T. E. DANIELS.

Machine for Molding Concrete Pipe, Drain Tile, &c.

No. 166,264. Patented Aug. 3, 1875.

Fig. 1.

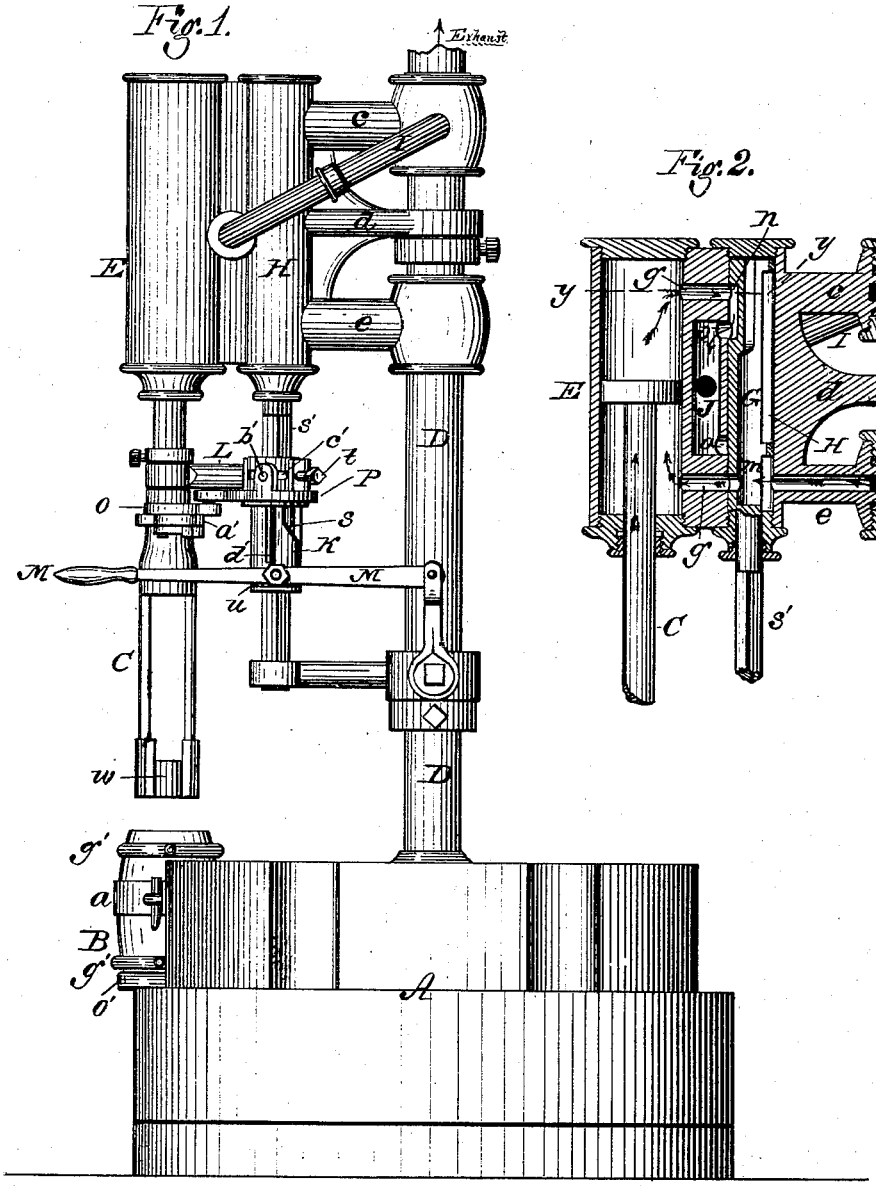

Fig. 2.

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Donn Twitchell

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2 Sheets--Sheet 2.

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Fig. 3.

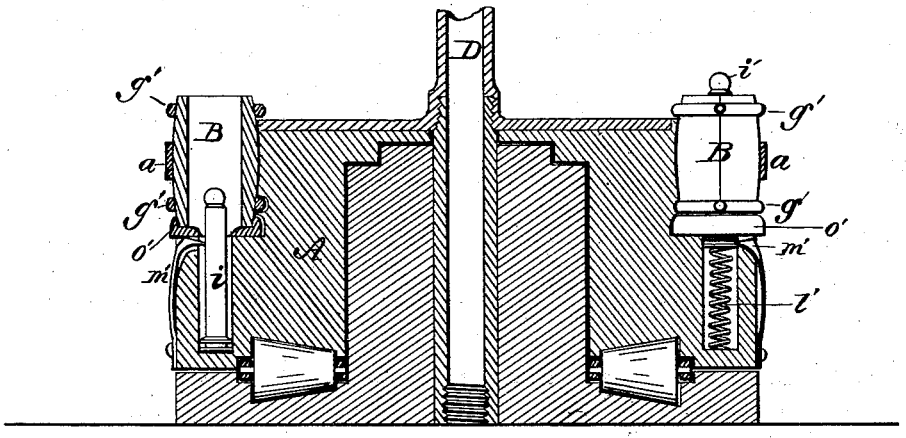


Fig. 5.

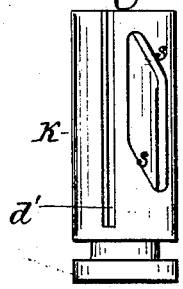


Fig. 4.

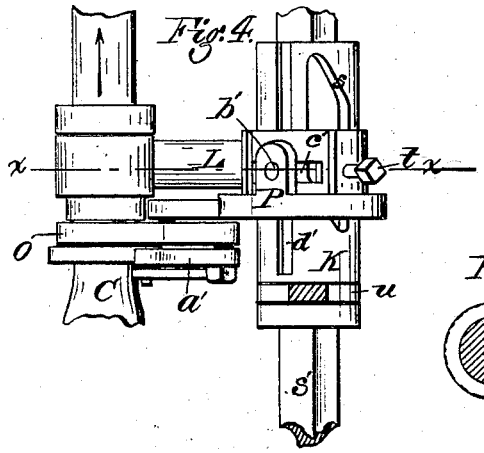


Fig. 9.

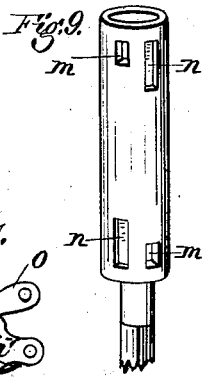


Fig. 7.

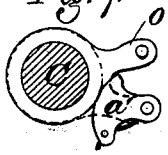


Fig. 10.

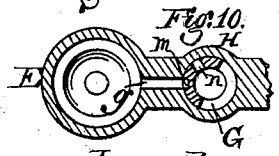


Fig. 6.

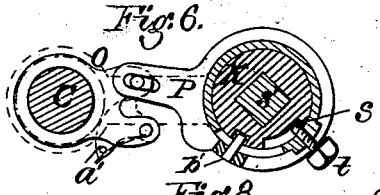
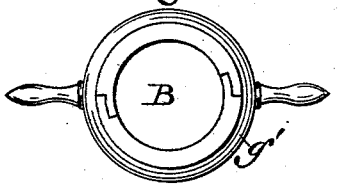


Fig. 8.



Witnesses:
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UNITED STATES PATENT OFFICE.

TAYLOR E. DANIELS, OF DETROIT, MICHIGAN.

IMPROVEMENT IN MACHINES FOR MOLDING CONCRETE PIPE, DRAIN-TILE, &c.

Specification forming part of Letters Patent No. **166,264**, dated August 3, 1875; application filed May 13, 1875.

To all whom it may concern:

Be it known that I, TAYLOR E. DANIELS, of Detroit, in the county of Wayne and State of Michigan, have invented certain Improvements in Machines for Molding Concrete Pipe, Drain-Tile, &c., of which the following is a specification:

My invention consists in the combination of a circular table, provided with a series of detachable molds on its periphery, and a steam hammer or tamp, so arranged that it may be caused to enter either one of the molds at will; in supporting the hammer by a hollow post located in the center of the table, and arranged to conduct steam to the hammer; in a peculiar construction of the oscillating steam-valve; in a peculiar construction and arrangement of the valve-gear, enabling the operator to control perfectly the movement of the hammer; in cutting away the head of the hammer in such manner that the concrete or other material may be fed into the mold while the hammer is at work; in devices for imparting to the hammer-head a rotary motion, to insure a uniform hardness of the pipe; in constructing the molds of two parts, tongued and grooved, and held together by outside bands; in the use of vertically-sliding cores, connected to spiral springs at their lower ends, and held up in place by catches, so that when released they will be drawn down out of the way to permit the removal of the molds, and in other details, as hereinafter described.

Figure 1 represents a side elevation of my machine; Fig. 2, a vertical central section of the cylinder, valve, and hollow supporting-post; Fig. 3, a vertical central section through the base of the machine; Fig. 4, a side view of the valve-gear; Fig. 5, a side view of the rotating sleeve which operates the valve and the hammer-rotating devices; Fig. 6, a cross-section of the valve-gear on the line *x x;* Fig. 7, a view showing the construction and arrangement of the devices for rotating the hammer; Fig. 8, a top-plan view of one of the molds; Fig. 9, a perspective view of the steam-valve detached; Fig. 10, a cross-section of the valve and valve-seat on the line *y y* of Fig. 2.

The machine consists, essentially, of a circular table, A, provided on its periphery with a series of removable upright molds, B, and of a steam hammer or tamp, C, sustained by a standard, D, in the center of the table, and arranged in such manner that it may be caused to enter the different molds in succession.

The table and molds may be made stationary, and the hammer arranged to swing around the standard over the molds; or the hammer may be stationary, and the table arranged to rotate, in order to bring the molds in succession under the hammer.

As I prefer to employ the fixed table and movable hammer, I will first describe the machine as constructed in that manner.

The table A is made of a circular form, and provided in its periphery with a series of seats or steps to receive upright cylindrical molds B, each of which is seated solidly upon its lower end, and also seated half its diameter into the side of the table, in order to prevent lateral displacement and insure a true vertical position.

Each mold is held in place by an outside band, *a*, which is hinged at one end to the table, and secured at its opposite end by a staple and a tapered key or pin, so that the mold may be quickly released and removed after the pipe has been formed therein. The hammer-head or tamp C is attached to the lower end of a piston-rod, the piston of which plays up and down in a vertical steam-cylinder, E, which is sustained in position by means of three lateral arms, *c*, *d*, and *e*, formed on its side, and journaled upon or around the hollow standard D, which is secured rigidly in the center of the table A, as shown.

The arms of the cylinder are arranged to turn freely on the standard, so that the cylinder may be swung around the standard, and the hammer thereby brought in position to enter either one of the series of molds B.

The construction and operation of the cylinder and piston are the same as in the ordinary steam hammers and engines, the cylinder being provided at its ends with ports *g*, through which steam is admitted alternately above and below the piston. The inlet and outlet of the steam is controlled by means of a vertical rotating valve, G, mounted in a steam chest or chamber, H, on the side of the cylinder. The steam is admitted from the boiler into the hol-

low standard D, and, escaping through holes *h* made therein, passes through the lower arm *e* of the cylinder, which is made hollow for the purpose, into the steam-chest, whence it is admitted to the cylinder. The exhaust steam is conducted through a pipe, I, into the upper end of the hollow standard D, from which it is exhausted into the open air, or conducted wheresoever it may be required. The hollow standard is closed by a transverse partition, *i*, just above the outlet-holes *h*, in order to prevent the escape of the live steam, except toward the cylinder, and to prevent the commingling of the live and the dead steam. The dead steam is discharged into the standard through holes *k*, as shown in Fig. 2, the holes being made at a point inside of the arm *c*.

In order to permit a free passage of the steam into and out of the standard, annular grooves *l* are made in the cylinder-arms around the standard, directly opposite the holes therein, so that the turning of the arms upon the standard does not affect the steam-passages.

The steam-chest and the valve G are made cylindrical in form, and the valve cut away on its back in such manner that it always permits the steam to pass freely from the hollow arm *e* into the chest or chamber H.

As shown in Fig. 9, the valve is provided at each end with a hole or port, *m*, passing through it from front to back, and with a groove or channel, *n*, lengthwise in its front face, near the hole, the hole at each end of the valve being in line with the groove or channel at the other.

Between the chest or chamber H and the cylinder E there is a chamber, J, communicating with the exhaust-pipe I, and provided at each end with a hole, *o*, leading into the chest or chamber H.

In operating the machine, the valve is rotated back and forth, so that at each end the port *m* and the channel *n* are alternately brought opposite the corresponding port *g* of the cylinder, the construction being such that when the hole at either end of the valve registers with one port of the cylinder the channel at the opposite end will register with the other port.

When the valve stands in one of its two positions, as shown in Figs. 2 and 10, steam will be admitted through the hole in the lower end of the valve into the cylinder, while at the same time steam will be permitted to escape from the upper end of the cylinder, through the channel *n* in the upper end of the valve, into the chamber J, whence it passes off through the pipe I, and out through the upper end of the standard D.

When the valve is turned to its opposite position steam will be admitted through the upper end of the valve into the cylinder, and from the lower end of the cylinder, out through the channel in the lower end of the valve, into chamber J.

It will thus be seen that by giving the valve a rotary reciprocating motion the steam is permitted to pass into and out of the cylinder in the proper manner to work the piston and hammer up and down.

The arrangement by which the rotary motion is imparted to the valve is clearly shown in Figs. 1, 4, 5, and 6. The valve is provided with a square stem, *s'*, extending downward and supported at its lower end in an arm or bracket on the standard D, as shown. On the valve-stem there slides a closely-fitting sleeve, K, which plays freely through a hole in the end of an arm, L, which latter is secured to and carried up and down with the hammer. The sleeve K is provided in its outer surface with recesses or depressions having inclined ends *s*, and the arm L, which encircles the sleeve, is provided with screws *t*, the ends of which enter the depressions in the sleeve, so that, as the arm L is carried up and down with the hammer, its screws *t* strike the inclines *s*, and thereby turn the sleeve K back and forth, so as to impart the rotary motion to the valve-stem and valve. The sleeve is provided at its lower end with a swivel band or collar, *u*, which is pivoted to a hand-lever, M, the end of which is pivoted to a link attached to the main standard, as shown in Fig. 1, so that the operator grasping the lever can raise and lower the sleeve and hold the same at any point desired. When the sleeve is held fast the hammer-piston will have a stroke equal in length only to the distance between the inclines *s* at the two ends of the sleeve; but, by raising and lowering the sleeve, the stroke may be lengthened and shortened as required, and the ascent and descent stopped at any desired points.

When operating the machine the concrete or other material is fed gradually into one of the molds at a time, and the hammer caused to solidify and pack the same therein by a series of short rapid strokes. When commencing operations the sleeve is lowered and held almost stationary, so that the hammer has a short stroke in the foot of the mold, and then, as the mold fills up, the sleeve is gradually raised to limit the descent of the hammer, the length of the stroke, however, remaining the same.

It will thus be seen that by simply operating the lever the movements of the hammer may be controlled perfectly and varied in any manner desired.

In order to permit the gradual feeding of the material into the mold while the hammer is working therein, the sides of the hammer are cut away, as shown at *w*, Fig. 1. This construction enables me to feed the material into the long molds gradually and continuously while the hammer is operating with a short stroke in the foot thereof.

In order to insure an even and uniform packing of the material by the hammer with its recessed sides, I give the hammer a rotary motion. The manner in which this is done is represented in Figs. 1, 4, 6, and 7. An arm, O, is mounted on the hammer or piston rod

in such manner as to turn freely thereon, and is provided with a spring friction-dog, a', pivoted in such manner that it will take hold and turn the rod when the arm O is moved to the left, but pass back freely when the arm is moved to the right. This arm O is provided with a stud entering the slotted end of an arm, P, which is mounted around the arm L and sleeve K, and provided with studs b', which pass through horizontal slots c' in said arm into vertical slots d' in the sleeve, as shown in Figs. 4 and 6. While this arrangement admits of the sleeve playing vertically without affecting the rotating devices, the rotary motion of the sleeve turns the arm P, which operates the arm O, and causes the dog a' to rotate the hammer. Each mold B is divided lengthwise through its middle into two parts, the edges of which will be provided with a tongue and groove, or with a lap-joint. The two parts are held together by two encircling bands, g', which are slipped on over the ends, the latter being slightly tapered to keep the bands in place, and to enable the operator to force the two parts tightly together. Each mold is also provided with a metal foot-plate, o', having a narrow flange or rim to fit up around the end of the mold and assist in holding its parts together, as well as to hold the mold in the precise position desired. The foot-plates remain in place on the table, when the molds are taken off to remove the pipe therefrom. Each mold, when in use, contains a central vertical core, i', to produce the bore or opening in the pipe, as shown in Fig. 3. These cores are mounted in the table A in such manner as to slide vertically, and are connected at their lower ends to spiral springs l', which tend to draw them down. They are provided at their lower ends with grooved heads, into which flanges m' engage, as shown, to hold them up in position.

After a mold is filled and the section of pipe molded complete therein, the catch is drawn back, and the spring at once draws the core down out of the mold, leaving the same free to be lifted from the table in order to remove the pipe. After the mold is removed the bands are drawn off by means of their handles, and the two parts separated, leaving the pipe complete and perfect. After the removal of the pipe the mold is again secured together, the core drawn up in position, and the mold placed on the table, as before. By arranging the series of molds around the circular table, and arranging the hammer so that it will act upon the various molds in succession, the machine is adapted for rapid operation, and the removal and replacement of the molds rendered a convenient and easy matter. By arranging the valve-gear in the manner described the operation of the hammer can be varied, as circumstances may require, and controlled perfectly. By cutting away the hammer-head and giving it the rotary motion I am enabled to mold long sections of pipe rapidly, without stopping the action of the hammer or causing it to rise out of the mold, and to render the pipe of a uniform hardness. By sustaining the revolving cylinder and the attendant parts on the central standard, and passing the steam through the same, I render the machine simple and compact, dispense with a frame, and leave the entire table clear and unobstructed, so that the molds may be filled, removed, and replaced without hinderance or obstructions of any kind in the way. By arranging the cores to slide down in the manner described I save the labor of raising the mold therefrom, and prevent the danger of injuring the pipe in removing the core.

When for any reason it is undesirable to have the cylinder swing around it may be made stationary, and the table mounted on rollers and arranged to revolve, as shown in Fig. 3, to bring the molds in succession under the hammer. In such case the hammer may be supported by an outside frame instead of by the central standard, and a stationary feeding apparatus may be arranged around or beside the hammer to supply the concrete or other materially gradually to the mold.

It is obvious that the form and size of the molds may be varied as desired.

Having thus described my invention, what I claim is—

1. In combination with the circular table A, provided with the series of molds B, the steam-hammer, mounted upon and swinging around the central standard D, substantially as shown and described.

2. In combination with the steam-cylinder E, the hollow standard D, serving both to support the cylinder and conduct steam thereto, substantially as shown and described.

3. In a pipe-molding machine constructed and operating substantially as shown and described, the steam-cylinder, provided with the ports g, and the valve-chest H, provided with the ports o, in combination with the hollow rotary valve G, having the openings m and channels n, as shown.

4. In combination with the stem s' of the rotating valve G, the sleeve K, provided with the inclines s, and the arm L, attached to the piston-rod, and provided with pins to act upon the inclines of the sleeve.

5. In combination with the cylinder and piston, operating the hammer, and the rotary valve, constructed as shown, to control the admission of the steam, the vertically-sliding sleeve K, held and controlled by a hand-lever, and provided with the inclines s, and the arm L, attached to the piston-rod and provided with projections, to impart a rotary motion to the sleeve, as described, whereby the operator is enabled to control the rise and fall of the hammer, as required.

6. In combination with the hammer, having a recess, w, in the side of its head, the arm O and dog a', operating substantially as described, to give the head a rotary motion.

7. The molds B, made in two parts, and se-

cured together by the outside bands g', as shown, the ends of the mold being tapered, and the edges of the parts jointed together, as described.

8. The vertically-sliding cores i', mounted in the table A, and connected to the springs l', in combination with a catch for sustaining them in position.

9. The detachable molds B, in combination with the table A, recessed in the manner shown, to receive and sustain them, and the band a or other fastening, for retaining them in place.

10. In a pipe-molding machine, the combination of a vertical mold, a steam-hammer working therein, and a vertically-adjustable valve-gear controlled by a hand-lever, constructed and operating substantially as shown and described, so that by gradually moving said lever the descent of the hammer may be limited as the mold fills up without changing the length of its stroke.

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