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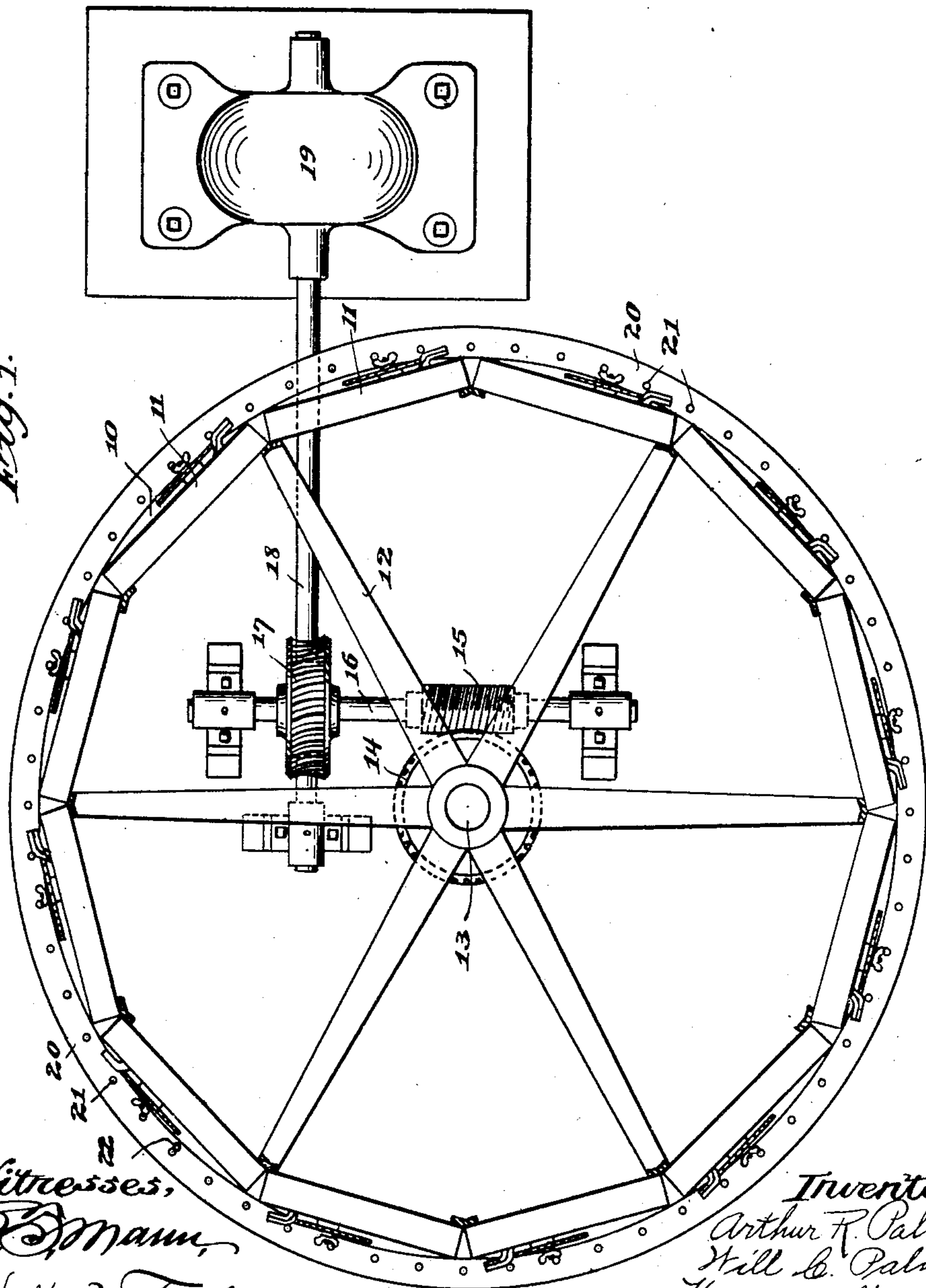
PATENTED SEPT. 10, 1907.

A. R. & W. C. PALMER & H. A. STANFORD.
AUTOMATIC PHOTOGRAPHIC PRINTING DEVICE.

APPLICATION FILED FEB. 23, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



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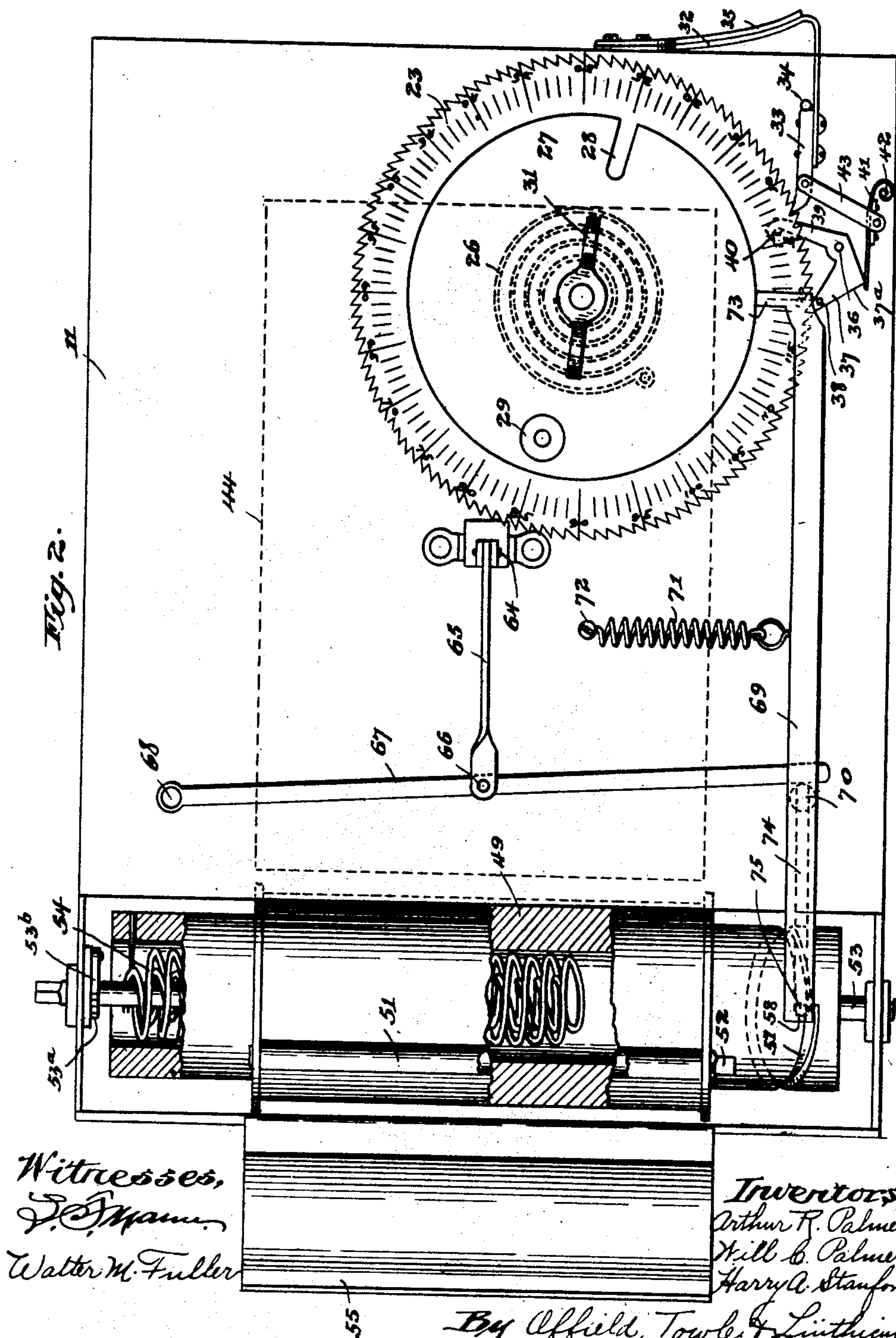
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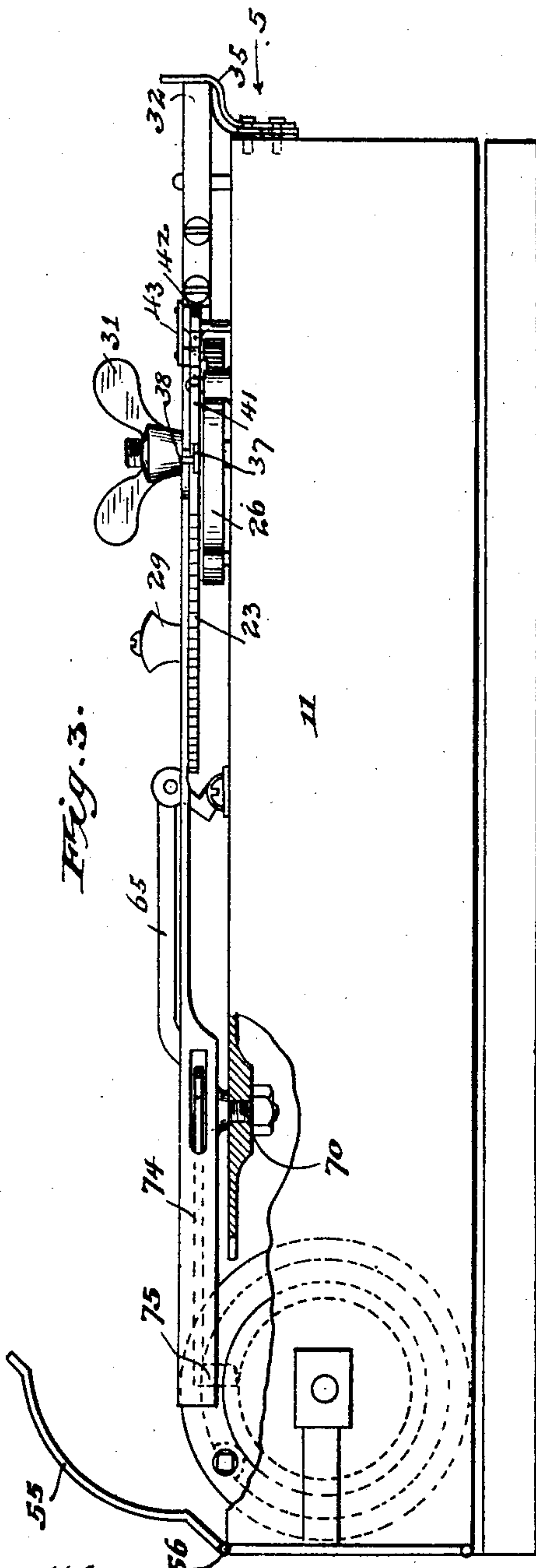
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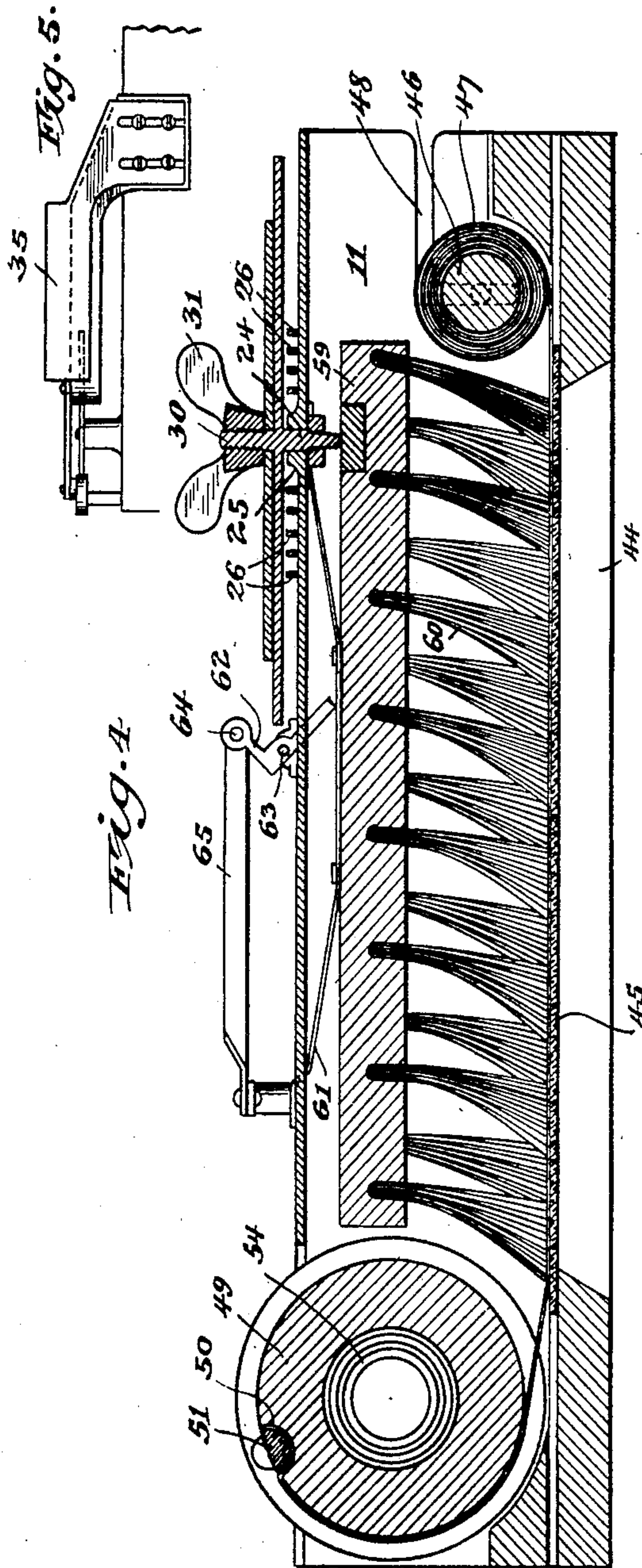
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4 SHEETS—SHEET 3.



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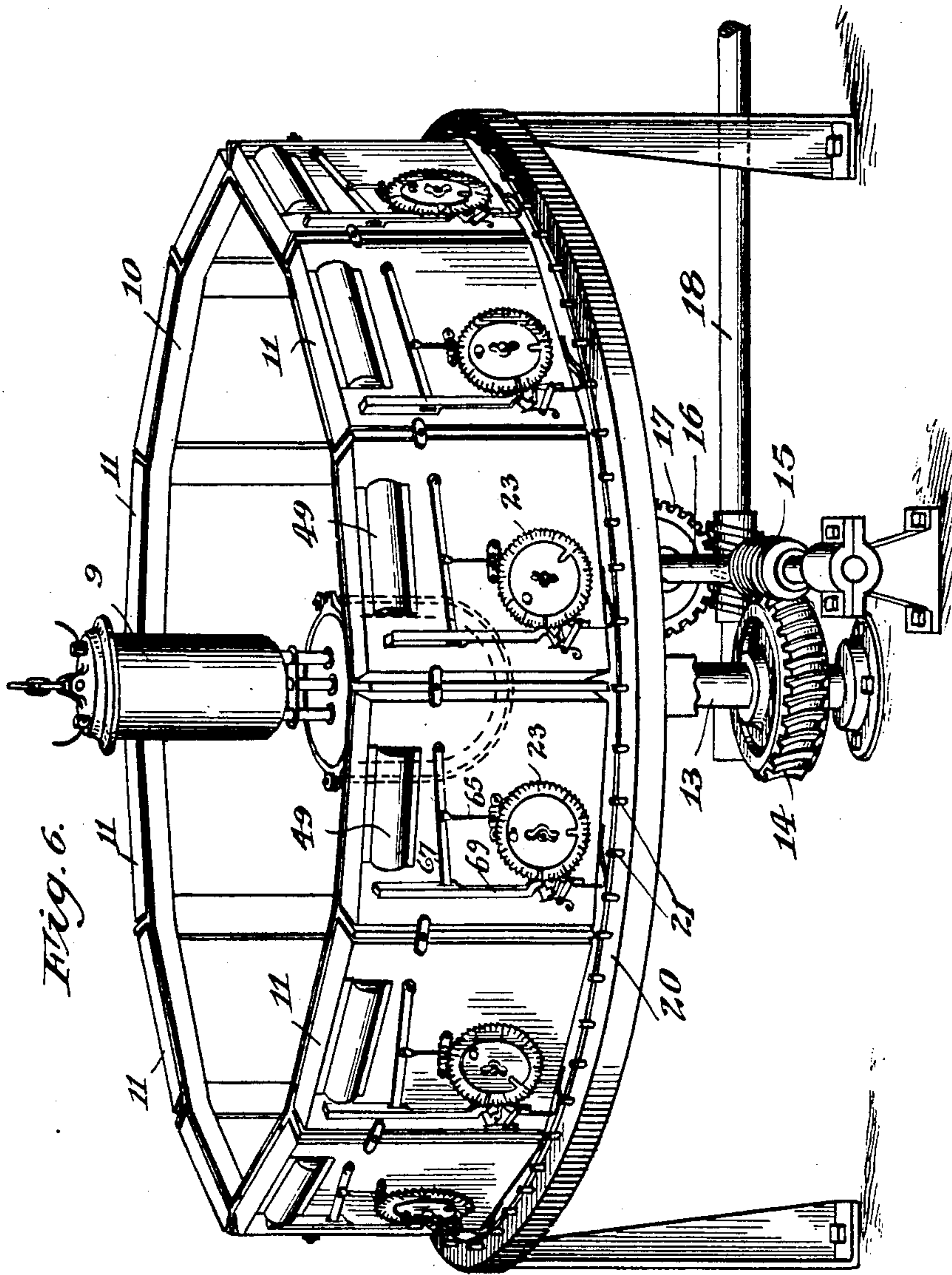
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

ARTHUR R. PALMER, OF SAN DIEGO, CALIFORNIA, AND WILL C. PALMER AND HARRY A. STANFORD, OF CHICAGO, ILLINOIS.

AUTOMATIC PHOTOGRAPHIC-PRINTING DEVICE.

No. 865,797.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed February 23, 1906. Serial No. 302,530.

To all whom it may concern:

Be it known that we, ARTHUR R. PALMER, WILL C. PALMER, and HARRY A. STANFORD, citizens of the United States, residing at San Diego, in the county of San Diego and State of California; Chicago, in the county of Cook and State of Illinois, and Chicago, in the county of Cook and State of Illinois, respectively, have invented certain new and useful Improvements in Automatic Photographic-Printing Devices, of which the following is a specification.

The object of our invention is to provide an automatic device which will print from a plurality of negatives at the same time a number of photographs from each, the times of exposure of the negatives being all the same or different as occasion demands. To attain this object we have invented a machine involving a rotary cabinet encircling a central source of light and adapted to receive a number of printing frames facing the light. Each of these frames has an adjustable timing device which coöperates with one or more stationary projections whereby each negative is allowed to print a length of time corresponding to the adjustment of its timing mechanism. On each printing frame there is an automatically acting roller which winds up the exposed portion of the sensitized paper, the action of this roller being controlled by the timing device. We also equip each frame with an elastic or flexible means to hold the sensitized paper against the film side of the negative, this flexible means being also controlled by the timing mechanism. The parts are so arranged that as the cabinet revolves the timing devices of the various frames are operated by the stationary projection or projections so that when a given strip of sensitized paper in a frame has been exposed beneath the negative to the light for the length of time indicated on its timing mechanism, the latter causes the flexible means to release its pressure on the paper and the winding-up roller turns so as to roll up the exposed portion of the paper and bring behind the negative a fresh paper, or portion of a strip, the timing mechanism automatically resetting itself for the next exposure. The only things in common between the numerous printing frames are their supporting cabinet and light and the timing mechanism operating projections. By our invention a number of photographs can be automatically made from each negative, and the times of exposure of the different negatives in the frames may vary widely although operating at the same time.

In the accompanying drawings we have illustrated the preferred embodiment of our invention, wherein

Figure 1 is a plan view of the printing frame receiving cabinet and the motor which rotates it; Fig. 2 is a plan view, partly in section, of the back of one of the printing frames; Fig. 3 is a side elevation partly in section of one of the printing frames; Fig. 4 is a longitudinal sec-

tion of one of the printing frames; Fig. 5 is a detail view of a portion of the means for operating the pawl of a timing device. Fig. 6 is a perspective view of our complete automatic printing device.

A revoluble cabinet 10 is provided with a series of 60 pockets or receptacles each adapted to accommodate a printing frame 11, the frames when in place all facing the center of the device where an artificial light 9 is positioned. At the lower portion of the cabinet is a supporting spider 12 mounted on shaft 13, the latter 65 having a gear 14 meshing with a worm 15 on a shaft 16, the latter also being provided with a gear 17 meshing with and operated by a worm on shaft 18, the gear mechanism forming speed reducing means. Shaft 18 is rotated by an electric or other motor 19. For the sake of simplicity we have shown a simple cabinet with only a single tier of printing frames, but it is obvious that a plurality of tiers of frames may be used in the cabinet, the frames being at equal distances or unequal distances from the central light. Just outside 75 of the rotating cabinet 10 is a stationary ring 20 having sixty upstanding pins 21 and a single similar pin 22 disposed just inside one of the pins 21.

Each printing frame 11 has on its back a rotary ratchet wheel 23, one hub of which 24 is rotatably mounted in 80 a bearing 25 on the back of the frame. The outer surface of ratchet wheel 23 is circularly graduated to indicate seconds or minutes as the case may be, and beneath the wheel is a spring 26 secured at its opposite ends to the wheel and to the frame the function of 85 which is to return the wheel to zero position. Lying flat on wheel 23 is a disk 27 having a radial slot 28 and an operating handle 29. This slotted disk is adapted to be adjusted angularly relatively to the ratchet wheel by means of its handle 29, the disk turning upon the 90 hub 30 of the wheel and being held in adjusted position by a winged nut 31 engaging a screw thread on the hub.

Attached to the lower side of each printing frame is a spring 32 which extends over the back of the frame 95 and has at its end an advancing pawl 33 adapted to engage the teeth of the ratchet wheel 23 and feed the same forwardly, the backward movement of the pawl being limited by a fixed stop 34. Adjustably mounted on spring 32 by means of a slot and screw-connection [as 100 shown in Fig. 5] is an additional spring 35 which may be made to engage as the cabinet revolves with either the single fixed stop or projection 22 or the sixty projections 21 according to its adjustment. Pivoted at 105 36 is a step pawl 37 engaging the ratchet wheel teeth and adapted to prevent rearward movement of the ratchet wheel, the pawl being provided at its forward end with a pin 38 and at its back end with a tail piece 39 which extends into the path of movement of a lug 40 on the under side of ratchet wheel 23. A spring 41 110

fixed at 42 presses upon the pawl 37 normally holding it in engagement with the ratchet teeth, and connecting spring 41 with the feed pawl 33 is a link 43.

On its face each printing frame has an opening or
 5 window 44 back of which, as is customary, is placed a photographic negative 45. At one end of each frame is a supply or delivery roller 46 on which is wound a considerable length of unexposed sensitized paper 47, the roller being rotatably mounted in the frame and
 10 removable by means of right angle slots 48 in which its pintles slide and roll. The paper on leaving the roller 47 passes over the back of the negative 45 and its forward end is secured in any convenient manner to a removable winding-up or receiving roller 49. This
 15 attachment of the paper to the roller or spool is desirably accomplished by inserting the end of the paper in the semi-cylindrical groove 50 after which a correspondingly shaped bar 51 rotatably mounted in the ends of the spool or roller 49 is turned by means of a
 20 wrench or similar device applied to the angular head 52 so as to grip the edge of the paper. Roller or spool 49 is revoluble on the transverse shaft 53 and in order to operate the roller automatically we provide in its hollow interior a spring 54 one end of which is fixed to
 25 the roller, the other to shaft 53. As shown in Fig. 2, this spring is made of a single length of wire and comprises two helical portions of different diameters the smaller one being within the larger one. By means of this peculiar type of spring, which occupies but small
 30 space, we secure a considerable turning movement so that a number of prints can be made from the negative with a single winding up of the spring, which is accomplished by rotating shaft 53 by means of a key applied to its angular end, backward movement of the shaft
 35 being prevented by ratchet 53^a and pawl 53^b. A hood or cap 55 hinged at 56 provides access to the winding-up spool and when lowered into position prevents the light from reaching the paper. At one end spool 49 has a cam slot 57 the same having an abrupt longitudinal
 40 shoulder 58 for a purpose described hereinafter.

In order to firmly hold the sensitized paper 47 against the back of negative 45 we use a form of brush comprising a back 59 having a number of bristles 60 rubbing evenly on the back surface of the paper. The
 45 brush has a normal tendency to be lifted from the paper and release its pressure thereon under the influence of leaf-spring 61, and to hold the brush in such position that it will firmly press the paper in place, we use a bell-crank lever 62 pivoted on the back of the frame
 50 at 63, the inner end of the lever cooperating with the back 59, the outer end being pivoted at 64 to one end of a link 65, the other end of the latter being pivoted at 66 to a transverse lever 67 pivoted at 68. A longitudinal lever 69 is pivoted at 70 and is pulled in-
 55 wardly by a spring 71 attached to a fixed stud 72. At the end of the lever adjacent to the slotted disk 27 is a tongue 73 adapted to enter slot 28 when the latter registers therewith. At its opposite end lever 69 has an internal sliding bar 74, which at one end abuts against
 60 lever 67 and at its other end has a projection 75 adapted to slide in cam slots 57 and strike the shoulder 58 thereby holding the spring actuated roller 49 from turning under the influence of its internal spring 54.

In considering the operation of this device the ac-
 65 tuation of a single printing frame will be explained,

and since the operation of all of these is the same the function of the whole device will be readily apparent. Assuming that the supply roller 46 has on it a roll of unexposed sensitized paper 47, that the paper has been drawn across the back of the negative and attached 70 to the winding-up roller 49, that the slotted disk 27 has been turned and secured in position so that its slot 28 is opposite the figure 25 on the ratchet wheel 23, that the spring 35 has been adjusted so that it will engage the single outstanding pin or projection 22, and that 75 the motor 19 is revolving the cabinet and printing frame or frames at the rate of one revolution per minute, at each revolution as the pin 22 strikes the spring 35 and moves the same and the spring 32 forwardly pawl 33 feeds the ratchet 23 forwardly one notch and then 80 resumes its normal position against stop 34 as soon as spring 35 has passed away from projection 22. During this interval and until the timing mechanism permits the winding up of the sensitized paper, the portion of paper back of the negative is being exposed to the 85 light. After the cabinet has revolved twenty-five times, occupying twenty-five minutes in so doing, slot 28 comes opposite tongue 73 which under the influence of spring 71 enters the same. This movement of lever 69 moves the pin or projection 75 from shoulder 90 58 allowing lever 67, link 65, and bell-crank lever 62 to shift sufficiently under the influence of spring 61 to lift the brush 59 or at least reduce its pressure on the paper so that the latter may pass freely over the back of the negative. As soon as the projection 75 95 moves away from the shoulder 58 the winding-up roller 49 is free to turn under the actuation of spring 54 and in turning its one revolution winds up an amount of paper corresponding approximately to the length of the negative or window of the frame. As soon as roller 49 100 has completed its single revolution it is prevented from further turning by the striking of shoulder 58 against projection 75, the slot 28 in disk 27 having previously moved out of register with the tongue 73. The shape of cam slot 57 is such that as soon as lever 105 69 moves inwardly its tongue 73 passing into slot 28 it is moved outwardly again, and in its backward movement strikes pin 38 of stop pawl 37 retracting the latter which is held in its inactive position by the flat spring 41 which is first moved backward and then 110 lies against the flat surface 37^a of the pawl. This withdrawal of the stop pawl also causes the retraction of feed pawl 33, the movement of spring 41 being transmitted to the pawl by the connecting link 43. Just as soon as both pawls are free from the ratchet teeth, 115 the ratchet wheel 23 and the disk 27 return to normal position due to the unwinding of coil spring 26. When these two parts have assumed approximately their normal position pin 40 on the ratchet wheel strikes the tail piece 39 of the stop pawl 37 freeing the latter from 120 its spring 41 so that it and also the feed pawl again engage the teeth. It is thus apparent that after a length of exposure corresponding to the length of time to which the timing device is adjusted the exposed sensitized paper is automatically wound up bringing into 125 the field of the negative a new unexposed portion, and the timing device automatically resets itself ready for another operation.

In case it is desired to expose the paper beneath the negative a number of seconds instead of a number of 130

minutes spring 35 is adjusted so as to cooperate with the sixty fixed stops 22 and then the feeding of the time mechanism occurs once a second instead once a minute. By this simple adjustment the timing device of the frame can be changed from an exposure of minutes to an exposure of seconds. When a number of printing frames are placed in the revolving cabinet the times of exposure of the paper in the frames may be all different and some of them may have exposures of minutes while others have exposures of seconds. To those skilled in the art many minor mechanical changes in a device of this character will be obvious.

We claim:

1. In a photographic printing device, the combination of a printing frame, an adjustable timing device mounted thereon, and means to operate said timing device to expose the sensitized medium in said frame a length of time equal to that for which said timing mechanism is set, substantially as described.

2. In a photographic printing device, the combination of a plurality of printing frames, an adjustable timing device mounted on each of said printing frames, and means common to all of said frames to operate said timing devices to expose the sensitized medium in each of said frames a length of time equal to that for which its timing mechanism is set, substantially as described.

3. In a photographic printing device, the combination of a plurality of printing frames each equipped with a timing device, means to operate said devices whereby to expose the sensitized medium in each frame a length of time equal to that for which its timing device corresponds, and automatic means on each frame to remove the exposed portion of sensitized medium from the negative and bring an unexposed portion behind the negative at the termination of each exposure, substantially as described.

4. In a photographic printing device, the combination of a plurality of printing frames each equipped with an adjustable timing device, means to operate said devices whereby to expose the sensitized medium in each frame a length of time equal to that for which its timing device is adjusted, and automatic means on each frame to remove the exposed portion of sensitized medium from the negative and bring an unexposed portion behind the negative at the termination of each exposure, substantially as described.

5. In a photographic printing device, the combination of a plurality of printing frames each equipped with an adjustable timing device, means to operate said devices whereby to expose the sensitized medium in each frame a length of time equal to that for which its timing device is adjusted, a supply roller for each frame adapted to receive a roll of sensitized paper, a wind-up roller for each frame, and automatic means to roll on said wind-up roller a length of paper corresponding substantially to the length of the negative and to draw from said supply roller an unexposed portion of said paper back of the negative at the termination of each exposure, substantially as described.

6. In a photographic printing device, the combination of a cabinet adapted to receive a plurality of printing frames and expose the same to light, a plurality of printing frames each having mounted thereon an adjustable timing device to limit the exposure of the sensitized medium, and means to operate said timing devices, substantially as described.

7. In a photographic printing device, the combination of a rotatable cabinet adapted to receive printing frames, a plurality of printing frames each equipped with a timing device, and one or more projections adapted to actuate said timing devices, substantially as described.

8. In a photographic printing device, the combination of a rotatable cabinet adapted to receive printing frames, a plurality of printing frames each equipped with an adjustable timing device, and one or more stationary projections adapted to operate said timing device, substantially as described.

9. In a photographic printing device, the combination of a rotatable cabinet adapted to receive printing frames, a plurality of printing frames each provided with a timing device, one or more stationary projections to operate said timing devices, and automatic means on each printing frame adapted to remove the exposed paper from behind the negative and replace it with unexposed paper, said means being controlled by said timing device, substantially as described.

10. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with a timing device to determine the duration of exposure of the sensitized medium including a ratchet wheel and a feeding pawl, and means to actuate said timing devices, substantially as described.

11. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with a timing device to determine the duration of exposure of the sensitized medium including a ratchet wheel, a feeding pawl, and a pawl actuating means, said means and cabinet being relatively rotatable, and means for each frame controlled by its timing device to remove the exposed paper from behind the negative and replace it with unexposed paper, substantially as described.

12. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with an adjustable timing device to determine the duration of exposure of the sensitized medium including a ratchet wheel, a spring actuated pawl, and an adjustable plate, one or more pawl actuating means, said means and cabinet being relatively rotatable, and automatic means for each frame controlled by its timing device to remove the exposed sensitized medium from behind the negative and replace it with unexposed, substantially as described.

13. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with an adjustable timing device to determine the duration of the exposure of the sensitized medium including a ratchet wheel, a pawl and a slotted plate adjustable relatively to said ratchet wheel, one or more pawl actuating means, said means and cabinet being relatively rotatable, a lever controlled by said slotted plate, and automatic means for each frame controlled by said lever to remove the exposed sensitized medium from behind the negative and replace it with unexposed, substantially as described.

14. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with a timing device to determine the duration of exposure of the sensitized medium including a ratchet wheel, a feed pawl, and a spring to return said ratchet wheel to normal position, and one or more pawl actuating means, said means and cabinet being relatively rotatable, substantially as described.

15. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with an adjustable timing device to determine the duration of exposure of the sensitized medium, a lever for each frame controlled by its timing device, and a winding-up roller equipped with a cam cooperating with said lever adapted to wind up the sensitized medium to remove the exposed portion from behind a negative at the termination of each exposure, substantially as described.

16. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with a timing device to determine the duration of the exposure of the sensitized medium including a spring actuated rotatable ratchet wheel, a slotted disk, and a feeding pawl, one or more pawl actuating means, said means and cabinet being relatively rotatable, and an automatically actuated wind-up roller on each frame to

roll up the exposed portion of sensitized medium at the termination of each exposure, said roller being equipped with a cam, and a lever cooperating with said cam and the slot of said disk to control the operation of said roller, substantially as described.

17. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with an automatically resetting timing device to determine the duration of exposure of the sensitized medium, and one or more actuating means for said timing devices, substantially as described.

18. In a photographic printing device, the combination of a cabinet adapted to receive printing frames and expose them to light, one or more printing frames each equipped with a rotary automatically-resetting timing device to determine the duration of exposure of the sensitized medium, and actuating means for said timing devices, substantially as described.

19. In a photographic printing device, the combination of a printing frame and timing mechanism to determine the duration of exposure of the sensitized medium in said printing frame, means to press said sensitized medium on the negative, means controlled by said timing mechanism

to release the pressure on said sensitized medium, means controlled by said timing mechanism to remove the exposed sensitized medium from said negative, and means to operate said timing device, substantially as described.

20. In a photographic printing frame, a brush to hold the sensitized medium on the negative, substantially as described.

21. In a photographic printing frame, the combination of a brush to hold the sensitized medium on the negative, a spring tending to reduce the pressure of said brush on said sensitized medium, and means to maintain said brush in position to firmly hold said medium on the negative in opposition to the action of said spring, substantially as described.

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