

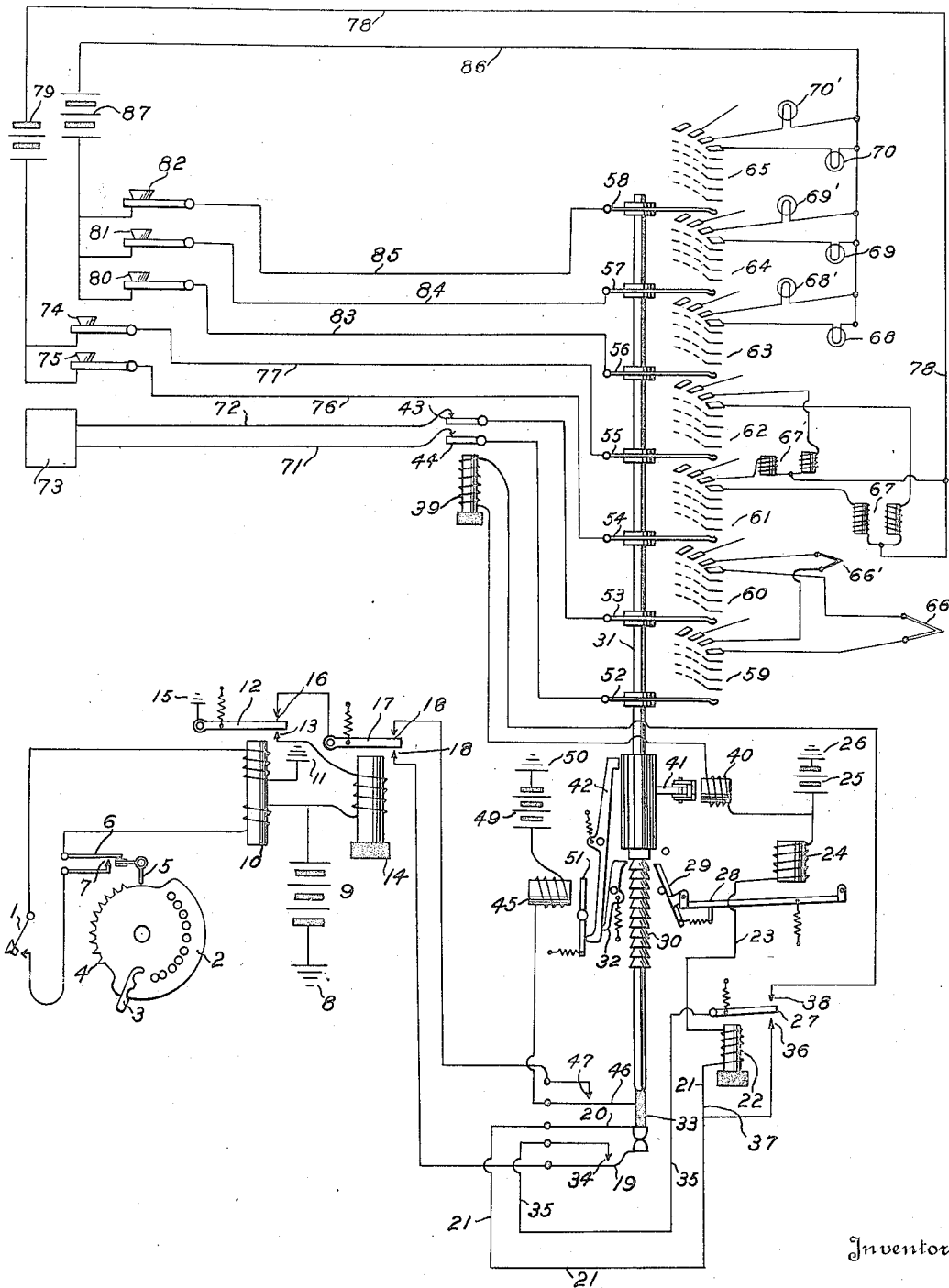
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THERMOELECTRIC TEMPERATURE MEASURING AND CONTROL SYSTEM

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THERMOELECTRIC TEMPERATURE MEASURING AND CONTROL SYSTEM.

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To all whom it may concern:

Be it known that HENRY MARTIN SCHMITT, a citizen of the United States, residing at Washington, in the District of Columbia, has invented certain new and useful Improvements in Thermoelectric Temperature Measuring and Control Systems, of which the following is a specification.

This invention relates to an improvement in pyrometric systems wherein the temperatures of a number of points or furnaces are controlled from a central instrument station.

In plants where a number of furnaces are located at different points and the temperature of the various furnaces must be closely regulated, it is common to have a control station at a distance from the furnaces. The instruments such as thermocouples, circuit breakers and signal flash lamps are then connected by electrical wiring to the control station, where manual switching means may be installed to connect the instruments at the furnaces with a common set of recording and control instruments. Such arrangements necessitate a great amount of wiring between the furnaces and the control station adding greatly to the initial cost and the maintenance cost.

The objects of this invention are: to provide a selective control pyrometric system in which a switch at the furnaces is operated to connect the various furnace instruments to control station instruments; to provide a cheaper and more efficient control system; and such other objects as are attained in the preferred embodiment of the invention hereinafter set forth.

In general these objects are attained by the use of any well known form of automatic telephone or other automatic switches, such for example, as the ordinary Keith two motion connector switch disclosed in United States Patent No. 815,176. This automatic switch is controlled over the usual two wire stepping circuit well known in automatic telephony, by the usual automatic telephone impulse sender or dial for example as disclosed in United States Patent No. 1,324,356.

Referring to the drawing, 1 represents a circuit closing switch at the control station, and 2 is the dial of a common automatic telephone impulse sender. To send a set of

impulses, a finger is inserted in the holes in the dial and the dial is drawn around until the finger strikes stop 3. The finger is then withdrawn, and a spring (not shown) causes dial 2 to return to normal position. On the return movement teeth 4 rock pivoted bell crank member 5 to open contacts 6 and 7 as each tooth passes by member 5.

Closure of switch 1 completes an energizing circuit from ground 8, through lower winding of line relay 10; contacts 6 and 7, switch 1 and upper winding of 10 to ground 11. Relay 10 energizes, pulls armature 12 against contact 13, and completes an energizing circuit from ground 8 through battery 9, slow-release relay, contact 13, armature 12 and ground 15. Relay 14 energizes and prepares a circuit from contact 16, through armature 17, contact 18, lower off-normal spring 19, upper off-normal spring 20, conductor 21, slow-release magnet 22, conductor 23, vertical magnet 24, battery 25 to ground 26. As dial 2 rotates on its return movement, the circuit through 10 is interrupted, causing armature 12 to drop back and complete the circuit last traced from ground 26 through relays 24 and 22 to ground for each tooth striking. Relay 14 being slow to release, does not allow armature 17 to drop back due to the rapidity with which line relay 10 operates. When 12 drops back on the first interruption at 6 and 7, relay 22 pulls up armature 27, and at the same time magnet 24 pulls up its armature 28 causing pawl 29 to engage ratchet 30 and lift wiper shaft 31 one step. As shaft 31 is raised vertical holding pawl 32 engages ratchet 30 and prevents the shaft from dropping back as armature 28 is restored. As 31 is raised off-normal contact member 33 rises, permitting spring member 19 to engage contact 34 to shift the energizing circuit of magnets 22 and 24 through contact 36, conductor 37, conductor 23 and through battery 25 to ground 26. After this last traced circuit is completed, contacts 19, and 20 separate, and the succeeding interruption at 6 and 7 cause actuation of magnet 24 to raise the shaft 31 one step for each interruption, through the following circuit: ground 15, 12, 16, 17, 18, 19, 34, 35, 27, 36, 37, 21, 23, 24, 25 and 26. Relay 22 is slow to release, and the interruptions due to rotation of the dial

2 are too rapid to permit release of armature 17 until the whole series of interruptions has been sent. At the end of a first series of interruptions, shaft 31 has been raised vertically a number of steps equal to the number of impulses sent by the dialing operation. When dial 2 comes to rest after the first actuation, 12 is pulled against 13 and the circuit through 22 is broken a sufficiently long time to permit armature 27 to drop back against contact 38. The dialing operation is repeated, and a second series of impulses is sent in the manner above described. Since 27 has dropped back against 38, and as the circuit of 10 is interrupted, a circuit is completed from ground 15 through armature 12, contact 16, armature 17, contact 18, spring 19, contact 34, conductor 35, armature 27, contact 38, slow-release relay 39, rotary stepping magnet 40, and battery 25 to ground 26. Rotary magnet 40 actuates armature 41 to rotate wiper shaft 31 against the tension of a restoring spring (not shown) in well known manner. Pawl 42 holds shaft 41 against rotary restoration. The closure of the circuit through relay 39, causes this relay to energize and attracts armatures 43 and 44. Armatures 43 and 44 are held attracted until the end of the series of impulses, and until the rotary movement of shaft 31 has been completed.

On the first vertical step of shaft 31, a circuit to release magnet 45 was prepared by closure of off-normal contacts 46 and 47. When it is desired to restore the connector switch shaft to normal, switch 1 is opened. The circuit of 10 is broken in this manner, armature 12 drops back against 16 and opens the circuit of relay 14. Armature 17 of relay 14 drops back against contact 48 and completes a release circuit from ground 15 through 12, 16, 17, 48, 47 and through magnet 45, battery 49 and ground 50. Release magnet 45 energizes in this circuit and actuates its armature 51 to withdraw, rotary pawl 42 and vertical pawl 32 from engagement with the wiper shaft ratchets. Shaft 32 first restores in a rotary direction, and then drops vertically downward. As the shaft reaches its normal position it engages member 33 and restores the off normal contacts, breaking the release magnet circuit at spring 46 and contact 47. The mechanical structure of this type of switch is well known, and is fully disclosed in the United States Patent No. 815,176, above referred to.

Secured to shaft 31 are a plurality of wipers, 52 to 58, inclusive. Cooperating with each wiper are banks of contacts 59 to 65, inclusive, arranged in vertical and horizontal rows. The number of contacts in each bank, the number of banks and the number of wipers may be varied as desired to accommodate varying numbers of instruments

and furnaces. The contacts in each bank are numbered for convenience in the following manner. Assuming there are ten vertical rows of contacts in each bank and ten horizontal contacts in each row, the first row of contacts would be numbered 11 to 20, inclusive, the second row, 21 to 30, inclusive, and so on. By dialing the number 25 for instance, the shaft 31 would be stepped vertically two steps, and horizontally in a rotary direction five steps. Each of the wipers 52 to 58 would be then set on the fifth horizontal contact in the second vertical row of each bank. It will be obvious that the operator, by dialing a proper number, may simultaneously be set on the corresponding contacts in each of the banks, 59 to 65 at will.

In the arrangement shown banks 59 and 60 are allotted to thermo-couples, 66, 66' etc.; banks 61 and 62 are allotted to circuit breakers, 67, 67' etc.; and banks 63, 64, and 65 are allotted to signal lamps 68, 68' etc., 69, 69' etc., and 70, 70' etc. It will be understood that the instruments and apparatus 66 to 70 may be located in a different furnace widely removed from a furnace where instruments and apparatus 66' to 70' are located. It will also be understood that many furnaces with instruments individual there-to may be connected to the different banks in any manner desired.

The circuit for the pyrometers 66, 66' etc. is completed to a recording instrument 73 at the central control station through brush 52, armature 44, conductor 71, conductor 72, armature 43 and brush 53 to the selected pyrometer. Circuit breakers 67, 67' etc. are controlled from the central station through keys 74 and 75, over conductors 76 and 77, brushes, 54 and 55 through the coils of breakers 67, 67' etc. over common return lead 78, through battery 79 and to keys 74 and 75. Lamps 68 and 68' to 70 and 70' are controlled from keys 80, 81 and 82 over conductors 83, 84 and 85, brushes 56, 57 and 58, through the lamps, conductor 86, battery 87 and to ground.

Operation.

The operator at the control station, when it is desired to control a particular furnace, simply dials the proper number to set the brushes 52 to 58 on the contacts allotted to control apparatus at the desired furnace. When the brushes are properly set on the contacts at the end of the second series of impulses, magnet 39 de-energizes and connects the pyrometer at the furnace to the common recording instrument 73 at the control station. The operator takes the reading, and then controls the furnace through keys 74 or 75, or flashes signals to an operator at the furnace. The function of relay 39 is to protect recording instrument 73

against disturbances due to the switching operations.

Having described a preferred embodiment of the invention what is desired to be secured by Letters Patent and claimed as new is:

1. In a pyrometric system, a central station; control and temperature recording means at said central station; a plurality of distant furnaces; thermo-electric responsive means at said furnaces; and automatic switching mechanism near said furnaces controlled from said central station and adapted to selectively connect any one of said thermo-electric responsive means with said temperature recording means at said central station.

2. The combination as set forth in claim 1 in which said automatic switching mechanism is a two motion step-by-step switch.

3. The combination as set forth in claim 2, and an electrical circuit arrangement for directly controlling movement of said switch.

4. The combination as set forth in claim 3, and an electrical circuit separate from said switch controlling circuit for connecting selected ones of said thermo-electric re-

sponsive means to said central station recording means.

5. The combination as set forth in claim 4 and means controlled by said switching mechanism for completing the circuit from said selected thermo-electric responsive means to said recording means, after selective step-by-step motion of said switch has been completed.

6. The combination as set forth in claim 4 in which the control means at the central station comprise an automatic impulse sender in said switch controlling circuit.

7. In a pyrometric system, a central station; control and temperature recording means at said central station; a plurality of distant thermo-electric responsive means; and an automatic switching mechanism controlled from said central station to selectively connect said thermo-electric responsive means with said recording means.

8. The combination as set forth in claim 7 in which said thermo-electric responsive means comprise thermo-couples.

Signed at Washington, D. C., this 5th day of February, 1923.

HENRY MARTIN SCHMITT.