(No Model.) 2 Sheets—Sheet 1.

D. SPOONER.

SEWER PIPE AND EARTHENWARE MANUFACTURING MACHINE.

No. 589,104. Patented Aug. 31, 1897.

Fig. 1.

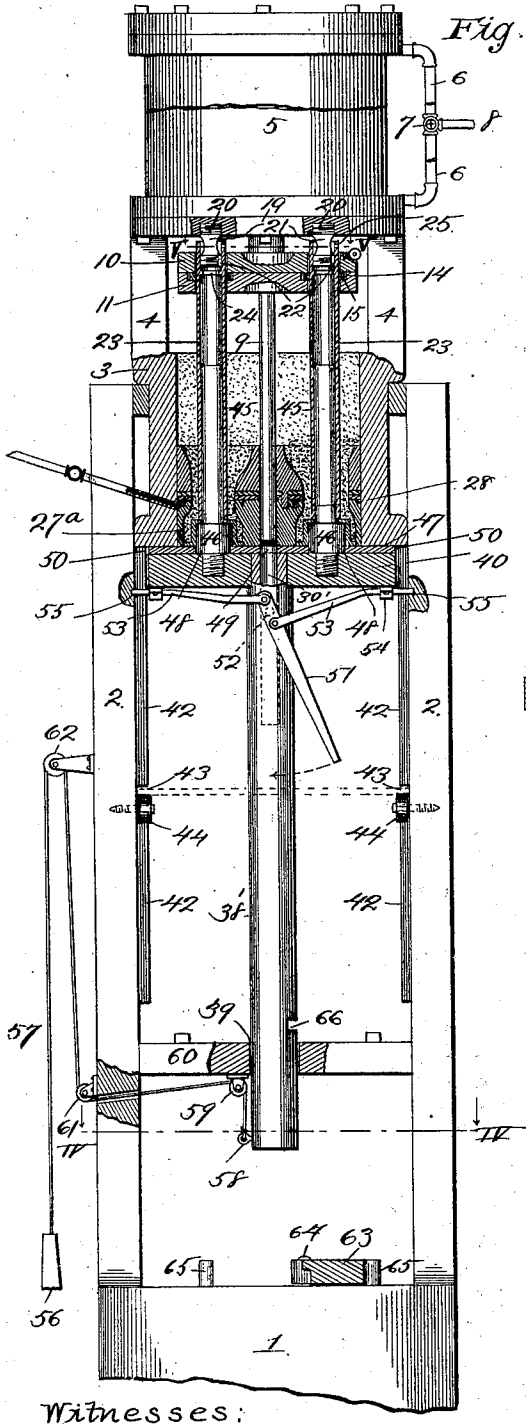


Fig. 2.

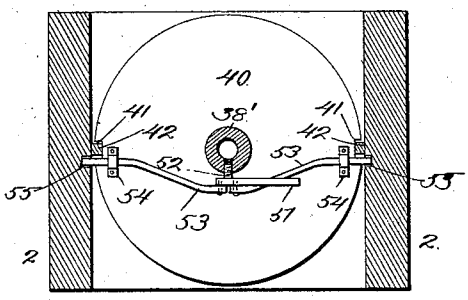


Fig. 3.

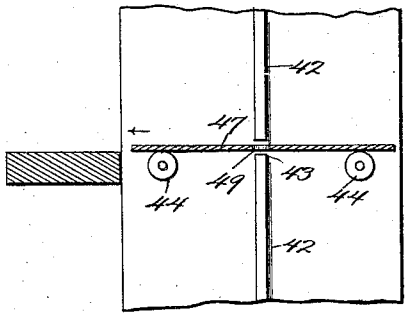
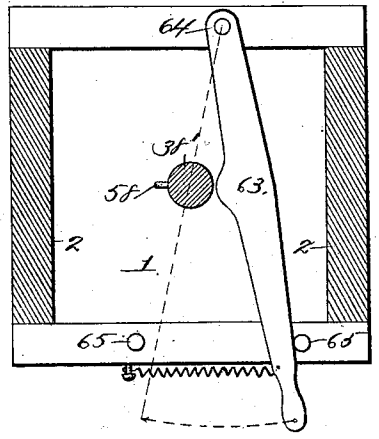


Fig. 4.



Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

D. SPOONER.

SEWER PIPE AND EARTHENWARE MANUFACTURING MACHINE.

No. 589,104. Patented Aug. 31, 1897.

Fig. 5.

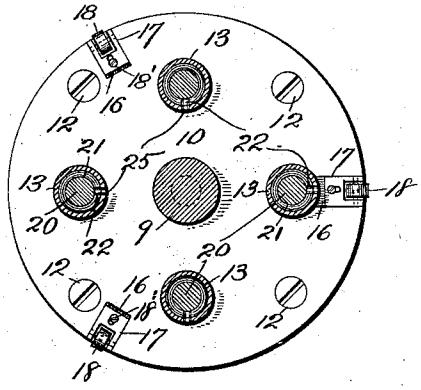


Fig. 8.

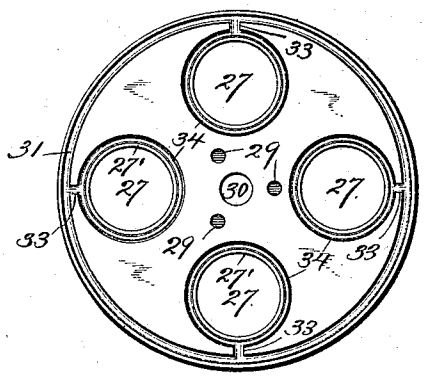


Fig. 6.

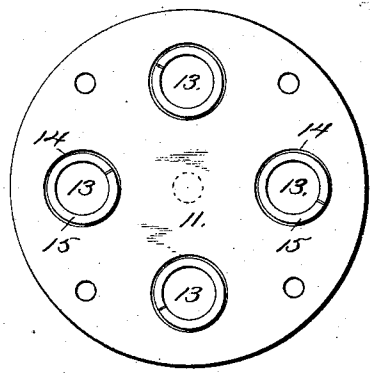


Fig. 9.

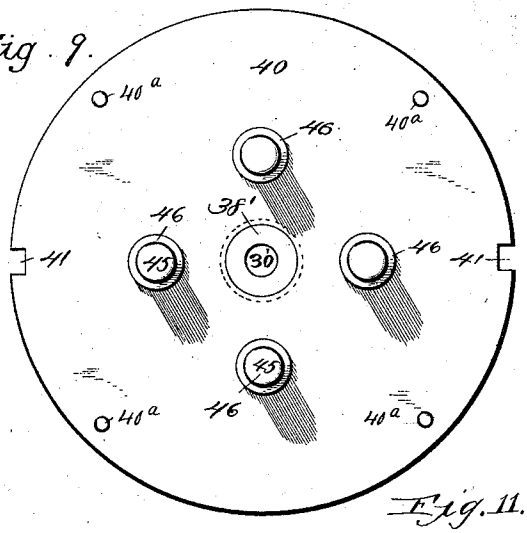


Fig. 7.

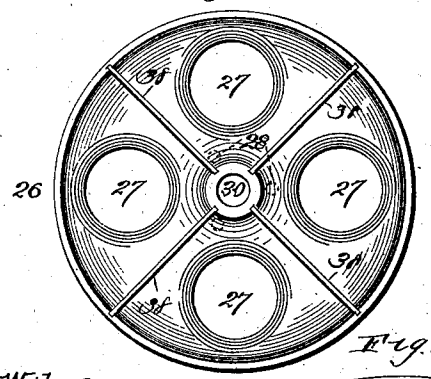


Fig. 11.

Fig. 10.

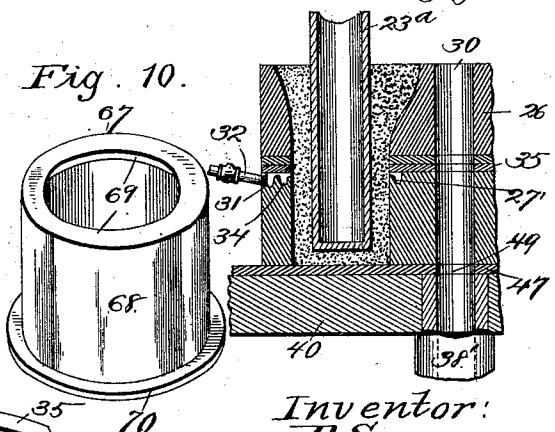
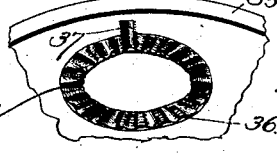


Fig. 12.



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UNITED STATES PATENT OFFICE.

DANIEL SPOONER, OF INDEPENDENCE, MISSOURI.

SEWER-PIPE AND EARTHENWARE MANUFACTURING MACHINE.

SPECIFICATION forming part of Letters Patent No. 589,104, dated August 31, 1897.

Application filed June 26, 1896. Serial No. 597,076. (No model.)

To all whom it may concern:

Be it known that I, DANIEL SPOONER, of Independence, Jackson county, Missouri, have invented certain new and useful Improvements in Sewer-Pipe and Earthenware Manufacturing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to machines for manufacturing sewer-pipe, earthenware, &c., and more particularly to a mechanism for this purpose which will produce at a single operation a plural number or pipes or other articles, my object being to produce a machine which is positive and reliable of operation, under perfect control, and may also be utilized, with slight changes in detail construction, to produce earthenware articles with one end closed as well as with both ends open.

Other objects of the invention will be hereinafter set forth, and the invention, consisting in certain novel and peculiar features of construction and combination of parts, will be hereinafter claimed.

In order that the invention may be fully understood, I will proceed to describe it with reference to the said accompanying drawings, in which—

Figure 1 represents a view, partly in side elevation and partly in vertical section, of a machine embodying my invention. Fig. 2 represents a horizontal section taken just below the head of the plug-shaft and looking upward. Fig. 3 is a vertical section to show the roller-supported pipe-carrying plate or board. Fig. 4 is a section taken on the line IV IV of Fig. 1. Fig. 5 is a section taken on the line V V of Fig. 1. Fig. 6 is a plan view of the lower half of the presser-head. Fig. 7 is a top plan view of the die for forming the pipes or other articles. Fig. 8 is a top plan view of the lower half of the same. Fig. 9 is a plan view of the plug-shaft. Fig. 10 is an enlarged detailed perspective view of one of the pipe-flange rings. Fig. 11 is a vertical section of a portion of the die and plug-shaft, together with one of the sleeves around which the pipe or article is formed. Fig. 12 is a detailed perspective view of a part of the gasket interposed between the upper and lower halves of the die.

Referring to said drawings, it will be observed where similar numerals designate corresponding parts, 1 designates a suitable framework, which, however, is preferably of rectangular form.

2 2 designate vertical arms projecting upwardly from said frame.

3 designates the clay-receiving cylinder, which is secured rigidly between the upper ends of said arms 2.

4 designates a number of vertical arms which project upwardly from the cylinder 3 and carry at their upper ends the steam-cylinder 5. 6 6 designate a pair of pipes which communicate at their discharge ends with the upper and lower ends of said cylinder and at their opposite ends are coupled by means of a valve 7 with the supply-pipe 8, connected with any suitable source of steam-supply under pressure.

Within the cylinder is located a piston (not shown) of the customary or any preferred construction or type, and 9 designates the piston-rod, which depends vertically and centrally into the clay-receiving cylinder 3, its lower end terminating just short of the lower end of said cylinder. Mounted rigidly upon said piston-rod is a presser-head constructed as follows: 10 designates the upper half and 11 the lower half of said presser-head, which is of diameter and form to fit snugly within the "clay-cylinder" 3, and said portions are secured rigidly together by a number of screw-bolts 12. They are also provided with registering vertical passages or holes 13. In this instance they are provided with four of said passages arranged at equidistant points, though of course the number of said passages may vary as occasion may demand or circumstances direct. The said holes or passages at the upper side of the lower half of the presser-head are countersunk or enlarged, as at 14, to receive the spring-metal expansion-rings 15, the object of which will be hereinafter described. In order that said presser-head may reciprocate in a perfectly vertical plane with the least amount of friction, the upper half is provided with a number of radial slots 16, and mounted therein are the bifurcated plates 17, carrying antifriction-rollers 18. Said plates are adjusted inwardly or outwardly to compensate wear upon the screw-bolts 18′, which

extend through longitudinal slots in said plates.

Secured by bolts or in any other suitable manner to the lower end of the steam-cylinder is a plate 19, and screwed vertically into and depending from the same are in this instance four plugs 20, which plugs are located in vertical alinement with the holes or passages 13 of the presser-head. Said plugs are diametrically reduced at their middle, as at 21, so as to form an oil or lubricator reservoir in conjunction with the upper ends of the vertical sleeves or tubular cores, which are screwed rigidly upon their lower ends, and in order to provide an outlet or escape for such lubricating substance the lower end of each plug is provided with a vertical groove 22, which of course is not closed by the embracing sleeve or core 23, but which at times may be closed by screwing said sleeves or cores upwardly upon the plugs until their internal flanges 24 bear against the lower ends of said plugs, as will be readily understood from reference to Fig. 1 of the drawings. The oil is supplied to said chambers by means of pipes (not shown) which communicate with the holes or apertures 25 in the upper ends of said sleeves or hollow cores. Said sleeves or hollow cores extend vertically downward through the holes or passages of the presser-head and are embraced snugly and tightly by means of the expansion-rings 15, whereby with each reciprocation of the presser-head said sleeves or cores are cleaned of adhering clay, or, in other words, such expansion-rings, by continuously scraping said sleeves, prevent any clay from remaining on them as the presser-head descends.

Secured in the lower end of the clay-cylinder is the die 26, in which the sewer-pipes or other articles are formed, and said die is provided at points in vertical alinement with the sleeves or cores 23 with the vertical openings 27, said openings in diameter equaling or determining the external diameter of the pipes or other articles formed, as will hereinafter appear. This die is composed of an upper half provided with a number of dowel-pins 28, which project downwardly into a corresponding number of recesses 29 of the lower half, so that it will be absolutely impossible for any independent rotary movement of the upper section to take place, as the lower half only is secured rigidly but detachably within the cylinder. Said die is also provided with a vertical central passage 30, in which reciprocates the piston-rod 9. The lower member of the die is provided in its upper side and near its edge with an annular groove or channel 31, which communicates with a pipe 32, connected with an oil-supply under pressure, (not shown,) and said pipe is preferably provided with an ordinary check-valve to prevent any backflow of the oil with each descent of the presser-head. Each opening 27 at the upper end of said lower member is surrounded by an annular groove 34, which is connected by a short groove 33 with the groove 31, whereby the oil which is forced into said groove 31 may readily pass into said groove 34 and lubricate externally the pipes or articles under process of formation. To accomplish this lubrication perfectly, the inner wall 27′ terminates a little short of the plane of the upper surface of said member, as shown in Fig. 11, and interposed between said members is a rubber washer or disk 35. Said disk or disks 35, if more than one be employed, is or are provided with holes which register with and are equal in diameter to the openings 27, and at its under side, or the under side of the lowest of the disks employed, is provided with a corresponding series of annular corrugations 36, which bridge the grooves 34 and are adapted to form, under the thirty-ton (more or less) pressure applied in the descent of the presser-head, a series of radial channels through which the oil or lubricator in said grooves 34 may be forced inwardly over the wall 27′ and thus lubricate externally the pipes or other articles being formed. In order to leave the passages 33 uninterrupted at all times, the disk 35 is provided with a corresponding series of grooves 37, which bridge the grooves 33 and communicate directly with the annular series of corrugations 36. In order to distribute the clay in equal quantities to the openings 27, that the pressure upon each pipe formed may be uniform, the upper side of the die 26 is annularly grooved or turned out and is divided in this case into four equal compartments by means of four radial partitions 38, which take the place of the customary spider used in this class of machines, and which is located at some distance above the die instead of being secured to and as a part of the die, as herein shown.

38′ designates the plug-shaft, which is arranged vertically in the center of the framework 1 and is guided through the opening 39 in said frame near its lower end. At its upper end it carries rigidly the head or disk 40, provided at diametrically opposite points with vertical grooves 41, embracing snugly the vertical guide-cleats 42, secured to the inner sides of the standards or arms 2. At a suitable point said guide-cleats are cut away so as to form the notches 43, in the same horizontal plane, and journaled at opposite sides of said cleats and with their upper surfaces in the plane of said notches are the antifriction-rollers 44, the object of which will presently appear. The head of the plug-shaft is provided in this case with four vertical and upwardly-projecting guide-arms 45, said arms being preferably screwed into said head, and near their lower ends are provided with diametric enlargements 46. When the plug-shaft is in its elevated position, as shown in Fig. 1, the guide-arms 45 project upwardly and fit snugly within the depending hollow cores or sleeves 23 and the upper ends of the enlargements 46 are nearly in contact with the lower ends of said hollow cores or sleeves.

As there must be a limited amount of play between the plug-shaft head and the cleats upon which it slides, to prevent any twisting movement of the head and consequent twisting and breaking of the pipe or other article being formed under the compression of the presser-head, I provide the said head with upwardly-projecting dowel-pins 40ª, of steel or other suitable material, and said pins engage holes (not shown) formed to receive them in the lower end of the clay-cylinder.

Interposed between the plug-shaft head and the lower end of the clay-cylinder is a plate or point-board 47, which is of course provided with holes or apertures 48, through which said guide-arms 45 project, and with a central hole 49, which registers with the passage 30 of the die and the continuation 30′ of said passage in the upper end of the plug-shaft, as shown clearly in Figs. 1 and 9. Said plate is preferably rectangular in form and is provided at opposite sides with the grooves 50, whereby it is guided vertically upon the cleats 42.

In order to hold the plug-shaft rigidly in the elevated position shown in Fig. 1, I employ the following-named devices: 51 designates a lever which is formed integrally with or secured rigidly upon the pivot-bolt 52, and said bolt extends radially into a threaded passage of the plug-shaft just below its head and is adapted at times by the operation of said lever to grip or release the piston-rod 9 when the presser-head has made its compression stroke or descent. 53 53 designate a pair of sliding bolts which are fastened to said lever at opposite sides of the bolt 52 and extend in opposite directions. Near their outer ends they are guided through bearings 54 and secured to the under side of the plug-shaft head, and when the lever is in the position shown in Fig. 1 they engage the notched brackets 55 in the opposing sides of the arms or standards 2, and thereby lock the plug-shaft in its elevated position. When the plug-shaft is to be lowered, it is unlocked by swinging the lever in the direction indicated by the dotted arrow, same figure. It will be observed in this connection that when the lever is in the position shown in full lines, the bolts are advanced and the pivotal set-screw 52 is withdrawn from engagement with the piston-rod, and then when the lever is thrown in the direction indicated by said dotted arrow the bolts will be withdrawn and the pivotal set-screw will be caused to impinge firmly upon the piston-rod for a purpose which will hereinafter be made apparent.

In order to raise the plug-shaft automatically to the position shown in Fig. 1, I provide, preferably, the following mechanism: 56 designates a weight which will not quite counterbalance the weight of the plug-shaft. Said weight is connected, by means of flexible cable 57, with the eyebolt 58, projecting from the lower end of the plug-shaft, and said cable is guided over the pulleys 59, arranged below and carried by the cross-bar 60 of the framework, and the superposed pulleys 61 and 62, carried at the corresponding side of the framework. At a suitable distance below the cross-bar 60 a horizontally-operating rocking lever 63 is mounted upon the pin 64 at one end and is limited as to its movement by the pins 65. Said rocking lever when the plug-shaft has been forced downward to its lowest position is adapted to be thrown or to be forced automatically into engagement with the notch 66 in the opposing side of the plug-shaft.

A sewer-pipe, as well known, is enlarged or flanged at one end to receive the diminished end of another. Consequently for sewer-pipe purposes the openings 27 at their lower ends are diametrically enlarged, as shown at 27ª, and the pipe may be enlarged internally by means of the enlargements 46 of the vertical guides 45. As large numbers of pipe are destroyed annually, however, by reason of the fact that such enlarged ends are compelled to sustain the entire weight of the pipe while being removed from the machine, and consequently while the pipe are yet green, I have employed metallic reinforcing-rings 67, which I fit snugly upon the enlargements 46 of the guide-arms 45. Said rings each comprise the vertical body portion 68, which clasps snugly said enlargements 46, the inwardly-projecting horizontal flange 69, which rests upon the shoulder formed at the upper ends of said enlargements and consequently forms a support for the internal shoulder of the green pipe, and the outwardly-projecting horizontal flange 70 at its lower end, upon which rests the lower end of the flange or enlargement of the pipe and which in turn after the guide-arms have been withdrawn rest equally and firmly upon the plate or point-board 47.

The general operation of the machine is as follows: Supposing the parts are in the position shown in Fig. 1 and the piston at the upper end of its stroke, the clay is fed into the cylinder from its upper end. The hollow cores or sleeves 23 are also rotatably adjusted upon the plugs 20 to permit of a gradual flow of oil from the lubricating-chambers, hereinbefore described, down upon and around the guide-arms 45, and the oil under pressure is also passing to the die through the pipe 32, as hereinbefore explained. The valve 7 is now operated to permit steam under pressure to pass into the upper end of the cylinder 5 and thereby cause the presser-head to commence its descent and force the clay downwardly into the die. In this operation it is obvious that the wall of the pipe or other article formed will be of uniform thickness, owing to the fact that the hollow cores or sleeves are concentrically disposed with relation to the openings of the die and have no lateral movement at all, because they are secured rigidly at their upper ends to the plugs 20 and at their lower ends snugly embrace the vertical guide-arms 45. The lateral movement of said cores or sleeves is also insured against by rea-

son of the fact that the presser-head embraces them snugly and is itself accurately caused to reciprocate vertically by means of the guide-rollers 18, engaging the inner wall of the clay-cylinder, as hereinbefore explained. After the presser-head has moved downwardly a sufficient distance to form or shape the pipe or other articles, but before the piston has completed its stroke, the lever 51 is thrown in the direction indicated by the dotted arrow, and the screw 52 thereof impinges firmly upon the piston-rod 9, and the bolts 53 are simultaneously withdrawn from the notches 55. As this is done the continued movement of the piston is accompanied at the same speed by the plug-shaft, or, in other words, the motion of the descending presser-head and the plug-shaft is made uniform, so as to avoid stretching or further compression and consequent bending of the pipe or articles being formed. This downward movement continues until the presser-head reaches the upper end of the die and the plate or point-board 47 has assumed a position opposite the notches 43 of the guide-cleats and rests upon the rollers 44 and the upper ends of the core-guides are a slight distance below the plane of the lower end of the clay-cylinder. The plug-shaft is now locked in this position from farther descent by the engagement, automatic or otherwise, of the lever 63 with the notch 66, and the lever 51 is operated to cause the set-screw 52 to release the piston-rod. The steam is then caused to enter the opposite or lower end of the cylinder 5 and the piston is raised until the lower end of the piston-rod rises a slight distance above the plane of the lower side of the die. As there is nothing in the way and the oil fed downward through the hollow cores or sleeves and around the said core-guides has in the meantime come in contact with and lubricated the internal surface of the pipes or articles formed to facilitate the withdrawal of the core-guides, the green pipe or other articles being formed are cut off in any suitable manner, preferably, however, by means of the customary wire. (Not shown.) Immediately this operation takes place the plug-shaft automatically and slowly descends by reason of the fact that it more than counterbalances the weight 56, which consequently rises. This movement continues until the core-guides 45 are entirely withdrawn from the pipes and through said point-board. The plate or point-board 47, with the green pipe or other articles formed, is now withdrawn from the frame and conveyed and deposited at the required point, and after they have been baked, or at any time after the flanges have become sufficiently strong to withstand the weight of the pipe, the thin metallic rings forming cores for said flanges are removed. Immediately the said plate or point-board is removed it may be replaced by another, so that the operation of the machine may be practically continuous. When it and the plug-shaft have assumed the position shown in full lines, Fig. 1, and have been locked in such position by the proper manipulation of the lever 51, through the medium of the bolts 53, and a suitable quantity of clay has been fed into the clay-cylinder, the machine is ready for the second impression-stroke of the presser-head. All succeeding operations are repetitions of those described.

In case it be desired to form drain-tile of the same diameter throughout—that is, without flanges at one end—the lower half of the die shown in Fig. 1 is removed and that shown in Fig. 11 substituted in its place, the latter, it will be observed, having passages or openings of the same diameter throughout. In this case the hollow cores or sleeves 23 must fit squarely upon and be of the same external diameter as the enlargements 46 of the core-guides, or core-guides without such enlargements may be substituted and the hollow cores or sleeves be of sufficient length to rest squarely at their lower ends upon the point-board or plate 47. In either case the effect is the same.

In case it be desired to form cylindrical earthenware having a closed bottom the hollow cores or sleeves will be replaced by the sleeves or cores 23^a, having closed lower ends, and consequently the core-guides of the plug-shaft and the holes or openings of the point-board or plate will be dispensed with, the latter being imperforate except at the point through which the piston-rod 9 reciprocates. These sleeves or cores 23^a will preferably be slightly shorter than those first described in order to provide room below them to receive the clay forced down by the presser-head, as shown clearly in Fig. 11. It will be noted in this connection that the distance between the point-board or plate and the closed lower ends of the sleeves or cores determines the thickness of the bottom or closed end of the articles formed, and this distance may be varied by vertically adjusting said cores or sleeves or the plugs 20, as will be readily understood.

From the above description it is obvious that I have produced an apparatus for manufacturing a plural number of sewer-pipe, drain-tile, earthenware receptacle, or analogous articles which embrace the advantageous features enumerated in the statement of invention as desirable, it being understood, of course, that I reserve the right to make such changes or substitute such mechanical equivalents as shall be deemed necessary or desirable without departing from the spirit and scope or sacrificing any of the advantages of the invention.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus of the character described, the combination with a clay-cylinder, a superposed plate, plugs depending therefrom, and cores mounted upon said plugs and depending vertically into the clay-cylinder, of a presser-head mounted upon said cores

and adapted to reciprocate in said cylinder, substantially as described.

2. In an apparatus of the character described, the combination of a clay-cylinder, a superposed plate, plugs depending therefrom and annularly grooved at their middle and threaded at their lower ends and vertically grooved, hollow cores or sleeves screwed upon the threaded ends of said plugs and overlapping partially the grooves of the same so as to form lubricator-chambers, and provided with internal flanges adapted to close the lower ends of the said vertical grooves and thereby prevent the lubricant escaping from the reservoir or chamber, substantially as described.

3. In an apparatus of the character described, the combination with a clay-cylinder, a multiple die therein, provided with a central passage, a point-board bearing against the lower end of the cylinder and die, a plug-shaft supporting said point-board in such position, devices locking said plug-shaft in its elevated position, a series of cores extending vertically through the cylinder and the die, a piston-rod extending through the die, a presser-head mounted rigidly upon said piston-rod and perforated to receive said cores, means to force said piston-rod downward, and means to simultaneously unlock the plug-shaft from its elevated position and lock it rigidly to the descending piston-rod, substantially as and for the purpose set forth.

4. In an apparatus of the character described, the combination with a clay-cylinder, a multiple die therein, a headed plug-shaft, core-guides projecting from the same vertically upward through the die and the cylinder, hollow cores or sleeves mounted upon said core-guides, a point-board interposed between the head of the plug-shaft and the lower end of the cylinder and die and provided with perforations through which the core-guides extend, and a presser-head mounted slidingly upon said cores or sleeves and adapted to reciprocate within the cylinder, substantially as described.

5. In an apparatus of the character described, the combination with a clay-cylinder, a multiple die therein, hollow cores or sleeves extending vertically through said cylinder and said die, a reciprocatory rod extending through a central passage in the die and a presser-head perforated to receive said hollow cores or sleeves and mounted rigidly upon said rod, of a reciprocatory plug-shaft, core-guides projecting vertically upward from the same and into said hollow cores or sleeves, a perforated point-board resting upon the head of the plug-shaft and provided with holes through which said core-guides extend, lever-actuated plates locking the plug-shaft and point-board in their elevated position at the lower end of the cylinder and guide, means to force the presser-head downwardly to compress the clay within the die and around said cores and to cause said rod to descend through an opening in the point-board and into the upper end of the plug-shaft, means to support the point-board in a certain horizontal plane when the plug-shaft has reached a certain point in its descent, and the upper ends of the core-guides are below the lower ends of the cylinder and die, means to lock said plug-shaft in such depressed position until the pipe or articles formed have been severed and then to unlock it to permit the core-guides to be withdrawn entirely from said pipe that the point-board supporting the same may be removed, and devices to reëlevate said plug-shaft at the proper time, substantially as described.

6. In an apparatus of the character described, the combination with a clay-cylinder, a multiple die therein, and a plug-shaft provided with core-guides extending through said die and cylinder, of a plate superposed with relation to the cylinder, hollow cores or sleeves suspended vertically therefrom and embracing snugly said core-guides, and a presser-head mounted slidingly upon said hollow cores or sleeves, substantially as described.

7. In an apparatus of the character described, the combination with a clay-cylinder, a die therein provided with a plural number of openings diametrically enlarged at their upper ends, a plug-shaft at the lower end of said cylinder, core-guides projecting upwardly from the same, through the die and enlarged diametrically at their lower ends, an apertured point-board resting upon the plug-shaft, hollow cores or sleeves extending vertically and centrally through the openings of the die and embracing snugly the diminished upper portions of the core-guides, and a presser-head mounted slidingly upon said cores or sleeves, substantially as described.

8. In an apparatus of the character described, a clay-cylinder, and a die therein divided horizontally into two members provided with vertically-alined openings to determine the form and external diameter of the pipe or other articles formed, an oil-channel in the lower half of the die connected to a suitable pressure-supply, annular grooves or channels surrounding the openings of the lower half of the die having their inner walls terminating short of the plane represented by the upper face of the lower half of the die, connecting grooves or channels between said annular channels and the first-named annular channel, and a gasket of elastic material interposed between the halves of the die and provided with annular series of corrugations bridging the channels surrounding the openings of the die, substantially as described.

9. In an apparatus of the character described, the combination with a clay-cylinder, a multiple die therein, enlarged internally at its lower end, cores depending vertically and centrally through said die, and a reciprocatory presser-head to compress the clay in the cylinder and through the die, of a vertically-

adjustable plug-shaft below the cylinder, core-guides projecting upwardly into said cores, and provided at the lower end of the die with enlargements, a point-board resting upon the plug-shaft and provided with openings through which said core-guides project, and rings embracing loosely said core-guides and adapted to form a lining for the flange formed at the lower end of the pipe produced by compressing clay in the die, substantially as described.

10. In an apparatus of the character described, the combination with a clay-cylinder, a reciprocatory presser-head thereon, a multiple die therein, and cores extending vertically through said die, of a plug-shaft vertically adjustable below said cylinder, and provided with upwardly-projecting dowel-pins projecting into openings in the lower end of the cylinder at times, a point-board resting upon said plug-shaft and provided with openings through which said dowel-pins extend, and core-guides projecting upwardly from said plug-shaft through said point-board and into said cores, substantially as described.

11. In an apparatus of the character described, the combination with a framework, a clay-cylinder in the framework, a multiple die therein, provided with a central hole, cores extending vertically through said die, a piston-rod depending into the central opening of the die, and a presser-head mounted rigidly upon said rod and embracing said cores, of a plug-shaft vertically grooved at opposite points and suitably guided and provided with a central hole in alinement with the piston-rod, and with core-guides for said cores, a set-screw carried by said plug-shaft and provided with an arm or lever, sliding bolts suitably guided and pivotally connected to said lever at opposite sides of the set-screw and adapted to engage notches in the framework of the apparatus, and a point-board resting upon the plug-shaft and provided with openings through which the core-guides extend, and with a central opening in alinement with the piston-rod, substantially as and for the purpose set forth.

12. In an apparatus of the character described, the combination with a clay-cylinder, a presser-head and cores extending through the clay-cylinder, and around which the presser-head compresses the clay, of a multiple die in the cylinder surrounding the said cores, and annularly grooved or hollowed out at its upper end and partitions equally dividing the grooved upper end of the die and corresponding in number to the die openings or cores, substantially as described.

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

DANIEL SPOONER.

Witnesses:
A. M. PERKINS,
MARY D. LAWRENCE.