a female die member, cam bars rigidly secured to the head and vertically slidable through the plates, cam members removably secured to the cam bars for actuating the segments, said cam members

non-connected with the segments, a male die member adjustable into position in said female die member, a brace bar adapted to hold the same against the pressure, means also
 5 actuated by the press for retracting the segments, and a stripper carried on the male die member to discharge the formed article therefrom.

2. The combination with a frame of a
 10 hydraulic press affording a part thereof, a head secured thereon and movable thereby, inwardly movable segments arranged about said head and affording the side walls of a female die member, means operated from
 15 the press for moving the segments inwardly about said head, a male die member adjustable into position in said female die member, means acting to hold the same against the pressure, and cables connecting the segments
 20 and the press for retracting the segments thereby.

3. The combination with a vertical frame of a double acting hydraulic press, a head secured thereon and movable vertically
 25 thereby, parallel plates above the head having apertures therein, members rigidly connecting the plates, inwardly movable segments arranged about said apertures, and affording the side walls for a female die
 30 member of which said head is the bottom, cams operated from the press adapted to vertically reciprocate through apertures in the plates for moving the segments inwardly about said head, wear plates rigidly secured
 35 to the cams and said rigid connecting members, a complementary male die member adjustable into position in said female die member, a slidable brace bar adapted to engage the same to hold against the action of said
 40 press, and means operatively connecting the press and segments for retracting the segments thereby.

4. The combination with a vertical frame of a double acting hydraulic press, a ver-
 45 tically movable head secured thereon, inwardly movable segments arranged about said head and affording the side walls for a female die member of which said head affords the bottom, cams operated from the
 50 press and non-connected with the segments and acting to move the segments inwardly about said head, a male die member complementary with and adjustable into position in said female die member, rigid manually ac-
 55 tuated means adapted to engage the male die member to hold the same against the pressure, and cables connected with the segments and the press for retracting the segments.

5. In a machine of the class described the
 60 combination with the movable bottom member of peripherally arranged radially movable segments, alternate segments of which are provided with feather edges overlapping inclined faces on the adjacent segments,

means rigidly secured to the movable mem- 65
 ber for positively actuating all of said segments inwardly by engagement with said overlapped segments and non-connected with the segments, and power operated means for
 70 retracting some of said segments.

6. In a machine of the class described the combination with the movable bottom mem-
 ber, of peripherally arranged radially mov-
 able segments affording side walls around
 the same and alternate segments of which 75
 are provided with outer inclined faces terminating in feather edges and overlapping complementally inclined and non-shouldered
 faces of adjacent segments, a double acting
 hydraulic press for positively actuating all 80
 of said segments inwardly by impelling said overlapped segments, and one or more cables
 connected with each alternate segment and
 the press for retracting the segments.

7. In a machine of the class described the 85
 combination with the movable bottom member of peripherally arranged radially movable overlapping non-shouldered segments, means for positively actuating alternate seg-
 90 ments to impel all equally because of said overlapped relation, and cables positively connected to retract some of said segments and springs to retract the remainder simul-
 taneously.

8. In a machine of the class described the 95
 combination with the movable bottom member of peripherally arranged power impelled, radially movable segments, guide blocks therefor, segments slidably secured thereto
 and provided with feather edges overlap- 100
 ping the faces of the adjacent power impelled segments, means acting on the power impelled segments for positively actuating
 all of said segments inwardly, power oper-
 ated cables for retracting all of said power 105
 impelled segments, and springs for simultaneously retracting the alternate segments.

9. In a machine of the class described ra-
 dially movable power impelled segments
 having outwardly inclined, non-shouldered 110
 surfaces on each side of the compression surfaces, adjustable cylindric wear members secured to the segments, intermediate segments
 arranged between said movable segments and
 provided with complementary surfaces and 115
 having feather edges overlapping the inclined faces of the adjacent segments, cams adapted to contact the cylindric members for
 shifting the movable segments inwardly car-
 rying the intermediate segments thereby, 120
 and hydraulically operated means for retracting said segments simultaneously.

10. In a machine of the class described ra-
 dially movable power operated segments
 having outwardly inclined plane non-should- 125
 ered surfaces on each side of the compression surfaces, guide blocks between said segments, intermediate segments yieldingly se-

cured to the guide blocks and between said
power operated segments and provided with
feather edges overlapping the inclined faces
of the adjacent segments, a press, cams posi-
5 tively connected therewith for shifting the
power operated segments inwardly carrying
the intermediate segments thereby, cables op-
erated by the press or jack for retracting
said first named segments, and springs act-

ing to simultaneously retract the alternate 10
segments.

In testimony whereof I have hereunto sub-
scribed my name in the presence of two sub-
scribing witnesses.

ALFRED SHACKLETON.

Witnesses:

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J. W. ANGELL.