

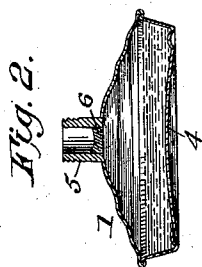
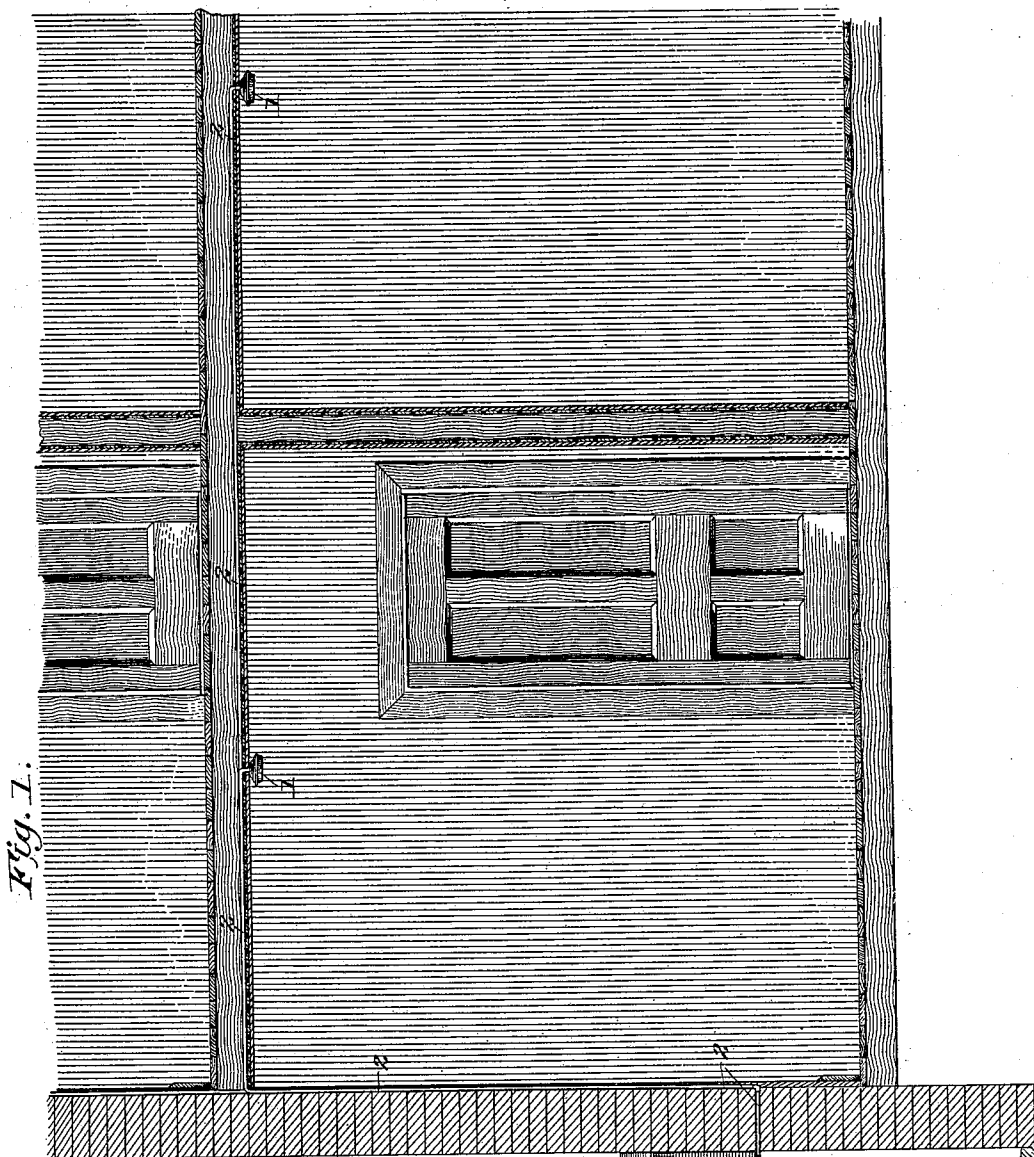
(No Model.)

3 Sheets—Sheet 1.

F. K. LUDLOW.
AUTOMATICALLY OPERATED FIRE ALARM.

No. 543,879.

Patented Aug. 6, 1895.



WITNESSES:

M. D. Olmsted.
Walter E. Allen.

INVENTOR

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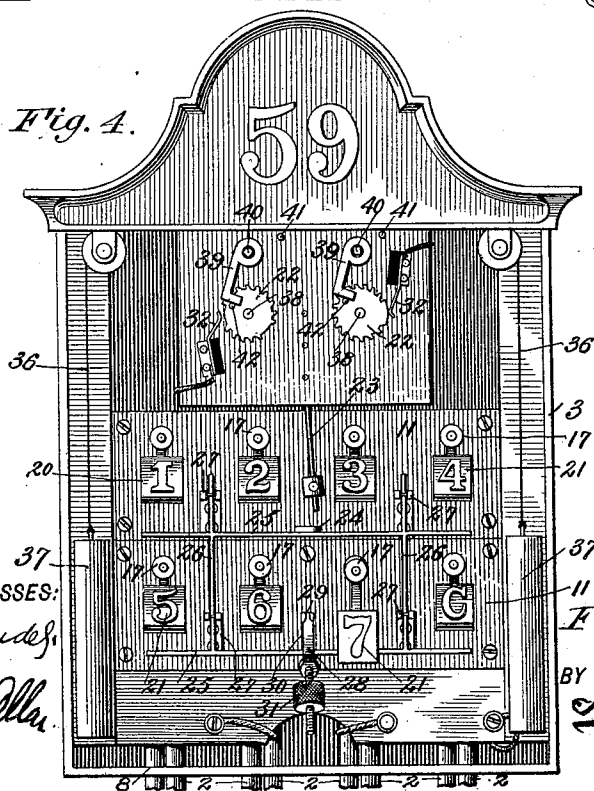
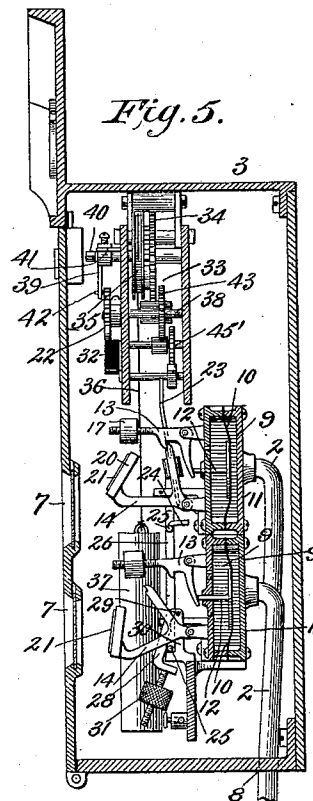
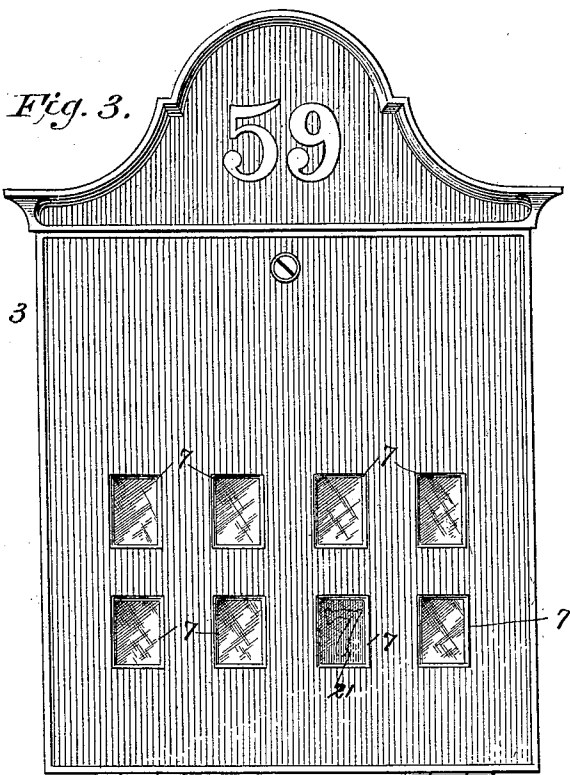
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WITNESSES:

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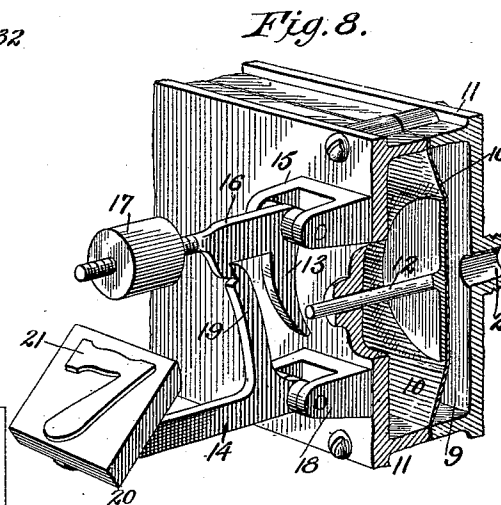
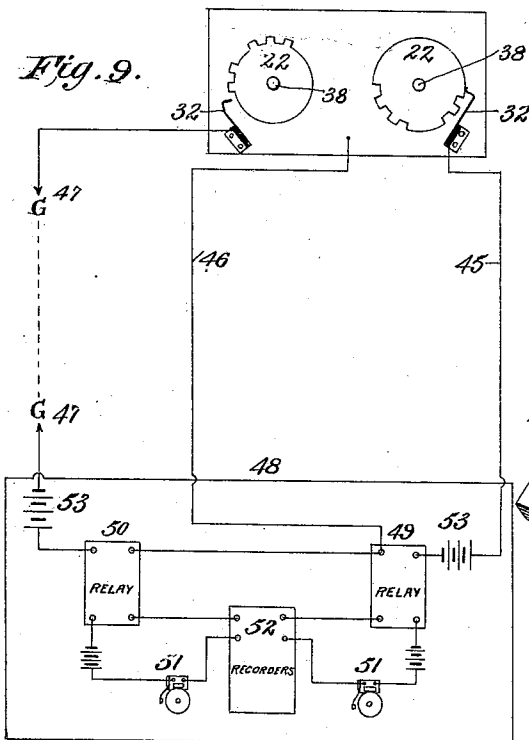
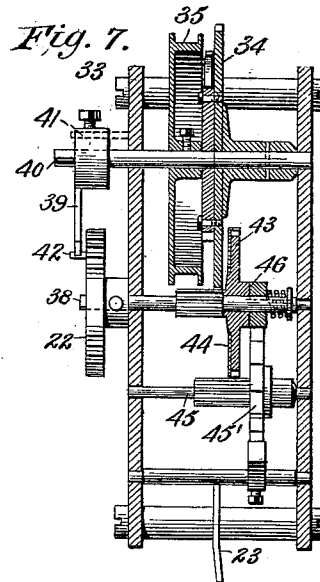
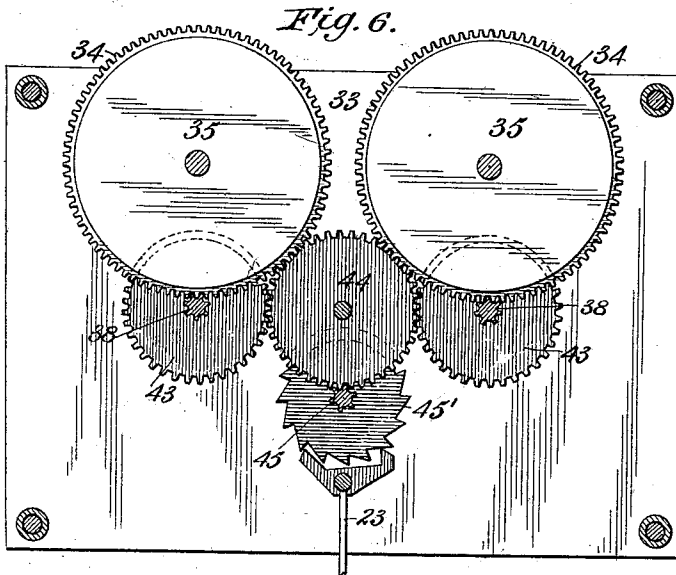
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UNITED STATES PATENT OFFICE.

FRANK K. LUDLOW, OF MADISONVILLE, OHIO.

AUTOMATICALLY-OPERATED FIRE-ALARM.

SPECIFICATION forming part of Letters Patent No. 543,879, dated August 6, 1895.

Application filed December 18, 1894, Serial No. 532,152. (No model.)

To all whom it may concern:

Be it known that I, FRANK K. LUDLOW, a citizen of the United States, and a resident of Madisonville, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Automatically-Operated Fire-Alarms, of which the following is a specification.

My invention relates to that class of fire-alarms in which the alarm is communicated to a central office, fire-tower, or other similar place by the closing or breaking, or both, of an electric circuit which includes the location of the fire, and in which the circuit is operated by the operation of a pressure-inducing device which is released or set into operation by the heat of the fire in the building, and which communicates said pressure to the circuit-wheels 22 22 to operate the same.

My invention consists in certain details in the arrangement and construction of parts of such a system, as will be hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional view of a building to which the local portion of the system is applied, the arrangement being such that each room or other portion of the building is protected by a pressure-inducing device capable of being put into operation by the heat of a fire in the incipient state, and all the pressure-inducing devices having tubes for communicating pressure to a double-circuit clock-movement and annunciator on the outside or other convenient portion of the building. Fig. 2 is a sectional view of one of the pressure-inducing devices which may be employed in my invention. Fig. 3 is a front elevation of the annunciator-box which carries the new clock-movement, which is released by any one of the pressure-inducing devices throughout the building. Fig. 4 is a front elevation of the same with the front removed and disclosing the contents of the box. Fig. 5 is a vertical transverse section of the same. Fig. 6 represents the clockwork employed for sending the alarm. Fig. 7 is a vertical section of the same. Fig. 8 is a perspective view of one of the combined tripping and annunciating devices for releasing the clockwork. Fig. 9 is a diagrammatical view of the alarm mechanism and circuits.

To equip a building with the apparatus necessary to set the fire-alarm and annunciator into operation upon the breaking out of a fire, each room or portion of a room is provided with one or more pressure-inducing devices 1, which have communication with pipes 2 leading through the building to the combined alarm and annunciator box 3 on the outside or other convenient portion of the building.

The pressure-inducing device which I prefer to use is represented at Fig. 2, and consists of a receptacle 4 of any convenient shape to contain an easily-evaporated liquid or any easily-expansible medium, and having a neck 5, which adapts it for attachment to the tubes 2, and which is normally closed by a fusible plug 6. The plug is arranged to fuse at about 160° Fahrenheit, and the liquid is one which will vaporize freely at a somewhat lower temperature—such, for instance, as carbon bisulphide—so that after the liquid commences to evolve, and up to the time the plug fuses, considerable pressure will have developed in the receptacle 4, and when the plug fuses the gas will escape with a sudden impulse that will be communicated through the pipe 2 to the alarm actuating device in the box 3.

So much of the system I do not claim, *per se*, inasmuch as the same constitutes the subject-matter of United States Letters Patent No. 502,734, granted August 8, 1893, to S. W. Ludlow.

There is preferably a separate tube 2 from each room or other division of the house running to the annunciator and alarm box, and each tube 2 communicates with a separate alarm-actuating device, which carry individual numbers and present them at the openings 7 (see Fig. 3) when the alarm is turned in, so that on arriving at the building it is possible to ascertain immediately the location or origin of the fire.

The combined annunciator and alarm actuating or tripping devices may be understood upon reference to Figs. 4, 5, and 7, from which it will be seen that each tube 2 enters the box at 8 and communicates with a space 9 on one side the diaphragm 10, which is mounted in one of the compartments of a casing 11 and carries a push-pin 12 projecting through the front of said casing and engaging the trigger 13 of the combined trip

and annunciator lever 14. As will appear more clearly from Fig. 8, each trigger 13 is fulcrumed in a bracket 15 and carries a detent 16 and an adjustable counterbalance 17, while each combined tripping and annunciator lever 14 is fulcrumed in a bracket 18 and carries an arm 19 for engagement with the detent 16 on the trigger, and upon the outer end of the lever 14 is fixed a drop-weight 20, the outer face of which is presented in the proper position to receive the distinguishing numeral or equivalent sign, as at 21, and present the same to view before the opening 7 of box 3 when lever 14 drops, and thus designate which particular device has released the alarm and consequently what locality the fire has started in.

Referring to Figs. 4 and 5, the electrically-transmitted alarm is sent in by a clockwork carrying make-and-break wheels 22, and controlled by pendulum 23, which is held normally inactive by a projection 24 on a frame 25, which is adapted to move vertically by reason of its uprights 26 having sliding guides 27, and said frame 25 is held elevated into engagement with the pendulum by a grip-bar 28, fulcrumed at 29 upon a bracket 30, against which it grips one of the cross-bars of frame 25, and this grip-bar is adapted to hold the frame up with a yielding force which may be regulated by an adjustable weight 31 on the bar 28. Now it will be seen that the cross-bars of frame 25 are made to lie in the paths of all the levers 14, and consequently when any one of said levers is released in the manner hereinbefore described the frame 25 will be immediately depressed, the pendulum released, and the alarm sent out through the movement of the notched disks 22 by the clockwork. At the same time the drop-weight 20 of the lever which it has pressed down will rest with its inscribed face exposed at one of the openings 7 of box 3 and announce that the fire is on floor 7 or room 7, or at any other location which, by suitable inscription, may be designated by the device which has caused the alarm. The notched wheels 22 and their brushes 32 are of common form, but the manner of employing and actuating these parts is new with me and is of great importance, as I will now proceed to describe.

The clockwork 33 consists of a duplex system each part of which is capable of operation to perform all its functions and give a complete alarm independently of the other and whether the other operates or not, and both parts are at the same time under control of a single escapement, which insures perfect coincidence of their respective operations when both are active. This idea of having the parts either independently or jointly operative is likewise extended to the circuits and their attachments at the central station or other place of receiving the alarm. I prefer to further vary the system by the employment of a grounded circuit for one make-or-break wheel of the clock mechanism and a

complete metallic circuit for the other. It may be also desirable to arrange one of the circuits as a normally-closed circuit to actuate the alarm by momentary breaks, while the other is a normally-open circuit to actuate the alarm by momentary contacts. These latter details are, however, not essential to a successful system. The object of the above arrangements is to give the utmost security against accidents or failures of the mechanism.

Each portion of the clockwork 33 has an independent driving-wheel 34, to which is applied any suitable driving-power—such, for instance, as drum 35, cord 36, and weight 37, or the well-known equivalent of these parts, a spring. Each driver 34 engages a cog on the arbor 38 of the make-and-break wheels 22, so as to drive the latter several revolutions by a limited movement of the drivers. The limit of movement of the drivers, and consequently of the wheels 22, may be determined by arms 39, fixed upon the winding-arbors 40, so that said arms engage stops 41 on the amounting after a certain extent of winding, and stop-pins 42 on the contact-wheels 22, which are intercepted by arms 39 when the winding runs down. I have shown the parts so proportioned that the contact-wheels 22 receive about five revolutions while the arms 39 are moving from fixed stops 41 to stop-pins 42. In other words, when the alarm apparatus is set in operation the alarm will be repeated five times.

The parts thus far described are independent in the two clock-movements. To control or govern both these movements by a single escapement, whether moved by pendulum or hair-spring, each arbor 38 has mounted upon it a wheel 43, which wheels 43 engage a common wheel 44, which in turn is engaged and controlled by the escapement-arbor 45. I have shown the escapement operated by a pendulum 23, heretofore referred to, and from the construction described it is obvious that both movements being checked by the same escapement their action must be the same.

To provide for the continuance of either movement in the event of the other stopping for any cause, each wheel 43 has positive connection with its arbor 38 in one direction only—that is to say, said wheels are connected to their arbors through the medium of clutches 46, which lock the parts together in one direction, but permit one to move in advance of the other in the other direction. Therefore if either movement stop the escapement-wheel 45', which continues to be driven by the other movement, will not be opposed by the wheel 43 on the movement which is stopped, for the reason that such wheel 43 can continue to rotate on its arbor.

It now remains to describe the circuits in connection with which the circuit closer and breaker are used and by means of which a signal is sent to a station at a distant point.

I prefer to employ two complete circuits for this purpose, made up of wires 45 and 46 and

a ground connection 47. The wire 45 is connected to one brush of the circuit-breaker, the wire 46 to the frame of the movements, and the ground connection 47 is made with the brush of the circuit-closer. By this means I obtain two circuits or an independent circuit for each one of the contact devices 32 32. Therefore either circuit-closer may fail to send in an alarm. The other may send in the signal over its own circuit independently of the former. I likewise differentiate the two circuit-closers 22 22 by making them so that one circuit is normally open while the other is normally closed. The circuit which is normally closed keeps a relay energized at the station, so as to avoid giving the alarm until the fire occurs, and consequently if anything should happen to either of the two metallic conductors 45 and 46 the alarm would be sent in and thus announce the accident.

The station 48 is equipped with two relays 49 50, each one of which controls an independent alarm 51, and each of which controls a recorder 52. These devices are of common construction, and I have therefore simply shown them in diagram. In addition to these parts the circuits 45 46 and 46 47 have independent batteries 53.

From the foregoing it will be observed that there is a circuit-closer and one circuit-breaker, each of which may be moved independently of the other, but both of which may move simultaneously, of which each has its own independent circuit-controlling device and independent relay, which in turn controls an independent local-alarm circuit, and each of which local-alarm circuits controls a signal-recorder.

It will further be noticed that by reason of the common escapement which regulates the movement of both circuit-wheels 22 22 the alarm sent in by the respective circuit-wheels must necessarily produce a single effect upon each recorder.

While I have described several features of the circuit closers and alarms, it is obvious that some of them, while desirable for absolute safety, might be dispensed with without impairing the efficiency of the remaining features—that is to say, the circuits need not necessarily be one open and one closed, nor need they be one an entire metallic and the other a ground circuit.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a fire-alarm, the combination of a plurality of alarm actuating make-and-break devices, a corresponding number of independently operative driving mechanisms, and a governor common to all the driving mechanisms for enforcing synchronous action in those that operate, substantially as and for the purpose set forth.

2. In a fire-alarm, the combination of a sin-

gle alarm, a grounded circuit, an all-metallic circuit, a make-and-break wheel for each of said circuits, independently operative driving mechanisms for the respective make-and-break wheels, and a coupling between said driving mechanisms for compelling synchronous action of the make-and-break wheels, as and for the purpose explained.

3. In an automatic fire alarm two or more circuit wheels having independent driving connection, and single escapement controlling both the driving connections, substantially as and for the purpose set forth.

4. In an automatic fire alarm, the combination of an alarm actuating device, having means whereby it is operated by starting of a fire, two independently operative circuit wheels, having connection with the alarm to be actuated, and an escapement under control of the alarm actuating device and having connection with both circuit wheels through the medium of ratchets, whereby both circuit wheels are caused to move simultaneously when in operation, but each permitted to move with the escapement wheel if the other remains at rest, substantially as set forth.

5. In an automatic fire alarm, the combination of the series of drop levers arranged to be released upon the starting of a fire in places with which they have operative connection, the drop frame 25 under control of said levers and having the uprights 26 movable in sliding bearings 27 and the circuit wheels under control of said frame, substantially as and for the purpose set forth.

6. In an automatic fire alarm, the combination of suitable circuit wheels, having driving connections, an escapement for controlling the movement of said driving connections, a drop frame normally in engagement with said escapement, and insulated therefrom, and a series of drop levers which are adapted to control said frame, and having connections whereby they are released by heat of a fire, substantially as set forth.

7. In an automatic fire alarm, the combination of the escapement controlling an alarm, the drop frame controlling the escapement, a grip 28, 30 for holding the frame in elevation with a yielding force and the drop levers adapted to depress said frame, as explained.

8. In an automatic fire alarm, the combination of the independent circuit wheels, independent driving connections for said circuit wheels, a pair of wheels having clutch connection with the drive connections for controlling them in one direction, a wheel for coupling the clutch wheels together and an escapement controlling said coupling wheel, substantially as and for the purpose set forth.

FRANK K. LUDLOW.

Witnesses:

W. B. CORWIN,
H. M. CORWIN.