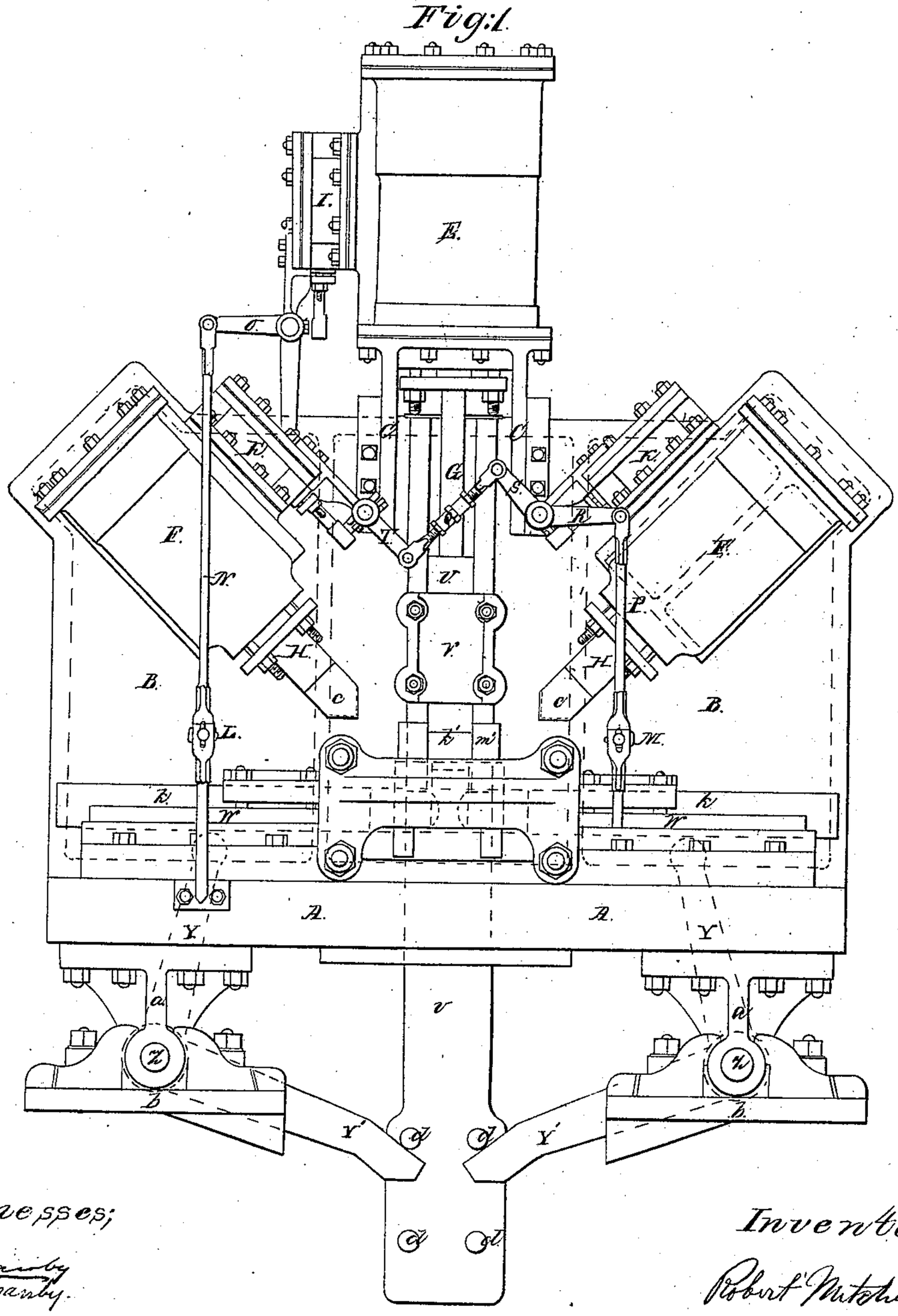
Sheet 1, 2 Sheets.

R. Mitchell.

Forging Pipe Fittings.

No. 70,595. Patented Nov. 5, 1867.

Fig: 1.



Witnesses;

W. Manby
G. Manby.

Inventor;

Robert Mitchell

Sheet 2, 2 Sheets.

R. Mitchell.

Forging Pipe Fittings.

No. 70,545. Patented Nov. 5, 1867.

Fig: 2.

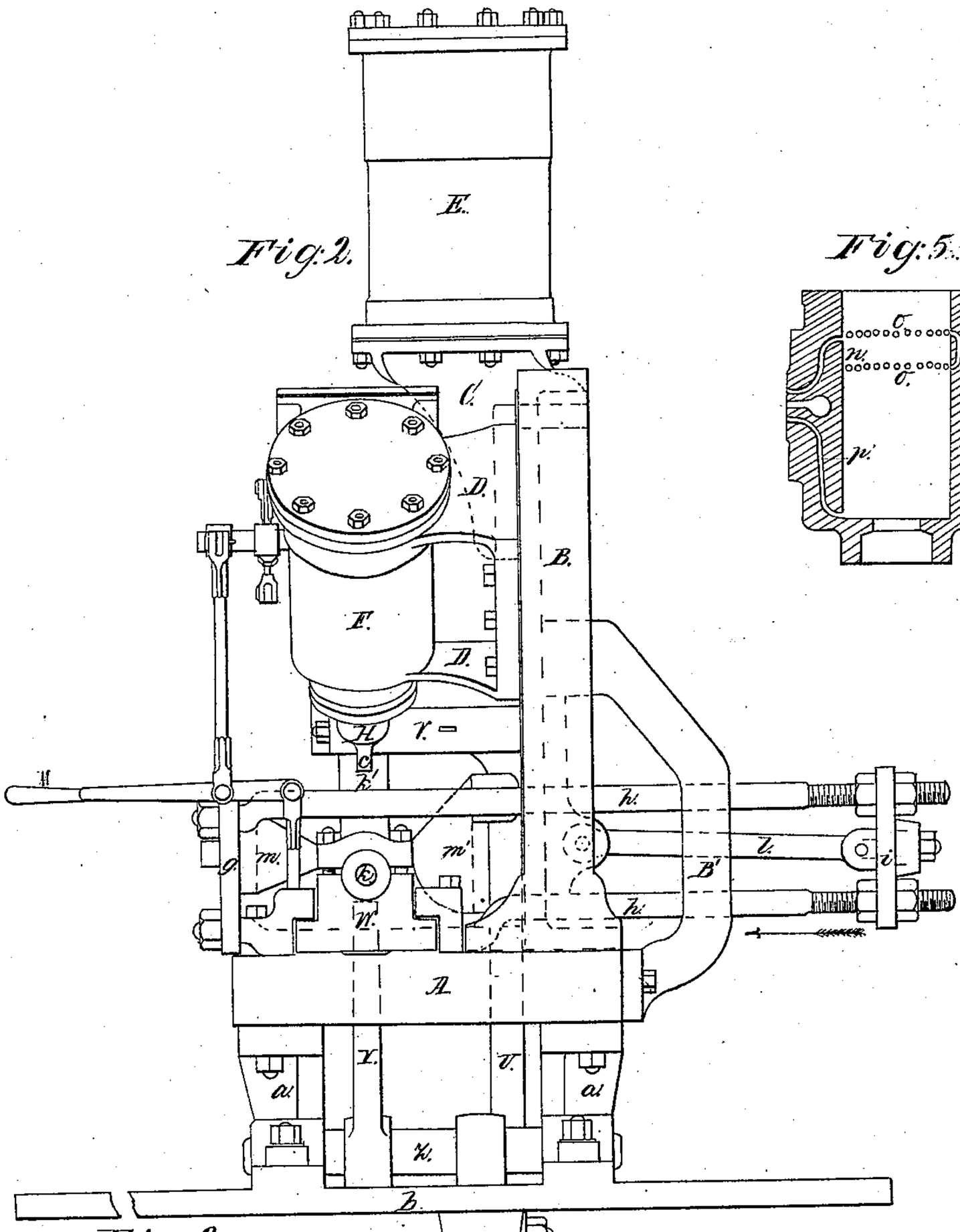


Fig: 5.

Fig: 3.

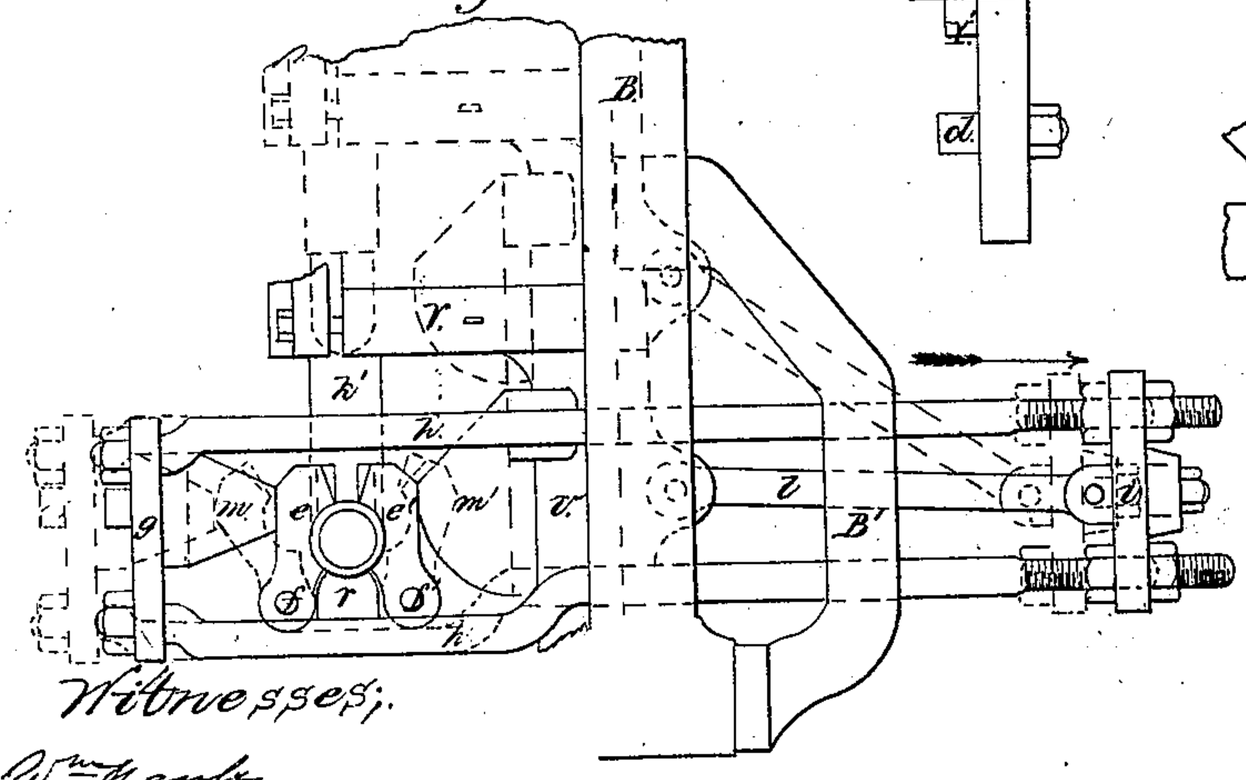
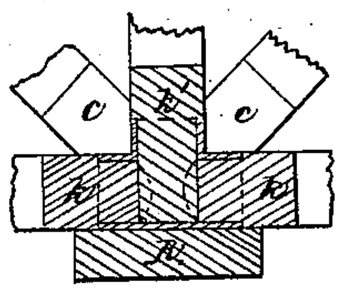


Fig: 4.



Witnesses;

Wm. Manby
G. Manby

Inventor;
Robert Mitchell

United States Patent Office.

ROBERT MITCHELL, OF WOLVERHAMPTON, GREAT BRITAIN.

Letters Patent No. 70,595, *dated November* 5, 1867.

IMPROVEMENT IN CYLINDER OF STEAM-HAMMERS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ROBERT MITCHELL, of Wolverhampton, Stafford county, England, have invented certain Improvements in Machinery for Forging Pipe-Joints and other similar articles; and I do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates partly to certain improvements upon the invention for which Letters Patent were granted in the United States to James Alfred Shipton and Robert Mitchell, bearing date the 16th day of October, 1866, and has for its object the facilitating the operation of finishing the partly forged "tees," "elbows," "bends," "crosses," "couplings," and other pipe-fittings mentioned in the specification of the said patent. According to this part of my invention, I propose to employ, in addition to the apparatus described in the specification of the patent hereinbefore referred to, for finishing or welding the forgings, a pair of clams, swages, or moulding-jaws, which are caused to nip the forging tightly between them, and thereby impart the desired shape or finish thereto. In combination with these moulding-jaws, I employ a pair of converging dies, which in lieu of embracing half the circumference of the article operated upon, as described in the specification hereinbefore referred to, embrace each only about one quarter of its circumference, the other two quarters being embraced by the two moulding-jaws or clams between which the dies operate. These moulding-jaws may be opened and closed by any convenient arrangement, as, for example, by means of a wedge action worked from the vertical cylinder of the machine, or by means of a single link, or a system of toggle-joint levers, also brought into operation by the vertical cylinder, and actuating a horizontal sliding frame, which closes one of the jaws whilst the other is closed by a vertical incline or wedge.

Another part of my invention consists of a peculiar arrangement of the parts of the cylinders of the forging or welding, and bending or shaping machines with a view to "cushioning" or confining the steam, compressed air, or other elastic fluid employed above the piston, and thereby preventing the piston striking against the cylinder-cover when steam is admitted below it. In carrying out this part of my invention, I make the steam-port some distance below or from the top or end cover of the cylinder, so as to leave a steam-space above the piston after it has "cut off" the steam, by covering the port. Round the interior of the cylinder is formed a separate series of steam-ways or passages, for establishing a communication between the upper and under sides of the piston, the distance between the upper and lower ends of such passages being rather more than the thickness of the piston, and the upper ends of these passages are a little above the upper edge of the steam-port. It will thus be seen that as the piston is driven up by the steam pressure below, it cuts off the steam escaping through the upper port, and confines a portion in the space above that port, such confined steam acting as a cushion. On the recoil of the piston a communication will be established between the upper and lower sides of the piston, by the steam-ways before referred to, and a perfect equilibrium will be obtained so long as the piston is not in operation, but on the admission of fresh steam above the piston, it will be forced down to its work, and when the escape is opened will rise again, and its course will be arrested, as before described, just before reaching the cover of the cylinder. This arrangement is obviously applicable to all double-action steam-hammers for general forging purposes.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawing, which forms a part of this specification, and in which—

Figure 1, sheet 1, of my drawings represents a front elevation of my improved welding or forging machine, as adapted for the manufacture of "tees," "elbows," "bends," "crosses," "couplings," and other like pipe-fittings.

Figure 2, sheet 2, is a corresponding side elevation of the same.

Figure 3 is an elevational detail, showing the mode of actuating the clams or jaws.

Figure 4 is a sectional detail, showing the conjoint action of the mandrels, dies, and mould-block, the jaws or clams not being visible in this figure; and

Figure 5 is a sectional detail of one of the cylinders.

A is the table of the machine, which may be supported on convenient standards, not shown in my drawings. This table carries a strong upright standard, B, to which are bolted the brackets C and D D, carrying the

respective cylinders E and F F. The cylinder E is placed vertically and in a reversed position, that is to say, with its piston-rod G working through a stuffing-box in the lower end cover thereof, whilst the other two cylinders F F, are situate at an angle of about forty-five degrees on each side of the vertical cylinder, and, like it, operate in a reversed position, the rods H H working through stuffing-boxes in the lower end covers of the cylinders. Each of the three cylinders is provided with an ordinary slide or other suitable valve, working in the respective valve-boxes I K K. The piston-rod G of the vertical cylinder is keyed to a slide, U, working in guides in the vertical standards B. This slide carries a projecting bracket, V, to which is secured the vertical mandrel K′, fig. 4. Two other mandrels *k k*, working horizontally, are secured to the two horizontal slides W W. These slides are caused to approach towards and recede from the mould-block *r* simultaneously, by the action of the lever-arms Y Y working in slots or recesses in the slides, and keyed on to the rocking spindles Z Z, supported by the brackets *a a* bolted to the under side of the table A, and by the base-plates *b b* secured to convenient standards or supports. Y′ Y′ are other lever-arms, also keyed on to the rocking spindles Z, which arms are alternately elevated and depressed by the action of the studs or pins *d d* in the lower portion of the vertical slide U, as shown clearly in fig. 1. *e e′*, fig. 3, are a pair of clams, swages, or moulding-jaws, which are shaped on their griping faces so as to accurately fit a portion of the surface of the article to be welded. In my drawing, fig. 3, I have represented these jaws as each embracing about one-third the circumference of the article, the remaining portion between the two jaws, on the under side of the article, being supported in the hollow of the mould-block *r*, whilst that portion on the upper surface where the weld is to be made is left exposed, so as to be free to be acted upon by the welding-dies or tools *c c*, fitted to the lower ends of the converging piston-rods H H of the cylinders F F. The clams or jaws *e e′* are hinged at *f f′* to the lugs in the surface of the table, disposed one on each side of the mould-block *r*. *g* is a plate bolted to the ends of four horizontal sliding rods *h h*, a corresponding plate, *i*, being also bolted on to the opposite ends of such rods. These sliding rods work through guide-holes in the vertical standard B and bracket B¹, and are caused to slide longitudinally to and fro upon the surface of the table A, by the action of the vertical slide U, through the intervention of the link *l*, which is jointed at one end to a lug in the back of the slide, and at the opposite end to another lug in the plate *i*. On the interior of the front plate *g* there is secured or formed a projection, *m*, which operates against the front one, *e*, of the two moulding-jaws, the opposite jaw *e*¹ being acted upon by a wedge or inclined projection, *m′*, fitted to or formed on the face of the vertical slide U.

Each of the operating cylinders is constructed in the manner shown by the sectional detail, fig. 5, with a view to cushioning the pistons and arresting their further ascent before reaching the top covers. This I accomplish by bringing the upper steam-port *n* into the cylinder, some distance below the top cover, so as to leave a steam-space above the piston after it has cut off the steam, by covering the port. Round the interior of the cylinder I form a separate series of steam-ways, *o o*, which establish a communication between the upper and under sides of the piston when elevated. The distance between the upper and lower ends of such passages should be rather greater than the thickness of the piston, and the upper ends of these passages *o*, should be a little above the upper edge of the steam-port *n*, as shown in fig. 5. The effect of this arrangement is that as the piston is driven up by the steam entering by the bottom port *p*, it cuts off or arrests the escape of steam through the upper steam-port *n*, and confines or imprisons a portion of the steam above it in the space between the top of the piston and the cylinder cover, such confined steam acting as a cushion. On the recoil, however, of the piston, a communication will be established between the upper and lower sides thereof, through the steam-ways *o o*, and a perfect equilibrium will be obtained so long as the piston is not in operation, but on the admission of fresh steam above the piston it will be forced down to its work, and when the escape is open it will rise again, and its course will be arrested, as before described, just before reaching the cover of the cylinder. It is obvious that the steam-ways *o o* may be advantageously employed in the cylinders of steam-hammers and other double-acting steam-forging machines.

Having set forth the general construction of my improved machinery or apparatus for shaping and forging metals, I will now proceed to describe its mode of working when forging "tees," "elbows," and the like pipe-fittings. The flat plate or suitably shaped blank, having been suitably heated for forging, is bent into the rough form of a "tee," "elbow," or "cross," by a shaping or bending machine, after the manner described in the specification of the patent hereinbefore referred to. The partly formed article is then reheated to a welding heat in a suitable heating-furnace, and is placed in the hollow of the mould-block *r*, in the position shown in figs. 3 and 4. The three mandrels *k′* and *k k* are then caused to approach or converge simultaneously, and enter the ends and vertical portion of the "tee," (see fig. 4.) This action of the mandrels is produced by adjusting the valve, so as to admit steam above the piston in the cylinder E, which is forced downward in company with the slide U and mandrel *k′*. The upper pair of pins *d d* in the slide U, by acting upon the levers Y′ Y′, cause the horizontal slides W to approach, carrying with them the mandrels *k k*. A shoulder or collar is formed on each of these three mandrels, which serves to square up the ends of the three arms of the "tee," as will be clearly seen on refering to fig. 4. Whilst this action is going on, the descent of the slide U also brings into operation the hinged moulding-jaws or clams *e e′*, (fig. 3,) causing them to close upon and firmly gripe the exterior of the forging, thereby imparting the proper shape or finish thereto, and holding it firmly whilst the two edges of the blank are being welded together by the welding-dies or tools *c c*, as I shall presently explain. In fig. 2 I have represented the slide U in its lowest position, but in fig. 3 I have shown in red lines the same slide in its highest position. On referring to these figures it will be seen that as the slide descends the link *l*, by assuming a more horizontal position, forces the sliding frame *h g i* in the direction of the arrow in fig. 3, thereby causing the projection *m* to press against and close the front jaw *e*, at the same time that the descent of the wedge or inclined projection *m′* fast on the slide U closes up the corresponding jaw *e′*. Whilst the forg-

ing is being thus firmly griped between the internal mandrels *k k'* and external jaws or clams *e e'*, the welding-tools *c c* are brought into operation by depressing the lever-handle M, and thereby admitting the steam simultaneously above each of the pistons in the cylinders F F. These tools *c c* operate upon the exposed portion of the forging between the edges of the closed jaws *e e'*, and are so shaped as to enter the angle at the junction of the vertical with the horizontal branches of the "tee," and to fit accurately round such portion of the forging as is exposed between the two upper edges of the closed jaws. The forging having been thus completed, a reverse movement of the valves effects the instant release of the article, by simultaneously withdrawing the three mandrels, and opening the jaws *e e'*, when the forging is removed, and a fresh blank introduced. I have only considered it necessary to describe and illustrate the mode of producing tees, as it will be obvious to the practical man that by suitably modifying the shape of the mould-block and jaws, and using one or both the horizontal mandrels *k k*, as the case may be, "elbows," "crosses," and other like forgings may be equally manufactured in this machine. Although I have described the direct application of steam to the working of the shaping and forging instruments, I do not confine or restrict myself to that mode of operation, as other elastic fluids may obviously be employed, such as compressed air, or non-elastic fluids, such as water, either directly or indirectly, or the requisite power may be derived indirectly from manual labor.

I claim as my invention, and desire to secure by Letters Patent, as an improvement on the aforesaid patent of Shipton and Mitchell—

The peculiar arrangement of steam-ports and ways in the cylinders of double-acting steam-hammers and forging machines, substantially as and for the purpose hereinbefore described, and illustrated by fig. 5 of my drawings.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT MITCHELL.

Witnesses:

WM. MANBY,

G. F. MANBY.