H. C. NICHOLAUS.

TIME SWITCH.

APPLICATION FILED NOV. 1, 1915.

1,233,692.

Patented July 17, 1917.

2 SHEETS—SHEET 1.

Fig. 2.

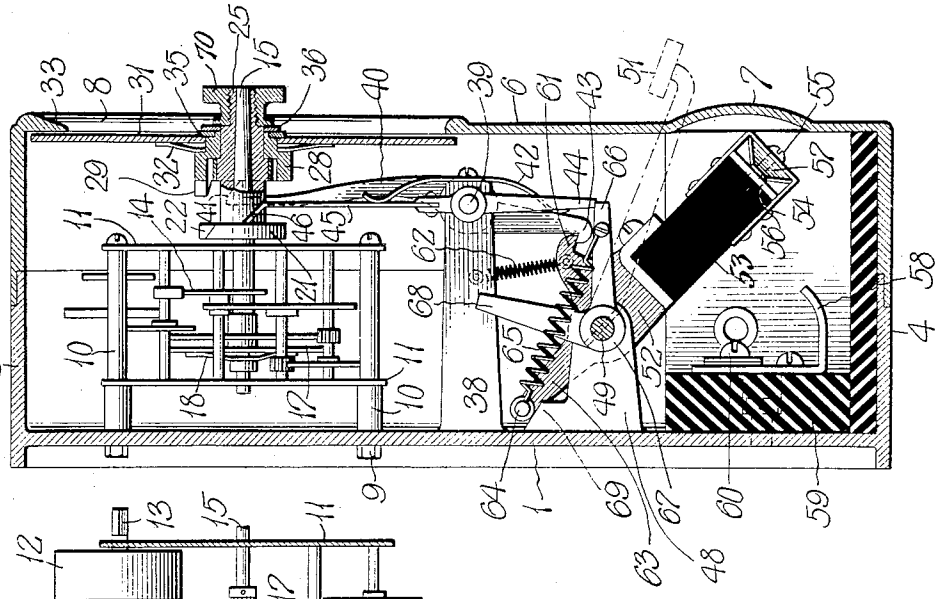


Fig. 3.

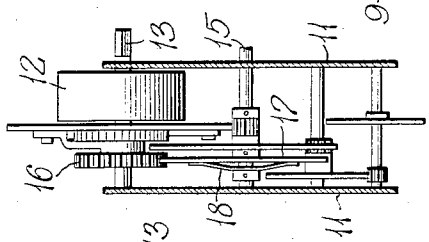


Fig. 1.

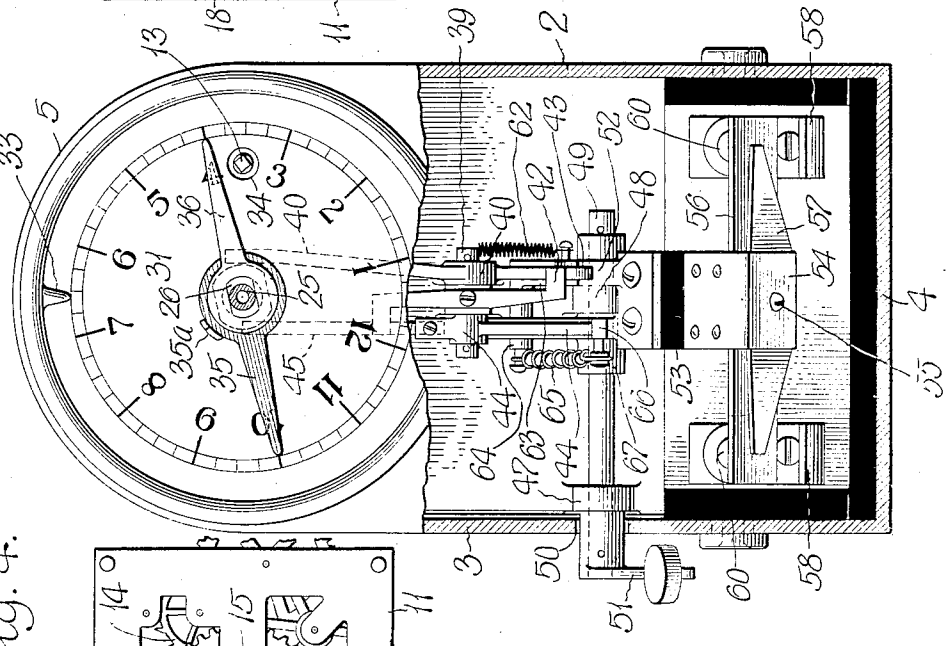
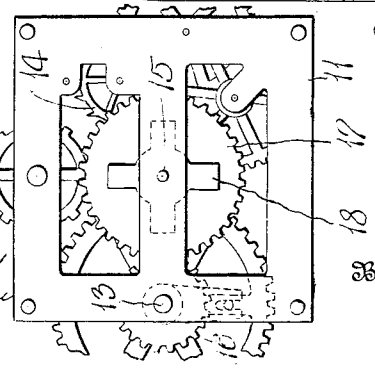


Fig. 4.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 7.

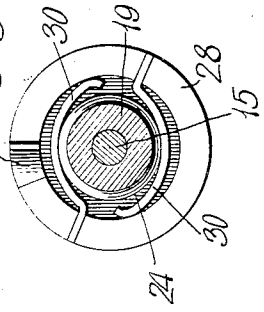


Fig. 8.

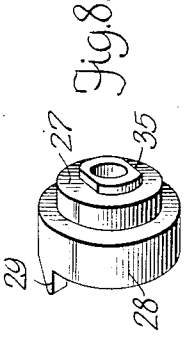


Fig. 9.

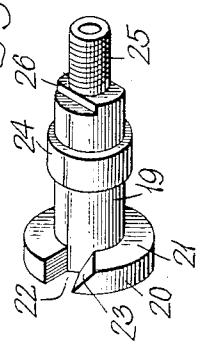


Fig. 10.

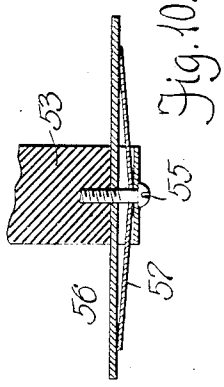


Fig. 6.

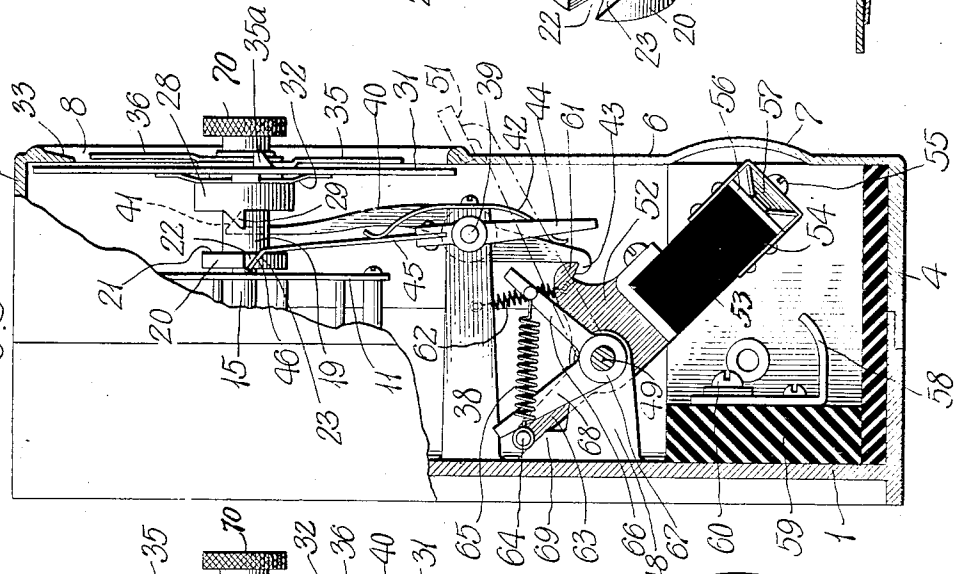
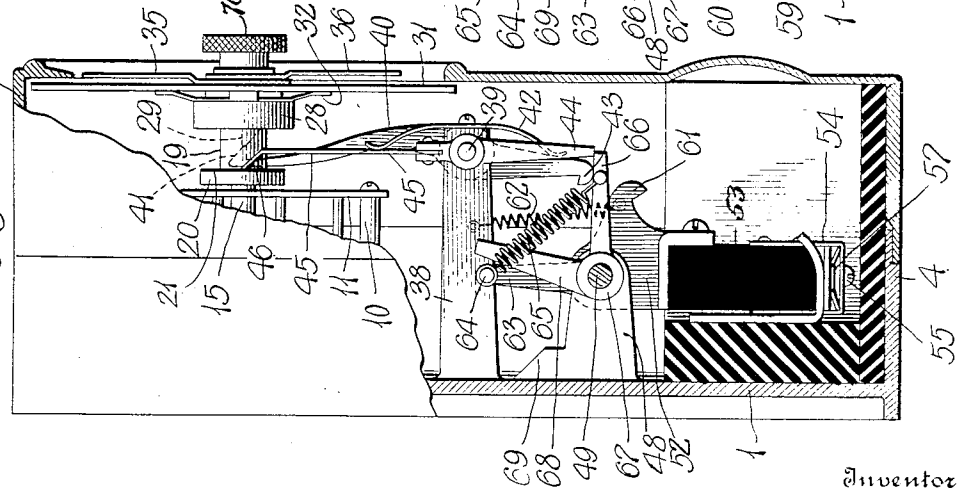


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

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TIME-SWITCH.

1,233,692. Specification of Letters Patent. Patented July 17, 1917.

Application filed November 1, 1915. Serial No. 58,954.

To all whom it may concern:

Be it known that I, HERMAN C. NICHOLAUS, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Time-Switches, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to a time switch that can be advantageously used in connection with electric cooking devices and ranges, electric street signs, electric baths, and apparatus where it is desired to use an electric current for various purposes a predetermined period of time.

The primary object of my invention is to provide a time switch which may be set and controlled by the intervention of a novel clock mechanism, embodying an adjustable dial which may be set whereby the clock mechanism will correspond in time to the time piece or watch of an operator; adjustable time setting hands which permit of predetermined periods of time being easily calculated in connection with the dial whereby the switch will be automatically actuated in accordance with the setting of the hands, and a novel switch mechanism associated with the clock mechanism and controlled thereby adapted to positively make and break an electric circuit as predetermined by setting the clock mechanism.

A further object of my invention is to provide a time switch wherein the parts are constructed with a view of reducing the cost of manufacture and at the same time retain the features by which accuracy, safety, durability, simplicity and ease of assembling are secured, and with such ends in view, my invention resides in the novel construction, combination and arrangement of parts to be hereinafter specifically described and then claimed.

Reference will now be had to the drawings, wherein—

Figure 1 is a front elevation of the time switch, partly broken away and partly in section;

Fig. 2 is a vertical sectional view of the time switch showing the mechanism set whereby an electric current will be turned on at a predetermined time;

Fig. 3 is a plan of the clock mechanism;

Fig. 4 is a rear elevation of the same;

Fig. 5 is a side elevation of the time switch, partly broken away and partly in section, showing the switch closed with an electric current turned on;

Fig. 6 is a similar view showing the switch open and the current turned off;

Fig. 7 is an enlarged rear elevation of a time-on cam;

Fig. 8 is a perspective view of the same;

Fig. 9 is a perspective view of a time-off cam, and

Fig. 10 is a longitudinal sectional view of a self-adjusting switch blade.

In describing my invention by aid of the views above referred to, I desire to point out that said views are intended as merely illustrative of an example whereby my invention may be applied in practice, and I do not care to confine my invention to the precise construction and arrangement of parts shown. The following description is therefore to be broadly construed as including substitute arrangements and construction of parts which are the obvious equivalent of those to be hereinafter referred to.

In the drawings, 1 denotes the rear wall of substantially a rectangular casing having side walls 2 and 3, a bottom wall 4, an arched top wall 5, and a front wall 6. The lower portion of the front wall 6 has a bulged or outset portion 7 providing clearance for the operation of certain mechanism within the casing, and the upper portion of said front wall as a circular dial opening 8.

Connected to the rear wall 1 of the casing by tie rods or bolts 9 and spacing sleeves 10 are the frames 11 of a clock mechanism, said mechanism including such horological elements, as a main spring 12, a spring arbor 13, an escapement 14, and a main arbor 15. Ordinarily the gear reduction between the spring arbor 13 and the main arbor 15 is located in front of the frames 11, but in order to provide clearance for mechanism to be hereinafter described, I arrange the gear reduction between the frames 11. The reduction gear on the spring arbor is designated 16 and the gear on the main arbor is designated 17, said gear being loose, but frictionally held on the main arbor to rotate therewith through the medium of a resilient member 18 carried by the main arbor and engaging the gear 17. With the gear 17 friction-

ally held relative to the main arbor 15, said arbor can be manually rotated independent of the gear 17 when it is desired to correct the time of the clock mechanism.

The main arbor 15 extends through the dial opening 8 and is concentric thereof. On the outer end of the main arbor is mounted a sleeve 19 having a time-off cam 20 on the inner end thereof. This time-off cam presents a flat space 21 and the periphery of said cam is slotted, as at 22, with a side wall of said slot beveled, as at 23. Intermediate the ends of the sleeve 19 is a collar 24, and the outer end of said sleeve terminates in an exteriorly screwthreaded stem 25 and a nut 26.

Loosely mounted upon the outer end of the sleeve 19, against the collar 24, is the hub 27 of a hollow time-on cam 28 and this time-on cam has a rearwardly projecting cam surface 29. Within the hollow cam 28 are two resilient members or springs 30, carried by the hollow cam and frictionally engaging the collar 24, whereby the time-on cam may move in synchronism with the sleeve 19 on the main arbor 15. Loose on the hub 27 of the time-on cam 28 is a dial 31 provided with resilient members 32 engaging the cam 28 whereby the dial 31 may rotate with said cam. The dial 31 is graduated with hours and minutes, in the ordinary manner, as shown in Fig. 1 and to designate time in connection with said dial, the top wall of the opening 8 has a depending stationary pointer or indicator 33.

The dial 31 has an opening 34 and by adjusting the dial to place the opening in alinement with the spring arbor 13, said arbor may be rotated by a suitable key and the spring wound and placed under tension.

The hub 27 of the time-on cam 28 terminates in a nut 70, and mounted on said nut, in front of the dial 31, is a hand 35, which for the convenience of describing my invention, will be hereinafter referred to as a circuit closing hand.

Mounted on the nut 26 of the sleeve 19 is another hand 36 and this hand will be hereinafter referred to as a circuit opening hand. To distinguish one hand from the other, it is preferable to paint or otherwise finish one of the hands in a distinctive color and thus avoid any confusion or mistake in setting the hands. The hand 35 has a lug or stop 35^a which limits the movement of said hand relative to the hand 36, thus preventing the hands when shifted, in one direction, from registering. This is essential on account of the design of the time-off cam 20.

The inner end of the hand 36 engages the inner end of the hand 35 and to retain said hands upon the nuts 26 and 35, a knurled button or nut 37 is screwed upon the stem 25 of the sleeve 19, as best shown in Fig. 2.

In order that the operation to be hereinafter referred to may be thoroughly understood, it is well to bear in mind at this point in the explanation that the sleeve 19 and the main arbor 15 rotate in synchronism and may be revolved independently of the reduction gears 16 and 17; that the time-on cam 28 and the circuit closing hand 35 thereof move in synchronism and may move with or independently of the sleeve 19; and that the dial 31 may move with or independently of the time-on cam 28.

The rear wall 1 of the casing, below the clock mechanism has a forwardly extending bracket 38 provided with a transverse pin 39. Fulcrumed on one end of the pin 39 is a switch releasing or current turning-on arm 40 and the upper end of said lever terminates in a bill or hook 41 held against the inner face of the time-on cam 28 and in the path of the cam surface 29 by a flat compression spring 42 mounted upon the bracket 38. The spring 42 engages the lower end of the switch releasing or current turning-on arm 40 and the lower end of said arm terminates in a hook 43.

Fulcrumed upon the opposite end of the pin 39 is a trip or current turning-off arm 44 having a resilient detent 45 normally engaging the flat face 21 of the time-off cam 20. This detent has an angular end 46 adapted to recede into the slot 22 of the cam 20 and to insure this movement of the detent, an end of the spring 42 engages the detent, as best shown in Fig. 1.

The rear wall 1 of the casing has bearings 47 and 48 for a rock shaft 49, said shaft extending through an opening 50 in the side wall 3 of the casing. On the outer end of the rock shaft 49 is a switch setting lever 51 which may be manually actuated to rock the shaft 49. Loose on the rock shaft, at one side of the bearing 48, is a switch member 52 constituting a holder for a switch arm 53, preferably made of fiber or a suitable insulation material. The outer end of the arm 53 is provided with a yoke or stirrup 54 and loosely mounted in said yoke by a screw 55 is a transverse blade 56 held normally against the end of the arm by a flat compression spring 57. This spring allows the blade 56 to properly adjust itself, relative to the switch arm 53, whereby it will engage contact pieces 58 when the switch is closed. The contact pieces 58 are suitably connected to a block of insulation 59, preferably fiber, within the casing and against the rear wall 1 thereof. The block of insulation 59 has suitable binding posts 60 whereby leading-in wires can be connected to the contact pieces 58.

Forming part of the switch member 52 is a hook 61 adapted to be engaged by the hook 43 of the switch releasing or current turning-on arm 40, as shown in Fig. 6, and

the hook 61 is connected by a coiled retractile spring 62 to the bracket 38. This spring will retain the switch arm 53 in a raised or open position and will overcome the action of another spring to be hereinafter referred to.

The switch member 52 has a crank 63 provided with a right angularly disposed pin 64. The pin 64 is connected by a coiled retractile spring 65 to a bell crank 66 having a hub 67 fixed on the rock shaft at that side of the bearing 48 opposite the switch member 52. A crank 68 of the hub 67 is adapted to engage the pin 64 and the opening movement of the switch arm 53 is limited by said pin engaging an offset portion 69 of the bearing 48. The bell crank 66 is adapted to be engaged by the trip or current turning-off arm 44, as shown in Fig. 5, and said bell crank can readily ride under the trip 44 and engage the end thereof by virtue of the detent 45 possessing sufficient resiliency to permit of the trip rocking upon the pin 39.

As I remarked at the outset, the time clock may be used for various purposes and as illustrating its operation, I will assume, that the contact pieces 58 are in an open circuit with a suitable source of electrical energy and one or more incandescent lamps. I will further assume that the clock mechanism is in operation and that the time of day, as indicated by the dial 31 in connection with the stationary pointer or indicator 33 is 6:30 p. m., as shown in Fig. 1. Further assuming that the incandescent lamps are in front of a safe and a merchant desires that the electric current be turned on at 10 p. m. when the streets are devoid of pedestrians, to burn until 4 a. m. or daylight as a safety factor or guard in connection with the safe. As there may be some variation in the time of the clock and the time piece of the merchant a comparison of time is made and the merchant shifts the dial 31 relative to the indicator or pointer 33 until the clock time correctly corresponds to his time piece. He then swings the circuit closing hand 35 to the graduation 10 on the dial and the circuit opening hand 36 to the graduation 4 of the dial. He next depresses or pulls the switch setting lever 51 and the time clock is in condition to perform the functions ascribed to the same.

The normal condition of the clock mechanism is shown in Fig. 6 with the current cut off and the detent 45 has been shown at that moment when the angular end 46 thereof enters the slot 22 of the time-off cam. Otherwise the angular end 46 of the detent 45 bears against the flat face 21 of the cam 20, as shown in Fig. 5. When the switch setting lever 51 is depressed or pulled, the bell crank 66 is rocked by the shaft 49 and since the pin 64 of the switch member 52 is held by reason of the arm 40 engaging the hook 61 of the switch member, the coiled retractile spring 65 is placed under tension and held under tension by the trip 44 engaging the bell crank 66.

The switch mechanism is now in condition to be automatically actuated at predetermined times by the clock mechanism to turn on the electric current at 10 o'clock and turn off the current at four o'clock. As the sleeve 19 is fixed upon the main arbor 15 and the time-on cam 28 held to revolve with the sleeve and main arbor by the members 30, the cam surface 29 of the time-on cam is eventually carried into engagement with the hook or bill 41 of the switch releasing or current arm 40, rocking or tilting the arm 40 on the pin 39 to move the hook 43 out of engagement with the hook 61 of the switch member 52. With the coiled retractile spring 65 of greater tension than the spring 62, as indicated by their relative sizes, the spring 65 moves the crank 63 and rocks the switch member 52 upon the rock shaft 49, said rock shaft remaining inactive during this operation. The spring 65 therefore closes the switch with a snap action and the blade 56 of the switch arm will have a wiping action on the contact pieces 58 and adjust itself relative to said contact pieces to insure a positive contact and completion or closing of the electrical circuit.

This condition of the switch mechanism is shown in Fig. 5 and it is to be noted that the trip 44 is still in engagement with the bell crank 66.

As time progresses, the time-off cam 20 eventually places the slot 22 thereof in a position to receive the angular end 46 of the detent 45 and as said detent recedes into the slot 22, the trip 44 is rocked upon the pin 39 to release the bell crank 66. The spring 62 is immediately brought into action and elevates the switch arm 53 until the hook 43 engages the hook 61 of the switch member 52. During this action the rock shaft 49 and the switch circuit lever 51 are restored to normal position by reason of the spring 65 connecting the pin 64 of the switch member 52 and the bell crank 66. The electric circuit having been opened between the contact pieces 58, the current is turned off and the time clock is in condition for another operation.

From the foregoing it will be observed that I have devised a novel switch mechanism adapted to be automatically controlled by a clock mechanism embodying a dial and hands that are movable in synchronism by the clock mechanism, but capable of individual adjustment. When using such terms as "opening", "closing", "raising", "lowering", it is to be understood that such terms in no wise confine the clock mechanism to

any one position, and such terms are simply used as a matter of convenience in describing the invention.

What I claim is:—

1. In a time clock, a clock mechanism, a switch arm, a crank, a spring connecting said crank and said switch arm, means controlled by said clock mechanism adapted to hold said switch arm while said crank is moved to place said spring under tension to close said switch arm at a predetermined time, means controlled by said clock mechanism adapted to hold said crank when said switch arm is released, and means adapted to open said switch arm when said crank is released.

2. In a time clock, the combination with a clock mechanism and an electric switch, of a rock shaft, a switch arm loose on said rock shaft, a bell crank loose on said shaft, switch closing means connecting said switch arm to said bell crank, manually actuated means adapted for placing said switch closing means in an active position, a dial moved by said clock mechanism, hands movable in synchronism with said dial, a cam movable with each hand, switch opening means connected to said switch arm, an arm released by one of said cams and adapted to allow said switch to close, and a trip released by the other cam adapted to allow said switch to open.

3. In a time clock, a clock mechanism, cams moved thereby, means for adjusting said cams relative to said clock mechanism, a switch arm, a switch attached to said switch arm, means for placing said spring under tension to close said switch arm, a spring attached to said switch arm and placed under tension by the closing of said arm and adapted for opening said switch arm, an arm released by one of said cams adapted to release the switch closing spring, and a trip released by the other cam adapted to release said switch arm and set in motion the switch opening spring.

4. In a time clock, a clock mechanism, cams moved thereby, means for adjusting said cams relative to said clock mechanism, a switch mechanism comprising a rock shaft, a switch arm loose on said shaft, a bell crank loose on said shaft, switch closing means connecting said switch arm and said bell crank, means for manually placing said switch closing means in an active position, an arm adapted to engage said bell crank and be released by one cam adapted to release said switch closing means whereby said switch is closed, switch opening means and a trip released by the other cam adapted to release said switch opening means whereby said switch is opened.

5. In a time clock, a clock mechanism, cams moved thereby, means for adjusting said cams relative to said clock mechanism, a two part switch arm, means adapted to open said switch and maintain said switch arm open, a spring connecting the parts of said switch arm for closing said switch arm, means connected to one part of said switch arm for placng said spring under tension to close said switch arm against the action of the switch opening means, means for holding one part of said switch arm, means during movement of the other part of the switch arm to place said spring under tension and adapted to be released by one of said cams, and means actuated by the other of said cams to release the tension of said spring whereby said switch is closed.

In testimony whereof I affix my signature in presence of two witnesses.

HERMAN C. NICHOLAUS.

Witnesses:

ANNA M. DORR,

KARL H. BUTLER.