

No. 627,153.

Patented June 20, 1899.

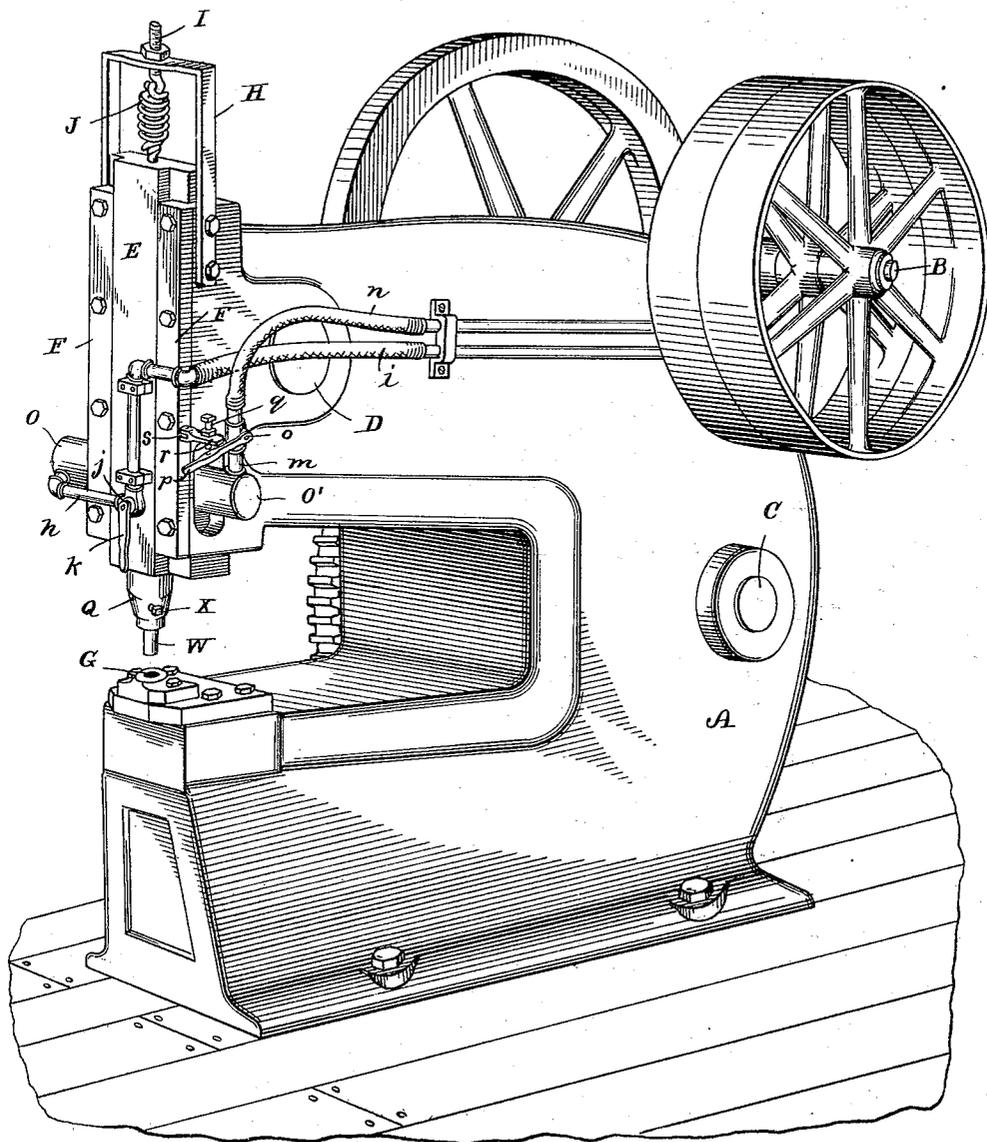
G. B. TENNANT.
GAG FOR METAL PUNCHES.

(Application filed Apr. 21, 1899.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



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4 Sheets—Sheet 2.

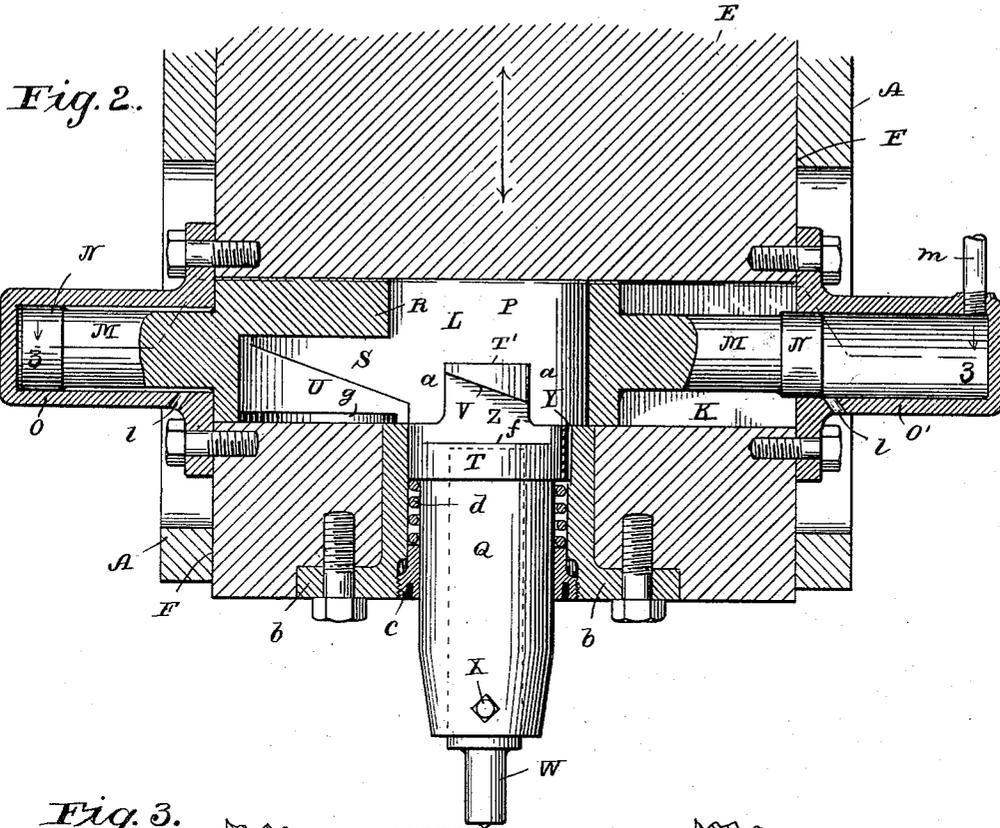
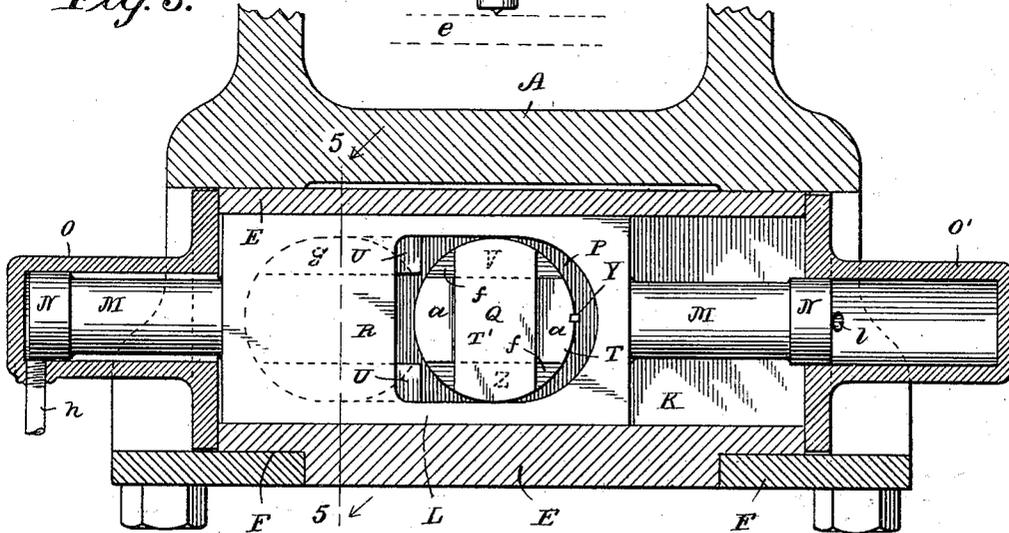


Fig. 3.



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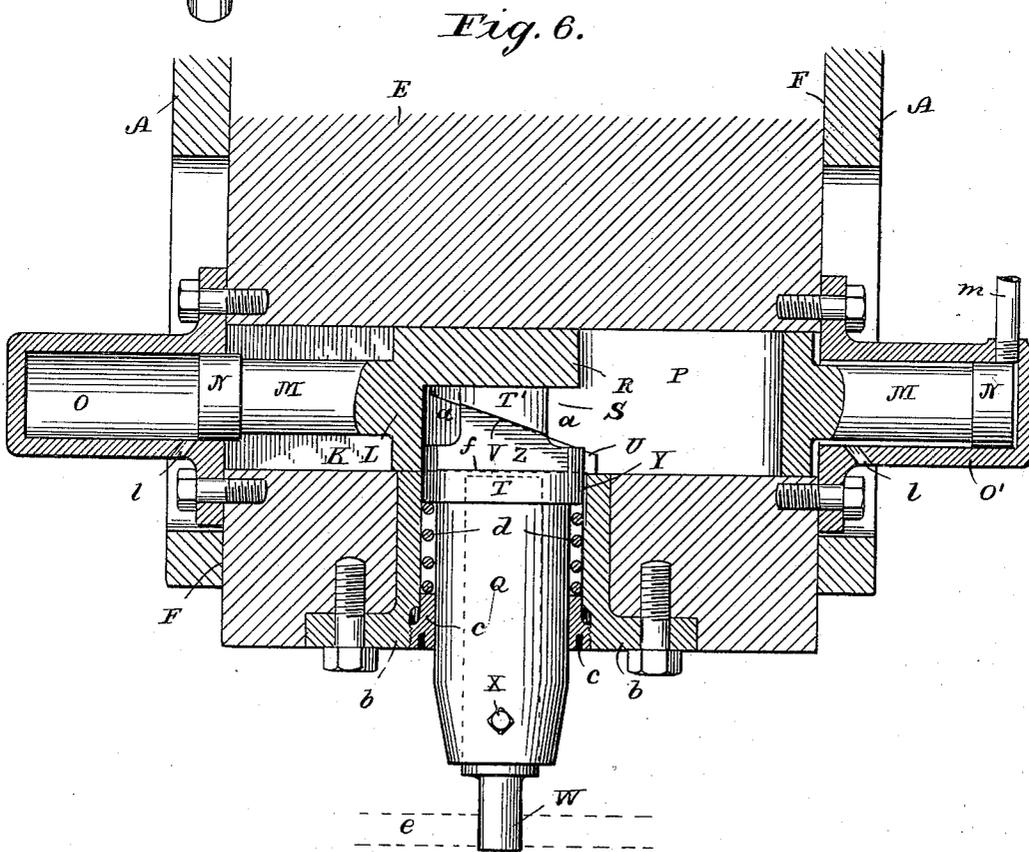
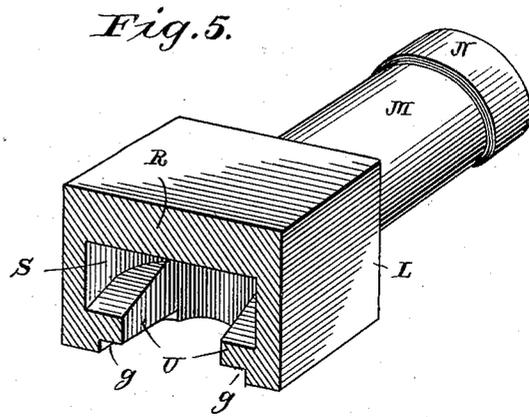
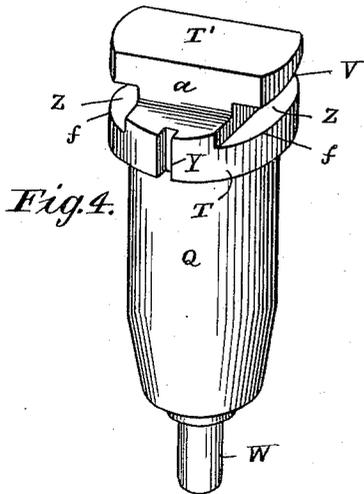
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4 Sheets—Sheet 3.



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GAG FOR METAL-PUNCHES.

SPECIFICATION forming part of Letters Patent No. 627,153, dated June 20, 1899.

Application filed April 21, 1899. Serial No. 713,838. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. TENNANT, a citizen of the United States, residing at Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Gags for Metal-Punches, of which the following is a specification.

My invention relates to new and useful improvements in gags for metal-punches, shears, presses, and similar tools for controlling the operative movement in cases where a reciprocating head is employed.

In some machines of the above class it has been customary to employ a simple sliding gag consisting of a plain piece of metal substantially rectangular in its various sections, provided with a handle and so arranged that it may be introduced between a portion of the surface of the reciprocating head and the upper surface of the punch stock or holder, so as to lock these parts together for an operative stroke, or it may be withdrawn when an operative stroke is not desired, all of which is readily understood by those skilled in the art to which this appertains.

The object of my invention is to provide novel mechanism for machines of the above class whereby the reciprocating head is quickly and positively thrown into engagement with the tool-holder for the purpose of manipulating the latter and the tool carried thereby for an operative stroke and at the same time to so engage said tool-holder that it will be immediately withdrawn from the beginning of the return stroke, and the construction whereby this withdrawal of said tool-holder is promptly effected is a particular feature and novel and important part of my invention. I further provide automatic connections whereby said engagement is released and the tool permitted to stand idle until such time when it is again required. Meanwhile the reciprocating head is in constant motion.

It is also the object of my invention to provide simple and durable mechanism for the above purpose which may be operated by hand, air, steam, or similar power.

With the above objects in view my invention resides and consists in the novel construction and combination of parts shown upon the accompanying four sheets of drawings, which

form part of this specification, and on which similar characters of reference denote like or corresponding parts throughout the several figures.

Referring now to the various sheets of drawings, Figure 1 is a perspective view of a lever-punch which is fitted with my improved gag and mechanism for controlling its operation. Fig. 2 is an enlarged vertical longitudinal sectional view through the frame, reciprocating head, and my improved gag and its connections. Fig. 3 is a horizontal cross-section through the head, taken on line 3 3 of Fig. 2. Fig. 4 is a perspective view of a punch-holder of special construction forming a part of my invention. Fig. 5 is a sectional perspective view of my improved gag, the section being taken on line 5 5 of Fig. 3, and in this view the forward end of the gag is not shown in order that the rear portion may be clearly seen. Fig. 6 is a sectional view similar to Fig. 2, but in this view the gag is shown in operative connection with the punch-stock. Fig. 7 is a form of construction of my improved gag designed to be operated direct by hand. Fig. 8 is another form of my improved punch-holder in which the punch is much smaller than in the previous figures and is readily changed and attached by means of a threaded coupling-sleeve.

Although I have shown my invention applied to a certain form of punch, it will be obvious to those skilled in the art to which it appertains that it is equally applicable to other forms of machinery—such as shears, presses, and the like—in which a continuously-reciprocating head is used to impart an intermittent movement to the tool proper.

Referring now to the various characters of reference marked upon the drawings, A is the main frame or casting of the punch, B the driving-shaft, and C an intermediate shaft which operates a lever (not shown) pivoted at D, the short end of said lever being arranged to engage and reciprocate the sliding head E. Said head moves to and fro in suitable ways F, formed in the frame of the machine.

G is a die upon which the material rests while being operated upon.

Attached to the sliding head E is a coiled spring J, which is secured to the stationary

frame of the machine by the bolt I and support H, and this arrangement serves as an adjustable counterbalance for the sliding head E. The head E, as before stated, slides to and fro in suitable ways or guides provided in the frame, and in actual practice ordinarily makes a number of idle strokes while the material to be punched is being placed and adjusted upon the die, and my mechanism for effecting an operative stroke of the head is clearly shown in Figs. 1, 2, 3, and 6 of the drawings. Transversely across the sliding head E is formed an opening constituting a way K, in which I mount a specially-constructed gag L, which is adapted to be thrown into and out of gear by air-pressure or other means, which I will hereinafter more particularly describe.

One construction of the gag which forms part of my invention is shown clearly in Figs. 2, 3, 5, and 6, and consists of a single rectangular piece having a stem or piston M extended from each end, said stems being provided each with a suitable piston-head N, which operate to and fro in the cylinders O and O', which are secured to the sliding head E through orifices of the main stationary frame provided for the purpose. Said gag is provided with a vertical U-shaped opening P, into which the head of the tool-holder or punch-stock Q may retreat when the gag is in its left-hand position, as seen in the drawings, while the punch-stock is idle, although the sliding head may be reciprocating. Adjacent to the opening P is formed a bridge R, which serves as the filler-block or gag proper, adapted to be placed between the under side of the opening in the sliding head E and the top of the punch stock or holder Q, whereby they are locked together in such a manner that said holder travels with the head, and in consequence the punch W makes an operative stroke through any stock which may be placed on the die below it. Beneath the bridge R is formed a recess S to receive the head T' of the punch-holder, and at either side of said recess are inclines U, which serve to engage corresponding inclines V upon the under side of said head T', and whereby the top of the same is drawn up firmly against the under side of the bridge R.

The construction and operation of the punch-holder Q will be readily understood from Fig. 4 in connection with Figs. 2, 3, and 6, wherein it will be seen that said holder is composed of a cylindrical piece having a central recess to receive the punch W proper, which can be retained in place in any suitable manner—as, for instance, by means of a set-screw X. The upper end of said holder contains an enlargement or head T, in the periphery of which I form a slot Y to receive a key and by means of which said head is guided in its vertical movement, and two sides of said head are cut away, forming pockets or openings Z to receive the inclines U of the gag. At right angles to said recess I cut

away the top edge of the head to produce a clearance *a*, so as to insure compactness and to further secure proper and nearly central engagement of the punch-stock with the gag. The punch-holder is guided in a suitable sleeve *b*, which is secured within a proper recess on the under side of the sliding head E, and within the bore of said sleeve is movably fitted a threaded ring *c*, forming an adjustable bearing for a spiral spring *d*, encircling and normally supporting the punch-holder. From the foregoing it will be seen that when the sliding head is reciprocating idly (with the gag out) the punch is raised and lowered by said head, but with a yielding movement, from the fact that it is resting upon the spiral spring before mentioned and its upper end is entirely free. Upon the other hand, if the operator is adjusting a plate upon the die the punch will come down until it touches the plate *e*, as indicated in Fig. 2, whereby the proper position of the plate is determined, and by a further movement of the sliding head the holder will back up into the opening P of the gag. By this means the punch may rest upon the plate or material to be punched during more or less of the stroke, dependent upon the adjustment of the punch-holder by means of the threaded ring *c* and the supporting-spring *d*, and this action assists the operator in properly locating said plate beneath the punch. After the material to be punched is located the gag is thrown in, drawing up the punch stock or holder against the bridge, which in turn is backed or operatively engaged by the sliding head, thus insuring the complete travel of the punch with the head, which travel is sufficient to force said punch through the stock beneath it. A particular and novel feature of my invention consists in the construction whereby the tool-holder is firmly grasped, and thus immediately withdrawn from the beginning of the return stroke, thus withdrawing or stripping the punch from the material in which a hole has just been formed.

In the old form of gag the thickness of the bridge is either about equal to the distance between the lower surface of the reciprocating head, against which it bears, and the top of the tool-holder, or the thickness of said bridge may be somewhat less than this distance. If the old construction is made in the former manner, the period of time during which the gag may be introduced is very small, as may be readily understood, and if the opening into which the gag is to be introduced is somewhat greater than the thickness of said gag the time during which it may be introduced is somewhat increased. In the last-described old form, however, there is a great disadvantage in that some lost motion exists on account of the fact that the opening into which the gag is introduced is somewhat larger than the thickness of said gag, the result being that when the upward stroke is begun the punch-holder does not begin to

move until a portion of a stroke has been made equal to the difference between the thickness of the gag and the normal depth of the space into which it is inserted. This lost motion seriously interferes with the operation of the punch, and one of the reasons therefor is that it limits the time in which the operator can move and adjust the material for the next stroke, thus seriously reducing the capacity of the machine. I overcome this difficulty by my improved construction, and my gag is so formed and constructed that the bridge-piece R is of somewhat less thickness than the normal distance between the sliding head E, against which it bears, and the upper surface of the head of the punch-holder T', against which the lower surface of said bridge bears. Further than this, the inclined ribs U of my gag are so proportioned and arranged that when the gag is introduced they bear against similar inclined surfaces V, formed on the head of the punch-holder, so that in operation said punch-holder is securely grasped in such a manner that it is immediately withdrawn from the beginning of the return stroke, and my construction therefore does away with the lost motion of the older form and gives the operator more time in which to perform his work.

By referring to the construction of my improved form of gag and punch-holder as shown on the various drawings herewith it may be readily seen that said punch-holder is firmly grasped and positively held for the downward movement by the contact of the lower surface of the bridge R against the upper surface of the head T', and it is also held firmly for the upward motion by the contact of the surface of the inclined ribs U against the inclines V of the punch-holder, and this form of construction whereby the punch-holder is securely held in both directions during operation is a distinct and valuable feature of my invention.

Another particular and novel feature of my invention consists in the construction and proportions of the ribs U of the gag, in combination with the construction of the head T' of the punch-holder, which are so devised that the gag cannot be introduced unless the punch-holder is in such position that the bridge R of the gag can obtain a sufficient bearing upon the head T' of the punch-holder. This is an important point for the reason that if the forward corner of the bridge R could be placed in contact with a small portion of the surface of the head T' the intensity of the pressure during the downward stroke transmitted from the material would be such as to destroy either one or the other of these parts, and this is what frequently happens in gags of the old forms. The means whereby I accomplish the desired results in this respect consists in the construction of the forward point of the inclined ribs U and the location of the surface *f* of the head of the punch-holder T.

Referring now to Figs. 2 and 3 for convenience in description, it may be seen that if the punch W is resting upon the surface of a plate while the head is reciprocating the gag can be introduced at any time until the surface *f* of the punch-holder T is above the lower horizontal surface of the forward end of the inclined rib U. The proportions of my improved construction are such that when the surface *f* of the punch-holder T is below the lower horizontal surface of the forward end of the inclined ribs U there is sufficient room between the lower surface of the bridge R of the gag and the upper surface T' of the punch-head, so that said gag can be readily and sufficiently introduced, so as to have ample bearing on the head T' of the punch-holder. On the other hand, if the punch-holder T is at or near its upper position the forward points of the inclined ribs U will bear against the cylindrical surface T' in such a manner that the gag could not be introduced, which thus prevents operative engagement of the bridge R of the gag with the head T' of the punch-holder at a time when only a small portion of either surface could bear upon the other, and this construction therefore avoids all possibilities of a destructive engagement between said parts, as explained.

In order to relieve the punch-holder of any possible operative engagement between the surface *f* of the recess Z and the under side of the inclined ribs U, I cut away beneath said ribs, as at *g*, (see Figs. 2, 3, 5, and 7,) thus only permitting a downward operative engagement between the top of the holder T' and the under surface of the bridge R of the gag.

As shown in Figs. 1, 2, 3, 5, and 6, the gag is operated by air-pressure cylinders located at each end and upon each side of the sliding head, and in these figures, the cylinder O, located at the left-hand side, serves to throw the gag in, while the one on the right, O', drives it out. The first-named cylinder is fitted with suitable pipe connections *h*, secured to the sliding head, connected to any suitable source of fluid-pressure supply by means of the flexible pipe *i*, as shown in Fig. 1. Within the piping *h* and convenient to the operator is located a valve *j*, which controls the supply of air to the cylinder, and said valve is normally held in a closed position by means of a spring or other suitable device, and it is opened by the attendant by a throw of the lever *k* to either the right or left. It will thus be seen that when said valve is thrown open, as stated, the air-pressure is admitted into the cylinder O, which instantly sends the gag in, whereupon the pressure is cut off with the release of the handle by the operator, and the air in said cylinder exhausts through the port *l* of the cylinder O aforesaid.

The right-hand cylinder O' is adapted to be automatically operated, but can also be manipulated by hand, as will be obvious from

the following description of its construction and connections. A short pipe *m* serves to convey compressed air to the cylinder *O'* from a flexible pipe *n* through the valve *o*, by means of which said pressure is controlled. Said valve *o* is provided with a spring-actuated operating-lever *p*, which projects forward, normally holding the valve closed, and is carried up and down with the movement of the cylinder, the valve, and its attached parts. In the line of travel of said lever I provide an adjustable stop, consisting of a contact-screw *q*, mounted in a swinging arm *r*, hinged to a lug *s* of the main stationary frame. It will thus be apparent that if the arm *r* is placed in the position shown in Fig. 1 the lever *p* will strike the stop *q* with each upward movement of the sliding head, thus opening the valve and operating the cylinder to throw out the gag. By the above means it will be obvious that a single operative stroke is effected by a simple manipulation of the lever of valve *j* to throw in the gag and that with the completion of said stroke the other valve *o* is automatically operated to throw said gag out, and the following strokes will be idle until the valve *j* is again operated. If for any reason it is desirable to leave the gag in and secure repeated operations of the punch, it would simply be necessary to swing the arm *r* to the front out of the path of the lever.

Although I have shown my improved form of gag in connection with fluid-pressure operating devices for throwing it into and out of operation, as described above and illustrated in Figs. 1, 2, 3, 5, and 6, it can also be used without said operating devices, and in Fig. 7 I show a construction adapted to be operated by hand.

Referring now to Fig. 7, the gag as shown is somewhat shorter by reason of the omission of the pistons, and it is designed to work in and out of the front upon a bracket *t*, which bears a pin *u*, forming a stop for the gag. A small knob *v* serves as a handle for the operator, by means of which the gag may be inserted or withdrawn, as required.

A different form of my improved punch-holder is shown in Fig. 8, in which the construction of its upper portion is similar to that shown in the previous figures; but the punch *W* is much smaller and readily changed by means of the coupling-sleeve *X*.

One particular feature of my improved form of gag is that the punch bears upon the material to be punched for a considerable portion of the time with a yielding pressure, due to its adjustable spring-support, thus facilitating setting the work exactly right and still leaving time to insert the gag and punch the hole during one downstroke of the machine.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a metal-working machine of the class described, the combination with the reciprocating head and the tool-holder, of a gag provided with fluid-pressure cylinders and connections for operating said gag, and means for controlling the operation of said cylinders.

2. In a metal-working machine of the class described, the combination with the reciprocating head, of a gag provided with fluid-pressure cylinders and connections for operating the same, valves for controlling the pressure within said cylinders and means for automatically operating one of said valves.

3. In a metal-working machine of the class described, the combination with the reciprocating head and a tool-holder mounted therein, of a gag adapted to be inserted between a portion of said head and said tool-holder, fluid-pressure cylinders and connections arranged to operate said gag, a valve for controlling the pressure in the cylinder for inserting said gag, and mechanism for automatically removing said gag.

4. In a metal-working machine of the class described, the combination with the reciprocating head and a tool-holder having inclined shoulders formed thereon, of a gag provided with inclined surfaces adapted to engage said inclined shoulders, said gag being also provided with a bridge portion adapted to be placed between said reciprocating head and said tool-holder.

5. In a metal-working machine of the class described, the combination with the reciprocating head, of a tool-holder provided with wedge-shaped openings in the sides of the head thereof, a gag provided with a recess in which said tool-holder may idly operate and a bridge portion adjacent to said tool-holder, wedge-shaped recesses formed in the gag below the bridge thereof, the surfaces of which are adapted to engage the inclined surfaces formed by the wedge-shaped openings in the head of said tool-holder, whereby the same may be firmly grasped and held in both directions.

6. In a metal-working tool of the class described, the combination with the reciprocating head, of a tool-holder, a gag provided with a central recess into which the top of said tool-holder may operate, and a bridge portion on said gag adapted to be inserted between the reciprocating head and the tool-holder.

7. In a metal-working machine of the class described, the combination with the reciprocating head, of a tool-holder movably mounted therein, a gag adapted to be inserted between said head and said holder, inclined ribs on said gag adapted to engage corresponding inclines on the tool-holder whereby the latter may be drawn against the gag and held in position for operation and withdrawal.

8. In a metal-working machine of the class described, the combination with the reciprocating head, of a gag adapted for insertion between said head and said holder, inclined ribs on said gag, corresponding inclines on said holder, and clearance-spaces formed in

the lower surfaces of said gag to insure proper positive engagement between the reciprocating head, the gag and the tool-holder.

9. In a metal-working machine of the class described, the combination with the reciprocating head, of a gag provided with a bridge and inclined surfaces, a tool-holder provided with corresponding inclines, and an adjustable support for said tool-holder within the reciprocating head.

10. In a metal-working machine of the class described, the combination with the reciprocating head, of a tool-holder loosely and adjustably mounted therein and provided with a spring-support, wedge-shaped openings formed in the sides of the head of said tool-holder, and a gag provided with a bridge and wedge-shaped ribs adapted to engage said holder.

11. In a metal-working machine of the class described, the combination with the reciprocating head, of a tool-holder loosely and adjustably mounted therein and provided with a spring-support, wedge-shaped openings formed in the sides of the head of said tool-holder, a gag provided with a bridge and wedge-shaped ribs adapted to engage said tool-

holder, and transverse clearance-spaces *a* formed on each side of the head of said tool-holder.

12. In a metal-working machine of the class described, the combination with the reciprocating head, of a gag consisting of a block provided with a bridge portion and wedge-shaped ribs, a tool-holder provided with a head and inclined surfaces adapted for engagement by said bridge and wedge-shaped ribs respectively, for the purpose of firmly grasping said holder.

13. In a metal-working machine of the class described, the combination with the reciprocating head, of a gag movably mounted therein and provided with a bridge, fluid-pressure cylinders and connections for operating said gag, means for controlling the operations of said cylinders, a tool-holder loosely mounted in said head and adapted to be engaged by the bridge of the gag aforesaid.

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

GEORGE B. TENNANT.

Witnesses:

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