

1,131,683.

Fig. 1.

12, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812,

UNITED STATES PATENT OFFICE.

JOHN A. DOBLE, OF WALTHAM, MASSACHUSETTS.

AUTOMATIC FUEL-CONTROL SYSTEM FOR BOILERS.

1,131,683.

Specification of Letters Patent.

Patented Mar. 16, 1915.

Application filed January 28, 1914. Serial No. 815,060.

To all whom it may concern:

Be it known that I, JOHN A. DOBLE, a citizen of the United States of America, and resident of Waltham, in the county of Middlesex, State of Massachusetts, have invented certain new and useful Improvements in Automatic Fuel-Control Systems for Boilers, of which the following is a specification.

This invention relates to apparatus for automatically controlling the supply of fuel to a burner, and has reference more particularly to fuel control systems for automobile boilers.

The objects of the invention are to provide a system which is economical in the use of the fuel and which is thoroughly automatic and responsive to the condition of the steam generated.

It is a further object to eliminate the usual pilot burner and provide improved electrical igniting means for the burner which will act automatically to supply a spark whenever fuel is supplied to the burner.

The novel features of the invention will be apparent from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view of an apparatus embodying the invention; Fig. 2 is a part section and part elevation of an automobile boiler and a carbureter therefor; and Figs. 3 and 4 are modified forms of a portion of the apparatus shown in Fig. 1.

Referring to the drawings, 10 indicates an automobile boiler, preferably of the coil or similar flash type, the coil being inclosed in a casing 11 and having arranged beneath it the burner 12 which is supplied by means of a pipe 13 from a suitable mixing device or carbureter. The boiler and carbureter shown in Fig. 2 form the subject-matter of my co-pending application, Serial No. 816,587, filed February 4, 1914.

As shown in Fig. 2, a hydrocarbon fuel such as gasoline is supplied by means of a pipe 14, the upper end of which constitutes a nozzle and is arranged at the center of a fan 15 which is rotated by means of a motor 16. The fuel supplied through the pipe 14 is sprayed into the center of the fan and mixed with the air which enters through the pipe 17, this pipe leading from a preheating chamber 18 arranged below the burner 12.

Referring to Fig. 1, it will be seen that I have provided a sparking or igniting device or plug 19, the terminals of which are ar-

ranged above one of the burner openings. The sparking device is connected with the secondary coil of the transformer 20 by means of the conductors 21 and 22. One terminal of the primary of the transformer 20 is connected with the brush 23 of a rotary interrupter by means of a conductor 24.

The generator 25 preferably driven by the vehicle engine is arranged to charge a secondary battery 26 in the usual way and a conductor 27 is connected with one terminal of the battery 26 and with the primary coil of the transformer 20. The conductor 27 is also connected with one terminal of the motor 16, the other terminal of which has connected therewith a conductor 28. The conductor 28 is connected with a switch member 29 which is arranged to move over a series of contacts 30, these contacts being connected with the different cells of the secondary battery 26 so that any desired number of cells may be used to operate the motor 16. The conductor 28 has arranged therein a switch 31, preferably located on the vehicle dash, and adapted to open the motor circuit. The conductor 28 also has arranged therein one or more switches 32 which are actuated by thermostats 33, of any usual or preferred construction, to open the motor circuit whenever the temperature of the steam delivered by the boiler exceeds a predetermined degree, or when the boiler water level falls below a predetermined point. The switch member 29 is connected with a piston 34 in a cylinder 35, the lower side of this piston being subjected to the pressure of the steam delivered by the boiler 10, the pressure of the steam on the piston being opposed by a spring 36.

The brush 37 of the interrupter is connected with the conductor 28 by means of a conductor 38 and the interrupter is preferably mounted on the shaft of the motor 16 as shown in Fig. 2, so that a spark will be formed across the terminals 19 whenever the motor 16 is in operation. In the normal operation of the apparatus, the switches 31 and 32 are closed and the motor 16 operates at a substantially uniform speed. When the pressure of the steam generated in the boiler 10 increases above a predetermined amount, the switch member 29, which normally rests on the lowermost one of the contact members 30, is gradually moved upwardly to successively cut out the cells of the secondary battery 26 so as to reduce the voltage at the mo-

tor 16 and thereby cut down the speed of the motor. The motor 16, driving the fan 15 forces the fuel to the burner 12 and therefore when the speed of the fan is reduced, the rate at which fuel is received by the burner is also reduced and there is a corresponding reduction in the heat generated by the burner. Upon an excessive rise in pressure the switch member 29 would be moved to a position to cut out all of the cells and thereby stop the motor. When the motor is stopped the interrupter is also stopped and no spark is produced across the terminals 19. When the pressure in the boiler drops, the switch member 29 is moved to a position to successively cut in the cells of the battery 26 and thereby gradually increase the speed of the motor 16 and also produce a spark across the terminals 19. The starting of the motor causes the fan to force the mixture to the burner 12 and therefore the simultaneous production of a spark is desirable in order to immediately ignite the fuel. When the temperature of the steam reaches a predetermined degree, or should the water level fall below a predetermined point, a thermostat 33 moves a switch member 32 to open the motor circuit and thus stop the motor so that fuel will not be supplied to the burner and the temperature of the steam will in consequence be lowered and injury to the boiler prevented. The lowering of the steam temperature, or the restoration of the normal water level in the boiler, will cause the thermostat to act to close the switch member 32 again and thus start the motor.

From the foregoing it will be seen that I have provided a system which is thoroughly automatic in its action and which will be very economical in the use of fuel because the fuel is reduced or cut off entirely in response to excessive steam conditions. In devices heretofore used, it has been customary to provide pilot burners and these burners are in operation continuously and consume fuel when no heat is required by the boiler.

In Fig. 3 I have shown a modification of the sparking mechanism, the terminals 19 being connected with the secondary coil of the transformer 20 by means of conductors 40 and 41 and a condenser 42 being arranged in series and another condenser 43 being arranged in parallel with the terminals 19. These condensers produce a more effective spark and prolong the life of the terminals or electrodes 19.

In Fig. 4 I have shown another form of the invention in which the motor 16 is shown diagrammatically and the terminals of one coil of the armature are connected with collector rings 44, these collector rings being in turn connected with the primary of the transformer 20. This arrangement eliminates the interrupter shown in Figs. 1 and 2,

the alternating current in the coil of the armature producing the spark across the terminals 19.

Having thus described the invention, what is claimed is:

1. In an automatic fuel regulating system, the combination of means adapted to receive a heat-absorbing medium, a burner associated therewith, means for forming a combustible mixture, pressure-creating means for forcing the mixture to the burner, a sparking mechanism associated with the burner, a source of electricity, a motor supplied from said source and operating said mechanism and said pressure-creating means, and means, responsive to changes in conditions in the heat-absorbing medium, for controlling said motor.

2. In an automatic fuel regulating system, the combination of means adapted to receive a heat-absorbing medium, a burner associated therewith, means for forming a combustible mixture, pressure-creating means for forcing the mixture to the burner, a sparking mechanism associated with the burner, a source of electricity, a motor supplied from said source and operating said mechanism and said pressure-creating means, means, responsive to pressure changes in the heat-absorbing medium, for varying the speed of said motor, and means, responsive to changes in temperature of the heat-absorbing medium, for stopping and starting the motor.

3. In an automatic fuel regulating system, the combination of means adapted to receive a heat-absorbing medium, a burner associated therewith, means for forming a combustible mixture, pressure-creating means for forcing the mixture to the burner, a sparking mechanism associated with the burner, a source of electricity, a motor supplied from said source and operating said mechanism and said pressure-creating means, means, responsive to the excess of pressure of the heat-absorbing medium above a predetermined pressure, for reducing the speed of said motor as the excess increases, and independent means, responsive to a predetermined temperature of the heat-absorbing medium, for stopping the motor.

4. In an automatic fuel regulating system, the combination of means adapted to receive a heat-absorbing medium, a burner associated therewith, means for forming a combustible mixture, pressure-creating means for forcing the mixture to the burner, a sparking mechanism associated with the burner, a source of electricity, a motor supplied from said source and operating said mechanism and said pressure-creating means, a switch adapted to be moved to vary the voltage at said motor, a cylinder having a piston therein, said piston being subjected on one side to the pressure of said

medium and being operatively connected with said switch, means for moving said piston in opposition to the pressure thereof, a switch for stopping and starting the motor, and a thermostat operatively connected with said last-mentioned switch and actuated in response to the temperature of said medium.

5 5. In combination, a burner, a spark plug associated with the burner, a spark coil connected with the spark plug, an interrupter connected with the spark coil, a motor and means operated thereby for supplying fuel to said burner, and driving connections between said motor and said interrupter.

6. In combination, a burner, a spark plug associated with the burner, a spark coil connected with the spark plug, an interrupter connected with the spark coil, a motor and means operated thereby for supplying fuel to said burner, driving connections between said motor and interrupter, and a condenser connected with the spark plug circuit.

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

JOHN A. DOBLE.

Witnesses:

HERBERT L. FROST,
JOHN W. ALLEN.