(No Model.) 2 Sheets—Sheet 1.

J. R. BURDICK & W. H. DAVIS.

SEWER PIPE MACHINE.

No. 292,535. Patented Jan. 29, 1884.

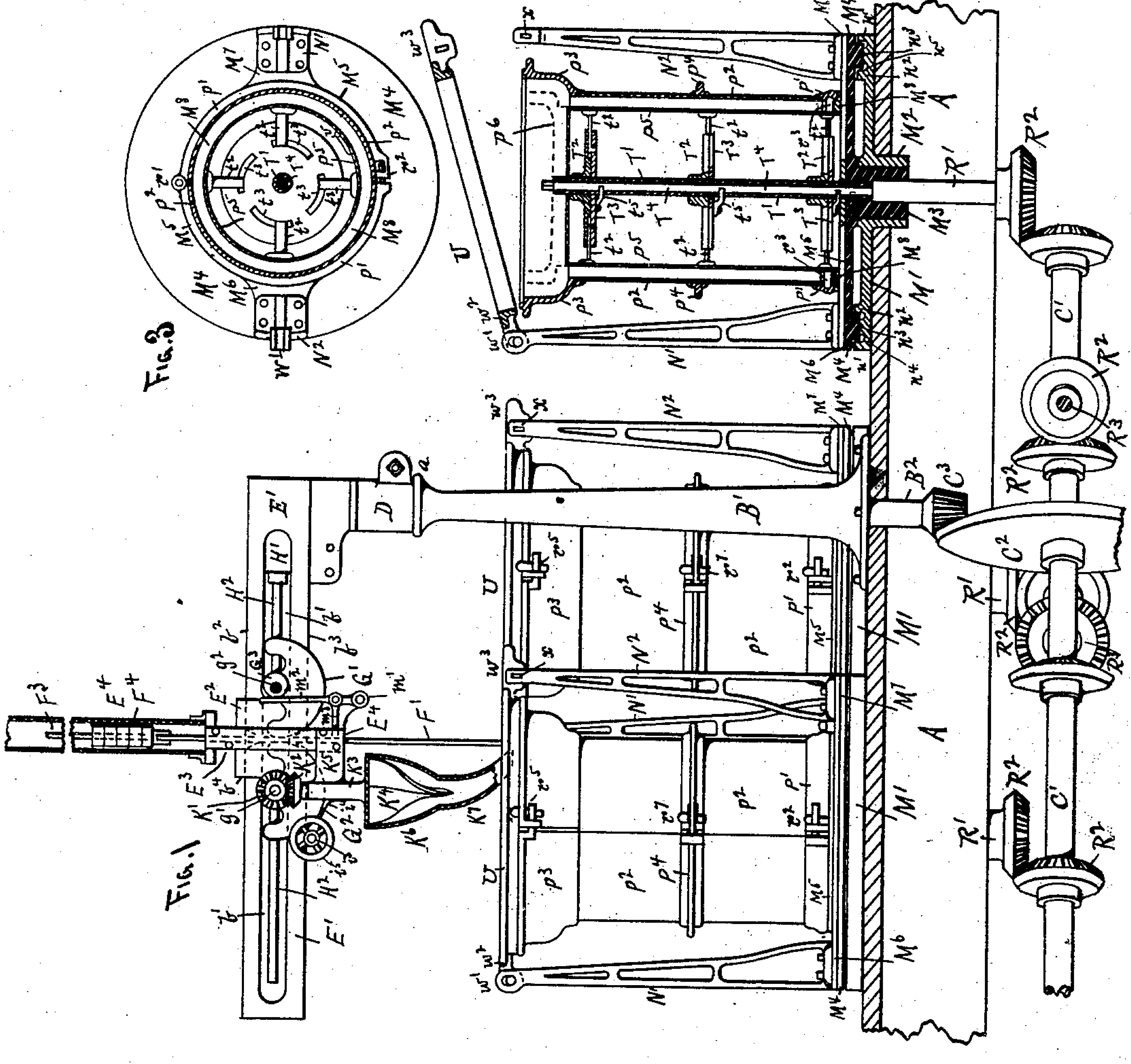

FIG. 3

FIG. 1

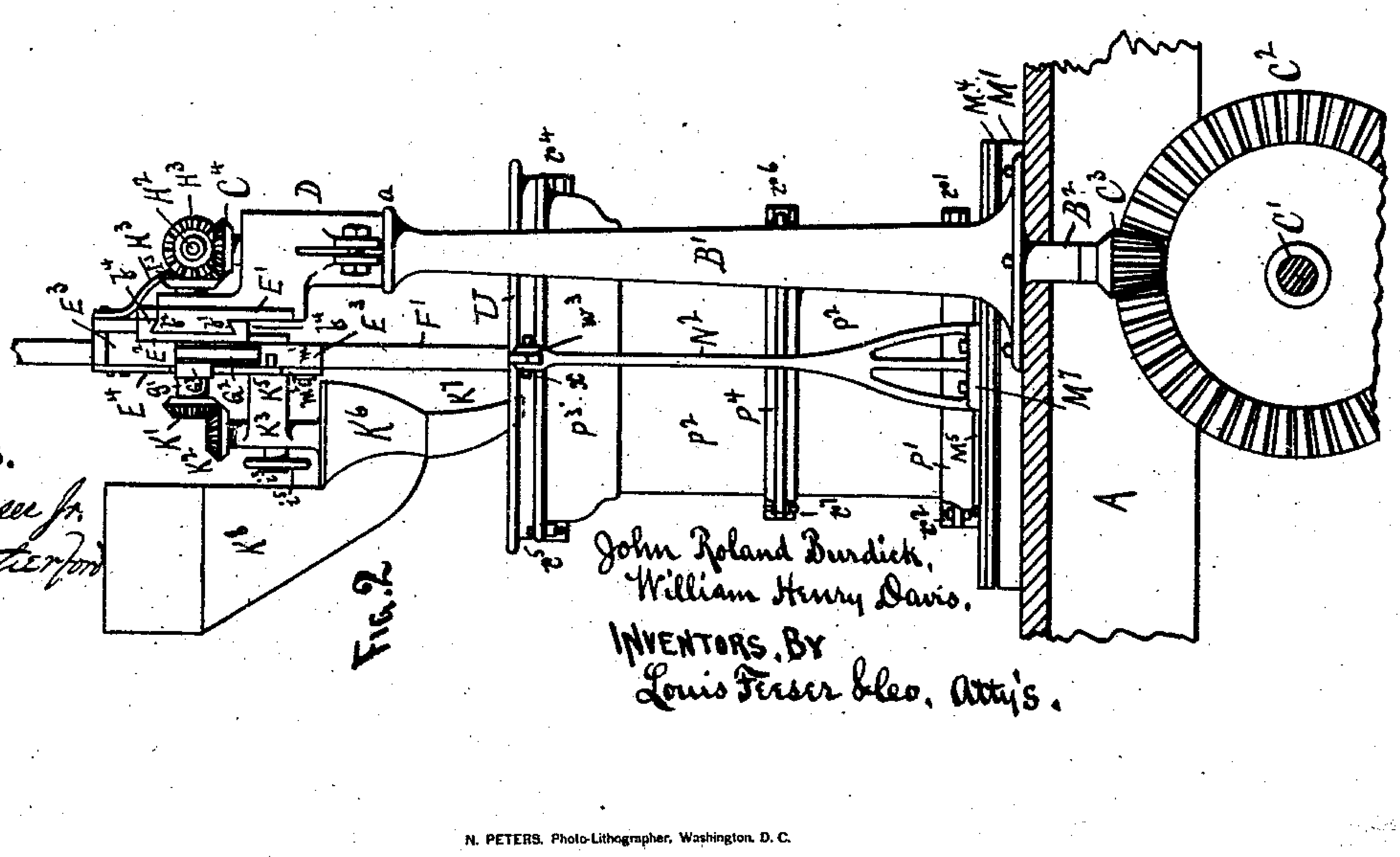

FIG. 2

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John Roland Burdick,
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INVENTORS, BY
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N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. R. BURDICK & W. H. DAVIS.

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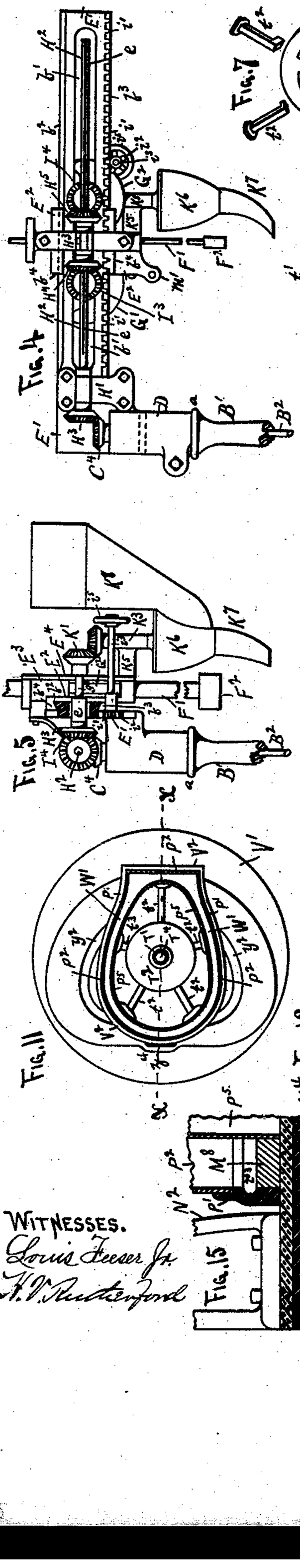

Fig. 4

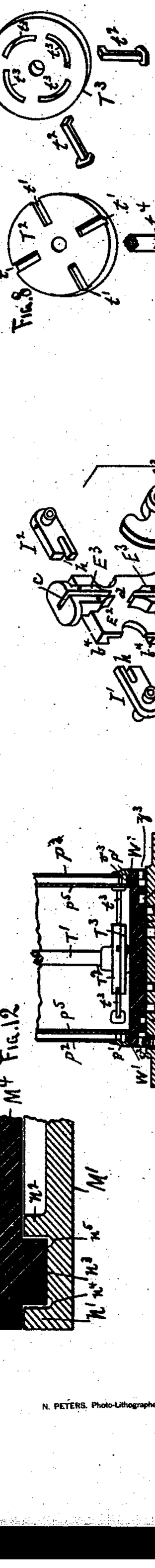

Fig. 7

Fig. 8

Fig. 9

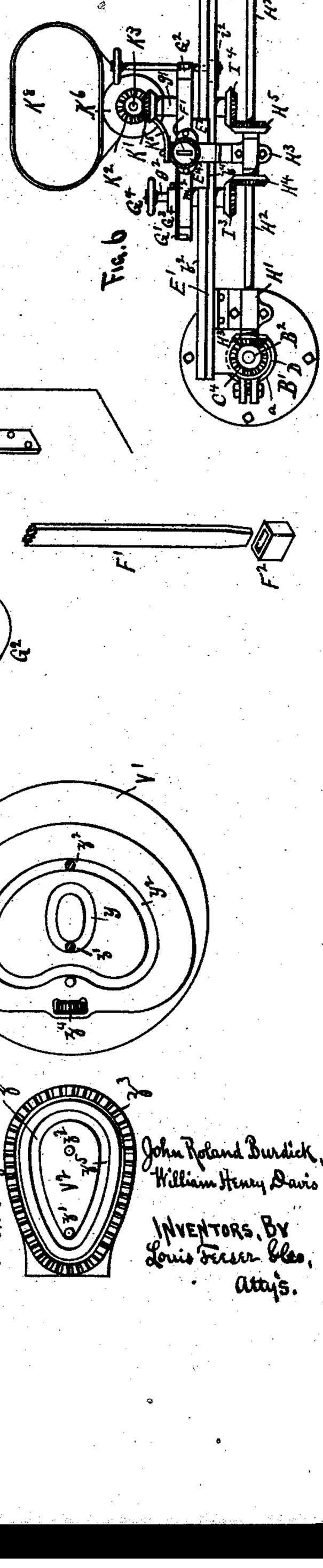

Fig. 6

Fig. 5

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 15

Fig. 14

WITNESSES.
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UNITED STATES PATENT OFFICE.

JOHN ROLAND BURDICK AND WILLIAM H. DAVIS, OF MINNEAPOLIS, MINN.

SEWER-PIPE MACHINE.

SPECIFICATION forming part of Letters Patent No. 292,535, dated January 29, 1884.

Application filed February 21, 1883. (No model.)

To all whom it may concern:

Be it known that we, JOHN ROLAND BURDICK and WILLIAM HENRY DAVIS, both citizens of the United States, and both residing at Minneapolis, in the county of Hennepin, in the State of Minnesota, have invented certain new and useful Improvements in Sewer-Pipe Machines, of which the following specification is a full, clear, and exact description, reference being also had to the accompanying drawings, in which—

Figure 1 is a front view of the tamping mechanism and three of the pipe-molds, one of the latter being in section. Fig. 2 is an end view of the tamping mechanism, and a side view of one of the molds. Fig. 3 is a plan view of the revolving mold-bed, and a horizontal sectional view of the mold arranged thereon. Fig. 4 is a rear view, Fig. 5 is a cross-sectional view, and Fig. 6 is a plan view, of the tamping mechanism. Figs. 7, 8, and 9 are detached and disconnected perspective views of the core-expanding mechanism. Fig. 10 shows detached and disconnected perspective views of the tamping-bar-operating mechanism. Fig. 11 is a plan view of the mold-bed plate, and a horizontal sectional view of the mold arranged therein. Fig. 12 is a longitudinal sectional view on the line *x x* of Fig. 11. Fig. 13 is a plan view of the mold-bed plate; and Fig. 14 is an inverted view of the mold, illustrating the manner of constructing and operating the mold to form egg-shaped pipe. Fig. 15 is an enlarged sectional view of a portion of the mold and its bed-plate, illustrating more fully its construction.

A is the floor upon which the machinery is set, and B′ is a cast-iron standard secured to said floor, and having an upright shaft, B^2, running through it and projecting downward through the floor, and adapted to be revolved by a horizontal shaft, C′, and bevel-gears C^2 C^3, and projecting upward through the upper end of the standard, and having upon said projecting upper end a miter-pinion, C^4.

Surrounding the upper part of the standard B′ is a large "collar" or "head," D, supported by a shoulder, *a*, on the standard, and adapted to turn freely thereon. Attached to this head D, and running off at right angles thereto, is a frame, E′, having an open-slotted central part, *b*′, and "dovetail" upper and lower edges, b^2 b^3.

E^2 is a flat plate, resting across the face of the frame E′, and having ribs or guides b^4, adapted to fit over the dovetail edges b^2 b^3, so that while said plate is free to be moved back and forth along the frame E′ it cannot be removed therefrom, except by drawing off from the ends of the frame.

Formed upon the outer face of the plate E^2 is a projection, E^3, having an upright slot, *c*, in which a flat upright rod or bar, F′, is adapted to slide up and down freely, being held in place within the slot *c* by a face-plate, E^4, attached to the projecting part B^3. The central portion of the projecting part E^3 is cut out, as shown at *d* in Fig. 10, to permit the cams G′ G^2 to come in contact with the sides of the bar F′, as hereinafter shown.

Upon the rear of the frame E′, near the head D, is a hanger or bracket, H′, supporting one end of a horizontal shaft, H^2, which runs outward parallel with the frame E′ and opposite the center of the slot *b*′, and at right angles to the shaft B^2 of the standard B′. Upon the end of this shaft H^2, between the hanger H′ and head D, is a miter-pinion, H^3, adapted to engage with the miter-pinion C^4 on the shaft B^2, by which the revolution of the shaft B^2 will be communicated to the shaft H^2, and at the same time by this arrangement the head D and its attached frame E′ may be revolved around the standard B′ without interfering with the action of the shafting.

H^3 is another bracket or hanger, attached to the rear part of the plate E^2, and adapted to support the shaft H^2 at that point, and mounted loosely upon this shaft H^2, upon opposite sides of the bracket H^3, are two oppositely-facing miter-gears, H^4 H^5. The shaft H^2 has a horizontal feather or groove, *e*, cut in its whole length, in which keys in the interior of the gears H^4 H^5 fit loosely, so that while the plate E^2 and its attached parts may be moved freely back and forth along the frame E′ and carry the gears H^4 H^5 with it, the latter will be revolved with the shaft H^2 at all times independently of the position of the parts upon the frame E′. If preferred, the pinions H^4 H^5 may be made fast upon the shaft H^2, and the latter made to slide through the hanger H′

and the pinion H^3, this pinion H^3 having a key on the interior of its hub to fit into the feather *c*. The action, however, is the same in both cases.

I' I^2 are two small slides, fitting loosely within the slot *b'*, and attached by their inner ends to the rear face of the plate E^2, and with their outer ends adapted to carry small horizontal shafts g' g^2, as shown. These small shafts pass through the slot *b'* and plates I' I^2, and are provided on their rear ends with miter-gears I^3 I^4, engaging with the gears H^4 H^5 on the shaft H^2. By this means the shafts g' g^2 are revolved in opposite directions through the medium of the gears and shafts, as shown.

Fixed upon the outer ends of the shafts g' g^2 are two segmental cams, G' G^2, having faces formed of leather or similar substance, and adapted to be revolved in surface-contact with the opposite sides of the bar F', as shown in Fig. 1. By this arrangement, when the cams G' G^2 are revolved toward each other, the segmental parts of the cams will catch the bar F' between them and elevate it a distance equal to the length of the arc of the circle of their faces, and then leave the bar and allow it to drop of its own weight when the flat portions of the cams are opposite the bar. By this construction of the cams the bar F' will be raised up and allowed to drop once in every revolution of the shafts g' g^2, to "tamp" the plastic material of which the pipes are formed into the molds, as hereinafter described. The lower end of the bar F' is provided with a removable shoe or foot, F^2, as shown, to increase the tamping-surface of the bar.

The slides I' I^2 will be provided with small open-ended slots *h*, (see Fig. 10,) by which they are attached to the plate E^2, so that they may be adjusted to regulate the amount of the pressure of the cams G' G^2 upon the bar F', or to set the cams nearer to each other when worn. The shaft g' is continued outward beyond the cam G', and provided with a miter-gear, K', engaging with another miter-gear, K^2, upon an upright shaft, K^3, having upon its lower end a screw feeding device, K^4. This shaft K^3 is held by a hanger, K^5, attached to any suitable part of the plate E^2 or its attachments, so that they will be carried along the frame E' together, and the screw-feeder K^4 is surrounded by a conical casing, K^6, having a curved outlet, K^7, at the bottom, and a large supply hopper or reservoir, K^8, leading into its upper part, as shown, this conical casing K^6 being firmly attached to the hanger K^5. By this means the plastic material of which the pipes are formed, being placed in the hopper K^8, will be fed by the screw K^4, out through the exit K^7 in an even regular stream at a point in close proximity to the bar F', as shown.

i' is a rack formed upon or attached to the lower edge of the frame E', at a point so as not to interfere with the plate E^2, in which a small pinion, i^2, is adapted to run. This pinion i^2 is mounted upon a small shaft, i^3, journaled in an arm, i^4, upon the plate E^2, (see Fig. 10,) and provided on its outer end with a hand-wheel, i^5, so that the plate E^2 and its attached parts may be moved back and forth along the frame E' by simply turning the shaft i^3 by its hand-wheel i^5.

m' is a small lug or arm on the plate E^2, in which is pivoted a lever, m^2, adapted to be forced inward toward the bar F' by a small cam, G^3, on the shaft g^2, outside the larger cam G', as shown.

m^3 is a small slide, pivoted at its outer end in the lever m^2, and its inner end adapted to pass through the lower part of the projection E^3, and be thrown in contact with the bar F' by the cam G^3 once at every revolution of the cams G' G^2. The cam G^3 will be so placed that the inner end of the slide m^3 will be thrown in contact with the bar F' at the point where the cams G' G^2 leave it, so that a brake is formed to check the upward movement of the bar F' just when the cams cease to act, so that there will be no danger of the momentum of the bar causing it to run up higher than the stroke of the cams would carry it. When running slowly, no danger exists of the bar being thrown upward; but when running at a high rate of speed, there is danger of the bar being thrown too high; hence the object of the brake m^3. A rubber, leather, or other suitable cap may be used upon the inner end of the slide m^3, to cause it to more quickly and surely act upon the bar F'.

In Fig. 1 the upper end of the projecting part E^3 is shown provided with a tube, E^4, of any suitable length, into which the upper end of the bar F' runs up and down. The upper end of the bar F' is provided with an extension-bar, F^3, upon which weights F^4 will be placed to increase the striking power of the bar and its shoe F^2 when required, the tube E^4 merely serving as an additional guide, to prevent the extra weight upon the bar from bending it over sidewise.

A small hand-wheel, G^4, (shown only in Fig. 6), will be attached to the outer end of the shaft g^2, by which the cams G' G^2 may be turned by hand, (the gearing connecting the shaft with the mechanism below the floor A having first been disconnected to release the bar F') and enable the bar F' to be raised up out of the mold, for changing the shoes F^2 or for altering the position of the bar with relation to the mold. After the bar F' is thus elevated by hand, if the cams G' G^2 be turned around until their faces are again in contact with the bar, the latter will be clamped and held elevated, or in whatever desired position.

Secured upon the floor A at equal distances apart, and at the same distance from the center of the standard B', are a number of molds, in which the pipes are formed. By using a series of the molds after the material is tamped into one mold, the tamping mechanism may be swung around on the head D and the

next mold filled while the first mold is removed, the pipe permitted to "set" and be removed from the mold, and the empty mold replaced before the remaining molds in the series are filled, so that the tamping mechanism may be used uninterruptedly. Any desired number of these molds may be used, according to the length of the frame E', but ordinarily four will be sufficient to keep the tamping mechanism in constant operation. In Fig. 1 one of these molds is shown at the right of the standard B' in section, and another at the left in outside elevation, while a third is shown in the background in the rear of the standard, also in outside elevation. These molds consist in a circular stationary bed-plate, M', secured in a level position upon the floor A, and with a central hollow sleeve, M^2, in which a hollow hub, M^3, on another circular revolving plate, M^4, runs, as shown. In the outer upper edge of the plate M' is a channel formed by two circular ribs, n' n^2, on the plate M', into which channel a ring, n^3, on the upper plate, M^4, is adapted to run, the channel forming an oil-reservoir to lubricate the two plates. The friction and strain by this arrangement is removed largely from the central hub, M^3, and sleeve M^2 and borne by the outer edges of the plates. Small grooves n^4 n^5 will be formed in the channel next to the ribs n' n^2, to form reservoirs for the oil and any grit or sand that may work in between the plates; and the ring n^3 on the plate M^4 will be narrower than the space between the ribs n' n^2, so that the edges of the ring n^4 and the ribs n' n^2 will not touch each other, but all the friction will be borne by the central part of the channel between the ribs n' n^2 and the lower surface of the ring n^4.

Secured upon the upper surface of the plate M^4 is another plate, consisting of a central circular part, M^5, a little larger than the outer diameter of the lower part of the mold, and with two projections, M^6 M^7, on opposite sides, to which standards N' N^2 are secured. The plate M^5 M^6 M^7 is attached securely to the plate M^4 and revolves with it.

Upon the upper part of the plate N^5 a ring, M^8, is secured, the inner diameter of the ring being the same size as the inner diameter of the pipe to be molded, and the outer diameter of the ring being the same size as the outer diameter of the pipe.

P' is a ring formed in two equal parts, hinged together at one side at r', and coupled together by any suitable coupling, r^2, at the other side. This divided ring is formed to fit closely around the solid ring M^8 and rest upon the upper surface of the plate M^5. A semicircular groove, r^3, is formed in the ring P', at its intersection with the ring M^8, into which the plastic material forming the pipes is forced to form the usual rib on the lower end of the sections of the pipe.

Attached to the upper edge of the ring P' is a sheet-metal tube, P^2, of the same interior diameter as the exterior diameter of the pipe to be molded, and attached at its upper end to a ring, P^3, formed in two parts, hinged on one side at r^4, and coupled together on the other side at r^5, in the same manner as the ring P'. The tube P^2 is also formed in two equal parts, the joint being in line with the joints of the rings P' and P^3, and is strengthened at the center by a third divided ring, P^4, hinged at one side at r^6, and coupled at the other side at r^7, these rings P' P^3 P^4 and the tube P^2 forming a cylinder adapted to be opened and closed longitudinally, and with its interior conforming to the exterior of the pipe to be molded. The outward flare of the ring P^3, as shown, is the same shape as the outwardly-flaring coupling end of the pipe to be molded.

P^5 is a sheet-metal tube, adapted to fit closely the interior of the ring M^8, and of a sufficient length to reach from the upper surface of the plate M^5 to a point opposite that part of the ring P^3 where its outward-flaring coupling-forming part begins, as shown in Fig. 1.

Each of the plates M^4 is provided with a driving-shaft, R', driven by suitable gearing, R^2, and shafting R^3, below the floor.

Secured in an upright position in the center of each of the plates M^4 and adapted to revolve with it is a tube, T', having disks T^2 fast thereon at suitable intervals. Three of these disks are shown in the drawings, but any desired number may be used. Each of the disks T^2 is provided with a series of grooves, t', radiating from its center, as shown in Fig. 8, which represents a perspective view of one of these disks reversed, and each groove is adapted to receive a small dog, t^2, whose outer ends project against the interior of the tube P^5, and whose inner ends are turned downward and rest in cam-slots t^3 in disks T^3. These disks T^3 are loose upon the tubes T', and conform in size to the disk T^2, and are held up beneath them by collars or other suitable means upon the tubes T'.

T^4 is an upright shaft, setting loosely down inside the tube T', and projecting a short distance above it, and provided with a square head above the tube T', by which the shaft may be turned. At points just below each of the disks T^3 small horizontal slots t^4 are cut through the tubes T', and at points opposite these slots holes are bored into the shaft T^5. Each of the disks T^3 has attached to its under surface a small spur or pin, t^5, adapted to pass through the slots t^4 and rest in the holes opposite the slots in the shaft T^5. By this means the turning of the shaft T^5 will revolve the disks T^3 as far as the length of the slots t^4 will permit, and cause the cam-grooves t^3 to force the dogs t^2 outward and inward, according to which direction the shaft T^4 is turned.

The tube P^5 is formed with a joint throughout its entire length, and with an overlapping

piece, *e*, attached to one part of the tube, to cover the joint and allow the two edges to be spread apart a short distance without forming an open joint. The tube P^5 will be formed so that when the two edges of its joint are brought close together its diameter will be less than the interior diameter of the pipe to be molded, and will have sufficient springiness to keep the joint closed when the dogs t^2 are turned inward by turning the shaft T^5. By this means the tube P^5 (which acts as a core to the pipe to be formed) may be set down inside the mold and outside the series of dogs t^2, and then expanded to conform to the interior diameter of the pipe by simply revolving the shaft T^5 a short distance, and then, after the pipe is completed, the core may be reduced again in size to enable it to be withdrawn by simply reversing the motion of the same shaft.

In the upper end of one of the standards, N′, at w', a ring, U, is pivoted by a projecting arm, w^2, attached to one side of the ring, while a similar projecting arm, w^3, on the opposite side of the ring, fits down into slots in the upper ends of the standards N^2. The rings U are formed to rest upon the upper outer edges of the rings P^3, and with no part thereof projecting beyond the interior of the rings P^3. A key or other fastening, *x*, will be used to secure the arms w^3 in the standards N^2, if found necessary. The holes in the standards N′, for the pivots of the arms w^2, are slotted, as shown, so that the rings U may rise and fall slightly to enable them to adapt themselves to the surfaces of the rings P^3, and then, when down in the proper position, a small wedge may be inserted in the slot in the standard above the pivot, to hold the ring U down in place upon the mold. By this means the molds are securely held in position upon the plates M^4.

The standards N′ N^2 and ring M^8 may be attached directly to the plate M^4 and the plate M^5, and its projecting parts M^6 M^7 dispensed with, if desired; but by attaching the standards and mold-base all to one plate, much time may be saved in changing the molds to make different-sized pipes.

The above-described form of mold will be used for circular pipes; but egg-shaped or other irregular forms will require somewhat different mechanism to operate them, as it is necessary that the molds be so revolved as to cause every part to pass the tamping-bar F′ at the same point.

The manner we have adopted for revolving the ordinary egg-shaped molds is shown in Figs. 11, 12, 13, 14, and 15. This consists in a circular or other shaped bed-plate, V′, secured to the floor A, and provided with a small oval-shaped cam-groove, y', and a larger heart-shaped cam-groove, y^2, outside of it, as shown in Fig. 13, which represents a plan view of the plate V′ detached. Lying upon top of the plate V′ is another plate, V^2, conforming to but a little larger than the egg-shaped pipe which is to be formed thereon. Upon top of this latter plate an egg-shaped ring, W′, is secured, corresponding to the ring M^8, and for the same purpose, and upon this plate V^2 is placed the mold in which the pipe is formed, which is constructed and operated in the same manner, except that it is made egg-shaped instead of circular. Projecting down from the lower part of the plate V^2 are two pins, z' z^2, adapted to set down into the cam-grooves y' y^2, as shown. The center of the pin z^2 is opposite the center of the upper or larger segmental part of the mold, and the pin z' is opposite the center of the lower or smaller segmental part. Upon the lower part of the plate V^2 is a curved rack, z^3, conforming in shape to the egg-shaped mold, and adapted to be acted upon by a pinion, z^4, projecting up through the plate V′, as shown.

z^5 is a cam-groove parallel with the rack z^3, in which a pin, z^6, projecting up from the plate V′, fits. By this arrangement the revolution of the pinion z^4 will cause the plate V^2 to revolve, and by means of the cam-grooves y', y^2, and z^5 the rack z^3 will always be held in contact with the pinion z^4; hence, if the tamping-bar F′ be adjusted to rise and fall within the mold at a point opposite the pinion z^4, the mold will be so revolved as to retain the same relative position to the tamping-bar at all points of its revolution. By this means an oval or egg shaped pipe may be as readily tamped as a circular one. Any other form of pipe may also be formed by a slight variation in the form of the cam-grooves y' y^2, it being only necessary that all parts of the mold pass beneath the tamping-bar at one point of its revolution.

This machine may be used to form pipes of any plastic material; but we intend it more particularly for the material described in the Patent No. 244,988, August 2, 1881. This material requires to be tamped into the mold a small quantity at a time and at regular intervals, and by means of the screw feeding device and the constant even tamping by the rod F′ the material will be of a uniform consistency throughout the pipe. One great advantage gained by this arrangement of the lifting mechanism for the rod F′ is that it strikes with the same degree of force at all parts of the work, as the cams G′ G^2 lift it upward precisely the same distance at every stroke. When the material is tamped into the molds up to a point level with the upper part of the core P^5, a head, P^6, is set upon top of the core P^5, as shown in dotted lines in Fig. 1, the outside of this head conforming to the inside of the coupling end of the pipe. The mechanism carrying the tamping-bar F′ is then run outward upon the frame E′ a short distance, to cause the shoe F^2 to fall upon the material within the space between the head P^6 and ring P^3, and thereby tamp the coupling or "bell" end of the pipe. The shoes F^2 on the bar F′ are made removable, as shown in Fig. 10, so that new or different-sized ones may be easily

placed thereon. Each size of pipe requires a different-sized shoe, and the coupling-collar or enlargement on the pipe requires a different-shaped shoe; and by making the shoes easily and quickly changeable much time is saved.

In forming the pipes of the material described in the Patent No. 244,988, above referred to, it is necessary to keep the material, molds, shoes, shovels, and trowels with which it is handled, and also the screw feeding device, heated, and by forming the shoes F^2 removable, as soon as one becomes cool a hot one may be placed on the bar F′ with very little trouble.

Pipe-machines have been before constructed in which the molds are arranged concentrically around a vertical spindle or shaft around which the tamper swings or turns, and oval and irregular forms of pipes have been molded with a tamper traveling around in and adapting itself to the form of the mold. These features we do not broadly claim.

Having described our invention and set forth its merits, what we claim is—

1. The combination of a rotary mold adapted to receive plastic material for forming pipe, means for rotating the mold on its axis, and a tamping-bar having a rising and falling movement and radial and circular adjustments, substantially as and for the purpose herein specified.

2. The combination of a rotary mold for receiving plastic pipe-forming material, means for rotating the mold on its axis, means for automatically feeding the plastic material into the mold, and a tamping-bar having a rising and falling movement and radial and circular adjustments, substantially as and for the purpose specified.

3. The combination of a rotary mold for receiving plastic pipe-forming material, means for rotating the mold on its axis, a rising and falling tamping-bar, and revolving segmental cams G′ G^2, adapted to alternately lift the tamping-bar and to let it drop upon the pipe-forming material in the mold, substantially as specified.

4. The combination of a rotary mold for receiving plastic pipe-forming material, means for rotating the mold on its axis, a tamping-bar having a rising and falling movement, a feeding spout or case, K^6, adjustable in position over the mold, a screw-feeder, K^4, and means for rotating the said feeder, substantially as herein specified.

5. The combination of two or more rotary molds adapted to receive plastic pipe-forming material, means for rotating each mold, a standard equidistant from the several molds, a frame revolving on the standard and carrying the tamping-bar, and a rising and falling tamping-bar having an adjustment upon the carrying-frame toward and from the supporting-standard, for the purpose specified.

6. The combination, with two or more molds adapted to receive plastic pipe-forming material, means for revolving said molds, an upright standard, B′, equidistant from all of said molds, a horizontal frame, E′, adapted to revolve upon said standard as a center, a plate, E^2, adapted to slide upon said horizontal frame, segmental cams G′ G^2, means for revolving said cams, and a tamping-bar, F′, held loosely upon said plate E^2, and adapted to be raised upward by said cams and allowed to fall of its own weight, substantially as described.

7. The combination, with two or more molds adapted to receive plastic pipe-forming material, means for revolving said molds, an upright standard, B′, equidistant from all of said molds, a horizontal frame, E′, adapted to revolve upon said standard as a center, a plate, E^2, adapted to slide upon said horizontal frame, segmental cams G′ G^2, means for revolving said cams, a tamping-bar, F′, held loosely upon said plate E^2, and adapted to be raised upward by said cams and allowed to fall of its own weight, and a brake adapted to be applied to said tamping-bar at the end of its upward stroke, substantially as and for the purpose set forth.

8. The combination, with two or more molds adapted to receive plastic pipe-forming material, means for revolving said molds, an upright standard, B′, equidistant from all of said molds, a horizontal frame, E′, adapted to revolve upon said standard as a center, a plate, E^2, adapted to slide upon said horizontal frame, segmental cams G′ G^2, means for revolving said cams, and a tamping-bar, F′, held loosely upon said plate E^2, and adapted to be raised upward by said cams and allowed to fall of its own weight, and a screw-feeder, K^4, substantially as and for the purpose set forth.

9. The combination, with two or more molds adapted to receive plastic pipe-forming material, means for revolving said molds, an upright standard, B′, equidistant from all of said molds, a horizontal frame, E′, adapted to revolve upon said standard as a center, a plate, E^2, adapted to slide upon said horizontal frame, segmental cams G′ G^2, means for revolving said cams, and a tamping-bar, F′, held loosely upon said plate E^2, and adapted to be raised upward by said cams and allowed to fall of its own weight, a guide-tube, E^4, and weights F^4, substantially as and for the purpose specified.

10. The combination, with the mold adapted to receive plastic pipe-forming material, of a central sheet-metal core, P^5, adapted to be expanded or contracted, fixed tube T′, having slots t^4, stationary disks T^2, provided with grooves t', and disks T^3, having cam-slots t^3 and spurs t^5, substantially as set forth.

11. The combination of the stationary base-plate M′, provided with a lubricating-channel at its outer edge and a sleeve, M^2, at its center, a revolving plate, M^4, having a hub, M^3, fitting into said sleeve, a mold adapted to receive plastic pipe-forming material, standards N′ N^2, and ring U, substantially as specified.

12. The combination of a mold adapted to receive plastic pipe-forming material, a tamping-bar, F′, and removable shoe F², substantially as and for the purpose set forth.

13. The combination of a revolving mold for forming oval and irregular-shaped pipe, a rising and falling tamping-bar, and means, substantially as described, for giving the mold a rotary movement accurately beneath the tamping-bar in every part of the revolution, for the purpose specified.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JOHN ROLAND BURDICK.
WILLIAM H. DAVIS.

Witnesses:
C. N. WOODWARD,
LOUIS FEESER, Sr.