Serrell & Smith,

Making Lead Pipe,

No. 6,563. Patented July 3, 1849.

Fig. 1

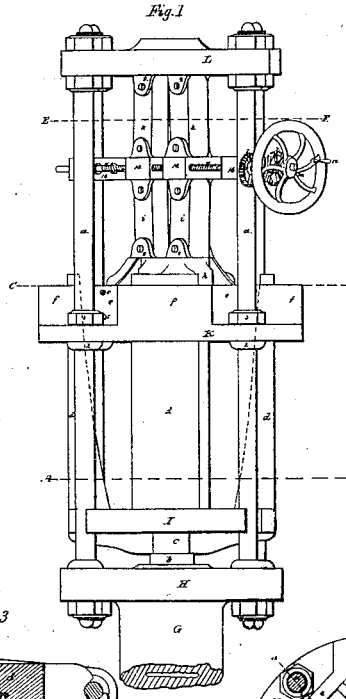


Fig. 2

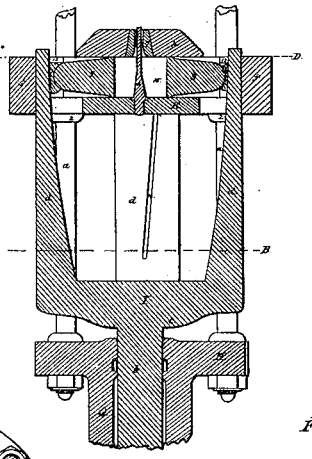


Fig. 3

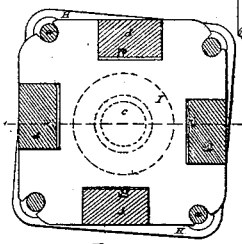


Fig. 4

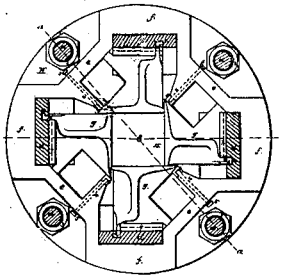


Fig. 5

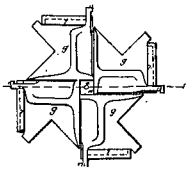


Fig. 6

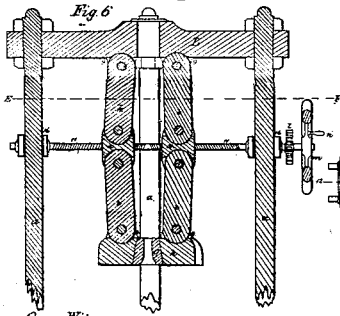


Fig. 7

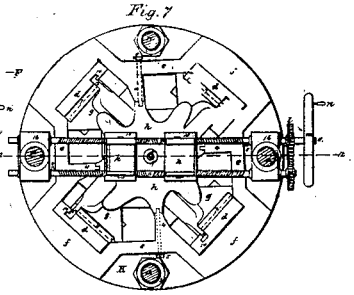
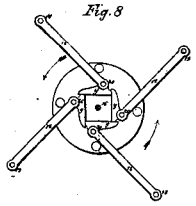


Fig. 8



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UNITED STATES PATENT OFFICE.

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CENTRIPETAL PRESS.

Specification forming part of Letters Patent No. **6,563**, dated July 3, 1849.

To all whom it may concern:

Be it known that we, JAMES E. SERRELL, civil engineer, and DAVID SMITH, lead-pipe manufacturer, both of the city of New York, have invented and made certain new and useful improvements in the means of manufacturing lad pipe from a slug of metal inclosed or cast in a cell, and compressed upon a mandrel in lateral directions, so that the pressure around is concentrated in the center on the material, and forces that portion of lead to rise between parts that give the material the required form while issuing from the cell by a new arrangement of mechanical means, operated on by a hydraulic press or any other competent power. That the general arrangement of mechanical parts hereinafter described, though originally intended by us for making lead pipe, may be applied to other uses, and give other forms to other ductile metals, or give other forms to other substances, either through local variations of the parts that give the required form to the material, or by mechanical variations of the means employed through which the power operates on the forming parts, these effects being produced by means substantially the same as those we use, and describe hereinafter as our invention and improvements, and for which improvements we seek Letters Patent of the United States. That one of the original modes of making lead or other pipe was by drawing the material through a die or hole over a mandrel or core. That other modes of compressing slugs or ingots by hydraulic pressure now in use effect the forming pipe by compressing a mass of hot and half-solid metal endwise, which mass is separated to pass on each side of the bridge by which the mandrel is held, and has to weld or reunite beyond this point, thus risking an imperfectly adhesive seam lengthwise of the pipe. Another mode provides for compressing the metal into pipe, which is forced out through or behind the compressing-ram or follower, and in nearly all such cases a considerable portion of the slug or ingot of metal is left in the chamber of compression. That our improvements differ with all foregoing modes by casting the metal round a core or mandrel of any proper size in the center of a cell, which cell may be of almost any form; but it is believed a square, as described and shown hereinafter, will be preferable. The metal is then securely covered by a movable platen having a die or hole round the upper end or point of the core or mandrel, of a size to give the pipe any proper thickness round the bore formed by the core or mandrel, and a competent lateral compression forces the metal to issue through the die round the core or mandrel with the required size of bore and thickness of pipe.

The general means of effecting these objects are fully and substantially set forth and shown in the following description, referring to the accompanying drawings, wherein—

Figure 1 is a full elevation of a complete machine for making lead pipe, when ready for operating on the material. Fig. 2 is a sectional elevation of the lower portion of Fig. 1, showing the machine as it would appear if divided at the line 1 1 of Figs. 3, 4, and 5, but below the line C D, Fig. 1. Fig. 3 is a plan of the machine at and below the line A B of Figs. 1 and 2, showing the relative positions of the foot-plate, lower and pressing platen, and the position of the pressing-wedges. Fig. 4 is a plan of the parts at, around, and below the line C D, but above the line A B, Figs. 1 and 2, and shows the form of the press-carriage with the relative positions of the pressing-wedges, and forms of the lateral pressing-blocks with the cell for the slug or ingot, and the mandrel or core, to form the bore of the pipe, shown as when ready to commence work and form the pipe. Fig. 5 is a plan of the press-blocks shown in Fig. 4, but represented as in the positions they assume when closed in after forming one length of pipe from the slug or ingot of metal. Fig. 6 is a sectional elevation of the parts above the line C D, Figs. 1 and 2, taken in the line 12 12 of Figs. 4 and 7, or nearly at an angle of forty-five degrees with the Figs. 1 and 2. Fig. 7 is a plan of the parts at and below the line E F, Figs. 1 and 6, showing the form of the covering, holding, and opening platen, the position for the core and die to form the bore and thickness of the pipe, and the working-joints and screws of the toggle-arms that govern the action of this platen, and the same letters and numbers and other marks of reference apply to the like parts in all the several figures.

In these figures, G is a hydraulic-press cylinder, beneath the foot-plate H, which plate is connected by tie-rods *a a* to the head-plate L. In the cylinder G is the ram *b*, the top of

which takes a metal block, *c*, beneath the pressing-platen I. On this platen I are four vertical wedges, *d d d d*. These are shown in Figs. 1, 2, 3, 4, and 7 as formed with outsides vertically parallel to the axis of the machine, and from their upper ends downward increasing their thickness inward in the line of an arc of a circle, which increase of thickness is shown as in the proportion of three at the bottom to one at the top in a length of twelve; but we do not mean to confine ourselves to these proportions, nor to the form of the inner faces of these wedges, as we intend to use wedges of either two straight lines diverging toward the bottom, or to use a straight outer face and a parabolically-curved inner face, in any case having in view the obtaining the smallest compressive motion and greatest power at starting the machinery, and increasing the rate of the compressing action as the lower parts of the wedges come up to act on the reduced and smaller quantity of metal or other material under compression, by giving the lower and larger ends of the wedges such an increase of thickness as is found practically best for this purpose, according to the density or ductility of the material operated on.

K is a fixed press carriage-block, secured in place on the tie-rods *a a* by collars 2 and nuts 3, (see Figs. 1 and 2,) and having at *f f f f* vertical flanges serving as holders and guides at the back of the wedges *d d d d*, that come through the block K. Between the returns of each two flanges *f* are continued other guide-flanges, *e e e e*, standing on the block K at an angle of forty-five degrees with the flanges *f*. Each of these flanges *e* has a tongue or projection, 4, and through each flange *e* and tongue 4 are two or more screw-bolts, 5, the points of which take a slide-cap, 6, that stands against one face of each of the lateral press-blocks *g g g g*. Between each wedge *d* and press-block *g* is an intermediate knuckle-block, 7, formed sectionally as seen in Fig. 2, so that it accommodates itself to the variations of the vertical angle formed on the face of each wedge *d* as that rises, and a flange at each end of each block 7 takes a notch in the face of each press-block *g*, so that the knuckle-block and press-block *g* move regularly together. At the angle of the same face, and next the face of the next block, each pressing-block *g* is fitted with a returned guide-hook, 13, that takes into a returned groove, 14, in the face of each wedge *d*, which groove is cut out of the perpendicular with the top to the right, as seen in Fig. 2, so that though the wedges *d* each ascend perpendicularly and all at the same time, the press-blocks *g* are each forced in a compound direction, both sidewise and laterally, or inward toward the center of the machine, in such a manner that the inner angle of each block *g* travels toward the center at an angle of forty-five degrees with the face of the pressing-wedge, when four wedges and blocks are used, as shown and described herein; but it will be readily understood that the number of these wedges and blocks may be varied to suit any given use, and that as the numberis is varied the line of the angle in which each block travels will be varied correspondingly with the number of wedges and blocks. For instance, three blocks will travel at an angle of thirty degrees with the faces of the three wedges, and this number may sometimes be used advantageously, as this angle slides easy against considerable resistance, but does not come up to the medium or balance of effect between resistance, friction, and power that the angle of forty-five degrees obtains, while, on the contrary, if a more rapid movement is admissible, five blocks moving at an angle of fifty-four degrees, with the faces of the five wedges or six blocks moving at an angle of sixty degrees with the faces of six wedges, may be employed; but eight blocks, moving at an angle of sixty-seven degrees thirty minutes with the faces of eight wedges, would probably be of very small useful effect, and we state these numbers, angles, and effects, as we intend to use any number of wedges or analogous means to give lateral compression on blocks moving laterally that may be most available for any given purpose.

Between the four lateral and central pressing-blocks *g* last described is the cell 15 shown in Figs. 2 and 4 as open and ready for receiving fluid metal cast in round the core or mandrel *o* in its center; and in Fig. 5 the cell is shown as nearly closed after compressing the slug. Above the cell 15 is the covering, holding, and opening platen *h*, (see Figs. 1, 2, 6, and 7,) the use of which is to close the cell 15 after the metal is poured in to form the slug, and to hold the lateral press-blocks *g g*, so as to prevent their rising and yet permit their lateral movement. In the center of the lower face of the platen *h* is a die, 17, made as seen sectionally in Figs. 2 and 6, operating round the core or mandrel *o*, to give the pipe the required thickness round the bore. Upon the platen *h* are two knuckle-joint pieces, 8 8, receiving the lower ends of a pair of toggle-joint arms, *i i*, the upper arms, *k k*, of which are jointed at 9 9 to the head-block L. The intermediate joints of these toggle-arms are made double, as shown at 10 10, and the ends of the intermediate joint-pieces are made to project, so that each joint-piece 10 forms a nut at each side of the joint, to pass the threads of right-handed and left-handed screws 11 11. The shafts of these screws pass through pair of sliding guide-grommets, 16 16, on two of the tie-rods *a a*, and have mounted on one end of each a matching tooth-wheel, *l l*, working together to move the screws 11 11 at the same speed in or out; and as this operation proceeds the guide-grommets 16 slide up or down, the use of these being merely to steady the ends of the screws, as these are necessarily placed on each side the tie-rods, to leave room for the ascent of the wedges *d d*; and on one shaft 11 is a small fly-wheel, *m*, with a crank-handle, *n*, or this wheel *m* may be a drum connected to power in any convenient manner.

By turning the screws 11 11 inward, the cover-platen *h* is lifted, to allow of pouring the melted and fluid lead into the cell 15, in which the metal is skimmed, as usual, to take off dirt and oxidation, and before the metal is set the cover-platen *h* is let down by screwing the screws 11 11 outward. This both closes the top of the cell 15 and holds down the pressing-blocks *g g*, as before referred to and described. When thus ready, the hydraulic press or other fit power is to be put in action to raise the wedges *d d*. These rise past the backs of the knuckle-blocks 7 and press-blocks *g g*, and force them inward, the edge of each block sliding on the face of the next as they are guided by the hook 13 in the groove 14. The angles and faces of the blocks are kept together by the screws 5 and caps 6, and the increase in the thickness of the wedges *d d* forces all these press-blocks *g* inward, as before described, and the fluid lead held within them commences to rise, and the ascending part first fills the die 17 round the mandrel. The motion of the press or power is then suspended until the metal is just solid, and the press or power then recommencing, the metal issues through the die 17 in the form of a pipe, and ascends between the screws and toggle-joints, and is led out of a hole in the center of the head-block L. (See Fig. 6.) As the pipe issues, the metal within decreasing in resistance in proportion to the decrease of quantity, the curved faces of the wedges *d d* force the pressing-block *g* inward at a rate increasing in speed as the compressed metal diminishes in quantity and resistance, the knuckle-blocks 7 accommodating themselves to the faces of the wedges, and this operation proceeds until the press-blocks, closing on the center, have left a very small quantity of material round the mandrel. One important difference between this and former machinery for such or similar purposes is, that the compressing action being alike on all the sides of the cell 15, the pressure is concentrated round the core. This being slightly conical, assists the metal in sliding or sheathing off, and the ultimate effective pressure is denoted when that on one side is multiplied by the whole number of press-blocks *g* in motion, instead of being limited to the same amount of pressure acting on the surface of one part, as in former machines for this or similar uses.

It will be readily seen that the pressing-blocks *g g* may be forced inward by the direct action of hydraulic presses acting in the same line with the blocks; or that radial rods 18, Fig. 8, having each an immovable pivot, 19, at their outer ends, and a joint, 20, on the inner ends to the corresponding press-block *g* with the body of the machine forced into a limited rotation on the center in the direction of the arrows; or lateral toggle-joints, cams, or eccentrics may either of them be used to give the press-blocks *g g* a simultaneous lateral and uniform movement, compressing the material they operate on toward the center of the machine without any substantial departure from the arrangement we have herein described and shown as our invention, the essential elements of which consist in the operating, from any plurality of points of motion, to produce a simultaneously-acting lateral compression on any plurality of surfaces of any given substance, and to force the substance, under this treatment, to assume any required form which the machine and power are competent to produce; and we consider this invention as essentially differing from all others for similar purposes, because all such others, as far as we know, operate by applying the power from one or two points only in a direct line upon one or two surfaces only, instead of applying the power so that it shall be concentrated on the center of the material, and that the same maximum effect shall be produced and operate on each of several surfaces and at the same instant of time and progress.

What we claim as new and of our own invention, and desire to secure by Letters Patent of the United States, is—

The application of a plurality of pressing-blocks, *g g*, which, with the exception of the bottom and top, inclose on all sides the material to be acted on, and which blocks are so constructed as to allow of their lateral compressing action when moved in the compound direction herein described by a like number of wedges, *d d*, or with any analogous or equivalent device, through which any competent power can act to force the blocks *g* with a simultaneous compound and centripetal motion that concentrates the pressure on a plurality of surfaces of material to give the material a required form or degree of pressure, substantially as described and shown.

In witness whereof we have hereunto subscribed our names, in the city of New York, this 16th day of April, 1849.

JAMES E. SERRELL.
DAVID SMITH.

Witnesses:
W. SERRELL,
LEMUEL W. SERRELL.