

(No Model.)

3 Sheets—Sheet 1.

W. H. THOMPSON:  
STEAM STAMP MILL.

No. 304,471.

Patented Sept. 2, 1884.

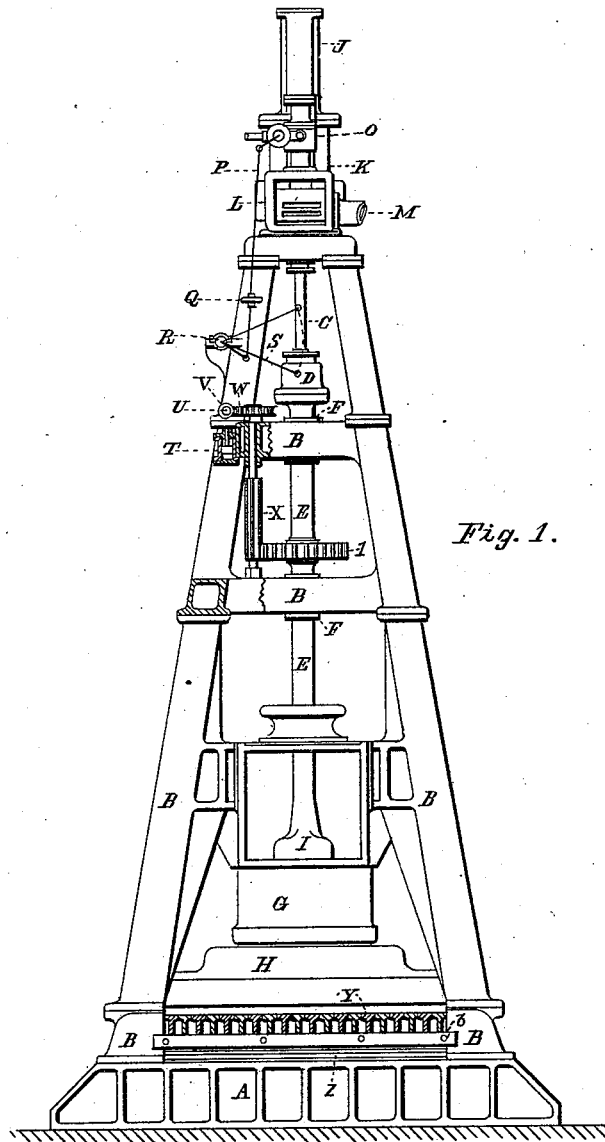


Fig. 1.

WITNESSES  
J. H. Burridge,  
C. W. Lurney

INVENTOR  
W. H. Thompson  
W. H. Burridge, Atty.

(No Model.)

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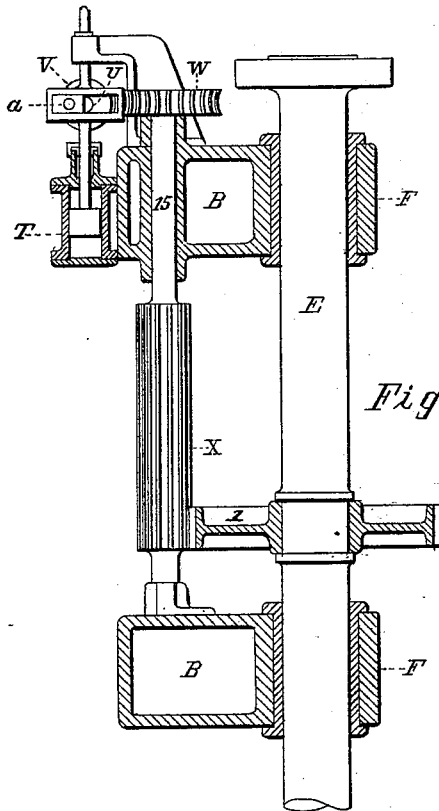


Fig. 3.

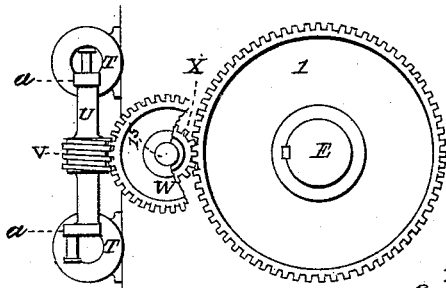


Fig. 4.

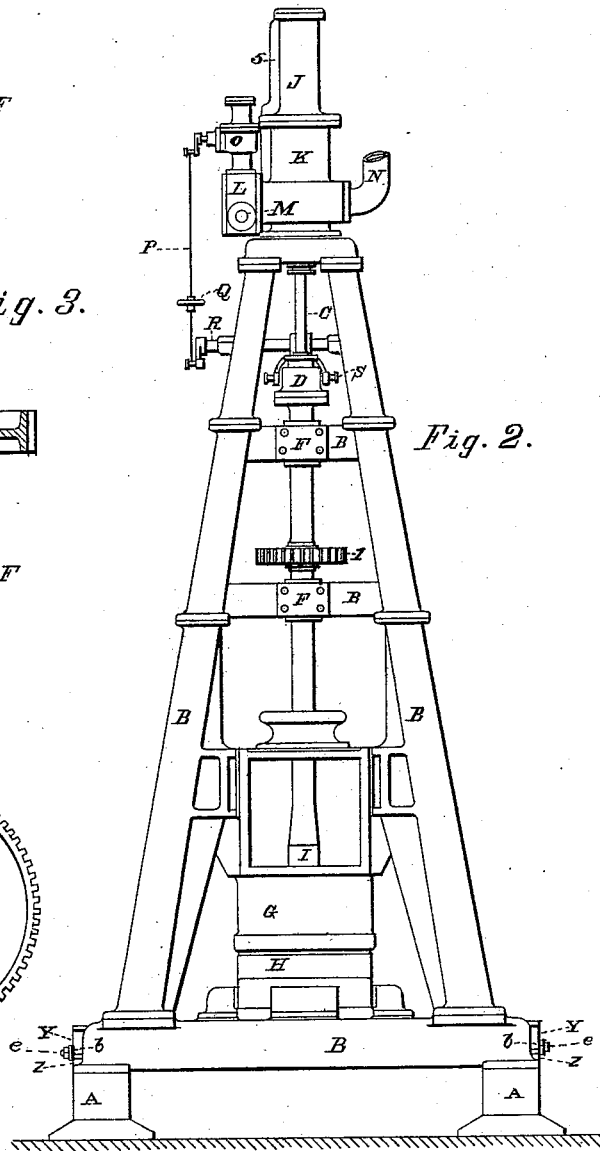


Fig. 2.

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(No Model.)

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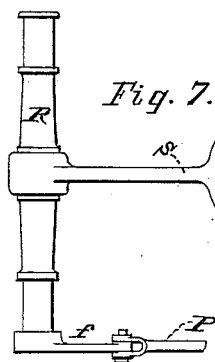
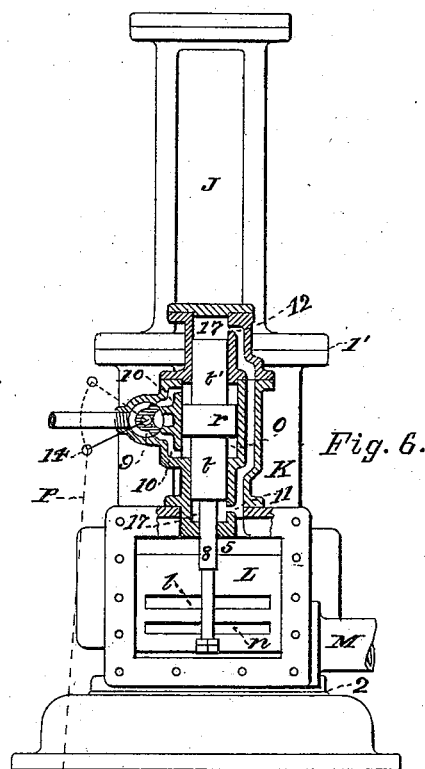
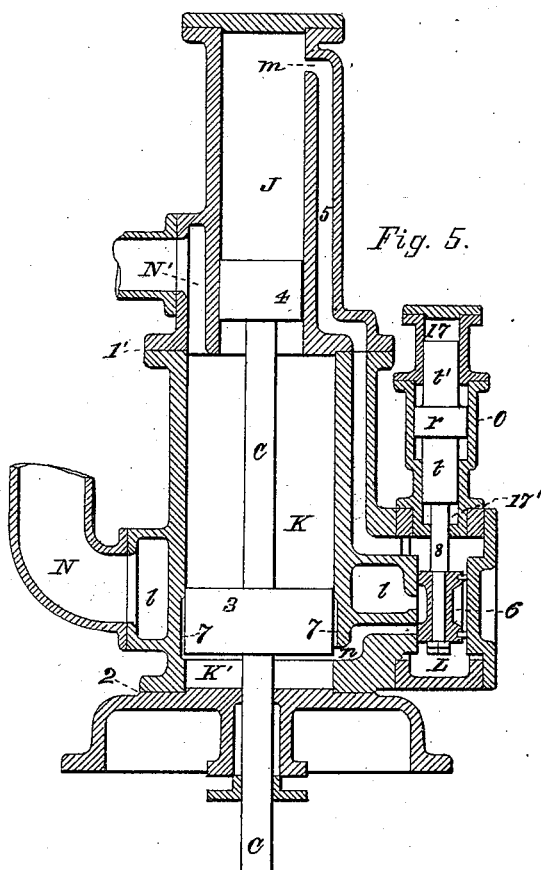


Fig. 7.

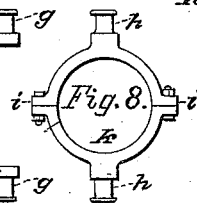


Fig. 8.

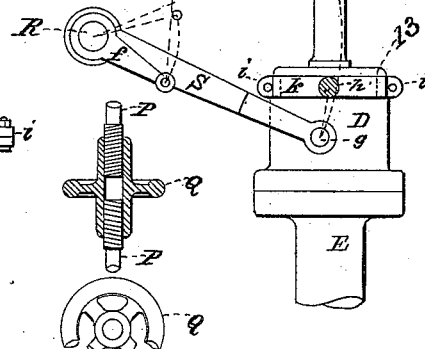


Fig. 9.

Witnesses.  
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# UNITED STATES PATENT OFFICE.

WILLIAM H. THOMPSON, OF CLEVELAND, OHIO.

## STEAM STAMP-MILL.

SPECIFICATION forming part of Letters Patent No. 304,471, dated September 2, 1884.

Application filed October 6, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. THOMPSON, of the city of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Steam Stamp-Mills of the class that use only a single stamp-shaft, and used for pulverizing metaliferous or mineralized rock, of which the following is a specification.

My improvements consist, first, of a new arrangement of steam cylinders and pistons, from which I obtain the power for producing the reciprocating vertical motion of the stamp-shaft, by which I am able to obtain a more powerful action of the stamp-shaft on the downstroke, increasing its pulverizing capacity to a greater extent than has been heretofore obtained, also to limit the stroke of the steam-pistons and stamp-shaft, so as to prevent any traveling beyond prescribed limits; second, a valve-motion for operating the main steam-valve, whereby the machine is enabled to maintain its own motion automatically; third, the mechanism for rotating the stamp-shaft automatically, so as to expose the rock material in the mortar or rock receptacle to a more uniform pulverization than by the usual means, and the face of the stamp head or die is subject to an even abrading action, whereby the face of the stamp-head will be preserved in the best condition until worn out.

In the accompanying drawings, Figure 1 is a general side elevation, and Fig. 2 is a general front elevation, of a steam stamp-mill in which my improvements are shown located. Figs. 3, 4, 5, 6, 7, 8, 9 show my improvements drawn on an enlarged scale for more complete illustration and explanation than could be had from the small scale at which the general elevations Fig. 1 and 2 are drawn, said Figs. 3, 4, 7, 8, and 9 being detached sections.

In the drawings like letters of reference indicate like parts in the several figures.

In the general elevations Figs. 1 and 2, A is the main sills or principal bottom sections of the frame of the machine, which are bolted securely to the foundation; B, the upper frame, suitably designed and constructed so that the machine shall be entirely self-contained and at the top form a substantial seat for the steam-cylinders for producing the re-

ciprocating vertical motion of the stamp-shaft; C, the steam-piston rod; D, buffer-box connection between the steam-piston rod and stamp-shaft; E, stamp-shaft; F, guides in the machine-frame for the stamp-shaft; G, mortar or rock receptacle for the rock or other material to be pulverized; H, anvil-block or bed-plate on which the mortar stands; I, stamp head or die at the bottom end of the stamp-shaft.

My improvements, as seen and located in the general elevations Figs. 1 and 2, are, first, steam-cylinders J and K, steam-piston rod C, main valve-chest L, inlet steam-pipe M, and the exhaust-pipe N N', for producing the vertical reciprocating motion of the stamp-shaft; second, steam-cylinder O, Figs. 1, 2, and 6, with its operating-valve chamber, and valve, valve-arms 14, connecting valve-rod P with the hand-wheel screw adjustment Q, arm f, rock-shaft R, and lever S, connected to ring k on the buffer-box D, connected with piston-rod C, receiving motion therefrom, which constitute the automatic valve-motion for operating the main steam-valve of cylinders J and K, Figs. 5 and 6; third, the steam-cylinders T, having valves and valve-motions adapted to produce rotary action, coupled at right angles to the cranks a a on crank-shaft U, worm V, worm-wheel W, spur-pinion X, and spur-wheel 1. This latter is keyed to the stamp-shaft E, constituting the device for rotating the stamp-shaft, Figs. 1 and 3.

Fig. 5 is a vertical section through the center of the steam-cylinders J and K, valve-chambers L, and main valve-cylinder O.

Fig. 6 is an external elevation of the cylinders J and K, steam valve-chamber L, with the steam-cylinder O shown in vertical section, the piston-rod C, buffer-box connection D, and top end of the stamp-shaft E, together with the levers and rods for operating the valve of cylinder O. The top steam-cylinder, J, is central with the larger bottom cylinder, K, and bolted thereto by a flange-connection at 1'. The larger or bottom steam-cylinder, K, stands upon its bottom head, and bolted thereto by the flange at 2. This bottom cylinder-head forms also the upper portion or cap for the frame of the machine. The diameter of the steam-cylinder J should be such as will give an aggregate steam-pressure of the piston suf-

5 sufficient to impart to the stamp-shaft on the down-  
 stroke the desired energy of action or force with  
 which the stamp-head will strike the rock ma-  
 terial to be pulverized. The diameter of the  
 10 steam-cylinder K, Fig. 5, should be such as to  
 give an aggregate steam-pressure on the piston  
 3 sufficient to counterbalance the steam-pres-  
 sure on piston 4, together with the weight of  
 15 the stamp-shaft, pistons, and rods, &c., and  
 leave a surplus steam-power sufficient to make  
 the upstroke with the desired velocity. The  
 bottom end of the cylinder J and top end of  
 the cylinder K are open one into the other,  
 and the chamber or space so formed between  
 20 the piston 3 and piston 4 is open at all times  
 to the atmosphere through the exhaust-pipe N',  
 Fig. 5.

25 The steam-pistons 3 and 4 are both fixed  
 upon the same piston-rod C, the upward stroke  
 of which will be made by admitting steam  
 below the large piston 3, which being ex-  
 hausted at the termination of the upward  
 stroke, the downward stroke will be made by  
 the steam action upon piston 4. The steam-  
 30 passage 5, leading from main valve-chamber  
 L to the top end of cylinder J, is at all times  
 in free communication with the valve-cham-  
 ber L, Figs. 1, 5, and 6, and not subject to  
 valve action, leaving the steam constantly act-  
 ing on the top side of the piston 4. *n*, the in-  
 35 let steam-port from the main valve-chamber  
 to the bottom end of the cylinder K. For the  
 main steam-valve 6, although not a necessity, I  
 prefer what is known as a "balanced valve,"  
 40 inasmuch as the relief of the steam load upon  
 the valve promotes a more prompt valve ac-  
 tion. This valve is only single-acting, ad-  
 mitting steam to and from the under side of  
 piston 3, only the exhaust-steam passing off  
 45 to the atmosphere through the exhaust-cham-  
 ber *l* and the exhaust-pipe N, Figs. 5 and 6.  
 Toward or near the bottom end of cylinder K,  
 commencing at the bottom of the inlet steam-  
 50 port *n*, Fig. 5, and extending upward to about  
 half an inch less than the face depth of pis-  
 ton 3, is a chamber, 7, about half an inch larger  
 in diameter than the working-bore of the cyl-  
 55 nder, which arrangement is for arresting the  
 working of the machine when from any acci-  
 dental derangement or neglect the pistons go  
 below the prescribed limit of stroke, and to  
 prevent the piston 3 striking the bottom cyl-  
 60 nder-head. The ordinary conditions of work-  
 ing the downward stroke will be determined  
 by the stamp-head striking the rock material,  
 and during this condition no means are nec-  
 essary in the cylinder for arresting the travel  
 of the piston downward. Should, however,  
 65 the feeding of the machine be neglected or  
 some accidental derangement occur and allow  
 the piston to descend beyond its prescribed  
 limit of stroke, the bottom edge of the piston  
 3 will then have passed the bottom edge of the  
 chamber 7, Fig. 5, and have entered the lower  
 section, *k'*, of the cylinder, the diameter of  
 which is the same as the diameter of piston.  
 The inlet steam-port *n* will then be shut off

from the under side of the piston, and the  
 steam, being trapped in the bottom end of  
 cylinder, will prevent the piston descending 70  
 so as to strike the bottom cylinder-head. At  
 the same time the upper edge of the piston  
 will have descended below the top edge of  
 the chamber 7, and so allow the inflowing  
 steam to pass around the piston into the up- 75  
 per end of the cylinder and escape through  
 the exhaust-pipe N', and further working of  
 the machine will be arrested until the irregu-  
 larity has been corrected. The upward stroke  
 80 will be determined by the piston 4 closing the  
 port *m* of the cylinder J, and thereby trapping  
 the steam in the upper end of the cylinder,  
 and so preventing further motion in that  
 direction. This action will occur at every  
 stroke with more or less intensity, and the 85  
 entrapped steam above the piston will be more  
 or less compressed and correspondingly in-  
 creased in pressure, which will accordingly ac-  
 celerate the return or downward stroke of the  
 stamp-shaft. The main steam-valve 6, Fig. 5, 90  
 is operated by power obtained from the steam-  
 cylinder O, connected to the top side of the  
 main valve steam-chest L, the steam-piston  
*r*, Fig. 6, being directly connected to the top  
 end of the main-valve stem 8, the operating- 95  
 valve 9 and inlet and outlet steam-ports 10 be-  
 ing of the usual construction to admit steam  
 to and from either end of the cylinder, to pro-  
 duce a reciprocating piston motion. Each  
 side of the piston *r*, Figs. 5 and 6, is a trunk- 100  
 extension, *t t'*, both of equal diameter, each  
 provided with packing-rings, so that each  
 trunk will operate as an ordinary single-act-  
 ing trunk-piston. These trunk-pistons work  
 in steam-cylinders 17 17', of corresponding di- 105  
 ameter.

To the top end of the top trunk-cylinder, 17,  
 and to the bottom end of the bottom trunk-  
 cylinder, 17', the steam from the steam-chest  
 L has free access through the ports 11 and 12. 110  
 These ports are at a proper distance from the  
 end of each trunk-piston to admit of a piston-  
 travel equal to the stroke of the main valve 6  
 at the prescribed limit of the piston-stroke in  
 either direction. The trunk-piston will close 115  
 the ports 11 or 12, thereby trapping the steam  
 in that end of the trunk-cylinder and pre-  
 venting further travel in that direction, thus  
 alternately moving the main steam-valve 6  
 without injurious jar. 120

The motion of the operating-valve 9 of the  
 steam-cylinder O, Fig. 6, is obtained from the  
 movement of the piston-rod C. On the top  
 end of the buffer-box connection D, attached  
 to the piston-rod C, is a square groove, 13. 125  
 Into this groove is fitted the ring *k*, Fig. 8,  
 which is formed in two halves and bolted  
 together by bolts through the lugs *i*, so as  
 to form one ring. On each side of this ring  
 is a journal, *h h*. Each journal is connected 130  
 by a suitable link with corresponding journals,  
*g g*, connected with the forked end of lever S.  
 (Another view of lever S is seen in Fig. 7.)  
 Lever S is fixed to the rock-shaft R. On one

end of said rock-shaft R is an arm, *f*, to which is attached the rod P, Fig. 6, which extends to and in connection with the arm 14 on the stem of the valve 9 of cylinder O. This rod P is in two sections, connected about the middle by right and left screwed ends into the hub of the hand-wheel Q, which admits of the rod being lengthened or shortened, so as to obtain a proper relative adjustment between the valve 9 of cylinder O and main valve 6.

The device for rotating the stamp-shaft is shown on an enlarged scale in Figs. 3 and 4, where Fig. 3 is an elevation, with the supporting portions of the frame B shown in section. Fig. 4 is a plan view of the same. T T are two steam-cylinders fixed to the frame of the machine, each cylinder having suitable pistons, with piston-rods attached to cranks *a a*, set at right angles, one on each end of the crank-shaft U. No valves or valve-motion for these steam-cylinders is shown in the drawings, it being understood that any ordinary construction of valves and valve-gear adapted to produce rotary motion being sufficient. The worm V is fixed upon the crank-shaft, and worm-wheel W gears with the worm V on the crank-shaft, and fixed on the top end of the shaft 15. The spur-pinion *x* is fixed on the shaft 15, and having a sufficient breadth of face to keep in gear with the spur-wheel 1, as it moves vertically with the stamp-shaft, through the whole stroke, the spur-wheel 1 being fixed to the stamp-shaft, so as to rotate the same, and moves vertically with it, and through the entire stroke gears with pinion *x*. It will be understood that by the rotation of the crank-shaft U, worm V and worm-wheel W, spur-pinion *x*, and spur-wheel 1 a slow rotary motion will be imparted to the stamp-shaft E, Figs. 1, 3, and 6.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Steam-cylinders J and K, provided with pistons 4 and 3, piston-rod C, valve-chamber

L, steam-valve 6, and valve-stem 8, in combination with the buffer-bore connection D, stamp-shaft E, mortar G, anvil-block H, main sills A, and a suitable supporting-frame, substantially as described, and for the purpose set forth.

2. The steam-cylinder J, provided with the steam-passage 5, and steam-port *m*, and exhaust-port N', in combination with the valve-chamber L, steam-cylinder K, steam-pistons 4 and 3, and piston-rod C, substantially as described, and for the purpose set forth.

3. In the steam-cylinder K, the chamber 7 and cushioning-chamber K', in combination with the steam-port *n*, valve-chamber L, steam-valve 6, valve-stem 8, steam-cylinder J, steam-pistons 3 and 4, and piston-rod C, substantially as described, and for the purpose set forth.

4. Steam-cylinder O, steam-piston *r*, trunk-pistons *t t'*, and trunk-cylinders 17 17', with a valve-chamber and valve, in combination with the valve-chamber L, steam-valve 6, valve-stem 8, and steam-cylinders J and K, substantially as described, and for the purpose set forth.

5. Valve-arm 14, valve-rod P, hand-wheel Q, arm *f*, rock-shaft R, lever S, and ring *k*, in combination with the piston-rod C, buffer-box connection D, stamp-shaft E, steam-cylinder O, and steam-valve 9, substantially as described, and for the purpose set forth.

6. Steam-cylinders T T, with their pistons and piston-rods, crank *a a*, crank-shaft U, worm V, worm-wheel W, shaft 15, spur-pinion *x*, and spur-wheel 1, in combination with the stamp-shaft E, with a supporting-frame, B, substantially as described, and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM H. THOMPSON.

Witnesses:

W. H. BURRIDGE,  
J. H. BURRIDGE.