(No Model.) 2 Sheets—Sheet 1.

J. F. ALLEN.

RIVETING MACHINE.

No. 307,421. Patented Nov. 4, 1884.

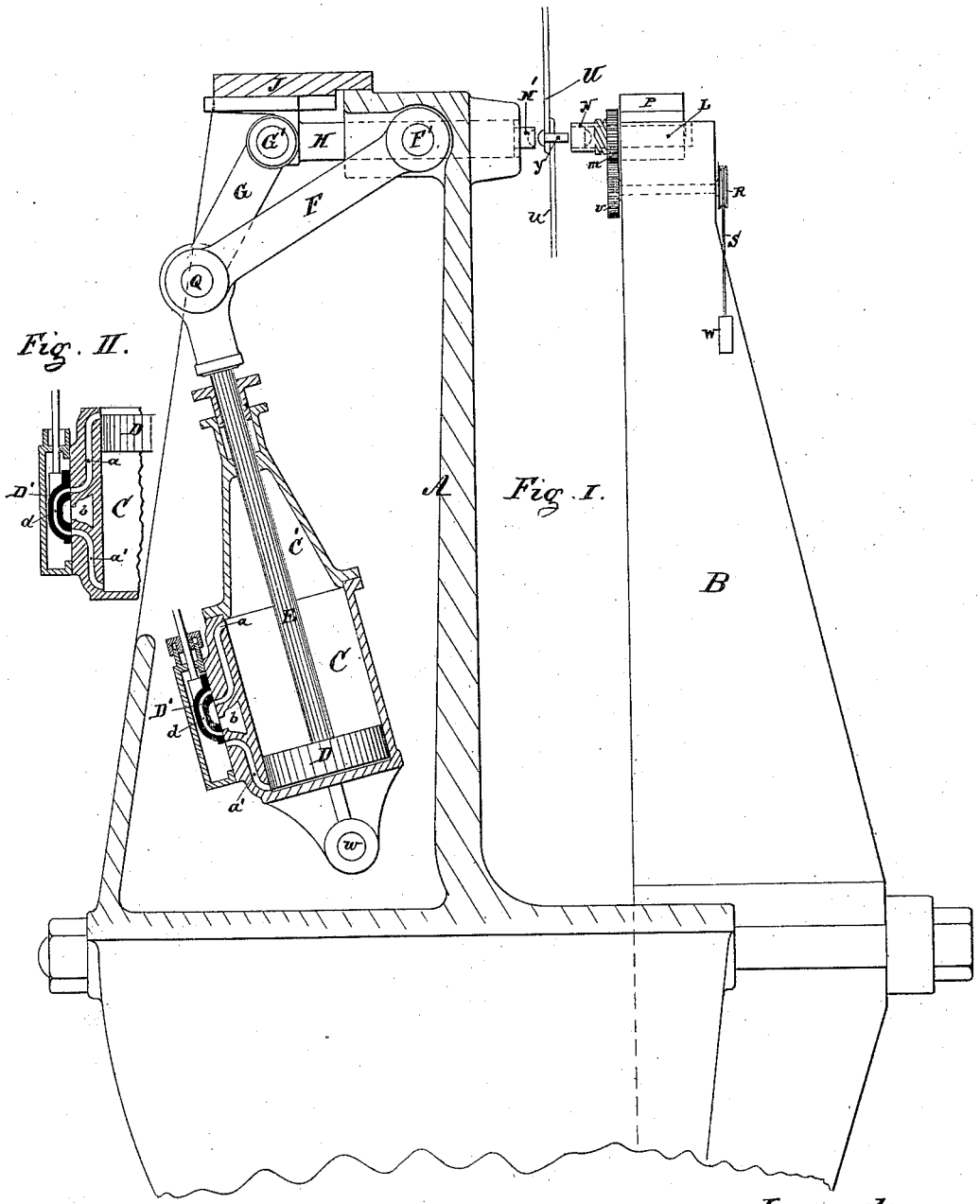


Fig. II.

Fig. I.

Witnesses

E. Pauls

J. Gemmel, Jr.

Inventor

John F. Allen

per Emery & Booth

Attorney

(No Model.) 2 Sheets—Sheet 2.

J. F. ALLEN.

RIVETING MACHINE.

No. 307,421. Patented Nov. 4, 1884.

Fig. II.

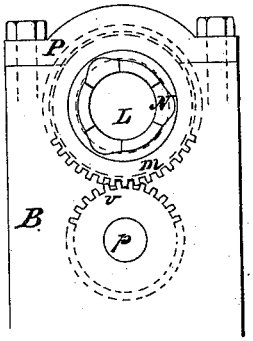


Fig. III.

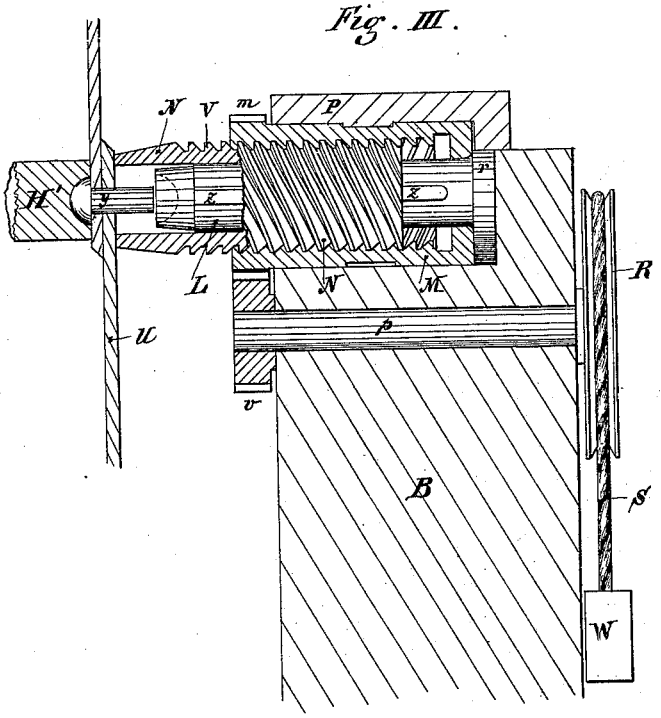


Fig. V.

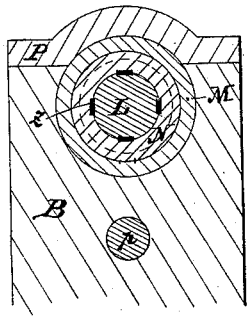


Fig. VI.

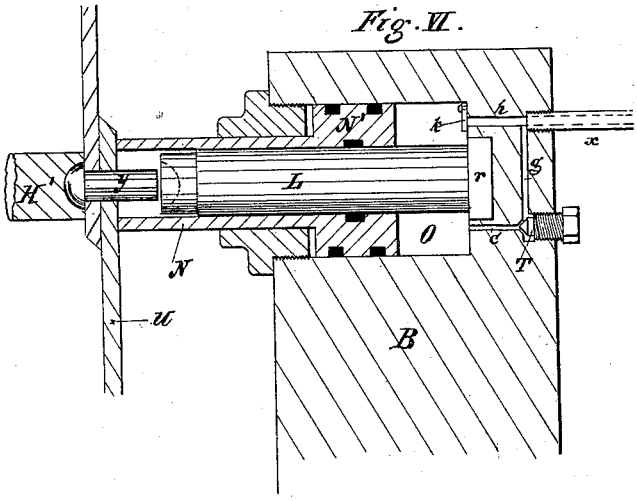
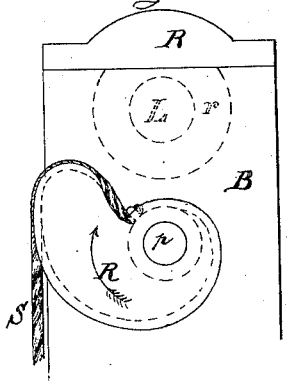


Fig. VII.



WITNESSES:

Jacob. Kotlowsky.

Gustave Berger

INVENTOR

John F. Allen

BY

Henry E. Roocker

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN F. ALLEN, OF BROOKLYN, NEW YORK.

RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 307,421, dated November 4, 1884.

Application filed May 25, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. ALLEN, of Brooklyn, in the State of New York, have invented new and useful Improvements in Riveting-Machines, of which the following is a specification.

The nature of my invention relates to the arrangement of a sleeve in the "end stake" of a riveting-machine surrounding the end die and acted upon by a suitable pressure, whereby, together with the moving ram and its die, the plates to be riveted together are previously to and during the process of forming the rivet-head pressed firmly together, to prevent any possibility of forming a fin between said plates.

Riveting-machines have heretofore been constructed to press the plates together before and during the operation of forming the rivet-head. In that construction a ram or sleeve surrounding the die or dolly-bar is employed, operated separately by gearing or by two cylinders, (see English Patent No. 2,487 of 1862,) arranged upon the main frame of the machine, where the ram or sleeve is first moved forward to exert a pressure against the plates, after which the die is moved forward to form the rivet-head. This construction necessitates the insertion of the rivet to be operated upon from the side of the end stake or from the inside of the boiler-shell and the forming of the rivet-head at the outside of the shell, which is more or less objectionable on account of the general formation of fins or projections around this head.

My invention permits the rivet to be inserted from the outside, and the head to be formed in the inside of the shell, and has besides the advantage that it can readily be applied to any existing machine by altering the head of the end stake.

My invention consists in the arrangement of a sleeve surrounding the stationary die in the end stake, said sleeve being provided with an external screw-thread working in a corresponding nut turning freely in the end stake. By moving or turning the nut by hand or by a weight the sleeve will be moved outward toward the inner side of the plates, when the forward motion of the ram and its die against the head of the rivet produces the desired pressure against the plates. The further motion of the ram and its die overcomes the friction of the screw-thread, and as this sleeve moves on feathers or keys fast to the stationary die, and is thereby prevented from turning, its nut will turn around and allow the sleeve to recede slowly, when the end of the rivet will be pressed into the cavity of the end die and the desired head be formed on the rivet. It will thus be perceived that the plates will be subjected to a pressure between the ram and this sleeve before and during the operation of forming the rivet-head equal to the power required to cause the nut to turn around, and by varying the resistance of this nut the pressure on the plates may be increased or diminished at pleasure. This sleeve may be attached to a piston working in a cylinder made or placed in the end stake or attached to the same, and surrounding the stationary end die, and hydraulic pressure employed to force the piston and sleeve outward. When the force of the forward-moving ram and die comes against the outside of the plates, the fluid in this cylinder is allowed to escape through a very small orifice or loaded valve, the size of which, and consequently the velocity of the escaping fluid, will regulate the pressure exerted against the plates.

In the accompanying drawings, Figure I represents an elevation of a riveting-machine, partly in section, embodying my invention. Fig. II is a section of part of the cylinder and valve. Fig. III is a section of the end stake, the screw-threaded sleeve, and its nut. Fig. IV is a front view of the same. Fig. V is a cross-section of the same. Fig. VI is a section of the head of an end stake and sleeve operated by hydraulic pressure. Fig. VII is an end view of the stake, showing the construction of a cam.

Similar letters represent similar parts in all the figures.

A is the main frame of the machine, and B the end stake or anvil-post. The main frame A is made hollow or box-shaped, and contains the cylinder C, to operate the ram H by means of the toggle-levers G and F. These levers are connected at one end to the piston-rod E at Q. The other end of the lever F turns on a fixed center, F', on the frame A, and the other end of the lever G is attached to

the end of the ram H at G′, and as these levers are of unequal length, the lever G will communicate the desired motion to the ram H. The forward end of this ram H is furnished with the necessary die H′, and is guided in the frame A, and the after end of said ram is guided in the cap J.

In the end stake, B, is the end die, L, the rotation of which is prevented by its head *r*. Around this die L a sleeve, N, is placed, working on feathers or keys *z z*, Fig. V, attached to the die L, which prevent said sleeve N from turning, but allow the free inward or outward movement of the same. On the outer surface of this sleeve N is a screw-thread, V, working in a nut, M, that turns freely in the end stake, B, and is held in place by the cap P. At the outer end of this nut M teeth *m* are made, meshing into corresponding teeth in the wheel *v*, fast to a shaft, *p*, on the end of which a wheel or cam, R, is attached, around which a cord, S, passes, having a weight, W, attached to its end. When the outer end of the sleeve N is not subjected to any pressure from the ram, the weight W will act, through its wheel or cam R and wheel *v*, upon the teeth *m* on the nut M, so as to cause the turning of said nut M, and thereby move the sleeve N outward into the desired position, projecting some distance forward of the die L, as shown in Figs. I and III. The rivet Y having been inserted in the rivet-holes in the plates U from the outside of the plates or shell, the die H′ in the ram H will, during the forward movement of said ram H, come against the rivet-head and press the plates U between it and the end of the sleeve N. The further movement of the die H′ and ram H will cause the sleeve N to recede or move inward under a pressure corresponding to the power required to turn the nut M and overcome the resistance produced by the connected weight W until the end of the sleeve N will be in the same plane with the outer end of the die L. During this latter movement of the ram H and its die H′ the end of the rivet will be forced into the cavity in the end die, L, and the desired rivet-head formed thereby. As soon as the ram H with its die H′ is moved backward, the action of the weight W will turn the nut M, moving thereby the sleeve N outward into its original position ready for the next operation. It will be perceived that the force required to cause the sleeve N to recede or move inward depends first upon the pitch of the screw-thread V; secondly, upon the movement of the weight W, and also upon the relation of the diameters of the gear-wheel *v* and the gear upon the nut M; hence by varying any or all of these the resistance opposing the rotation of the nut M, and consequently the amount of pressure exerted against the plates U, can be easily regulated.

The object of throwing a pressure against the plates is to prevent the formation of "fins" between the plates in case the same are not very well fitted. This danger is the greatest at the beginning of the action of the end die against the end of the rivet. It may therefore be advisable in some cases to increase the resistance opposing the rotation of the nut M, and consequently the amount of pressure against the plates at the time the end die begins to act against the end of the rivet. This can be done by substituting a cam, R, (see Fig. VII,) for the wheel R, Fig. III, whereby the movement of the weight W will be at its maximum at that time when the sleeve N begins to move inward and gradually diminish as the danger of forming a fin between the plates is removed, and which may be regulated by the shape of this cam.

It will be perceived that the weight W, together with its connecting-gearing, may be dispensed with and the nut M turned by hand, less than one-quarter turn of said nut M being required to move the sleeve N the required distance outward; but by the arrangement of weight and gear above described the whole operation will be automatic.

In Fig. VI, where B represents the head of the end stake and L the stationary end die, the sleeve N, surrounding the end die, L, is attached to a piston, N′, working in a cylinder, O, made in the end stake, B, or a suitable cylinder may be attached to the inside of the end stake. This cylinder O is supplied with the required fluid through the pipe *x* and passage *h* to move the piston N′ and its sleeve N outward into the required position whenever the end of said sleeve N is relieved from pressure resulting from the movement of the ram H and its die H′. Whenever the ram H with its die H′ forces the plates U against the end of the sleeve N, as above described, the fluid previously introduced into the cylinder O will be forced out through the passages *e* and *g* into the pipe *x* or accumulator. The size of the opening through which the fluid is forced to escape will regulate the back-pressure on the piston N′, and consequently the force exerted by the end of the sleeve N against the plates U.

To regulate the orifice through which the fluid must pass a screw-valve, T, is arranged, whereby the opening may be increased or diminished, as may be desired. At the end of the passage *h* a self-acting valve, K, is arranged to prevent the escape of the fluid through this passage, or a check or non-return valve may be arranged in the pipe *x* for that purpose; but in this latter case the passage *g* must connect with the pipe *x* outside of said valve.

In riveting-machines the power required from the cylinder is mainly required in one direction—namely, to move the ram outward to form the desired rivet-head by compression, while to cause the backward motion only very little power is required, as the weight of the several parts will almost effect that result. To save, therefore, the amount of steam or its equivalent which would be required to fill

the cylinder in the backward movement of the piston D, I arrange at the upper end of the cylinder a large chamber, C′, into which the steam previously employed to raise the piston D is allowed to escape through a passage, *d*, made in the valve D′, which, as shown in Fig. II, forms a direct communication between the lower port, *a′*, and the upper port, *a*, or between both ends of the cylinder. After thus filling the space C′ a farther motion of the valve D′ will close the port *a* and open a communication between the port *a′* and the exhaust *b*. The steam or its equivalent in the space or chamber C′ will then expand and move the piston D, together with all its connected parts, back again to the position shown in Fig. I, ready for operation, and then as soon as steam or its equivalent is admitted below the piston D, a communication will be made through the port *a* between the chamber C′ at that end of the cylinder and the exhaust-port *b* to allow the remaining steam or its equivalent to escape. The lap on the upper end of the valve D′ is made sufficiently large to prevent any communication between the passage *a* and the steam or its equivalent in the valve-chest surrounding the slide-valve. It will thus be perceived that the steam or its equivalent which has moved the piston in one direction is conducted into a large chamber at the opposite end of the same cylinder, and then caused to move the piston back again before being allowed to escape into the exhaust-passage.

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

1. In a riveting-machine, in combination with the end stake, B, and stationary end die, L, the nut M, and horizontal moving sleeve N, provided with screw-thread V, arranged to operate substantially as and for the purpose specified.

2. In a riveting-machine, the combination, with the nut M, operating a sleeve, N, as described, of the gearing *m*, wheel *v*, shaft *p*, wheel or cam R, cord S, and weight W, for the purpose specified.

JOHN F. ALLEN.

Witnesses:

HENRY E. ROEDER,

J. GEMMEL, Jr.