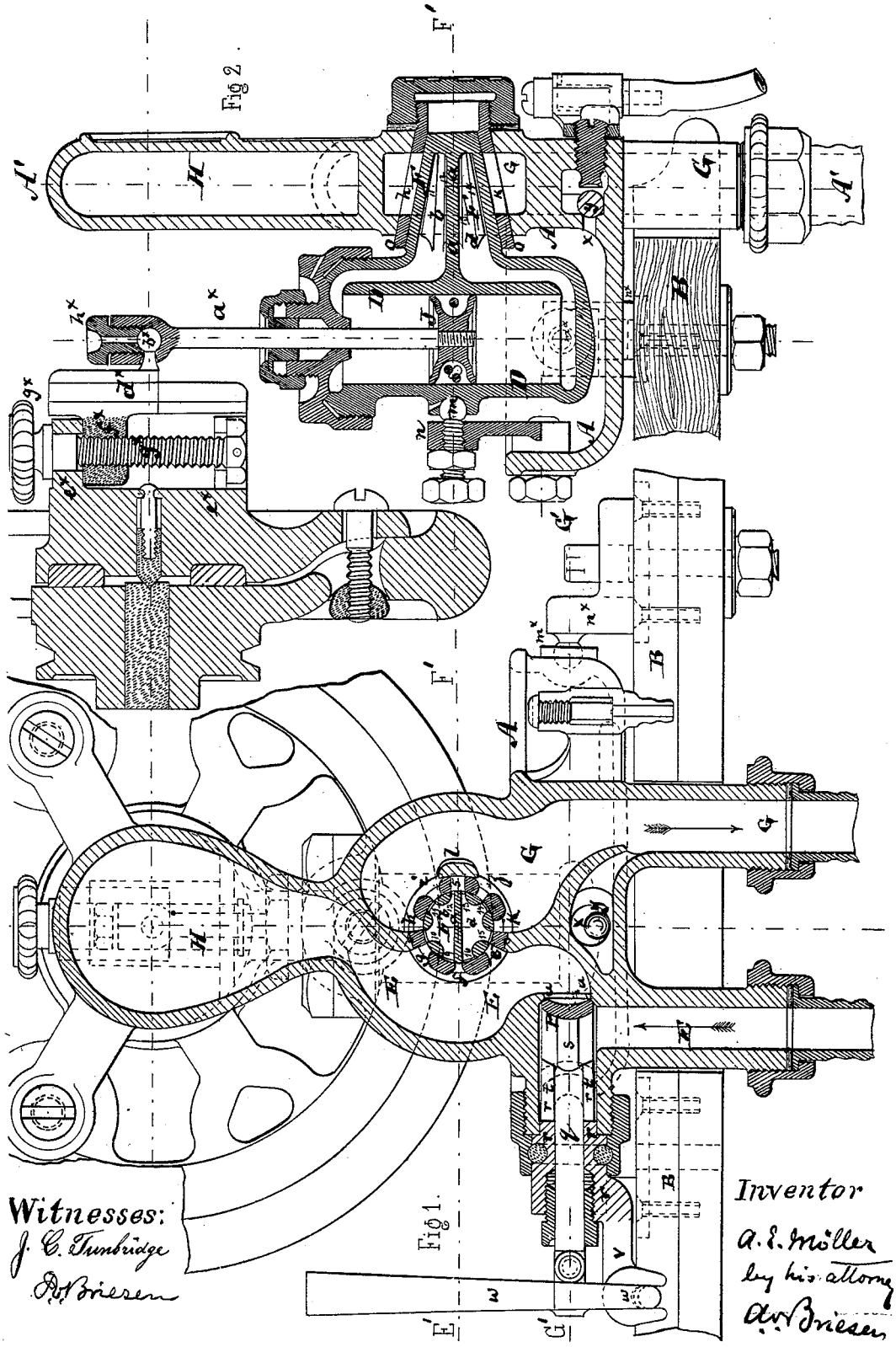
3 Sheets—Sheet 1

A. E. MOLLER.

Hydraulic-Engine.

No. 218,303. Patented Aug. 5, 1879.



Witnesses:
J. C. Trumbridge
D. W. Briesen

Inventor
A. E. Möller
by his attorney
D. W. Briesen

3 Sheets—Sheet 2.

A. E. MOLLER.

Hydraulic-Engine.

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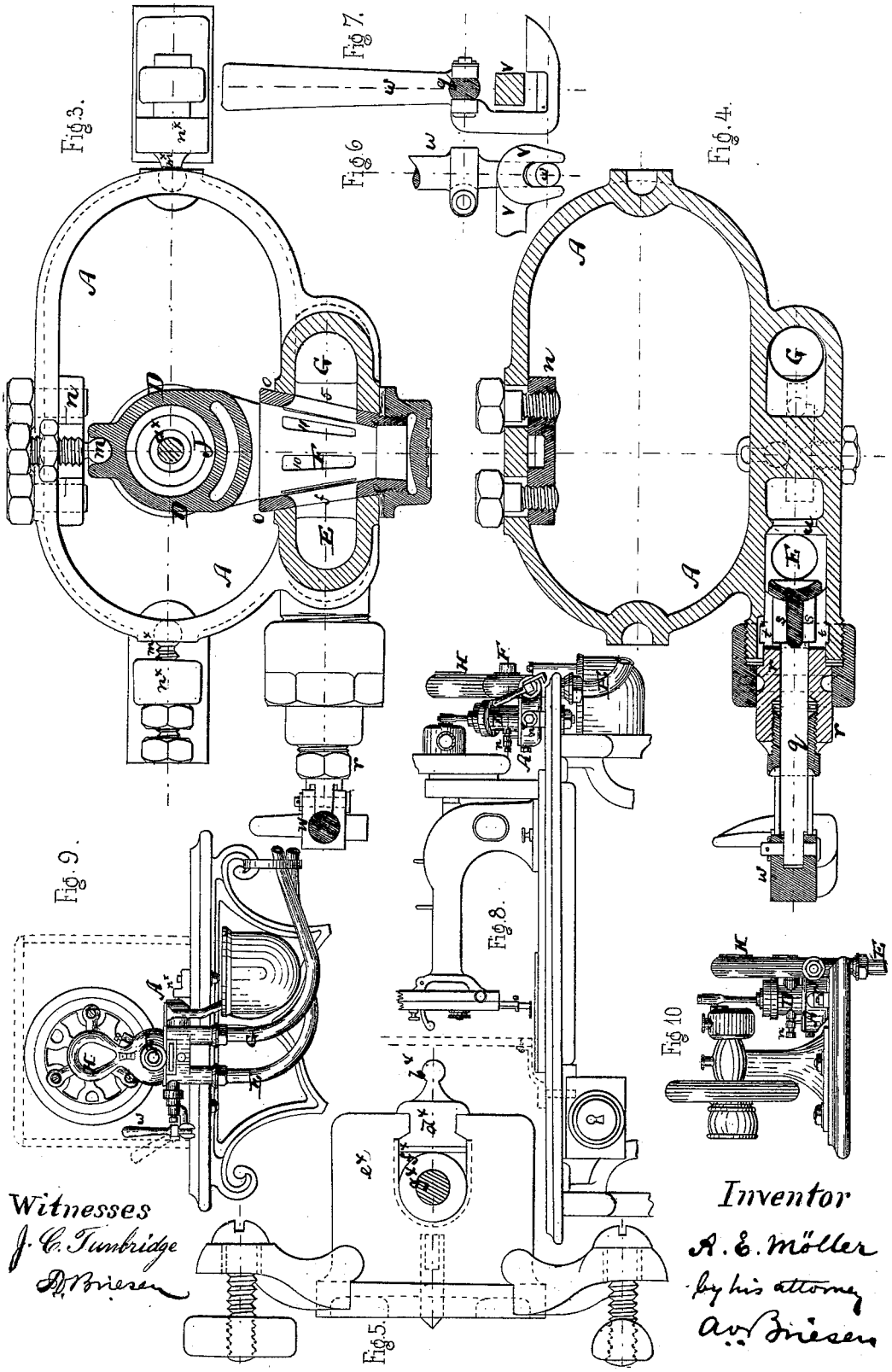

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3 Sheets—Sheet 3.

A. E. MOLLER.

Hydraulic-Engine.

No. 218,303. Patented Aug. 5, 1879.

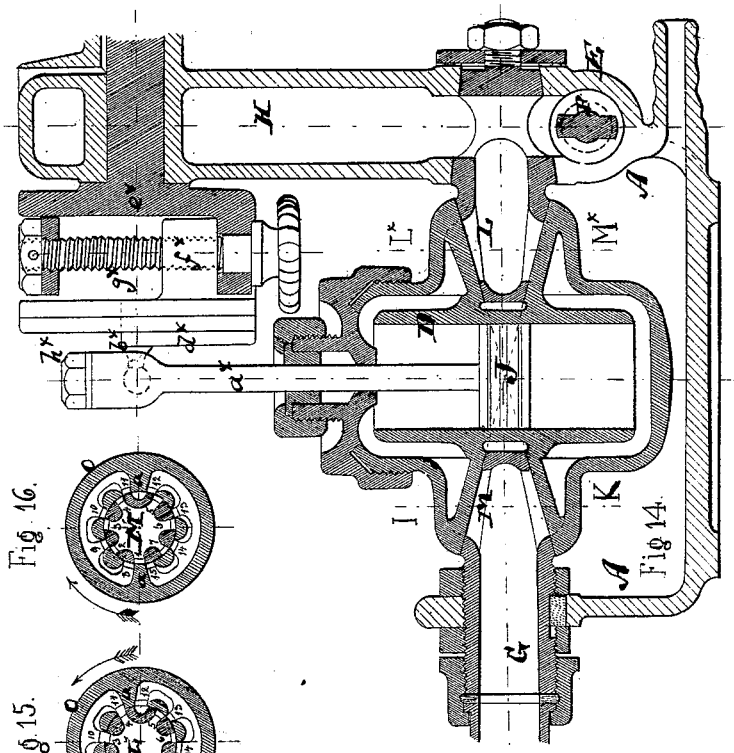

Fig. 14.

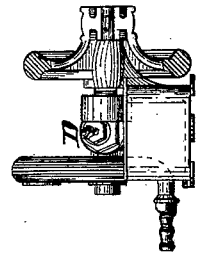

Fig. 20.

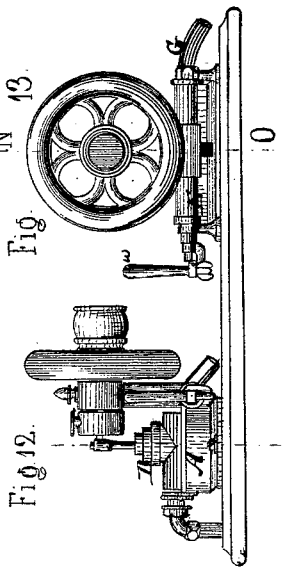

Fig. 13.

Fig. 16.

Fig. 15.

Fig. 12.

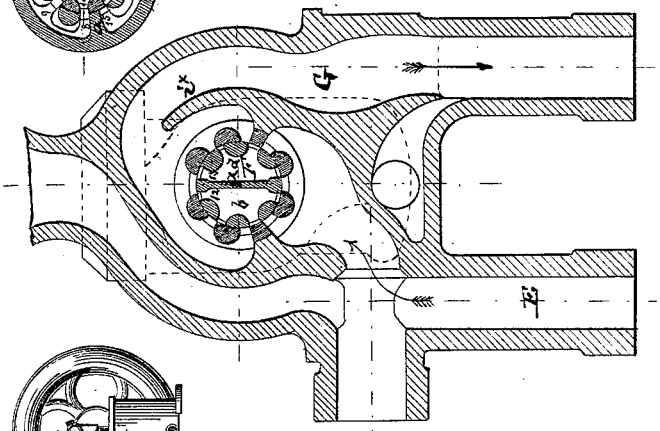

Fig. 17.

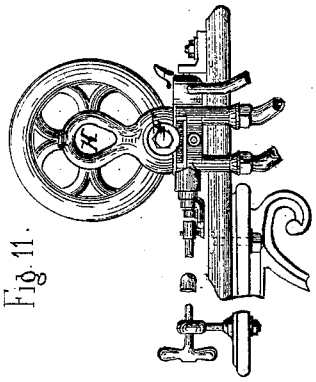

Fig. 11.

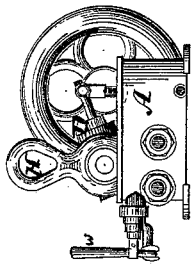

Fig. 19.

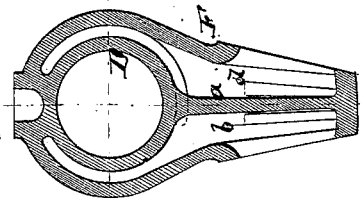

Fig. 18.

Witnesses:
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A. E. Möller
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A. v. Briesen

UNITED STATES PATENT OFFICE.

ANDREAS E. MÖLLER, OF BERLIN, PRUSSIA, GERMAN EMPIRE, ASSIGNOR TO HIMSELF AND CARL SCHATTENBRAND, OF SAME PLACE.

IMPROVEMENT IN HYDRAULIC ENGINES.

Specification forming part of Letters Patent No. **218,303**, dated August 5, 1879; application filed February 24, 1879.

To all whom it may concern:

Be it known that I, ANDREAS EMANUEL MÖLLER, of Berlin, Prussia, German Empire, have invented an Improved Hydraulic Engine, of which the following is a specification.

In the accompanying sheets of drawings, Figure 1, Sheet 1, is a vertical longitudinal section of my improved hydraulic engine on the line A′ A′, Fig. 2. Fig. 2, Sheet 1, is a vertical transverse section of the same through the center of the cylinder. Fig. 3, Sheet 2, is a horizontal section of the same on the line E′ F′, Figs. 1 and 2; Fig. 4, Sheet 2, a horizontal section on the line G′ G′, Fig. 1. Figs. 5, 6, and 7, Sheet 3, are detail views of parts of the engine. Figs. 8, 9, 10, Sheet 2, and Figs. 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20, Sheet 3, show modifications of the engine and also modes of applying the same for operating sewing-machines.

Similar letters of reference indicate corresponding parts in all the figures.

This invention relates to an improved hydraulic engine which is to be attached to sewing-machines and similar mechanism, for imparting motion to the same.

The invention consists in the details of improvements hereinafter pointed out.

With special reference to Figs. 1, 2, 3, 4, 5, 6, and 7 of the drawings, the letter A represents the basin for receiving the drippings from the cylinder. This basin is preferably made of elliptical form, and has two trunnions, $m^{\times}$ $m^{\times}$, in line with its longitudinal axis, by which trunnions it is hung in two brackets, $n^{\times}$ $n^{\times}$, that are secured to the table B of a sewing-machine or other mechanism to which motion is to be imparted, or to which the machine is to be attached.

The oscillating cylinder D is pivoted, in a manner hereinafter described, between the two sides of the basin A, at right angles to the trunnions $m^{\times}$ $m^{\times}$. The double pivotal connection of the cylinder to the plate B has the effect substantially of a universal joint, and allows for small inaccuracies in the mounting of the motor.

E is the water-inlet pipe of the machine; F, the valve that regulates the admission of water to and its proper discharge from the cylinder D. G is the water-outlet. H is an air-chamber communicating with the inlet-pipe E. J is the piston.

The water enters the inlet under pressure, and after passing through the valve mechanism enters the oscillating cylinder operating the piston, and is then discharged through the valve F into the outlet G. The valve F is a hollow cone, closed in front, and divided by a central partition, *a*, into two compartments, *b* and *d*, the upper compartment, *b*, communicating with the cylinder D above the piston, while the lower compartment, *d*, communicates with the cylinder below the piston.

Each compartment of the valve F has three (more or less) circumferential ports or apertures in line with the pipes E and G, in manner hereinafter described, said pipes having ports or apertures corresponding to those of the valve F. The supply-pipe E has three such ports or apertures, *e f g*, while the discharge-pipe has four, *h*, *i*, *j*, and *k*. The ports of the upper chamber, *b*, of the valve F are marked 9, 10, and 11, Fig. 1, and those of the lower chamber 14, 15, and 16.

Now, the relative position of the several ports is such that water is alternately admitted into each of the two chambers of the valve by two ports, and at the same time discharged by two ports from the other chamber of the valve, the apertures of the valve being, as the valve oscillates around its longitudinal axis, brought alternately in and out of line with those of the water-supply and discharge pipes.

In Fig. 1 the valve F is represented in the dead-center position, in which water is not admitted to nor discharged from the valve F, all the ports hereinabove specified being closed.

In one position of the valve—to wit, that in which water is to be admitted into its upper compartment, *b*—the ports 9 and 10, Fig. 1, of the valve communicate, respectively, with the apertures *f* and *g* of the water-supply pipe, while the induction-ports in the lower compartment, *d*, are brought out of line with those of the water-supply and closed, thereby preventing the admission of water into the lower compartment of the valve. At the same time the apertures 14 and 15 of the lower compart-

ment communicate, respectively, with the apertures *j* and *k* of the water-discharge, thereby allowing the discharge of water from the lower compartment, *d*, while the eduction-ports of the upper compartment are closed. At the opposite position of the valve the induction-ports of the lower compartment, *d*, are opened, while those of the upper compartment are closed. At the same time the eduction ports of the lower compartment are closed, and those of the upper compartment opened.

I prefer, in addition to the above arrangement, to establish communication between the two compartments *b* and *d* of the valve at the two extremities of motion of the piston, which occur whenever the cylinder is vertical, for the purpose of utilizing the residue of pressure from the full part of the cylinder to the emptied part. This I effect by providing the valve F with two additional smaller ports or apertures, 12 and 13, at two opposite sides of the central partition, *a*, one aperture being in the upper and one in the lower compartment. Both apertures are partially opposite to and communicate with a cavity, 5, in a cup-shaped plate, *l*, which is secured within the discharge-pipe.

Whenever the piston is in its uppermost or lowermost position, and the valve in the position shown in Fig. 1, communication will, through the openings 12 5 13, be established between the two compartments *b* and *d* of the valve, and thereby between the upper and lower portions of the cylinder D. The live water that has just acted upon the cylinder will be forced by the balance of pressure and momentum into the empty part of the cylinder at the opposite side of the piston, whereby its force is to some extent utilized to start the piston in the opposite direction and water is economized.

The conical valve F, being rigidly attached to the cylinder D, forms one of the pivotal supports for the cylinder. At the opposite side the cylinder D is, by a ball-joint, connected to an outwardly-projecting screw-pin, *m*, which is screwed into a bearing, *n*, that is fastened to and projects upward from the side of the basin A. The ball-shaped end of the pin *m* is much nearer to the longitudinal axis of the cylinder D than the support of the valve F, whereby such pin is made to bear the greater part of the strain of the cylinder, thus releasing the valve.

The pin *m* can be screwed in or out, so as to make the conical valve F bear properly on its supporting and surrounding sleeve *o*, which sleeve forms the ports *e*, *f*, *g*, *h*, *i*, *j*, and *k*. It is my desire to leave the valve F loose in the sleeve *o*, and allow water to leak around the valve into the basin A.

I shall now describe the mechanism which regulates the admission of water into the machine.

P is a suitable ball or disk valve fitted to the end of a valve-stem, *q*, to which reciprocating and oscillating motion may be imparted. This valve enters the water-admission pipe E through a proper side aperture and closes the pipe E, as in Fig. 1, when the admission of water is to be stopped. When the valve P is withdrawn the flow of water is resumed. The valve-stem *q* is partly surrounded by a stuffing-box, *r*.

Immediately back of the valve P the rod *q* has two sidewardly-projecting ribs, *s s*, which, when the valve P is opened, slide into two slots, *t t*, of the tubular box *r*, that surrounds the rod *q*. The inner ends of the ribs *s* are convex, and the end of the tube *r* nearest the pipe E is cut oblique, as indicated in Fig. 1. When the valve is closed the ribs *s* are entirely out of the tube *r*, and when thereupon the valve is slightly turned the ribs *s* will be moved along the oblique end of the tube, thus forcing the valve P tight against its seat *u*.

In order to prevent displacement of the tube *r*, I prefer to attach it within a surrounding shell by a feather-and-groove connection or otherwise rigidly secure it. At the rear end the stuffing-box *r* has a downwardly-projecting arm, *r*, which has a transverse slot open at the lower end. Into this slot fits the arm of an L-shaped lever, W, which is pivoted to the valve-stem *q*, and by which motion is imparted to the valve-stem and valve P. The shorter arm of the lever W is hook-shaped, as in Fig. 7, the beak of the hook projecting beyond the arm *r* when the lever W is in its vertical position and the valve P opened. When the lever W is in this position the valve P may be moved lengthwise toward or away from its seat, and when moved toward its seat the valve-rod *q* may be turned, by taking hold of the lever W, to firmly close the valve. When the valve is closed the beak of the hook-shaped projection of the L-shaped lever W enters the slot of the arm *r*, and thereby prevents any attempted longitudinal movement of the valve P before the valve and valve-rod *q* are first turned back into their normal position. (Shown in Fig. 1.)

In order to allow the discharge of water from the basin A into the discharge-pipe G, a connection is established between such basin and pipe by a suitable aperture, *x*. A rubber ball, *y*, may be placed against this aperture to prevent the flow of water back from the pipe G into the basin A. This ball *y* may, if desired, be closed against its seat by clamping it with a suitable set-screw. Any other mode of discharging the water from the basin A may, if desired, be substituted.

I shall now describe mechanism which serves to adjust the length of stroke of the piston.

The upper portion of the piston-rod $a^{\times}$ is connected by a sidewardly-projecting pin, $b^{\times}$, (which turns in an aperture in the piston-rod,) with a grooved slide, $d^{\times}$, which fits into a transverse slot at the end of a hollow drum, $e^{\times}$, said drum being on the shaft to which motion is to be imparted. The slide $d^{\times}$ is provided with a nut, $f^{\times}$, which projects into the hollow of the drum $e^{\times}$. A screw, $g^{\times}$, which is

swiveled in the drum $e^{\times}$, passes through the nut $f^{\times}$, and serves to move the slide $d^{\times}$ transversely in the drum, thereby carrying the pin $b^{\times}$ farther away from or nearer to the periphery of the drum.

When the slide $d^{\times}$ (and with it the pin $b^{\times}$) is adjusted at a considerable distance from the axis of the drum $e^{\times}$, the pin $b^{\times}$ will, when the drum revolves, be caused to describe a larger circle, and the piston-rod $a^{\times}$ will thereby be caused to make a longer stroke than when the pin $b^{\times}$ is brought nearer to the axis of the drum $e^{\times}$. A very exact adjustment of the length of stroke may, in this manner, be affected by the screw $g^{\times}$.

The aperture by which the ball end of the pin $b^{\times}$ enters the upper hollow portion of the piston-rod $a^{\times}$ is made so large that the ball-head of the pin may pass through such hole.

The connection of the pin $b^{\times}$ to the piston-rod is established by a screw-plug, $h^{\times}$, that enters the top of the piston-rod and bears with its end upon the ball end of the pin $b^{\times}$.

When the plug $h^{\times}$ is partly withdrawn the head of the pin $b^{\times}$ may be withdrawn from the piston-rod $a^{\times}$, and the communication thereby broken.

In Figs. 17 and 18 is shown a modification of the valve mechanism. In this modification the aperture 5 and cup *l* are dispensed with, and the two chambers of the valve communicate by the ports 12 and 13 directly with the discharge-pipe at the dead-point. An upright partition, $i^{\times}$, in the discharge-pipe prevents the water from escaping at the moment of dead-center, and causes it to flow from one port, 12, to the other port, 13, or vice versa, and consequently from one compartment to the other. In this modification the valve-ports are somewhat differently arranged from those heretofore described, and the partition *a* is vertical.

Figs. 8 and 9 show how the machine is attached to the working-plate of a sewing-machine.

Figs. 10 and 11 show the construction of the motor when not bodily attached to the sewing-machine.

Figs. 12, 13, 19, and 20 show a modified position of motor, the oscillating cylinder being horizontal and not vertical.

Figs. 14, 15, and 16 are sectional views of a modified valve arrangement. In this modification the inlet-valve L is at one side and the outlet-valve M at the other side of the cylinder, the two valves constituting the trunnions of the cylinder. The partition within the valves is dispensed with, and one in the surrounding shell substituted for substantially like effect.

I claim—

1. The combination of the basin A, hung on trunnions $m^{\times}$ $m^{\times}$, with the cylinder D, hung in the basin at right angles to the said trunnions, substantially as and for the purpose herein shown and described.

2. The valve F, having central partition *a* and two compartments, *b d*, and series of ports in each compartment, in combination with a perforated embracing-shell, all being so arranged that two induction-ports in one compartment of the valve are opened at the same time with two eduction-ports of the other compartment, while the other ports are closed, substantially as herein shown and described.

3. The combination of the cylinder D and hollow valve F, having the openings 12 and 13 at opposite sides of a dividing-partition, with the chamber 5, and with the discharge-pipe G, all so arranged that communication is established between the two compartments of the valve mechanism whenever the oscillating cylinder is in position of dead-center, substantially as specified.

4. The combination of the valve P and stem *q*, having projecting ribs *s*, with the surrounding tubular box *r*, having slots *t t*, substantially as specified.

5. The combination of the tube or box *r*, having slotted arm *v*, with the rod *q* and valve P, and with the L-shaped lever W, substantially as specified.

6. The combination of the hollow drum $e^{\times}$, which has a transverse slot at its end, with the grooved slide $d^{\times}$, which fits into said slot, and is provided with the outwardly-projecting pin $b^{\times}$ and inwardly extending nut $f^{\times}$, and with the screw $g^{\times}$, swiveled in the drum $e^{\times}$, for operation substantially as herein shown and described.

This specification signed by me this 7th day of December, 1878.

ANDREAS EMANUEL MÖLLER.

Witnesses:

FRIEDRICH GLASER,

CARL T. BURCKARDT.