J. F. WARE & T. W. RUNDLE.

AUTOMATIC FLUID CONTROLLED VARIABLE TIME EXPOSURE VALVE MECHANISM FOR PHOTOPRINTING MACHINES.

APPLICATION FILED MAR. 12, 1907.

899,235. Patented Sept. 22, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

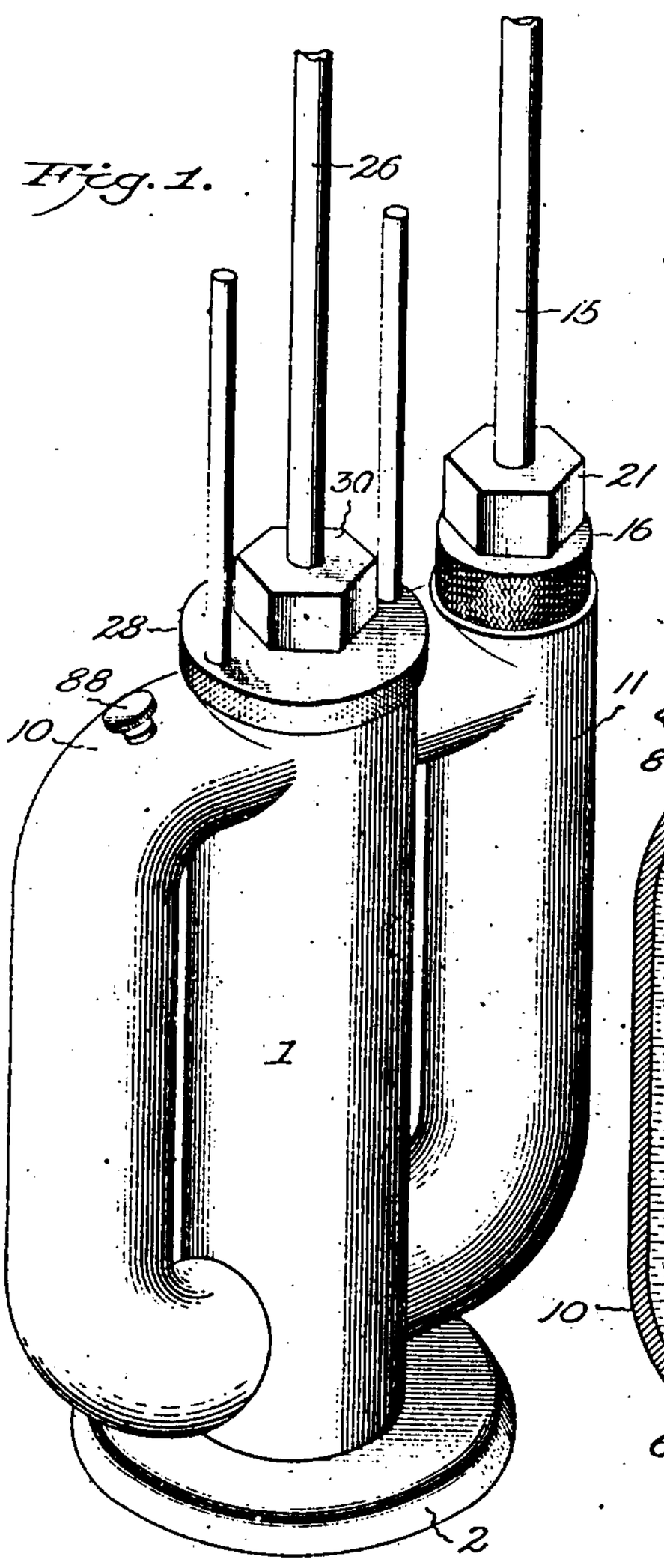
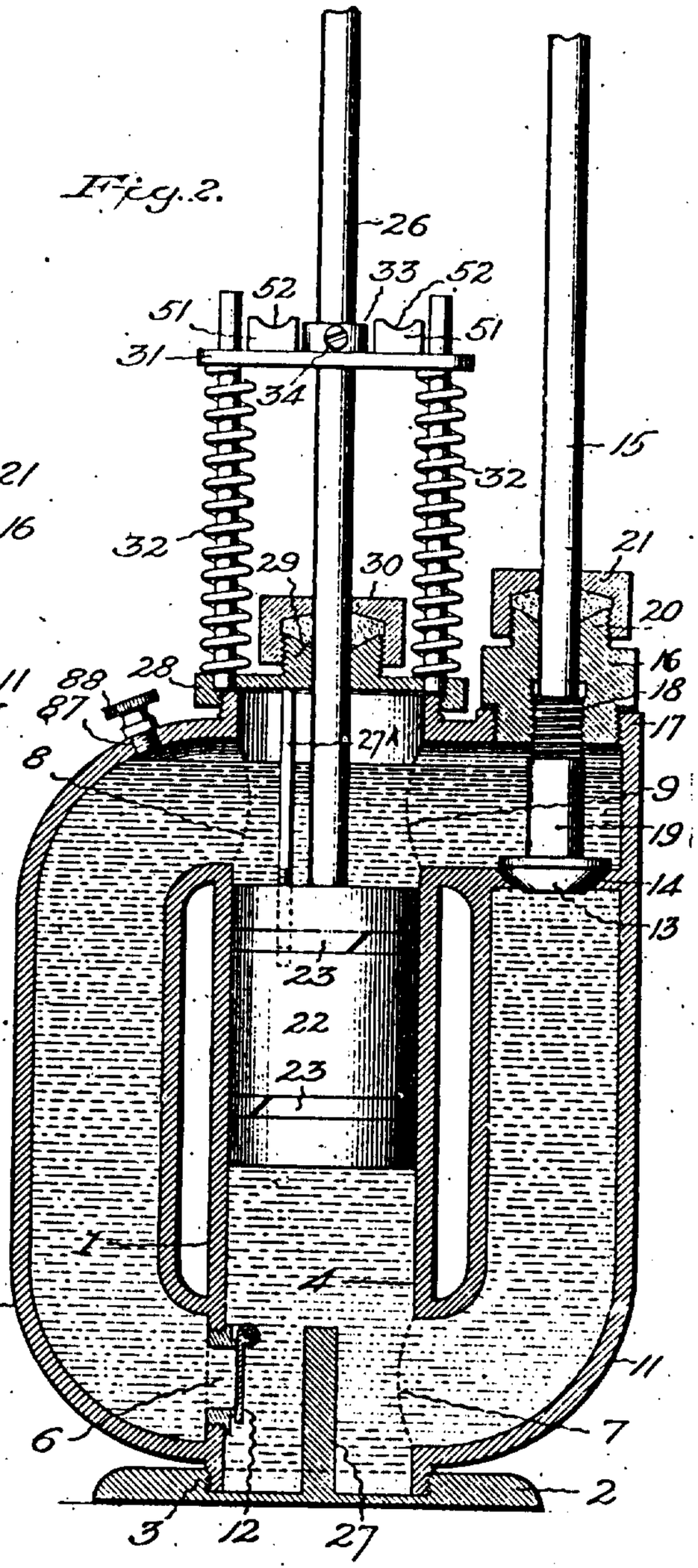


Fig. 2.



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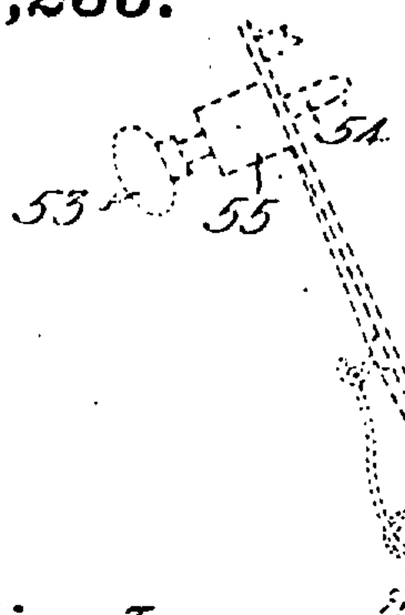


Fig. 3.

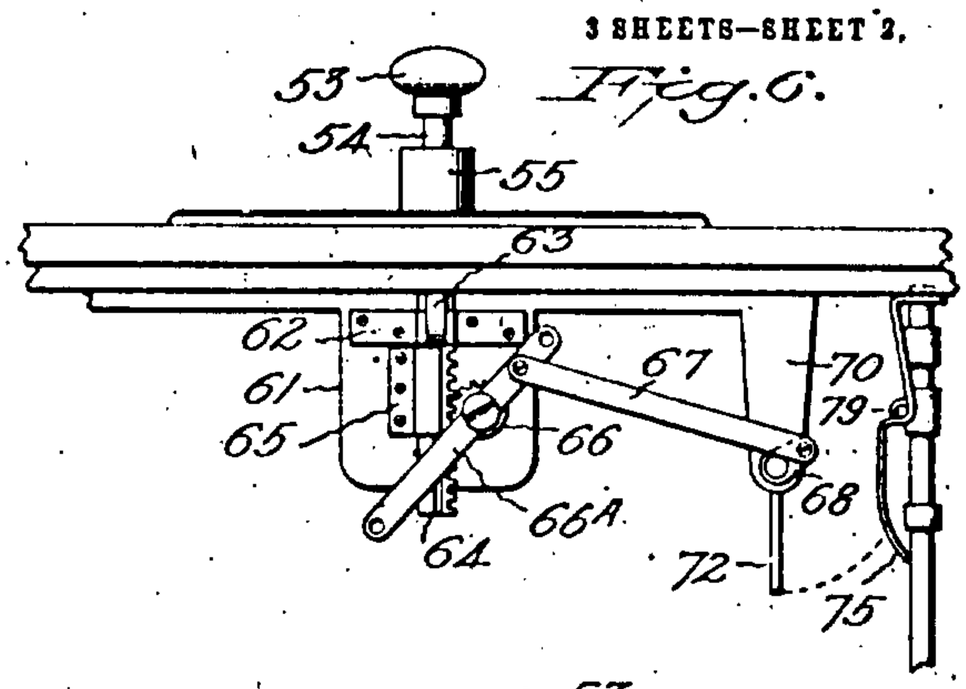
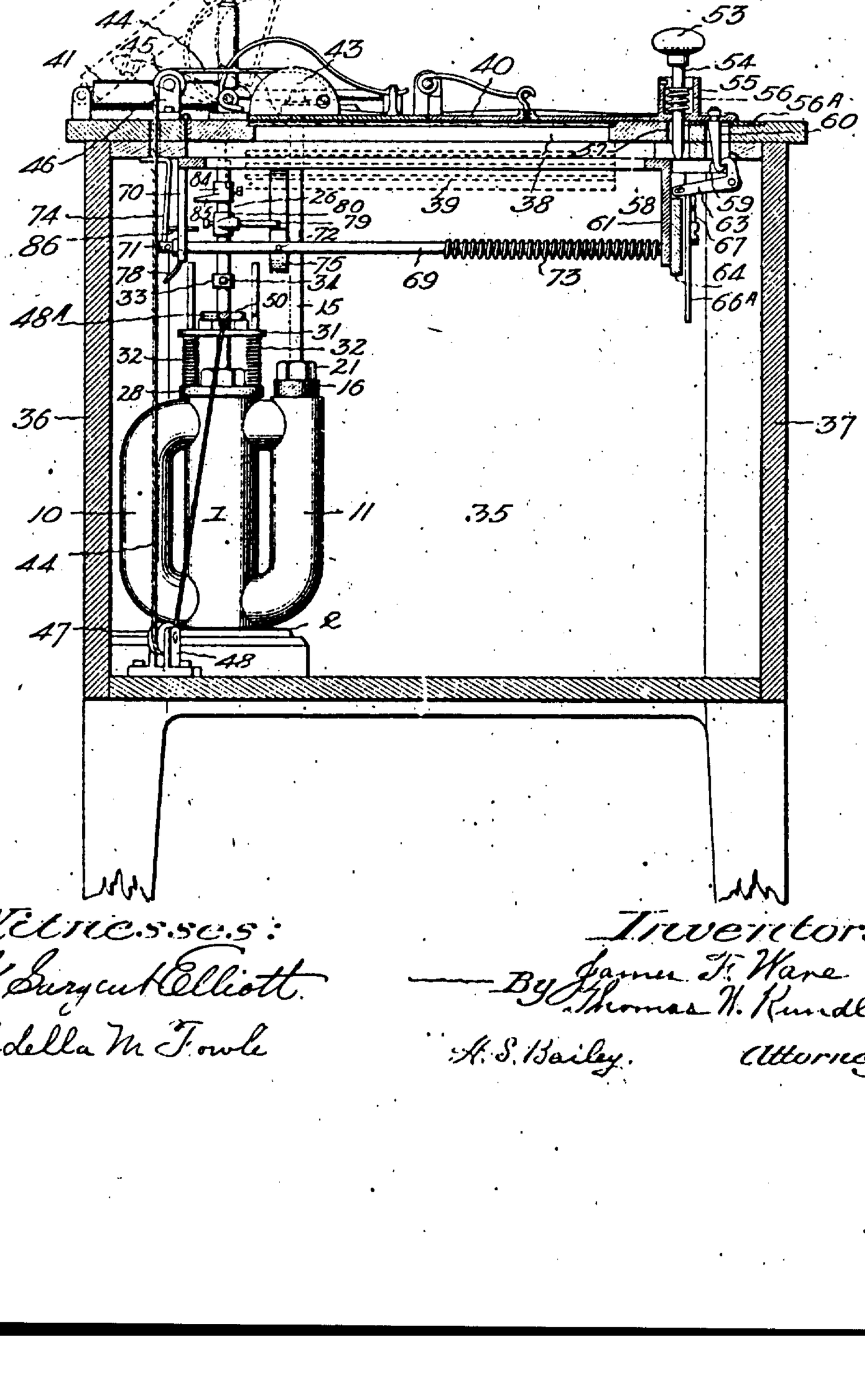


Fig. 6.



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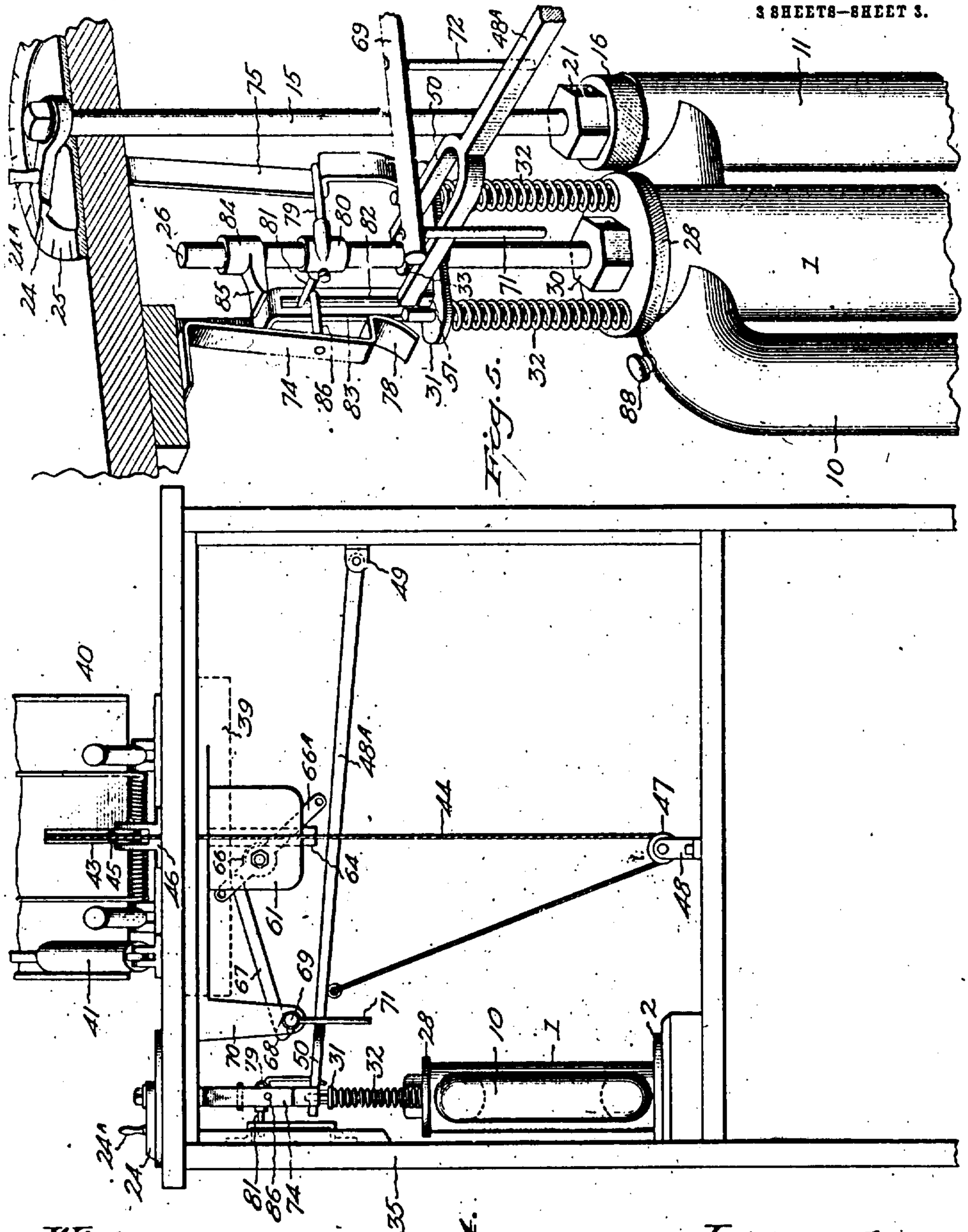

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

JAMES F. WARE AND THOMAS W. RUNDLE, OF DENVER, COLORADO, ASSIGNORS TO THE AUTOMATIC PHOTOGRAPH PRINTING MACHINE COMPANY, A CORPORATION OF ARIZONA TERRITORY.

AUTOMATIC FLUID-CONTROLLED VARIABLE-TIME-EXPOSURE VALVE MECHANISM FOR PHOTOPRINTING-MACHINES.

No. 899,235. Specification of Letters Patent. Patented Sept. 22, 1908.

Application filed March 12, 1907. Serial No. 361,970.

To all whom it may concern:

Be it known that we, JAMES F. WARE and THOMAS W. RUNDLE, citizens of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Automatic Fluid-Controlled Variable-Time-Exposure Valve Mechanism for Photoprinting-Machines, of which the following is a specification.

Our invention relates to a new automatic fluid controlled variable time exposure valve mechanism for photoprinting machines; and the objects of our invention are: First, to provide a variable time operating valve for automatically regulating and governing the intermittent operating movement of the printing mechanism of photographing machines, that require a regular intermittent period of time in which to make an exposure and to perform an operative printing movement. Second, to provide a valve that moves automatically through its operative movement with a steady, even movement, that can be varied to any predetermined quick or slow movement desired. Third, to provide a fluid controlled variable time operating valve that is adapted to control the operative action of doors, shutters, backs of printing machines, and other reciprocating devices. We attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a perspective view of a valve embodying our invention. Fig. 2, is a sectional elevation through the center of the valve. Fig. 3, is a sectional elevation of a photographic printing cabinet, showing the application of our improved variable time operating valve to the time control and the automatic release of its printing pad holding back or door, the said door being closed, and the valve plunger rod released and in the act of descending. Fig. 4, is an end view of the cabinet showing the valve and operating mechanism connected therewith, the door of the cabinet being removed. Fig. 5, is a perspective view of the upper portion of the valve, and mechanism connected therewith. And Fig. 6, is a front view of a fragment of the cabinet, showing the mechanism operated by the latch of the pad-holding door, for releasing the plunger rod, simultaneously with the latching of the door.

Similar letters of reference refer to similar parts throughout the several views.

Referring to the drawings, the numeral 1, designates the cylinder of our valve. This cylinder is mounted on any suitable supporting base 2, to which it may be threaded or otherwise secured, or with which it may be integrally cast. We preferably however, cut a thread on the lower end of the cylinder and screw it into a threaded recess 3, formed in the base plate. This cylinder is provided with a piston bore 4, which extends from one end to the other end. At the lower end of the cylinder and at diametrically opposite points, inlet and outlet ports 6 and 7 are formed at the bottom of the cylinder, and outlet and inlet ports 8 and 9 are also formed at the top of the cylinder. The port 6 is an inlet port into the cylinder, and the port 7 is an outlet port out of the cylinder on the opposite side of the port 6, while the port 8 is an outlet port from the cylinder at its top directly above the inlet port 6, and the port 9 is an inlet port into the cylinder directly above the outlet port 7. These two oppositely arranged sets of ports 6 and 8, and 7 and 9, are connected together on opposite sides of the cylinder by tubes or pipes 10 and 11, which are preferably cast integral with the cylinder. The inlet port 6 is controlled by any suitable automatically operating inlet valve, but we preferably employ a common flap valve 12, which is secured at one side to the port in a position to swing open under the pressure of the inflowing fluid, and to close the port when the fluid pressure is forced down in the cylinder. The cylinder inlet port 9, is also provided with a valve 13, and a valve seat 14, which are located in the top of the vertical portion of the tube 11. The valve is preferably of the plug type and fits against a taper seat formed around the interior of the tube. A valve stem 15 extends from the valve up through the tube and through a plug 16, which is screwed into a threaded aperture 17, formed in the top of the tube 11. This plug is provided with a threaded aperture 18, and the valve stem is provided with an enlarged portion 19, the upper end of which is threaded into the

threaded aperture in the plug. This plug is also provided with a stuffing box 20 and a gland nut 21 is screwed on top of the plug over the stuffing box, an aperture being formed through the stuffing box, and through the gland nut in line with the aperture in the stuffing box, through which the valve stem projects, and suitable packing is placed in the stuffing box and gland around the valve stem, and the gland is adjusted to pack the stem against leakage. At the top of the valve stem a pointer 24 is secured, and an index dial 25 is secured beneath the pointer, which is provided with a number of index lines arranged radially around it, and which indicate equal intervals of the circular movement of the pointer in moving the valve stem and valve from a closed to a fully opened position.

A piston 22 of suitable weight, is reciprocally mounted in the cylinder and is provided with suitable packing rings 23, and a piston rod 26 is secured at one end to the piston, and extends up through a cylinder head 28 which is threaded to the upper end of the cylinder. A pin 27 extends upward from the base plate, to limit the downward movement of the piston, and a pin 27^A extending upward from the top of the piston, contacts with the head 28, to limit the upward movement of the piston. The cylinder head 28 is provided with an axial aperture through which the piston rod passes, and also with a packing box 29, a packing gland 30, and a packing material. On the piston rod above the gland we mount slidably a crosshead 31, the opposite ends of which are slidably mounted on two vertical rods which are secured at their lower ends to the top of the cylinder head. On these rods expansive coiled springs 32 are placed, the lower ends of which rest on top of the cylinder head, and their opposite ends bear against the under side of the ends of the crosshead. These springs are of sufficient length to permit of a resilient movement equal to the stroke of the piston in its cylinder. Upon the piston rod a collar 33, is adjustably secured by a set screw 34. This collar is positioned on the piston rod to be engaged by the crosshead when the crosshead and also the piston is at the lowest point of its downward stroke, and when the crosshead is released the piston is raised to the top of its upper stroke by the engagement of the crosshead with this collar through the medium of the crosshead springs. This crosshead is moved down to the limit of its downward stroke by means of any suitable mechanism connected to the door or shutter or pad holding back or other thing or machine or device that is to be operated by the valve.

We have preferably illustrated our invention applied to our new photographic printing machine, for which we have especially invented it; and in which we have adapted it to automatically control the variable time exposures required to print different pictures from different negatives, and for vignetting printing work; and we preferably carry out this feature of our invention in the following manner: This printing machine consists of a cabinet 35, preferably mounted on legs, and preferably of a height to be operated by an operator standing beside it. This cabinet preferably consists of a square box-shaped frame inclosing a large chamber in which an electric or suitable light is placed. Hinged doors 36 and 37 are placed in the opposite sides of the cabinet to allow easy entrance to the cabinet from its opposite sides, and in the central portion of the top of the cabinet a glass door 38 is hinged to lift and swing upward, and to the under side of the top of the cabinet at the sides of this glass door several slide-ways 39, are placed, in which the vignetting sheets are placed. The negatives and sheets of photo-printing paper are laid on top of the glass door. At the rear or hinged end of the glass door, a pad pressure shutter or door 40 is hinged, which is adapted to press a suitable cushioning pad against the print paper and smoothly press it against the glass door. This pad pressure shutter is preferably made in two halves which are hinged together, a spring being arranged to extend from one half door to the other.

A pneumatic cylinder and piston 41, are connected to the shutter and top of the cabinet to cushion the opening movement of the shutter. This divided shutter and the pneumatic cushioning cylinder and piston do not however, form an essential part of my present invention, and a fuller description of their exact construction and arrangement is unnecessary, as any suitable single piece pad pressure hinged shutter can be used instead of the divided shutter illustrated, it only being necessary to operatively connect it to the oil valve in such a manner that the shutter is released and is arranged to open automatically and to be arranged to be instrumental in moving the piston of the oil valve down to the limit of its downward stroke when it stands fully open; and in carrying out this feature of our invention we preferably secure a segment of a sheave 43 to the center of the width of the back of the shutter adjacent to its hinged end, to which one end of a cord or chain 44 is attached, the opposite end of which is extended over a small sheave pulley 45, journaled in a lug 46, which is secured to the top of the cabinet. From this pulley the cord extends down through an aperture in the top of the cabinet into its light chamber, and to a sheave pulley 47 journaled in a lug 48, secured to the floor of the cabinet under which it passes and then extends upward and is connected to a lever 48^A, which is the crosshead actuating lever of the oil valve, one end

of which is pivotally secured to a lug 49, which is secured to one of the inside walls of the cabinet.

The oil valve is preferably set on the floor of the cabinet close to the opposite side of the chamber of the cabinet, from the side the pivoted end of the lever is secured to, and the opposite end of the lever 48^A extends to the valve and its end is bifurcated to form a fork 50, which straddles the piston rod and its collar 33, and these ends rest on a couple of blocks 51, which are secured to the top of the crosshead. The top surfaces of these blocks are preferably provided with concaved recesses 52, and the lower side of the fingers of the forked end of the lever are rounded to fit into these recesses, which arrangement holds the end of the lever 48^A in constant bearing engagement with the crosshead, as its springs hold it under constant upward pressure, and the closing weight of the shutter through the medium of the cord is pulling the lever down against the block with a constant downward pressure, the weight of the shutter being directly on the lever, and the crosshead springs are strong enough to raise the lever, and through the medium of the cord to raise the door and normally hold it in an opened position, as shown in Figs. 3 and 4.

When printing photos, the shutter is shut, that is pressed down against the glass door by the hand of the operator, and is locked there by an automatically operating lock, which we will presently describe; and this downward closing movement of the shutter pulls on the cord and pulls the lever 48^A down and it presses the crosshead down on its springs, and when the shutter is locked down against the glass door the lever holds the crosshead down to the limit of its operative downward movement under the expansive tension of its springs, until the shutter is unlocked by the piston at the end of its downward movement. This downward traveling movement of the piston begins the instant the shutter is closed and locked in a closed position, as the piston is normally at the upper end of its vertical stroke, as it is raised and held there by the crosshead's engagement with the collar 33 by the expansion tension of its springs.

While any suitable character of a locking mechanism that the downward movement of the oil valve's piston can release at the end of its downward stroke, can be employed to lock or latch the shutter in a closed position, we preferably carry out this feature of our invention in the following manner: The front end of the shutter is provided with a hand knob 53, which is secured to the upper end of a stem 54, which extends vertically and reciprocally through and beyond a hub 55, formed on the top of the shutter. This hub contains a chamber 56, in which an expansive spring is placed, which is arranged to normally hold the stem and knob at the top of its vertical movement. A plate 56^A is secured to the top of the cabinet and this stem extends down through an aperture 57 in the top of the plate and cabinet, into a lock 58. A hook 59 is secured to the under side of the shutter in front of the hub, and depends therefrom and extends through an aperture 60 formed in the plate 56 and the top of the cabinet. The lock 58 comprises a supporting plate 61, which is secured to the under side of the top of the cabinet. A yoke-shaped clip 62 is secured to the plate, to which a right-angled latch hook 63 is pivotally attached intermediate of its ends; one end of this latch stands vertically and is provided with a hook arranged to hook over the hooked end of the depending latch of the shutter. The opposite end of this latch extends to and is pivotally connected to a vertically-reciprocating toothed rack bar 64, which is reciprocally mounted in a slideway 65, secured on the plate, the top end of which lies in the path of and is engaged by the descending knob stem of the shutter, when it is closed against the top of the glass door of the cabinet.

The gear teeth of the rack bar mesh with the teeth of a segment of a pinion 66, which is pivotally secured to the plate. An arm 66^A is secured to this pinion, the outer end of which is pivotally connected to one end of a lever 67, the opposite end of which is pivotally connected to one end of a crank lever 68. the opposite end of which is secured to one end of a shaft 69, which is rotatably journaled in depending brackets 70, which are secured to the under side of the top of the cabinet. The opposite end of this shaft is provided with two pins 71 and 72, which are positioned to stand vertically downward when the shutter is open, being held in that position by a spring 73, which is coiled around the shaft and fastened at one end to it, its opposite end being secured to the adjacent bracket 70. The lower end of the arm 66^A is adapted to be connected to a mechanism used in printing, that does not form any part of my invention. These two pins 71 and 72 are adapted to engage two spring catches 74 and 75, which are made of sheet spring metal. These spring catches are secured at one end to the under side of the top of the cabinet, and in a position to depend on opposite sides of the piston rod of the oil valve, and opposite to the shaft 69, and in the oscillating path of the pins 71 and 72, which are engaged by them, the pin 71 being adapted to lock the knob and stem lock mechanism to the spring catch 74 when the shutter is shut, and the pin 72 being arranged to release the piston the instant the shutter is locked, allowing it to descend in its cylinder, and they are arranged to per-

form these functions in the following manner: The spring catch 74 is provided with a right-angled off-set that is positioned adjacent to its lower end to catch the pin 71 at the upper end of its upward oscillating movement. A curved terminal end 78 is formed on the end of the spring, which is arranged to be engaged by the pin and moved back enough to allow the step to spring back under the pin when it is moved upward by the movement of the lock and the oscillating movement of the shaft and pins, due to the closing of the shutter, which will be more fully described hereafter; thus locking the pin and shaft and the right-angled latch of the lock to the latch of the shutter and holding it locked until released by the piston at the end of its downward stroke, which act on the part of the piston will be presently explained. The lower end of the spring catch 75, is also provided with a right-angled step, and also with a terminal curved end portion adapted to be engaged and pushed back by the pin 72, as it is moved upward by the oscillating movement of the shaft. The step however, is adapted to act as a saddle for a pin or arm 79, that projects from a hub 80, which is adjustably secured to the piston rod of the oil valve. This hub is also provided with a second arm 81, which we term a guide arm, which projects towards the adjacent side of the cabinet where it enters a guide-way slot 82, formed in a bracket 83, which is secured to the side of the cabinet. This guide-way slot and the guide arm hold the piston against turning; consequently the hub arm 79 will move vertically and reciprocally in the same plane and will always be seated in the offset step of the spring lever 75, when it is raised to the top of its upward stroke. A hub 84 is also adjustably secured to the piston rod above the hub 80, which is provided with a projecting arm 85, that is positioned to engage the end of a projecting pin 86, which is secured to the spring catch 74, in the downward path of the arm 85. The arm 85 strikes the pin 86, at the end of the piston and piston rod's downward stroke, and moves the spring so that its step is forced from under the pin 71, which is under a constant downward pressure, due to the spring 73 on the shaft 69, and the minute the pin 71 is released the coiled spring on its shaft forces the shaft to oscillate and turn the pin down and this movement of the shaft partially rotates the gear segment through the medium of the lever at the end of the shaft, and the gear segment raises the rack bar which throws the hook of the latch out of engagement with the hook of the shutter and releases the shutter, which instantly springs up open through the medium of the crosshead springs, the forked lever, and cord, and as the crosshead springs upward it strikes the collar 33 and lifts the piston rod upward with it to the top of its upward stroke. The oil valve's valve stem 15 extends up through the top of the cabinet and through the index disk 25, which is secured to the top of the cabinet. This index plate is a circular disk that is graduated into a plurality of equal divisions, representing seconds and minutes, throughout its circumference, the minutes represented being the few usually required for the exposure in printing photographic pictures. To the top of the valve stem the index finger 24 is secured, and to the index finger a hand-grasping knob 24^A is attached, by which the index finger may be turned to any desired point of the graduated index disk.

The operation of our fluid controlled variable time exposure valve for photographic printing machines, is as follows: The printing machine is adapted to print in duplicate copies of photographs; consequently the different negatives of different pictures from which copies are to be printed would require different lengths of time exposures, and when it is desired to print a large number of copies from a negative, the index finger is set at a point of the index corresponding to the number of seconds or a minute and seconds or two or more minutes that the operator thinks will be the length of time required for the exposure required to print the picture; and the length of time for the exposure can be accurately adjusted by making a few tests and moving the index finger to either increase or diminish the time of the exposure until the printed copies are found to have the length of time exposure necessary to make them print satisfactorily. When printing photographic pictures, the inside of the cabinet is provided with a suitable light, and is otherwise arranged to print pictures. We do not however, illustrate or describe this feature, as it does not form a part of our present invention. The oil valve cylinder is made of a length and capacity suitable for the size of printing machine it is to be used on, and it is filled through an aperture 87 by removing a plug 88, with any suitable oil or other fluid, which when the piston descends flows through the tube 11, and valve 13, and port 9, into the top of the cylinder, and onto the top of the piston; when however the piston is raised the oil flows through the inlet port 6 into the cylinder and under the piston and into the tube 11. The cylinder should be made long enough to permit the piston to be three or four or more minutes in making its full downward latch releasing stroke with a valve opening sufficient to insure an even steady movement of the piston. The turning of the index finger turns the valve stem 15, which being threaded to the nut 16, lowers or raises the valve 13 either towards or from its seat in the compartment 11 of the cylinder, and thus allows more or less oil to flow through the valve port; thus if the index is set at ten

seconds, the valve port is opened to allow just enough oil to flow through the port to allow the piston rod to be ten seconds in traveling its downward stroke from the time it is released by the closing of the shutter until it releases the shutter at the end of its downward stroke. If the exposure required is one minute, the index finger is moved to the one minute point, which opens the valve far enough to allow the oil to flow fast enough to allow the piston rod to move slowly enough to be one minute in releasing the shutter after it is closed and locked to the valve. Consequently, after the operator has adjusted the time index to secure the desired time exposure, he simply closes and locks the shutter to the valve after each printing exposure, and the valve automatically holds the shutter closed and exposes each picture exactly the same length of time until as many pictures are printed as desired. And when a change is made to a negative requiring a longer time of exposure, the index must be readjusted to open or close the port of the oil valve to allow the piston and piston rod to make their downward operative movement in the time required, when the valve will automatically hold the shutter closed and release it at the end of the time required for the exposure, as often as the shutter is locked to it.

Our invention is simple, reliable, and enables photographic pictures to be quickly and accurately duplicated to any number required, and our invention contemplates the use of the oil valve and an operative locking and releasing mechanism for use for other characters of machinery and to perform other uses.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In an automatic fluid controlled variable time exposure valve mechanism, for photo-printing machines, the combination with a suitable cabinet, provided with a swinging shutter, and a spring-controlled latch mechanism, of a valve comprising a vertically disposed cylinder provided with a port on each side, a piston reciprocally mounted in said cylinder, a valved inlet from one port into the bottom of said cylinder, and outlet valve leading from the top of the other port into the top of said cylinder, an index controlled valve stem attached to said outlet valve, means including a spring controlled latch for locking said shutter in a closed position on said cabinet, and means including a projecting arm on said piston arranged to release said shutter's latch at the end of the piston rod's downward stroke, as specified.

2. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination of an oil valve, comprising a cylinder and its ports, provided with a body of oil, a piston and piston rod arranged to move on its downward stroke in said body of oil by their weight, and an oil outlet valve and valve stem, with a cabinet, a shutter hinged thereto, and arranged to be swingingly closed against said cabinet, means for latching said shutter against said cabinet, means connected with said oil valve for engaging said latch and releasing said shutter, resilient means on said valve for holding said shutter under a constant opening movement tension.

3. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination with the cabinet, the swinging shutter hinged thereto, and means for latching said shutter closed against said cabinet, of a fluid controlled valve connected to said cabinet and comprising the cylinder provided with a body of oil, the piston and piston rod, and the manually operated valve, said piston being arranged to move in said body of oil on its downward stroke by its weight, resilient means connected to said cylinder for raising and holding said piston at the top of its upward stroke, means including a lever and a cord connected with said shutter, and said cabinet, for holding said shutter under a constant opening tension, and means connected with said piston rod for releasing said shutter's latch, and shutter, at the end of its downward stroke.

4. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination of a vertically disposed cylinder having valve-controlled ports, and provided with a supply of liquid, a reciprocating piston and piston rod in said cylinder adapted to reciprocate in said fluid, and a manually controlled valve arranged to control the flow of fluid in said cylinder to permit different speed movements of said piston and piston rod on their down stroke in said cylinder, with a cabinet provided with a glass exposure plate, a shutter hinged to said cabinet and adapted to be closed against said exposure plate, means including a latching mechanism for locking said shutter closed to said exposure plate, a reciprocating lever secured at one end in said cabinet, a cord connected at one end adjacent to the hinged end of said hinged shutter and secured at its opposite end adjacent to the opposite end of said lever, a crosshead reciprocally mounted on said cylinder and piston rod, springs arranged to move said crosshead in one direction of its reciprocal movement, the closing weight of said shutter being arranged through the medium of said cord to hold the free end of said lever against said crosshead, and the said free end of said lever being moved by the closing movement of said shutter to force

said cross-head down against its springs whereby said crosshead exerts a constant opening pressure on said shutter, means including a latching mechanism connected to said shutter and cabinet for locking said shutter closed against said exposure plate, a collar on said piston rod engaged by said crosshead, said piston rod being adapted to be raised to the top of its upward stroke by the upward springing movement of said crosshead when said shutter is unlatched from its closed position over said exposure plate, means connected with said piston for engaging said latch mechanism and releasing said shutter, and an index plate arranged on said cabinet and arranged to determine the manual opening movement of said valve to permit said piston rod to fall on its downward stroke in said fluid and release said shutter latching mechanism.

5. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination of a cabinet provided with a glass exposure plate, a shutter hinged to said cabinet to swing down and be closed over said glass exposure plate, a hook depending from the free end of said shutter, a sliding knob spring controlled in one direction of its movement extending through said shutter, a latch mechanism attached to said cabinet comprising a hook, a toothed rack bar attached to said hook and arranged in the path of said sliding knob, and adapted to move said hook to engage and lock to the hook of said shutter, a gear segment in engagement with said rack bar provided with a projecting arm, a shaft journaled to said cabinet so as to be oscillated and provided with a projecting pin, a crank arm on one end of said shaft, a lever connected at one end to said gear segment's arm and at its opposite end to said shaft's crank arm, and a lever connected to said cabinet at one end and to said shutter adjacent to its opposite end, with a fluid valve comprising a cylinder having independent ports connecting its opposite ends, an automatically operating valve controlling the entrance of one of said ports into the bottom of said cylinder, a manually operated valve arranged to control the outlet of the other port into the top of said cylinder, a reciprocating piston and piston rod in said cylinder, a collar on said piston rod, guides on said cylinder, a crosshead slidably mounted on said guides and on said piston rod between said collar and said cylinder, expansive springs on said guides between said crosshead and said cylinder, said crosshead being arranged in engagement with and adapted to hold said shutter's opening lever and said shutter under a resilient opening pressure when said shutter is locked to said latch, a spring blade arranged to receive and hold the projecting pin of said latch's oscillating shaft when said shutter is closed, a projecting pin on said piston rod arranged to engage said spring and release said latch's oscillating shaft's pin, a projecting pin on said piston rod, a spring blade arranged to engage said piston rod's projecting pin, and hold said piston rod at the top of its upward stroke, a pin projecting from the oscillating shaft of said latch and arranged to engage said spring and release said piston rod, and a valve opening movement index arranged adjacent to said manually operated valve stem, substantially as specified.

6. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination with the cabinet, the exposure plate, and the hinged shutter arranged to swing down over said exposure plate, a latch mechanism on said cabinet arranged to latch said shutter down against said exposure plate, the lever and cord attached to said shutter for opening said shutter, and an oil valve in said cabinet having a vertical piston adapted to move on its upward stroke by an expansive spring arranged on said valve and piston, and adapted to operate said lever and cord to normally hold said shutter open, said piston being adapted to move on its downward stroke by its weight, means connected to said piston rod for releasing said shutter's locking mechanism at the end of its downward stroke, and a manually operated valve provided with a variable movement index attached to said oil valve and arranged and adapted to control said oil valve to cause said piston rod to move on its downward strokes at different rates of speed whereby said shutter may be locked to said cabinet and valve for different predetermined periods of time and be automatically released at the end of a set time by the downward stroke of said piston rod.

7. In an automatic fluid controlled variable time exposure valve mechanism for photo printing machines, the combination of the oil valve, the cabinet, the shutter, means for connecting said shutter to said oil valve to normally hold said shutter open, means including a latch mechanism connected to said cabinet for locking said shutter closed, and means connected with said valve for engaging said latching mechanism and for operatively releasing said shutter at different predetermined periods of time after said shutter is latched to said cabinet.

8. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination with the cabinet provided with a glass exposure plate and shutter hinged to said cabinet at one end, and adapted to swing down over said exposure plate, said shutter being divided into two halves hinged together, resilient means for holding said halves in operative relation to each other, a latch mechanism arranged partially in said cabinet and partially

on the free end of said shutter, a fluid-controlled valve mounted in said cabinet provided with a reciprocating piston and piston rod, spring controlled means for moving said piston and means for locking said piston and piston rod in said oil valve at the end of one stroke of its reciprocal movement, said piston being weighted to move automatically through said oil valve on the opposite stroke of its reciprocal movement, a manually regulated valve in said oil valve for regulating the speed and time of the weighted stroke of said piston in said fluid-controlled valve, means including springs connected to said piston and valve for raising and releasing said shutter's and cabinet's latching mechanism, at the end of its weight actuated stroke, and means connected with said shutter and with the spring actuated means for moving said piston and its piston rod to the end of one of its reciprocal movements for normally holding said shutter under constant opening movement tension, and means including a cylinder and a piston for cushioning the opening movement of said shutter.

9. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination of the cabinet, the oil valve, and the shutter divided in two halves hinged together, one part of said shutter being hinged to said cabinet, a resilient cushioning device on said cabinet connected to said shutter and arranged to cushion the opening movement of said shutter, the cord and lever for connecting said shutter to said oil valve, the latch mechanism arranged to lock said shutter to said cabinet in a closed position, and means connected to said oil valve for releasing said latch mechanism and for permitting the operation of said cord and lever of said shutter to open the same after predetermined periods of time.

10. In an automatic fluid controlled variable time exposure valve mechanism for photo-printing machines, the combination of the fluid controlled oil valve comprising the cylinder and ports, the piston and piston rods reciprocally mounted in said cylinder, the inlet valve, the outlet valve and valve stem provided with an opening movement index, with the cabinet, the glass exposure plate, and the shutter hinged to said cabinet and adapted to swing to cover said glass exposure plate, a latch mechanism connected to said shutter and said cabinet and arranged to lock said shutter closed to said cabinet, a spring controlled mechanism arranged to move said piston to the end of one of its reciprocal movements and operatively connected to said shutter to normally hold said shutter under a constant opening movement pressure and means connected to the piston rod of said oil valve for releasing the latching mechanism of said shutter.

11. In an automatic fluid-controlled variable time exposure valve mechanism for photo-printing machines, the combination with a photo-printing cabinet of a vertically positioned cylinder mounted therein, having ports connecting its opposite ends, a weighted piston and piston rod in said cylinder, a swinging inlet valve from one of the said cylinder ports into the bottom of said cylinder, a plug valve arranged to control the outlet of the other port into the top of said cylinder, a valve stem connected to said outlet valve and threaded to the top of said cylinder and arranged to be turned in its threaded seat to move said plug valve to open or close the port leading to the top of said cylinder, a body of oil in said cylinder and ports, a collar on said piston rod, guide rods secured to said cylinder, expansive coiled springs mounted on said guide rods, a cross head slidably mounted on said piston rod and guide rods, and resting on said guide rods' springs, and adapted to normally force said piston rod to the top of its vertical stroke and to be moved down on its guide rod springs far enough to permit said piston rod and piston to travel down in said cylinder to the end of its downward stroke and when released to force said piston rod up to the top of its upward stroke, a projection on said piston rod, a spring lever connected to said cabinet and arranged to engage the projection of said piston rod and hold said piston and rod at the top of its upward stroke when raised there by the spring movement of said crosshead; a coöperating latching mechanism connected to said shutter and said cabinet, means including a lever connected to said cabinet and shutter and arranged in engagement with said piston rod's crosshead, and adapted to move said crosshead down when said shutter is closed down and latched to said cabinet and to compress its spring far enough to allow said piston rod to move to the end of its downward stroke, a spring lever connected to said cabinet and arranged to engage and lock said shutter's latch mechanism, and means connected to said piston rod for engaging said cabinet's spring lever at the lower end of its downward stroke, and releasing the coöperating latching mechanism of said shutter and cabinet and thereby allowing said shutter to be forced open by the upward springing movement of said spring actuated crosshead and said shutter's connecting lever and thereby throwing said piston rod again to the top of its upward stroke, and means including an index for determining the opening and closing movement of said oil valve's outlet valve and the time of the falling stroke of said piston rod whereby said piston rod may be made to move on its downward shutter releasing stroke in different predetermined periods of time and said shutter is kept closed and released at the end of different predetermined periods of time.

12. In an automatic fluid controlled variable time exposure shutter releasing valve mechanism for photo-printing machines, the combination of the cabinet provided with the glass exposure plate and the swinging shutter, the cord and lever connected to said shutter and cabinet, the reciprocating hand operated knob and latch hook at the free end of said shutter, the latch mechanism attached to said cabinet and arranged to engage the hook of said shutter, with the fluid controlled valve comprising the cylinder, the piston and piston rod, the outlet valve and valve stem operatively arranged to engage said latch mechanism and open said shutter, and means for controlling said valve to hold said shutter closed and to release it at different predetermined periods of time.

13. In an automatic fluid controlled variable time exposure shutter releasing valve mechanism for photo-printing machines, the combination of the cabinet, the shutter hinged to said cabinet, the hook latch on said shutter, the tilting right angled latch on said cabinet, the rack-bar pivoted to said tilting latch and the rock shaft provided with projecting pins, the spring lever secured to said cabinet and arranged to engage said rock shaft's projecting pins, the spring controlled reciprocating knob on said shutter arranged to engage said rack-bar and cause said tilting latch to engage said shutter's hook and simultaneously tilt said rock shaft and cause its projecting pins to engage said cabinet's spring lever, and lock said shutter to said cabinet, and the fluid controlled valve provided with a variable time movement piston and an adjustable operating valve.

14. In a fluid valve controlled mechanism for photo-printing machines, the combination with a cabinet of a pad holding shutter hinged thereto, comprising two members united by a hinge connection; a catch on said shutter; a hook pivoted to the cabinet, for engaging the catch; a spring controlled rod connected at one end through a system of levers and a rack and pinion with said hook and having a finger at the other end; a spring catch adapted to hold said finger when said rod is turned, a liquid operated valve for releasing said finger having a piston rod which is held normally in a raised position; and an arm on said piston rod for engaging said spring catch as the piston rod descends; a knob on said shutter for operating the rod and pinion to simultaneously lock the shutter, turn the rod to cause its finger to engage the spring catch, and release the piston rod, and springs for raising said shutter when the latch is released.

15. In a fluid valve controlled mechanism for photo-printing machines, the combination with a cabinet of a pad-holding shutter hinged thereto comprising two members united by a hinge, a latch for locking said shutter against the top of said cabinet, springs for normally holding said shutter open; a spring controlled rod connected at one end with said latch and having a finger at its other end which is engaged by and held by a spring catch when the rod is turned; a fluid operated valve having a weighted piston provided with a rod having a projecting arm for engaging said spring catch on the descent of the piston; and means for simultaneously latching the shutter and releasing the piston and means for cushioning the upward movement of the shutter.

16. In a device as specified, the combination with a cabinet having a hinged pad holding shutter comprising two members hinged together, of means for latching and for automatically releasing said shutter, comprising an oil valve having an oil cylinder, a weighted piston in said cylinder having an extended rod; a spring catch, a finger on said piston rod which normally engages said catch and holds said piston elevated; an arm on said piston rod; a spring catch having a pin which is adapted to be engaged by said arm, a spring controlled rod, having fingers, one of which is engaged by said last mentioned catch when the rod is turned, while the other moves the first ntentioned latch to release the piston rod, a hook on said hinged shutter, a latch on the cabinet, and means connecting said latch and spring controlled rod consisting of a rack and pinion and arm, means for turning said pinion to operate the arm and rod and a spring controlled lever connected with the pad holding door, and with the piston rod of the air valve, which is depressed, when the shutter is closed, and which raises the piston when the shutter is released.

In testimony whereof we affix our signatures in presence of two witnesses.

JAMES F. WARE.
THOMAS W. RUNDLE.

Witnesses:
G. SARGENT ELLIOTT,
ADELLA M. FOWLE.