(No Model.) 5 Sheets—Sheet 1.

W. WATTIE.

TUBE MACHINE.

No. 324,198. Patented Aug. 11, 1885.

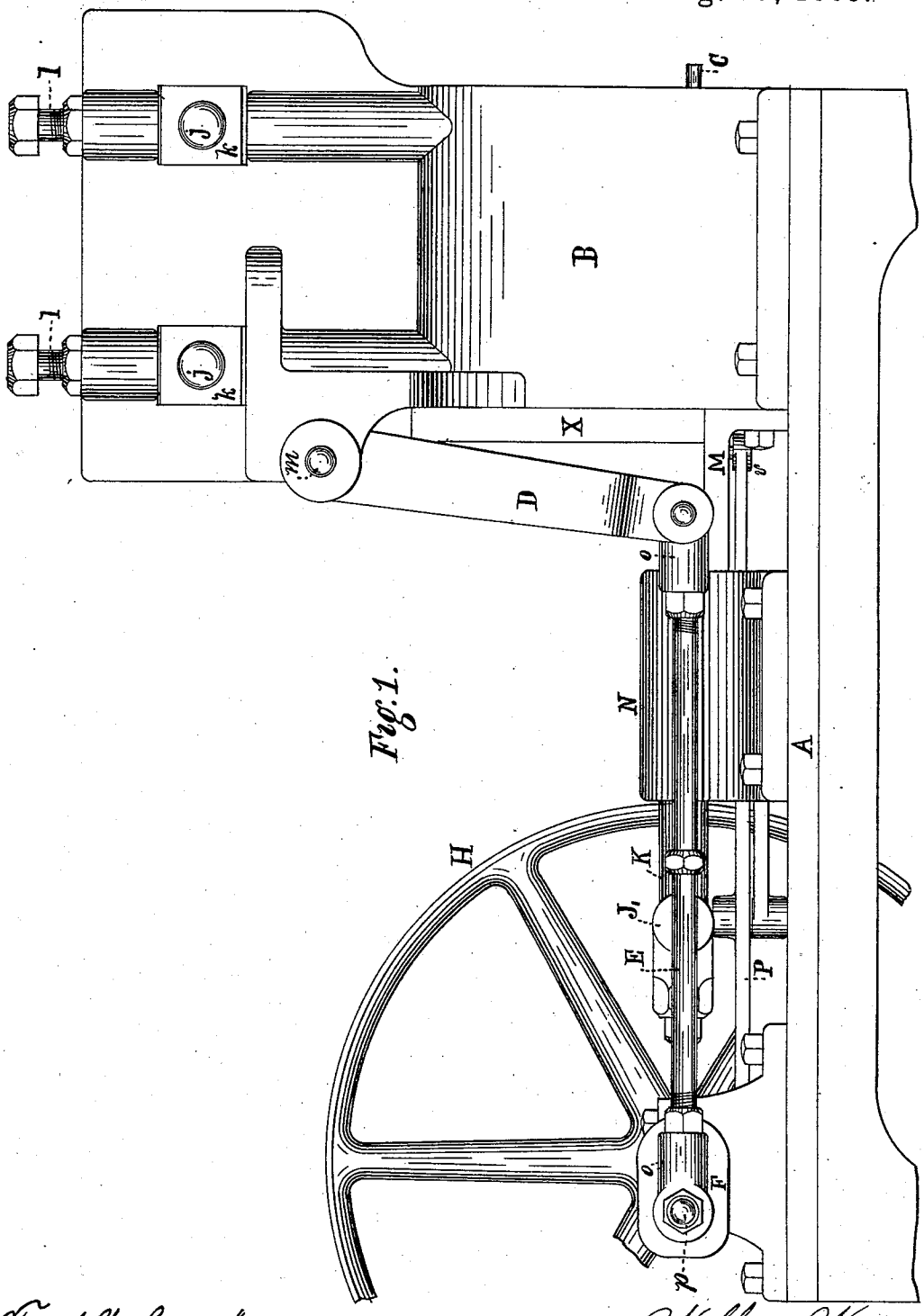


Fig. 1.

Witnesses
Fred. W. Smith
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Inventor
William Wattie
per John C. Dewey, Attorney

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 5 Sheets—Sheet 2.

W. WATTIE.

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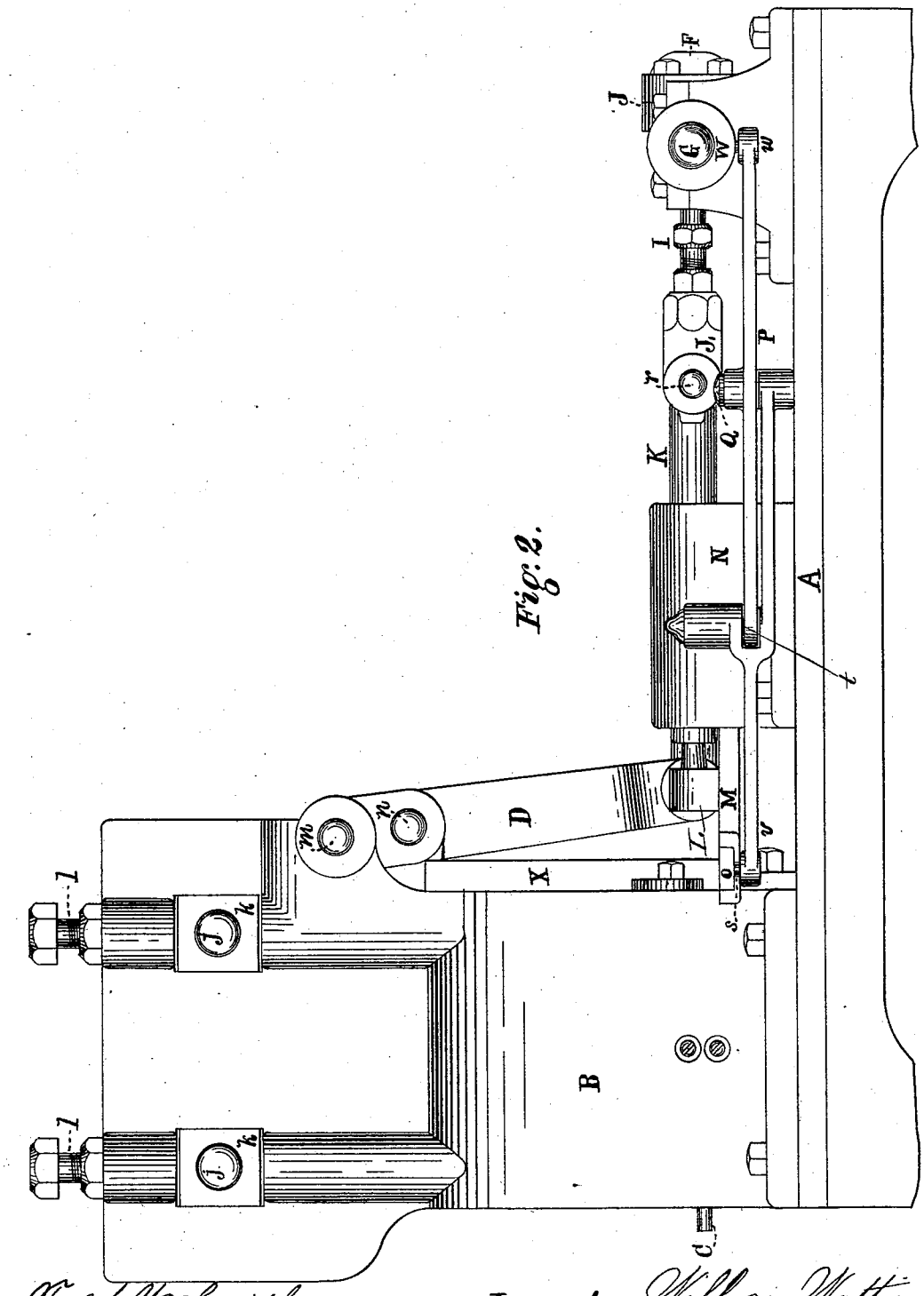


Fig. 2.

Witnesses
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(No Model.)

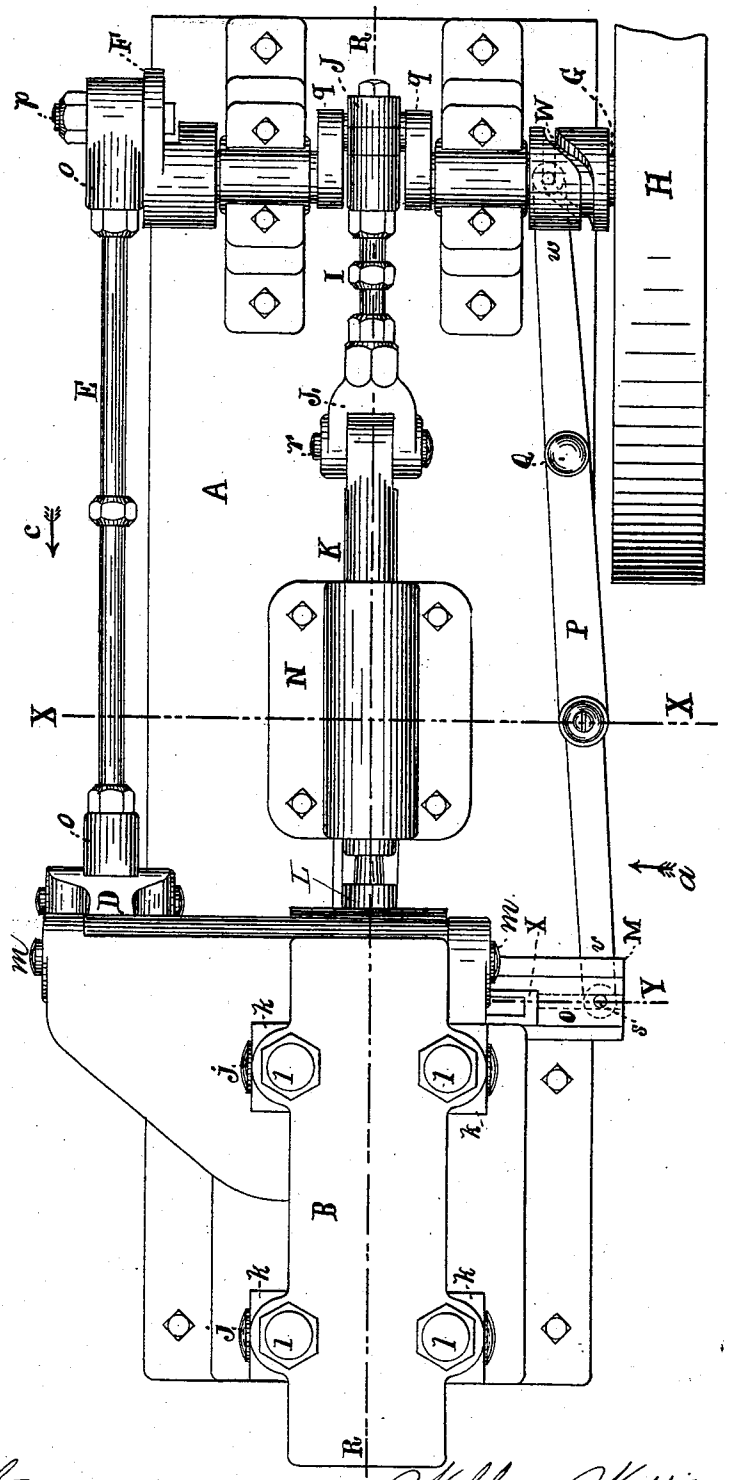
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W. WATTIE.

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No. 324,198. Patented Aug. 11, 1885.

Fig. 3.



Witnesses
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(No Model.)

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W. WATTIE.

TUBE MACHINE.

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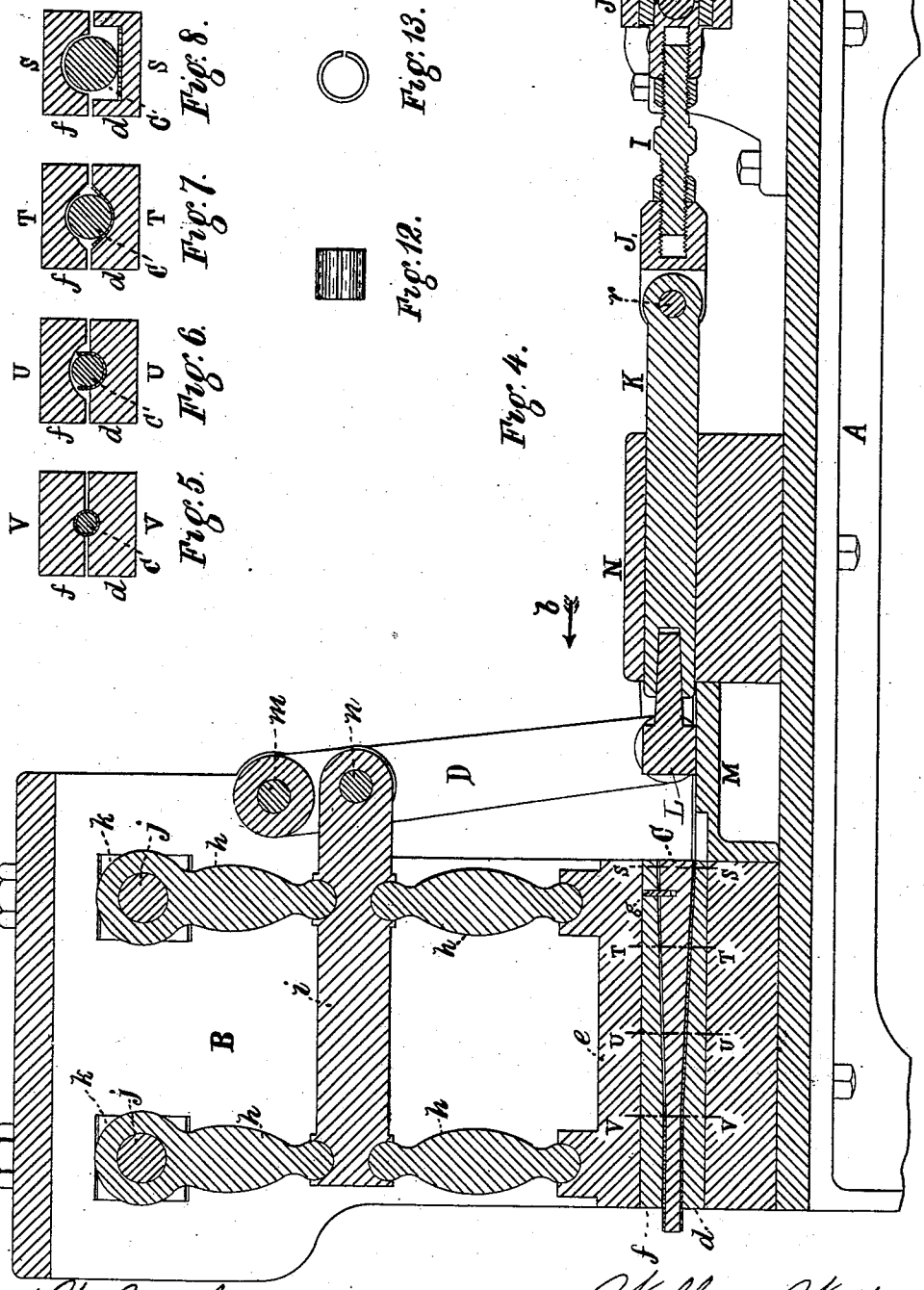


Fig. 4.

Fig. 12.

Fig. 13.

Fig. 8.

Fig. 7.

Fig. 6.

Fig. 5.

Witnesses.
Fred. N. Smith.
T. G. Kent.

Inventor William Wattie.
per John C. Dewey Attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 5 Sheets—Sheet 5.

W. WATTIE.

TUBE MACHINE.

No. 324,198. Patented Aug. 11, 1885.

Fig. 10.

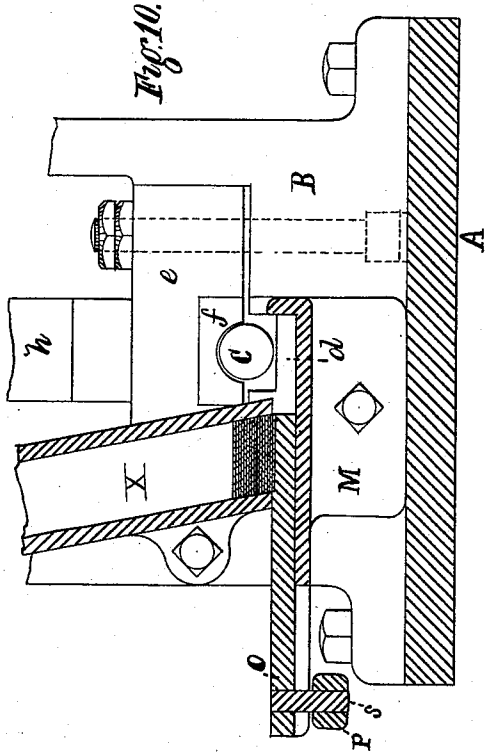


Fig. 11.

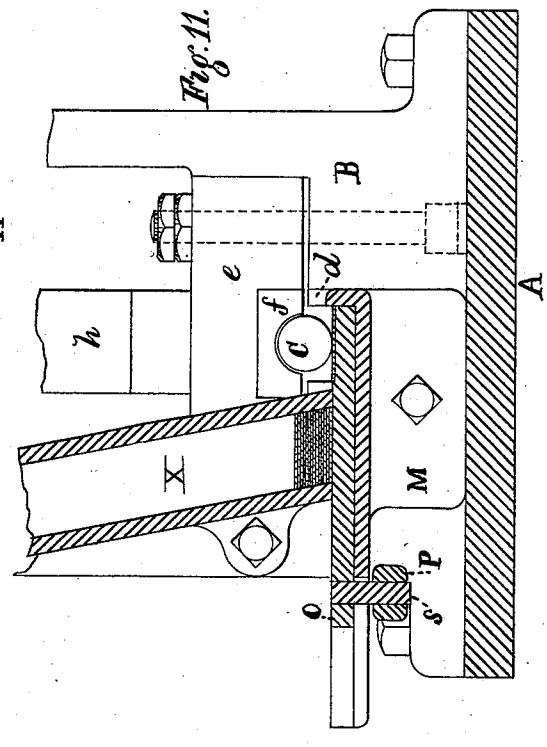
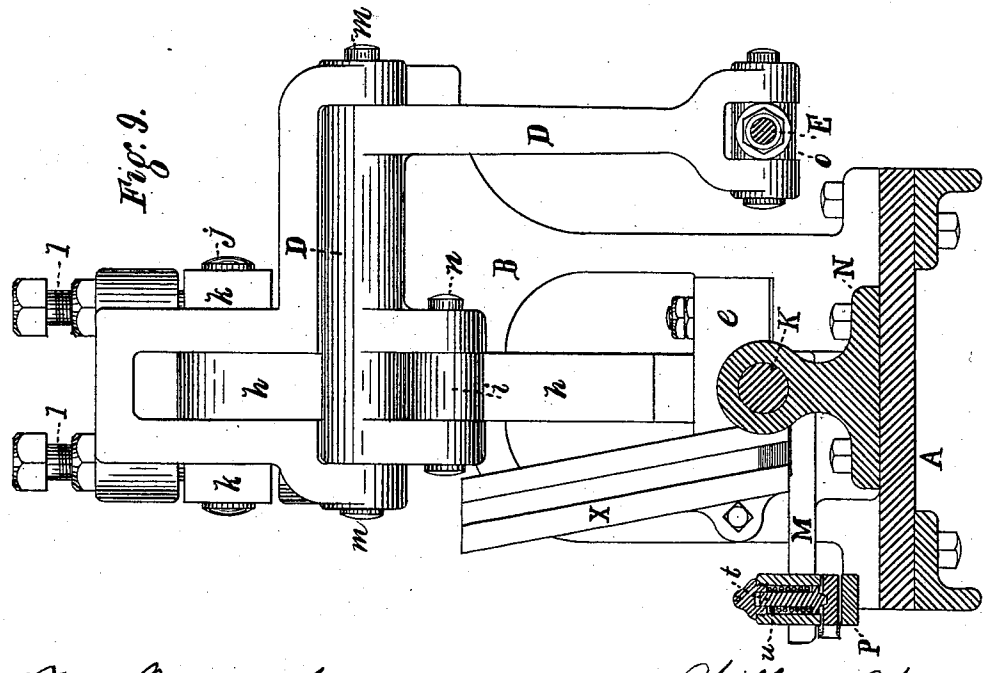


Fig. 9.



Witnesses

Fred. W. Smith

T. G. Kent

Inventor William Wattie

per John C. Dewey Attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM WATTIE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE KNOWLES LOOM WORKS, OF SAME PLACE.

TUBE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 324,198, dated August 11, 1885.

Application filed June 29, 1885. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WATTIE, a subject of the Queen of Great Britain, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Tube-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, which, in connection with the drawings making a part of this specification, will enable others skilled in the art to which my invention belongs to make and use the same.

My invention relates to an automatic machine for making metal tubes of small sizes out of metal blanks fed into the machine, and is especially designed to make the metal tubes which are so extensively used in pattern-chains of looms, and which have been heretofore made mostly by hand.

My invention consists in certain novel features of construction of a machine for automatically forming and making the tubes, ready for immediate use, out of metal blanks, which are previously cut or stamped out in any desired size or shape, according to the size and shape of the tubes to be made, and automatically fed into the machine, as will be hereinafter fully described, and the nature of my invention indicated by the claims.

Referring to the drawings, (which show different views and detached parts of my machine, and in which the legs or supports of the machine are broken away and not shown, as they form no part of the machine proper or of my invention, and are not essential to a clear understanding thereof,) Figure 1 represents a rear side elevation of the machine. Fig. 2 is a front side elevation, the driving-pulley shown in Fig. 1 being left off in this figure to more clearly illustrate other parts. Fig. 3 is a top or plan view of the machine as it is represented in Fig. 2, the driving-pulley being shown. Fig. 4 is a vertical longitudinal section on line R R, Fig. 3, looking in the direction of arrow *a*, same figure. Figs. 5, 6, 7, and 8 are vertical cross-sections of the dies and blanks, taken on lines V V, U U, T T, and S S, Fig. 4, looking in the direction of arrow *b*, same figure, to show the shape of the dies in cross-section and the manner of forming the tubes. Fig. 9 is a vertical cross-section on line X X, Fig. 3, looking in the direction of arrow *c*, same figure. Figs. 10 and 11 show on an enlarged scale a vertical cross-section on line Y, Fig. 3, looking in the direction of arrow *c*, same figure, the upper parts of the machine being broken away, Fig. 10 showing the position of the feeding-slide preparatory to pushing forward a blank, and Fig. 11 showing the slide pushed forward, ready for the blank to be pushed between the dies; and Figs. 12 and 13 show a side and end view, respectively, of a tube made by my machine, full size.

In the drawings the side of the machine on which the driving-wheel or pulley is located, as shown in Fig. 3, is considered the front side of the machine, as being the one on which the attendant stands.

Similar letters of reference refer to similar parts in the drawings.

In the accompanying drawings, A is the bed plate or frame of the machine, upon which the several parts of the machine are secured. Said frame A is supported by suitable legs or supports, which are broken off and not shown in the drawing.

B is the toggle-frame, the lower part of which forms a block for holding the lower die, *d*.

The part marked *e* is the block for holding the upper die, *f*. It is provided with bearings for holding the lower ends of the lower toggles.

C is the core for forming the tube. It is held in place between the dies in this instance by means of a pin, *g*, driven into the core C and extending up into a hole in the upper die, *f*.

The parts marked *h h* are the toggles. *i* is the toggle-connector. *j j* are the pins supported in bearing-blocks *k k* on the toggle-frame B, upon which the upper toggles swing, and which sustain the back swing when the pressure is thrown on the dies. *l l* are set-screws for adjusting the height of the bearing-blocks *k k*.

D is the toggle-arm by which motion is transmitted to the toggle-connector, and *m* is the stud or pin supported in the toggle-frame B on which the toggle-arm D swings.

The pin *n* connects the toggle-arm D with the toggle-connector *i*. The part E is the rod connecting the toggle-arm D with the toggle-crank F. The ends of the connecting-rod E are provided with a right and left hand screw-thread, respectively, which turns into bearing-boxes *o o*, so that the length of the connecting-rod E may be adjusted. *p* is the toggle-crank pin.

The part marked G is the driving-shaft, having its bearings in blocks secured upon the bed-plate of the machine. The shaft G is made with a crank, *q*, as shown in Fig. 3, to work the punch, to be hereinafter described. Said shaft G has in this instance a driving-wheel or pulley, H, secured to one end thereof, around which the driving-belt passes; but, if preferred, the shaft G may be operated by gear connection instead of by belt connection, as shown.

I is the punch-connecting rod, which is provided with a right and left hand screw-thread, respectively, at each end, which screws into bearing-boxes J' J, to allow the length of the connecting-rod I to be adjusted. The punch-holder K is connected at one end to the forked bearing-box J' of the rod I by a pin, *r*, and has a hole extending into its other end, into which fits securely the taper spindle or end of the punch L. The punch-holder K slides back and forth in the bearing-box N, secured upon the bed-plate of the machine. (See Fig. 4.)

The part marked M is the feed-table or support for the feed-slide O, which slides back and forth thereon to feed in the blanks to be pushed between the forming-dies. The slide O is operated by the lever P, being connected therewith by means of the pin *s*. Said lever is made substantially as shown in the drawings, and pivoted on the stud Q, and operated by a grooved cam, W, secured upon the shaft G. Said lever is hinged on a safety-stud, *t*, provided with a safety-spring, *u*, (see Fig. 9,) which keeps the lever P straight when no great resistance is encountered in conveying the blanks from the reservoir to the dies, but which, when a blank catches and will not move, allows the end *v* of the lever P to remain stationary while the other end, *w*, is being operated by the cam.

The part marked X is the reservoir or case for holding the metal blanks, which are previously stamped or cut out and placed therein. Said reservoir is secured to the toggle-frame B or some suitable support, so that its lower or delivery end will be just over and above the feed-slide O, as clearly shown in Figs. 9, 10, and 11, Fig. 10 showing the position of the feed-slide O preparatory to feeding in a metal blank to be pushed between the forming-dies by the punch E, and Fig. 11 showing a blank fed in ready to be pushed between the dies and formed into a tube.

From the above description, in connection with the drawings, the operation of my improved tube-machine will be readily understood by those skilled in the art to which my invention belongs.

A number of metal blanks are first placed in the reservoir or receiving-case X, in the manner shown in Figs. 9, 10, and 11. Power is then applied to the machine and it is set in motion. At each revolution of the driving-shaft G a blank is fed forward by the feed-slide O directly in front of the forming-dies *d* and *f*. This blank is pushed between the dies beneath the forming-core C, as clearly shown in Fig. 8, by the push or punch L, in the manner before described, and the upper die, *f*, is raised up and lowered to bring a pressure to bear upon the blank by means of the toggles in the manner hereinbefore described. Thus at each revolution of the driving-shaft a blank is fed forward to the forming-dies, pushed between said dies and pressed between them, one blank following another and pushing along between the forming-dies the blanks which have preceded it, each blank being gradually and regularly formed into a tube about the core C, as shown in Figs. 8, 7, 6, and 5, and passing out between the dies, and dropping off from the end of the core C, as long as the machine continues to operate in a proper manner and there are blanks in the reservoir X.

I have shown in the drawings and described a tube-machine in which metal blanks previously stamped or cut out are used for the tubes; but I do not wish to limit myself to this; for, if preferred, a continuous strip of metal may be fed to the machine, which may have attached thereto, in any well-known manner, cutters for cutting off the blanks from the strip as the strip is fed into the machine, substantially in the same manner as now generally employed in barb-fence machines for cutting off the wire to form the barbs as it is fed into the machine.

Having thus described my improvement in tube-machines, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. In a machine for making metal tubes, the combination, with mechanism constructed and arranged to automatically feed forward the metal blanks at stated intervals, and mechanism constructed and arranged to push the metal blanks between the forming-dies, of mechanism constructed and arranged to form the tubes, substantially as described.

2. In a tube-machine, the combination, with the forming-dies and a core, and means for operating the same, substantially as described, of mechanism for feeding in the blanks to the dies, and mechanism, substantially as described, for pushing the blanks between the forming-dies, all constructed and operated substantially as shown and described.

3. The combination, with toggle-frame B, toggles *h h*, connector *i*, and means for operating the same, substantially as described, of the forming-dies *d* and *f*, and core C, substantially as described.

4. The combination, with reservoir or holding-case X, and feed-slide O, of a lever, P, constructed and operated substantially as described.

5. The combination, with feed-slide O, of the lever P, pivoted on stud Q, and hinged on safety-stud *t*, provided with a safety-spring, *u*, for the purpose stated, and operated by a grooved cam, substantially as described.

6. The combination, with forming-dies, of the push L, and push-holder K, adjustably connected to and operated by the crank *q*, substantially as set forth.

7. The combination, with the toggles *h h*, toggle-connector *i*, and toggle-arm D, of the connecting-rod E, bearing-boxes *o o*, and toggle crank F, constructed and arranged substantially as described.

8. The combination, with the toggle-frame B, bearing-blocks *k k*, and adjusting-screws *l l*, of the toggles *h h*, pins *j j*, connector *i*, and block *e*, constructed and arranged, substantially as described.

WILLIAM WATTIE.

Witnesses:
JOSEPH KIRK,
JOHN C. DEWEY.