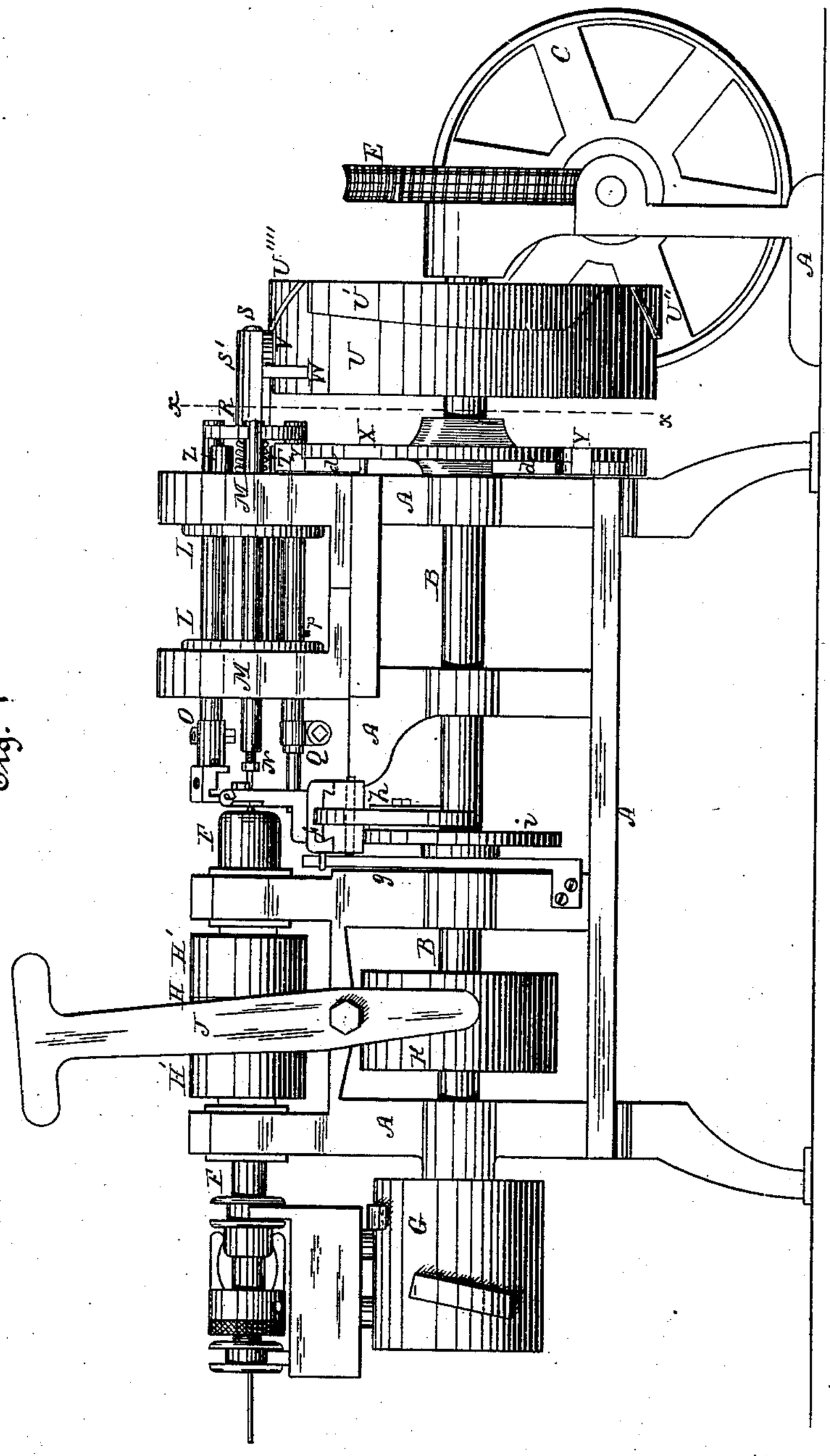
(No Model.) 4 Sheets—Sheet 1.

C. M. SPENCER.

METAL SCREW MACHINE.

No. 275,431. Patented Apr. 10, 1883.

Fig. 1.



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(No Model.)

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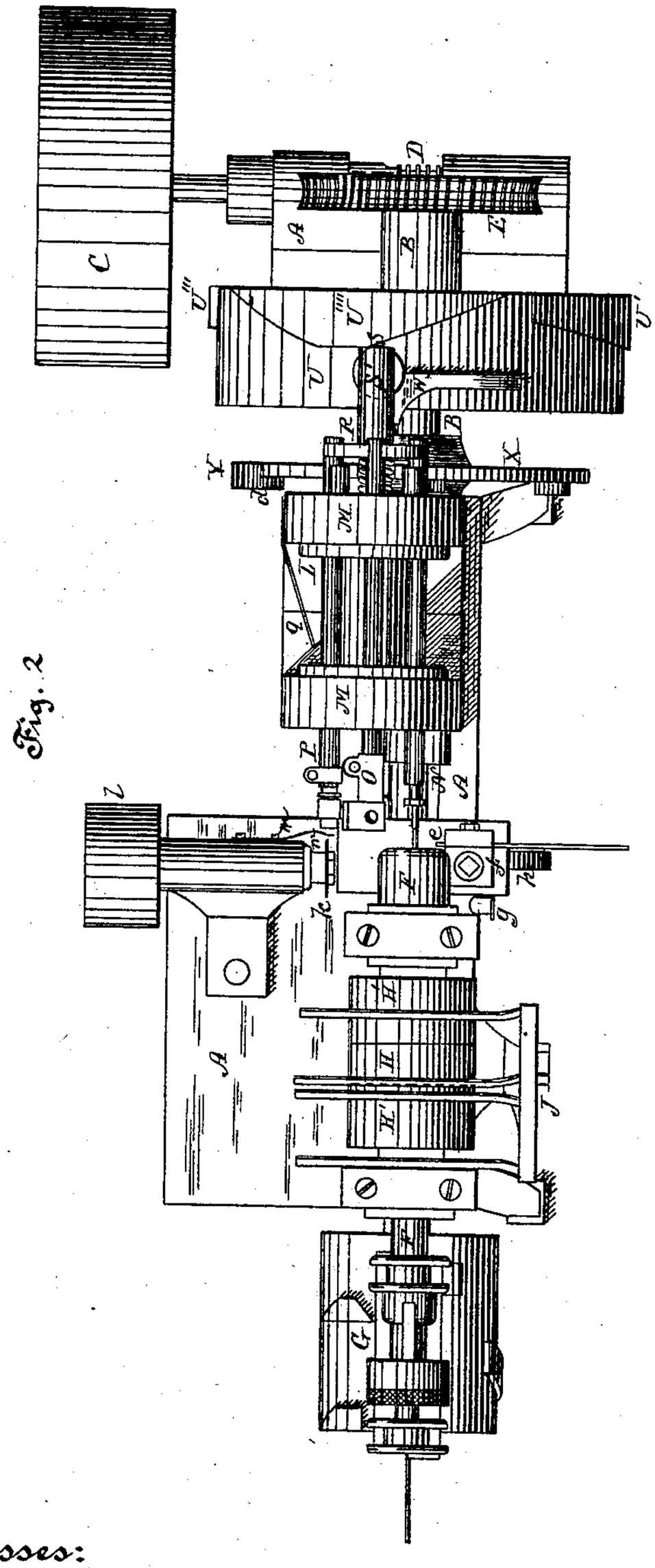

Fig. 2

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C. M. SPENCER.

METAL SCREW MACHINE.

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Fig. 3

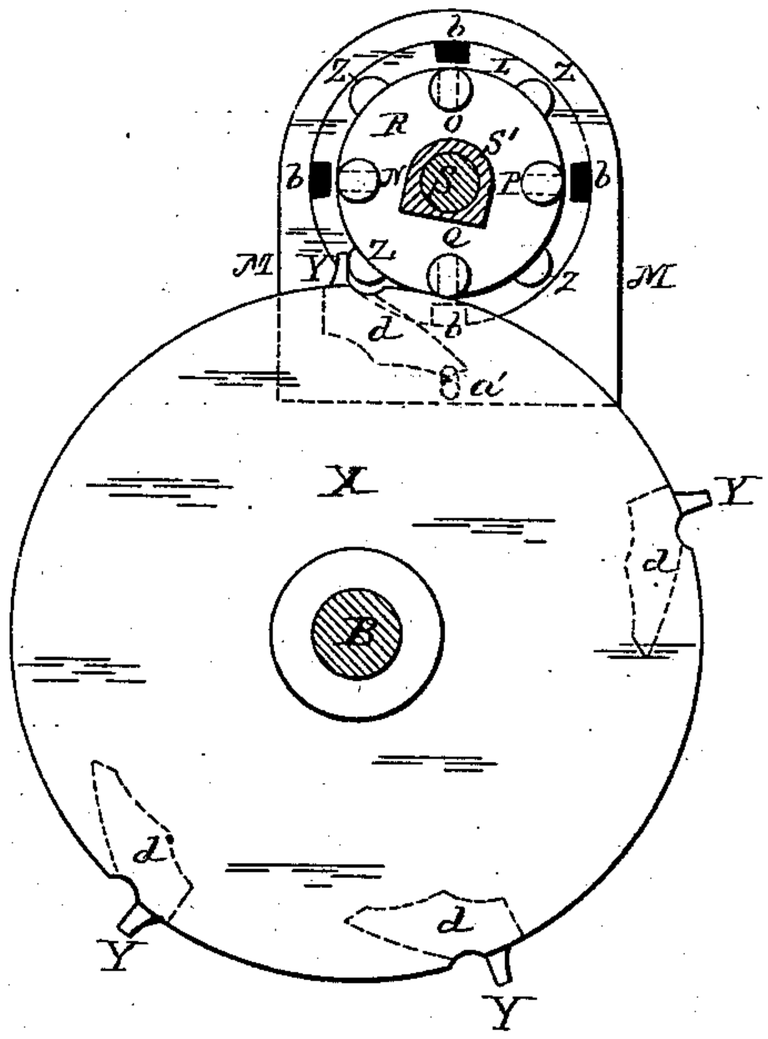


Fig. 4

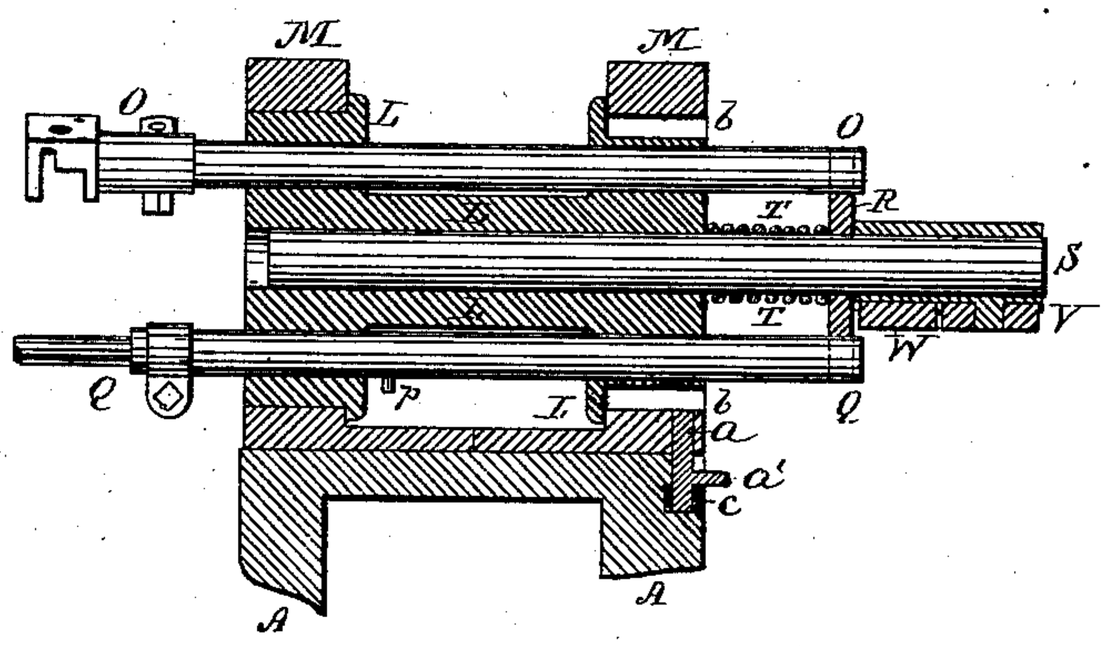
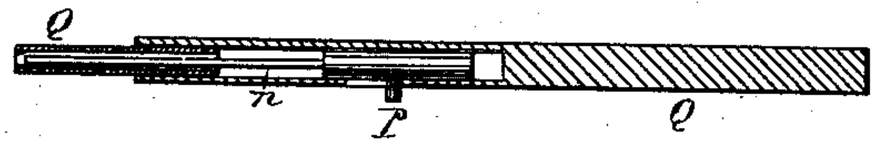


Fig. 5



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METAL SCREW MACHINE.

No. 275,431. Patented Apr. 10, 1883.

Fig 6.

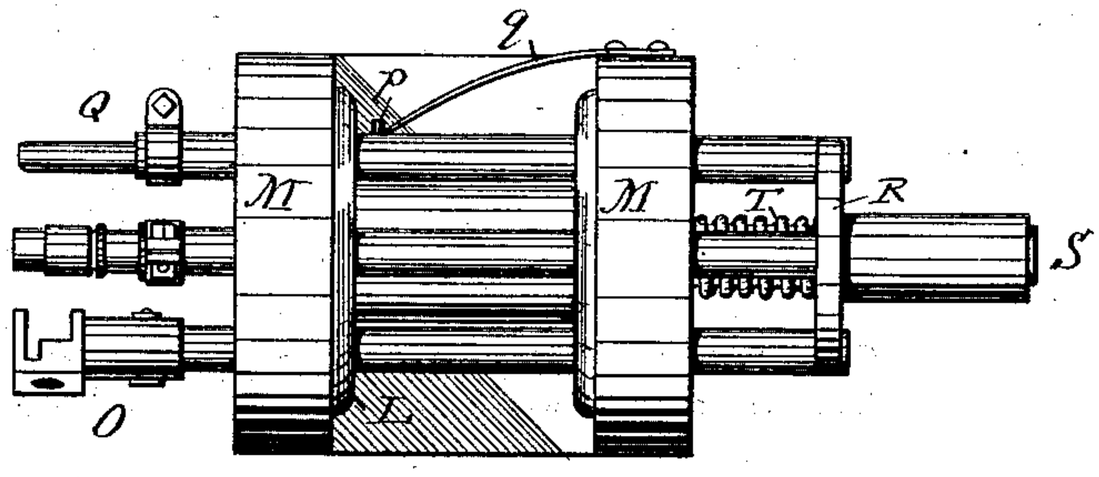
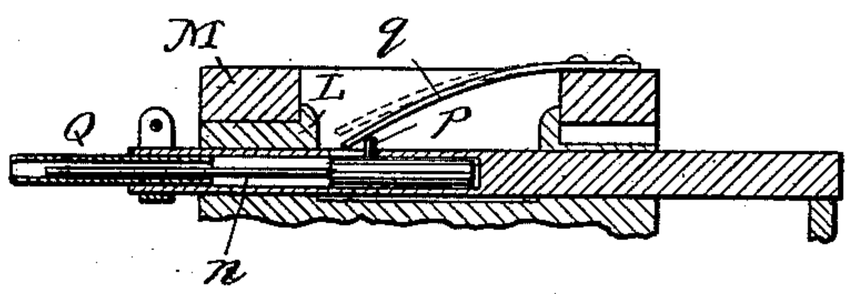


Fig 7.



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UNITED STATES PATENT OFFICE.

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METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 275,431, dated April 10, 1883.

Application filed August 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHRISTOPHER M. SPENCER, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Metal Screws; and I do hereby declare that the following is a full, clear, and exact description thereof, whereby a person skilled in the art can make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Like letters in the figures indicate the same parts.

My improvements relate to machines which are designed to make metal screws from a rod or wire automatically; and the object of my invention is to provide a machine which will make such screws in a more perfect manner than any heretofore in use.

In the accompanying drawings, illustrating my invention, Figure 1 is a front view of my improved machine. Fig. 2 is a top view of the same. Fig. 3 is a rear view of the tool-head and the actuating-cams, looking to the left of the line *x x* of Fig. 1. Fig. 4 is a longitudinal vertical section through the middle of the tool-head, showing the central spindle and the tool-spindles in view, and the revolving tool-holder unlocked and ready to turn. Fig. 5 is a longitudinal section through the tool Q. Fig. 6 is a detail top view, on enlarged scale, of the tool-head, showing tool Q, with the projecting pin *p* in front of spring *q*, and held by it against backward motion. Fig. 7 is a detail view, in longitudinal section, of the tool Q, showing the pin *p* as it rises under the spring *q*, which is pushed outward to the position shown by dotted lines when the tool and pin are advanced.

A is the fixed frame of the machine.

B is the main shaft, which drives the principal parts. It is driven by the pulley C through the worm D and worm-wheel E. A belt passes over the pulley C in the customary manner.

F is a revolving hollow spindle through which the wire is fed to the machine to form the screws. It is furnished with feeding devices of the construction now commonly used for delivering the wire intermittingly, as required by the machine. These are operated by cams upon the wheel G, which is fixed upon the shaft B, so that the feeding device moves at the proper time to conform to the operations performed upon the wire. The spindle F is revolved by a belt upon the pulley H. Each side of the fixed pulley H, upon the shaft F, is a loose pulley, H′.

J is a belt-shifter which guides two belts, turning the pulleys in opposite directions, one of which is always running upon one of the loose pulleys while the other is turning the spindle F. The belts are shifted by the wheel K, having a cam on its outer surface. The spindle F turns constantly in one direction, except during a short interval when the screw is withdrawn from the die by which the thread is cut.

L is a revolving tool-holder which turns horizontally in circular bearings in the tool-head M. Through this tool-holder the shanks of the tools N O P Q slide horizontally. They are connected at their rear ends by a yoke, R, fixed to a central sliding shaft, S, so that they are all moved back and forth together.

T is a spring acting between the yoke R and the tool-holder L to press the yoke and tools to the rear.

U is a wheel fixed to the shaft B, and provided with cams U′ U″ U‴ U⁗ for advancing the tool-shaft S as each tool performs its functions. The tool-holder is rotated through part of a revolution as each tool is successively advanced, and the cams on the wheel U are made of different shapes to properly control the movement of the several tools.

V is a roller set upon a pin or stud on a sleeve, S′, on the shaft S, to roll against the edges of the several cams on the wheel U to diminish the friction.

W is a finger upon the same sleeve which runs upon the cylindrical circumference of the wheel U, for the purpose of guiding the roller V and preventing its binding by turning laterally.

X is a wheel fixed on the shaft B for effecting the rotation of the tool-holder. It is furnished with a series of projections or teeth, Y, which engage with studs Z upon the rear of the tool-holder. One of these teeth comes upward at each time the tool-holder is re-

quired to be moved, and, encountering the stud, which is then on the lower side of the tool-holder, pushes it forward. The proportions of the tooth and stud are such as to leave the tool-holder in the position for the next tool to operate upon the screw. This wheel X also operates a locking device, so that the tool-holder is unlocked just before it commences to turn, and is again locked when the movement is finished.

a is a bolt fitting into a recess in the frame of the machine, which is pressed into either one of the notches *b* in the rotating tool-holder L which may be opposite to it. It is pressed upward by a spring, *c*. A pin, *a'*, projects through a slot in the frame, by means of which the bolt *a* is operated.

d d, &c., are cams upon the wheel X for drawing down the pin *a'* and releasing the bolt *a*, so as to permit the tool-holder to rotate. One of these cams immediately precedes each of the teeth Y, so as to withdraw the bolt at the proper time for the tooth to act upon the tool-holder. The cam passes over the pin, as shown in Fig. 3, and is of the proper form to act upon the bolt. The teeth Y and the cams *d* are spaced around the wheel at such intervals as to give each tool the proper time to operate upon the screw. The tools upon the tool-holder are equally spaced around it, so that the tool-holder moves an exact arc at each movement. There are four tools shown in the drawings, although other numbers may be used upon the same principle.

Of the four tools shown, N serves as a stop to limit the length of wire fed to the machine and determines the length of the screw. O is the cutting or turning tool, which passes onto the wire and turns it to its true form and size. P is the die which cuts the thread upon the screw, and Q is a tool for passing over the screw and holding it in position while being cut off, and then transferring it to the nicking-saw by which the slot is cut, after which it is discharged from the machine.

The cutting-off device consists of a tool, *e*, held upon a slide, *f*, which is held away from the screw by the spring *g*, and is pressed forward at the proper instant by the arm *h*, pivoted to the frame of the machine, and operated by a cam upon the wheel *i* on the shaft B.

k is the nicking-saw, which is continuously revolved by a belt on the pulley *l*.

m is a small spring which serves to press the screw into the tool Q as it advances toward the saw, so that it will be firmly held while the nick is cut.

n is a plunger sliding in a socket within the tool Q. It has a pin, *p*, passing outward through a slot in the side of the tool for operating it. *q* is a spring permanently fixed to the frame of the machine for operating this plunger and ejecting the finished screw. The tool Q when it arrives opposite the threaded screw, passes over it and holds it while it is cut off by the cutter *e*. It then transfers it around a half-circle to the nicking-saw, and advances it to be nicked by the same movement of the tool-holder which advances the tool O to turn the next screw. As the tool-holder is rotated the pin *p* passes under the spring *q*, and when the tool Q is moved forward to cut the nick this pin passes forward, pressing the end of the spring outward, which, when it is released, serves as a latch to prevent the pin from returning, so that when the tool is drawn back the end of the spring holds the plunger *n*, and thus ejects the screw from the tool. These parts are shown in detail in Figs. 4 and 5, and in operating position in Figs. 2, 6, and 7. The tool-holder then rotates, and at the next forward movement of the tool Q the pin is retracted by coming against the side of the flange of the revolving tool-holder, ready for the tool to pass over another screw. The retraction of the plunger is, however, not absolutely necessary, as it would be pressed back readily by the next screw, the plunger moving freely within its socket in the tool Q.

The general operation of my improved machine is as follows: The parts of the machine being in the position shown in the drawings, the wire is fed up one length by the mechanism of the feed-spindle *f*, which is revolving in the direction for turning a screw into a die. The end of the wire is stopped by the tool N, and it is then clutched by the spindle mechanism in the customary manner. One of the teeth Y then comes opposite its stud Z, and the tool-holder is rotated one-quarter way round. The cam U' then pushes the tool-holder forward and the tool O turns the blank for the screw, when the cam allows it to fall back. While the tool-holder is rotating, the bolt *a* is held withdrawn by one of the cams *d*, and when stationary is again locked. The tool is again rotated one-quarter way round, when the tool P advances by means of the cam U'' and cuts the thread on the screw. As soon as this is done, and while the cam is withdrawing the die, the belt on the spindle F is shifted by the arm J and the screw passes out of the die. The belt is then shifted back on the spindle, the tool-holder again rotated, and the tool Q is advanced by the cam U'''. This tool passes over the threaded part of the screw and holds it while the cutter *e* advances and cuts off the screw. At the next movement of the tool-holder by means of the cam U'''' the tool N is again advanced to commence a new screw, the screw taken off by the tool Q, passing on to the saw *k*, to which it advances, and is slotted, as before described. It is then ejected by the plunger and falls down to any proper receptacle.

What I claim as my invention is—

1. The cam-wheel X, furnished with the teeth Y and cams *d*, in combination with the rotary tool-holder L, furnished with studs Z, and carrying a horizontally-sliding series of successively-operating tools, and a locking device operated by said cams, all substantially as described.

2. The combination of the rotary cam-wheel

U, the rotary tool-holder L, mechanism for rotating the same, a series of horizontally-sliding tools revolving about and arranged parallel to the axis of said tool-holder, and cams U′, &c., upon said wheel U, whereby the said tool-holder and tools are operated, all substantially as described.

3. In a machine for making screws, the combination of a rotary tool-holder, L, turning upon a horizontal axis, a cam-wheel, X, provided with teeth Y, a series of horizontally-sliding tools turning with said tool-holder, a cam-wheel, U, provided with cams U′, &c., an automatic wire-feeding device, and a cam-wheel, G, for operating said feeding device, the cam-wheels being operated conjointly, all substantially as described.

4. The sliding tool Q and the rotary tool-holder L, in combination with the cutter *e* and the nicking-saw *k*, all substantially as described.

5. In a machine for making metal screws, the combination of the rotary tool-holder L, the sliding tool Q, the plunger *n*, furnished with the pin *p*, and the spring-latch *q*, all substantially as described.

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