(No Model.) 2 Sheets—Sheet 1.

S. TRABER.

MACHINE FOR MAKING LEAD PIPE.

No. 419,573. Patented Jan. 14, 1890.

Fig. I.

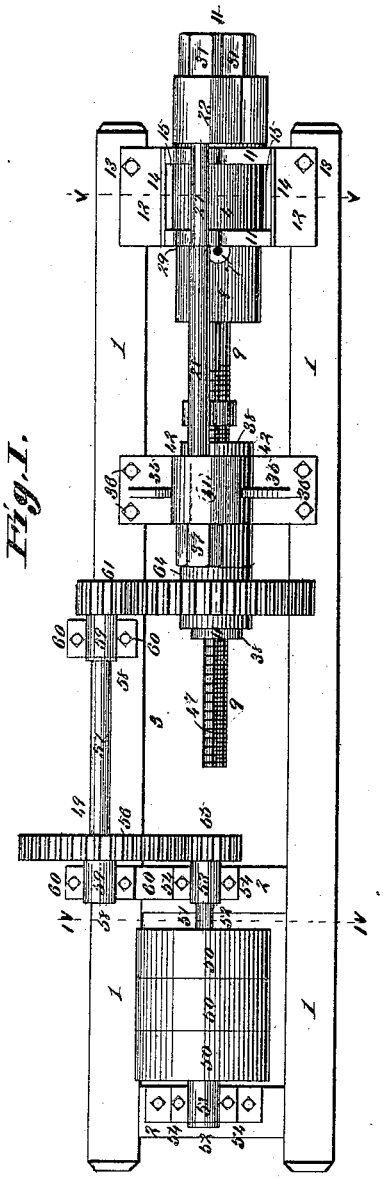
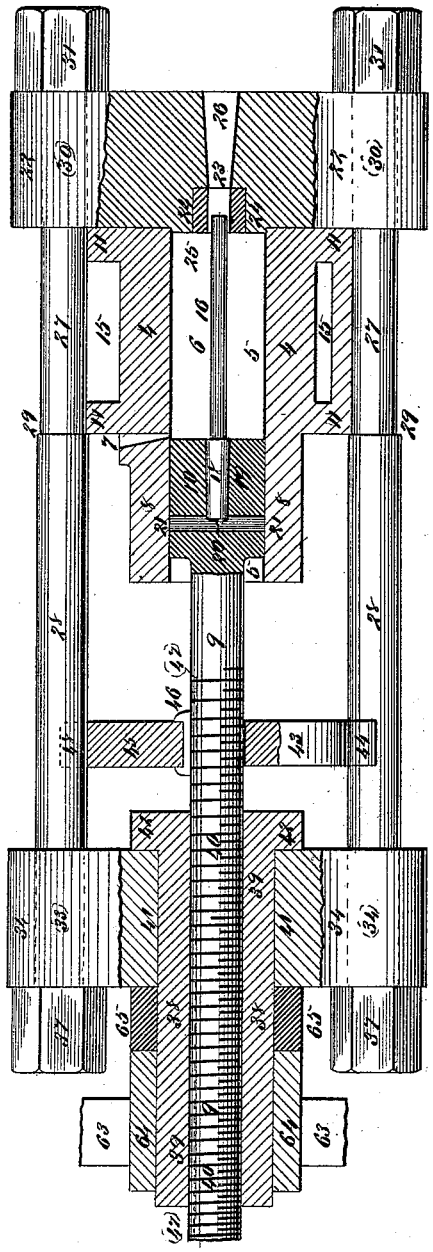


Fig. II.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. III

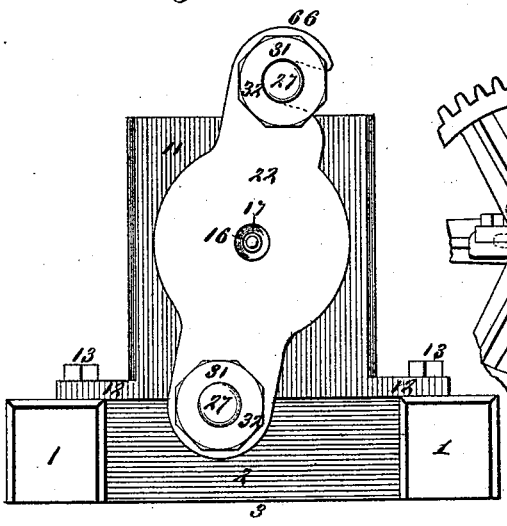


Fig. IV.

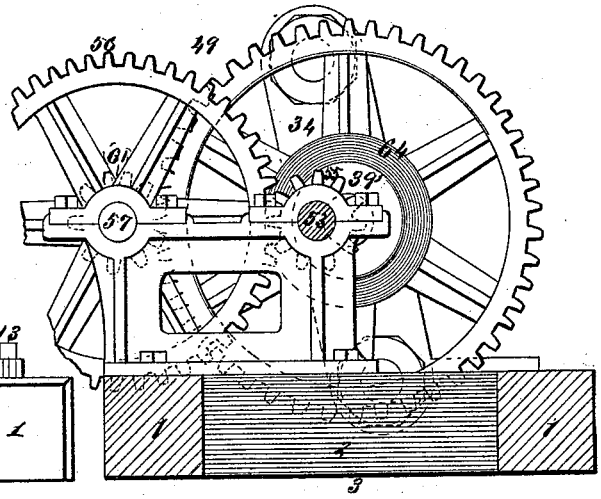


Fig. V.

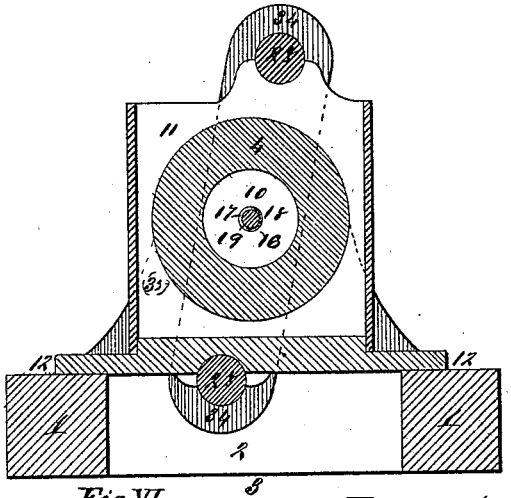
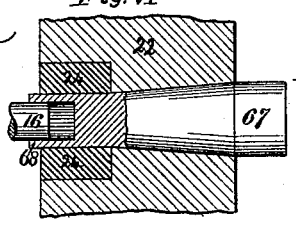


Fig. VI



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UNITED STATES PATENT OFFICE.

SIMON TRABER, OF ST. LOUIS, MISSOURI, ASSIGNOR OF TWO-THIRDS TO GEORGE T. MATTHEWS AND HENRY FLACHMAN, BOTH OF SAME PLACE.

MACHINE FOR MAKING LEAD PIPE.

SPECIFICATION forming part of Letters Patent No. 419,573, dated January 14, 1890.

Application filed October 12, 1889. Serial No. 326,799. (No model.)

To all whom it may concern:

Be it known that I, SIMON TRABER, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Lead-Pipe-Molding Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to devices for the manufacture of lead pipe in which screw propulsion is used for forcing the molten lead through the mold; and the invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a top view of the machine. Fig. II is a vertical section taken on line II II, Fig. I, and shows the tank into which the molten lead is poured, the die and mandrel-core that mold the pipe, and the force-screw shaft that drives the lead through the die. Fig. III is an enlarged front view of the gate-head that closes in the molding-cylinder chamber. Fig. IV is an enlarged vertical section taken on line IV IV, Fig. I, and shows the system of gear that multiplies the power exerted on the screw by the loss of speed. Fig. V is an enlarged vertical section taken on line V V, Fig. I, and shows the rear of the molding-chamber, and the coupling, boxing, and journal bearer which holds the rear ends of the stay-rods. Fig. VI is an enlarged detail view showing the plug.

Referring to the drawings, 1 represents the side pieces, and 2 the cross-ties, of the bed-frame 3.

4 represents the molding-cylinder, in the tube 5 of which is contained the molten lead 6, which is poured within said cylinder-chamber through the supply-duct 7.

8 represents the rear annex of said cylinder that is integral therewith, and 9 is the force-screw shaft, whose piston head or plunger 10 (integral therewith) works within the cylinder 4, and 11 are the sides of the box-housing, which incloses the main portion of the molding-cylinder, and is preferably cast integral therewith. The base-flanges 12 of said box-housing are secured by the screw-bolts 13 to the side pieces of the bed-frame that supports the machine. End plates 14 are secured by any suitable means to the ends of the box-housing, so as to effect water-tight joints, which inclose the water-jacket 15, which acts as a cooler to the molding-cylinder.

16 represents the mandrel-core, transposable ones of which are made of diverse diameters to gage the size of the tubes of the pipe 17 to be molded, and 18 is the conical shank of said mandrel, which is seated in its cone-seat 19 at the forward end in the center of the piston-head, which is worked by the force-screw. The said conical shank is provided with a convex rear terminal 20, which projects within the transverse tubular drift-channel 21.

When it is desired to change the mandrel for one of different diameter, the screw and its piston-head are run back until the drift-channel 21 registers outside at the rear of the cylinder. A drift-tool is then driven down through the tubular opening of the drift-channel, and as it strikes against and passes the convex terminal of the shank of the mandrel that projects inward into said channel it drives the shank ahead and the mandrel it carries, and loosens said shank in its conical seat, so that it is readily removed for the substitution of another of different diameter.

22 represents the die-carrier gate-head, which head closes in the mouth of the cylinder-chamber in which is held the molten lead, with the exception of the center bore 23, through which the new-molded pipe is propelled. The said gate-head thus prevents the escape of the molten lead except through the molding-die 24, that is secured in the initial enlargement of the center bore which forms the die-chamber 25, so that no molten lead escapes other than that which forms the new-molded pipe. The dies, like the mandrel, are made of any required diversity of sizes, graded to the size and weight of the pipe to be molded. The center bore—which is contracted at its junction with the enlarged die-chamber—then, from that outward, provides a flaring bore 26 for the exit of the projected pipe, the space around which pipe, increasing toward the flaring mouth of the bore, allows free entrance

to the cool air, so as to cool, stiffen, and set the lead in the pipe shortly after it is run out from the die. The said die-carrier gate-head is pivotally held below on the reduced end 27 of the lower tie or stay rod 28, at the junction of which reduction to the main rod are the shoulders 29, that clamp the rear side of the box-housing of the molding-cylinder, the front side of which is firmly held when the machine is in operation by the then closed die-carrier gate-head 22. The said reduced end 27 of the tie-rod passes through and lies in its perforate seat 30 in the lower or pivotally-hinged end of said gate-head. The screw stay-nut 31 engages on its screw-seat 32 on the outer terminal of the tie-rod, and thus holds the gate-head in position, and in conjunction with said gate-head and the coadjutary parts, yet to be described, clamps together the box-housing of the molding-cylinder. The inner end of said lower tie or stay rod is secured in its perforate seat 33 in the lower end of the coupling and journal-box head 34, whose foot-flanges 35, integral therewith, are secured to the side pieces of the bed-frame by the screw-bolts 36. The head 37 of the lower tie-rod clamps against the journal-box head 34. A duplicate tie or stay rod, with duplicate head at the inner end and screw stay-nut on its screw-seat on the forward end, is alike seated in the upper ends of the journal-box head 34 and gate-head 22, as its duplicate coadjutary tie-rod is seated in the lower ends thereof, and the duplicate accessory parts of each are alike numbered.

38 represents a journal-bearing drive-screw hub, whose perforate screw 39 registers with the peripheral screw 40 of the afore-described force-screw 9. The said journal-bearing screw-hub has rotary bearings 41 in the center of the journal-bearing box-head 34, and is provided with a collar-flange 42 at its forward end, which has a buffer hold against the journal-box head, so as to sustain the screw-projected piston in its force drive and hold it to its work.

43 represents a supporting bracket or bar that sustains the forward end of the piston force-screw, its concave flanged foot 44 being seated on the lower tie-rod 28, and itself seating and sustaining said screw. A surmounting bracket or bar 45, that is located between the top of said screw and the upper tie-rod 28, is provided with a spline foot-key 46, that treads within the spline channel-groove 47 in the top of said force-screw, to prevent the rotation of said screw as it is longitudinally propelled by the action of the journal-bearing screw-hub 38. The concave flanged head 48 of said surmounting bracket 45 is seated beneath the upper tie-rod 28. A system of pulley cog-gear 49 drives the force-screw piston to effect the propulsion of the molten lead through the die while molding the pipe, the members of which will now be introduced and their functions described for multiplying power at the expense of speed.

50 represents a triple multiple drive-pulley, which may, however, be a double or single pulley, or any desired number of multiple pulleys. The axle-shaft 51 of said pulley has its journal-bearings 52 in the journal-boxes 53, which are at each end of said multiple pulley secured to the cross-ties 2 of the bed-frame by the screw-bolts 54. A cog-pinion 55, that is mounted on the extension inner end of the axle-shaft 51, gears into the large cog-wheel 56, whose axle-shaft 57 has its bearings 58 in the journal-boxes 59, which are secured to one of the side pieces 1 of the bed-frame by the screw-bolts 60. A cog-pinion 61, which is mounted on the extension inner end of the axle-shaft 57, gears into the large cog-wheel 62, the spokes 63 and hub 64 of which are shown in enlarged detail and cross-section in Fig. II. The whole pulley-gear system is shown in Fig. I, and an enlarged view of the cog-gearing in Fig. IV. The cog-wheel 62 (the final member of the drive-gear) is mounted on the journal-bearing screw-hub 38, the hub of said wheel being shrunk, keyed, or otherwise fast mounted on said drive-screw hub, so as to rotate the same under the influence of the pulley drive-gear. An intervening collar 65, mounted on said drive-screw hub between the hub of the wheel 62 and the journal-box head 34, in conjunction with the collar-flange 42, prevents the longitudinal displacement of the screw-hub 38.

66 represents a hook on the upper limb of the die-carrier gate-head, which, when said gate is closed, embraces the forward end of the upper tie-rod, and when the stay-nut 31 is screwed home firmly holds the gate in its closed position.

The operation of the machine in molding lead pipe is as follows: A die 24 and mandrel 16 is selected in accordance with the size of the pipe to be molded and the diameter of its bore. The core-shank of the mandrel is seated in the piston-head of the force-screw and the die in the die-chamber 25 in the enlarged initial end of the center bore 23 of the gate-head 22. The piston-head, with the force-screw, is retired to the position shown in Fig. II. The molten lead is then poured through the supply-duct 7 into the molding-cylinder, and the endless drive-band that transfers power from the engine is then mounted around the multiple pulley that drives the system of cog-gearing, which, as heretofore stated, largely multiplies the power at the expense of speed. The last member of said gear system (the large gear-wheel 62) being fast mounted on the journal-bearing screw-hub 38, in which the force-drive-screw shaft 9 is screw-seated, the said screw drives the piston-head 10 it carries (and which is integral therewith) longitudinally forward in the molding-cylinder, the screw being held from rotation by the spline-key 46, that engages in the longitudinal channel-groove 47 in said screw. As the piston-head or plunger advances it forces the molten lead through

the die around the mandrel-core, and thus molds the pipe by continuous progression as long as the supply of molten lead within the cylinder holds out. The pipe, after being forced through the die in which and from the mandrel around which it is molded, passes forward through the flaring center bore of the die-carrier gate-head 22, the flare of which bore allows the free entrance of cool air around the warm fresh-molded pipe to cool and stiffen the same. The gear system that largely multiplies the power at the expense of speed is an advantageous arrangement, as a slow rate of speed is best adapted to the work to be effected, and great power is required to force the lead through the die in which it is molded. After the piston-head or plunger has been driven forward by the screw of which it is the integral head to the forward end of the cylinder or to as near contact with the die as it is advisable that it should be allowed to advance, and the cylinder has been thereby emptied, or nearly so, of the molten lead, the screw-shaft, with its piston-head, is then worked back (ready for a renewed charge of molten lead) either by the reversal of the drive-band on the pulleys 50; or, after casting the band from said pulleys, the machine may be easily reversed by hand, as there is no loading back of the piston-head, so that all the power that is required to be exercised in reversal is but little more than to overcome the friction of the screw-shaft and of the cog-gear system. When it is desired to open up the molding-cylinder, the stay-nuts 31 are sufficiently unscrewed to allow a slight longitudinal withdrawal of the gate-head 22 on the tie-rods out of interference with the sides 11 of the box-housing and of the forward end of the mandrel. When this release is effected, the hook 66 on the upper arm of said gate-head is readily thrown out of engagement with the upper tie-rod, and, said gate-head pivotally turning on the lower tie-rod, the gate is swung vertically out of the way, so as to present a clear opening to the interior of the cylinder. When the machine is set up in position for molding, before the insertion of the molten lead within the cylinder, the conical plug 67 is seated in the flaring center bore of the gate-head. The inner recessed end 68 of said plug, when inserted, fits around and thereby forms a sleeve to the point of the mandrel, thus centralizing the same, so as to effect an even thickness of metal around the tube of the pipe, which central position of the mandrel respectively to the die is afterward maintained by the metal filling as it is forced into position in the mold by the action of the screw piston-head. (See Fig. VI.) Another important function of said centering-plug 67 is to stop the outflow of the molten lead when it is first poured into the cylinder, in which it is allowed to remain until it is chilled, so as to stiffen it sufficiently to hold its form when molded, when, the drive-gear and piston-screw being started, sufficient pressure is brought to bear to eject the lead through the mold, and with it the plug 67 ahead of it. Should the plug at any time be seated so tightly in the flaring center bore that it refuses to be ejected by the action of the screw piston-head, the endless drive-band slipping on the pulley when it cannot effect its work, (as a safeguard against breakage,) then a few lateral side taps on the projecting head of the plug, in conjunction with the piston-screw pressure behind it, will aid its initiatory movement, and when once started, in consequence of the flaring form of the center bore, it will be easily ejected and the molded pipe will follow through the die. When the screw piston-head has effected its work and ejected the molten lead from the cylinder, the drive-band may be either cast by hand by the operator, or by any suitable automatic stop, of which there are several in use.

I claim as my invention—

1. In a lead-pipe-molding machine, the combination of the molding-cylinder, the mandrel, the die, and the force-screw shaft, with its piston-head that drives the molten lead through the die to effect the molding of the pipe, substantially as and for the purpose set forth.

2. In a lead-pipe molding machine, the combination of the molding-cylinder, the die-carrier gate-head 22, provided with a flaring center bore, the die-housing in the initial end of said bore, the force-screw shaft 9, with its piston head or plunger 10, that works in said molding-cylinder, and the mandrel 16, whose shank is seated in said piston-head, substantially as and for the purpose set forth.

3. In a lead-pipe-molding machine, the combination of the molding-cylinder, the die 24, the force-screw shaft 9, with its integral piston head or plunger 10, the mandrel, whose shank is seated in said plunger, and the journal-bearing screw-hub 38, that drives the force-screw, substantially as and for the purpose set forth.

4. In a lead-pipe-molding machine, the combination of the molding-cylinder provided with the supply-duct 7, the die transposable to the size of the pipe to be molded, the force-screw shaft 9, with its integral piston head or plunger, the mandrel transposable to the size of the pipe to be molded, whose shank is seated in said piston-head, the journal-bearing screw-hub 38, that drives the force-screw, and the bracket 45, with the spline foot-key it carries, the aforesaid force-screw shaft provided with a spline channel-groove, in which the spline-key engages to prevent the rotation of said screw-shaft, substantially as and for the purpose set forth.

5. In a lead-pipe-molding machine, the combination of the molding-cylinder, the transposable die and mandrel, both transchangeable to the size of the pipe to be molded, the force-screw shaft, with its integral piston

head or plunger, the journal-bearing screw-hub 38, that drives said force-screw shaft, and the system of pulley cog-gear that drives said screw-hub, substantially as and for the purpose set forth.

6. In a lead-pipe-molding machine, the combination of the molding-cylinder 4, having the rear integral annex 8, the box-housing of the main portion of said cylinder, the water-jacket within said box-housing, the force-screw shaft with its integral piston head or plunger 10, that works in the molding-cylinder, the journal-bearing screw-hub 38, that drives said force-screw, the interchangeable die and mandrel, the die-carrier, pivotal gate-head 22, with its surmounting clamping-hook 66, the coupling and journal-box head 34, and the screw-nutted tie-rods that couple together said gate-head and journal-box head, and with the shoulders 29 on said tie-rods form a clamp-hold to said box-housing, substantially as and for the purpose set forth.

7. In a lead-pipe-molding machine, the combination of the frame that carries the machine, the molding-cylinder, the die, the force-screw with its piston-head, the journal-bearing screw-hub, the drive cog-wheel 62, fast to said screw-hub, the pinion 61, that gears into said drive-wheel, the shaft 57, that carries said pinion, the cog-wheel 56, that is mounted on said shaft, the pinion 55, that gears with said cog-wheel, the drive axle-shaft 51, on which said pinion is mounted, and the pulley 50, also mounted on said shaft, substantially as and for the purpose set forth.

8. In a lead-pipe-molding machine, the combination of the molding-cylinder, the force-screw with its piston-head that works in said cylinder, the die-carrier gate-head, the interchangeable die seated in said gate-head, the interchangeable mandrel, whose conical shank with convex rear terminal is seated in said piston-head, and the said piston-head being provided with a drift-channel 21, into which the convex shank terminal of said mandrel protrudes, against which a drift-tool engages when it is driven down said drift-channel to loosen said mandrel from its seat, substantially as and for the purpose set forth.

9. In a lead-pipe-molding machine, the combination of the molding-cylinder, the force-screw with its piston-head that works in said cylinder, the die-carrier gate-head, the die seated in said gate-head, the mandrel whose shank is seated in said piston-head, and the conical plug 67, whose recessed end is seated around the point of and centralizes the mandrel, substantially as and for the purpose set forth.

SIMON TRABER.

In presence of—
BENJN. A. KNIGHT,
SAML. KNIGHT.