

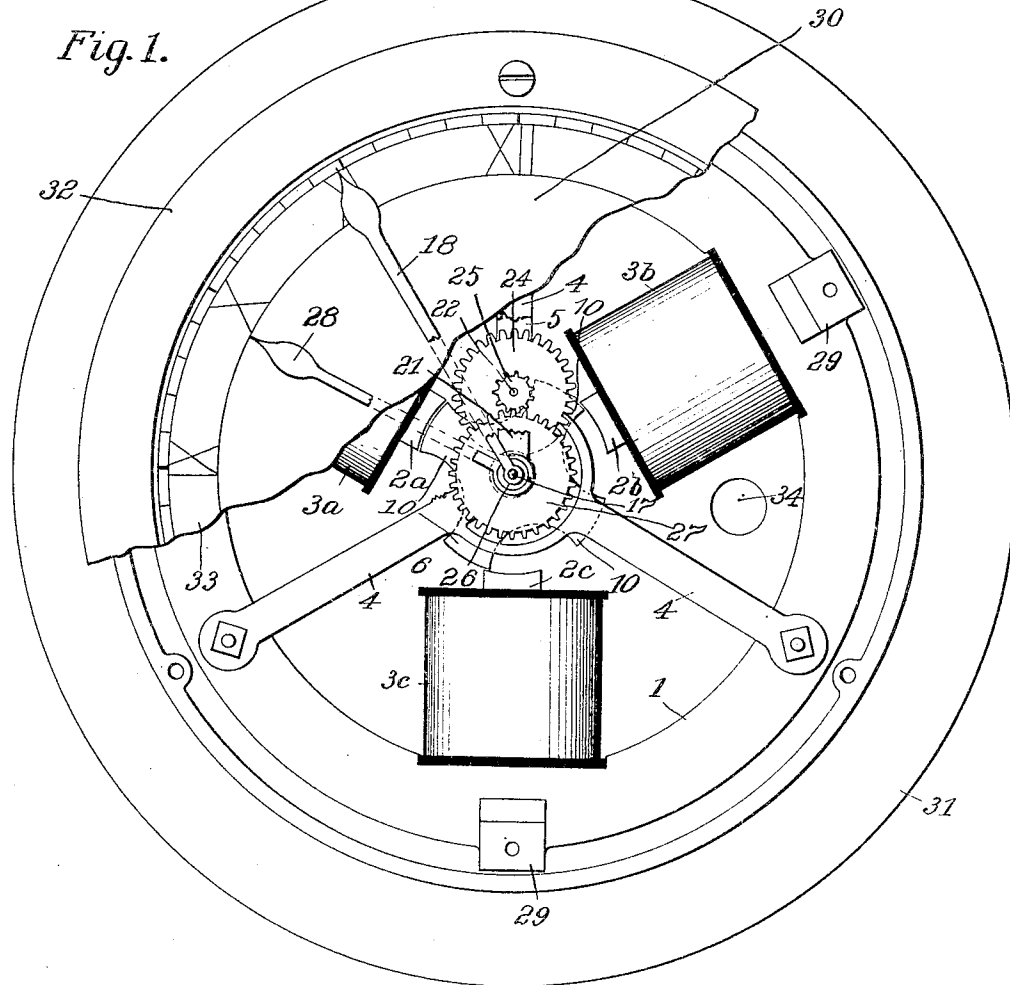
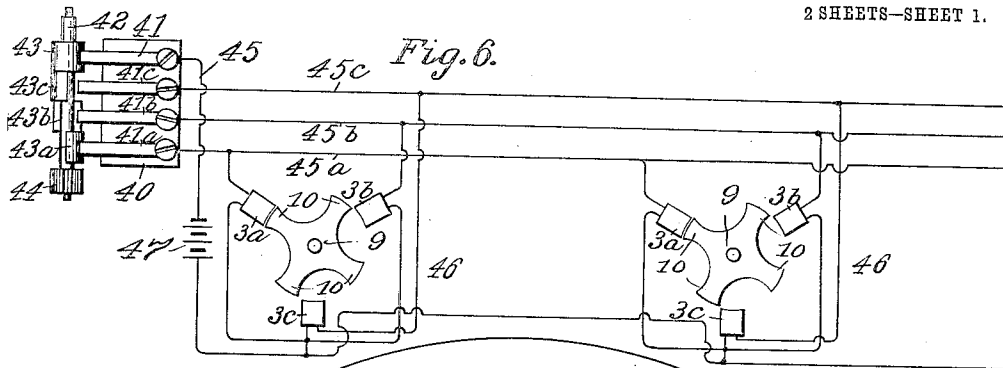
A. A. RADTKE.
TIME INDICATING SYSTEM.

APPLICATION FILED JUNE 29, 1908. RENEWED JAN. 25, 1909.

921,280.

Patented May 11, 1909.

2 SHEETS—SHEET 1.



Witnesses

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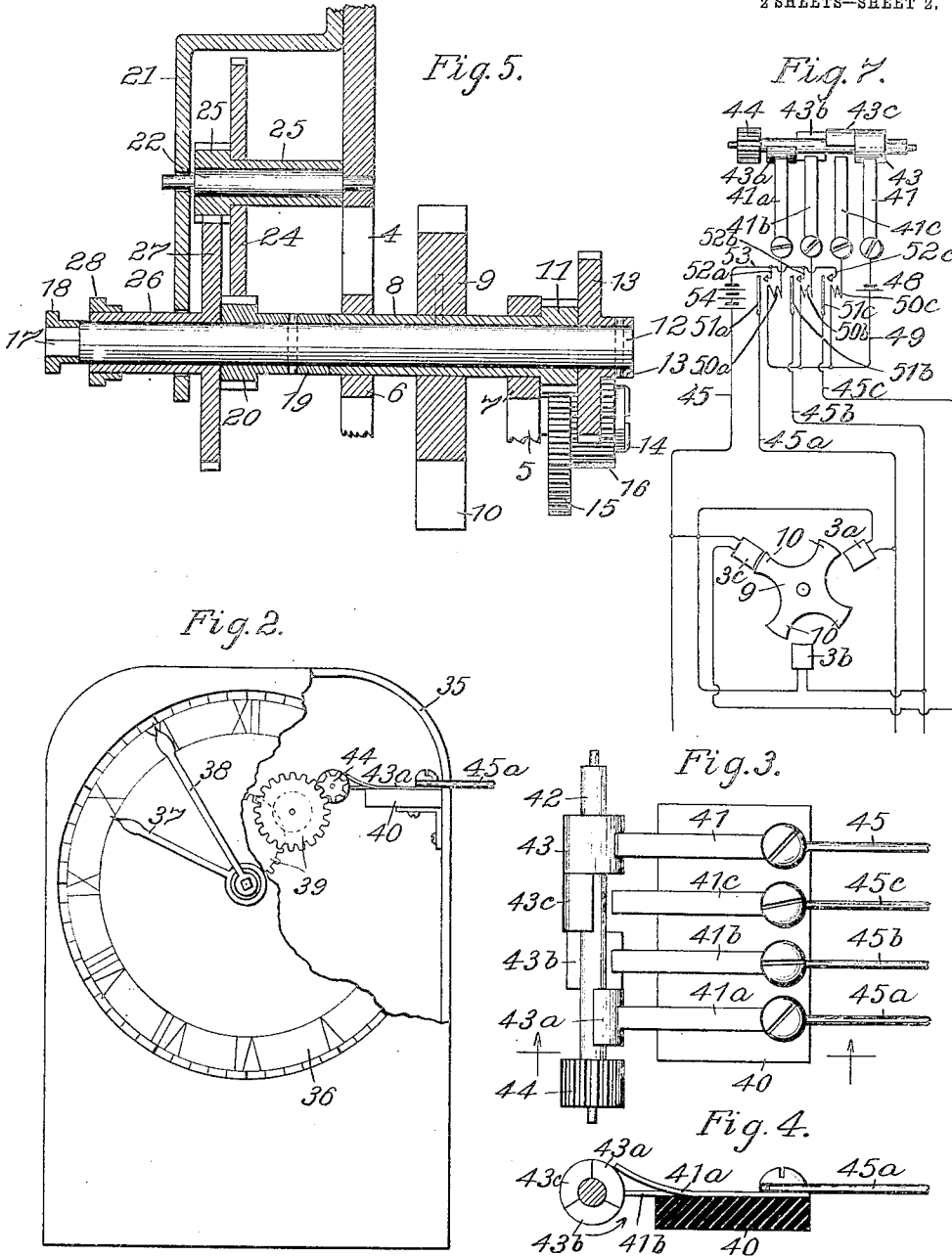
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UNITED STATES PATENT OFFICE.

ALBERT A. RADTKE, OF CHICAGO, ILLINOIS.

TIME-INDICATING SYSTEM.

No. 921,280.

Specification of Letters Patent.

Patented May 11, 1909.

Application filed June 29, 1908, Serial No. 440,843. Renewed January 25, 1909. Serial No. 474,152.

To all whom it may concern:

Be it known that I, ALBERT A. RADTKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Time-Indicating Systems, (Case 3,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to time indicating systems and has for its object improved electrical control for systems in which a plurality of time indicating devices are controlled by a master clock.

In my system I employ contact mechanism comprising a plurality of contact sets, this contact mechanism being driven by the clockwork of the master clock so that the contact sets are actuated in proper sequence and at proper intervals. Each time indicating device comprises time indicating mechanism, an armature connected with the time indicating mechanism and a plurality of electro-magnets for causing rotation of the armature. The electro-magnets are arranged about the armature so that if energized repeatedly in successive order, the armature will be rotated to drive the time indicating mechanism. For each electro-magnet there is a circuit-closing contact set at the master clock. An electrical supply source is also connected with the contact mechanism and with the time indicating units. The circuit arrangement is such that the indicating contacts of the time indicating mechanisms are always under the control of the electro-magnets and are, therefore, always kept in synchronism with the master clock indicating hands. The driving relation between the various parts can be adjusted to suitably adjust the increment of movement of the minute hand of the indicating mechanism. The arrangement is preferably such that the interval of actuation is one minute. The contact mechanism is therefore driven to close a contact set every minute so that the electro-magnets are successively energized at minute intervals so that the minute hands will move once a minute from one minute mark to another.

My invention will be clearly understood when described with reference to the accompanying drawings, in which—

Figure 1 is a plan view of a time indicating

unit, parts being broken away to more clearly show the various cooperating parts, Fig. 2 is a more or less diagrammatical plan view of a master clock and the contact mechanism driven thereby for controlling the time indicating units, Fig. 3 is an enlarged plan view of the contact mechanism driven by the master clock, Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3, Fig. 5 is an enlarged diametrical sectional view of the gearing mechanism intervening between the armature and the hour and minute hands of a time indicating unit, Fig. 6 shows diagrammatically the circuit arrangements for the system, and Fig. 7 shows a modified circuit arrangement.

Each time indicating unit has an annular field frame 1 from which extend radial poles, of any number, three being shown and lettered 2^a, 2^b and 2^c, placed 120 degrees apart. On these poles are the energizing windings 3^a, 3^b and 3^c respectively, and secured to the top and bottom sides of the field frame are the upper and lower spider frames 4 and 5, which are preferably of non-magnetic material, but which may be of any form so as to provide upper and lower bearing frames 6 and 7 in which is pivoted a sleeve 8 to which is keyed the armature 9 as shown. The armature is in the form of an iron frame having the four polar extensions 10, 90 degrees apart for cooperating with the field poles 2. At the lower end of the sleeve 8 is formed a pinion 11. Extending through the sleeve 8 is the shaft 12, to whose lower end directly below the pinion 11 is pinned the gear 13. A bearing stud or screw 14 extends downwardly from the frame 5 adjacent the pinion and gear 11 and 12, and on said shaft are pivoted gears 15 and 16, connected rigidly together, gear 15 meshing with pinion 11 and gear 16 meshing with gear 13 so that upon rotation of the armature and of the sleeve 8, the shaft 12 will be rotated, this shaft having a square upper end 17 for receiving the minute hand 18. Pinned to the shaft 12 directly upon the sleeve 8 is a sleeve 19, at whose upper end is formed a pinion 20. Extending upwardly from and parallel with the frame 4 is a bracket 21 between which and the frame 4 is pivoted the arbor 22. On this arbor 22 is a sleeve 23 carrying the gear 24 and pinion 25, the gear 24 meshing with the pinion 20. Pivoted on shaft 12 directly above the pinion 20 is a sleeve 26 carrying at its lower end the gear 27 which meshes with

the pinion 25, and at the upper end of this sleeve the hour hand 28 is suitably secured. The rotation of the armature is transmitted through this gearing train just described to the hour hand. Lugs 29 extend outwardly and upwardly from the field frame and at the top of these lugs is supported a dial plate 30 having the usual time characters.

The mechanism thus far described is contained in a cylindrical case 31 to whose cylindrical wall the lugs 29 on the field frame are secured. This casing, if of magnetic material, will form a secondary field frame. A cover for the casing comprises an annular frame 32 in which the glass plate 33 is held. The conductors for connecting the inclosed parts with the internal circuit may enter through suitable openings 34 in the base of the inclosing case.

The master clock arrangement is shown in Figs. 2, 3 and 4. The master clock can be of any construction and is shown as comprising the housing 35 on which is mounted a dial 36 over which travel the hour and minute hands 37 and 38. Clock mechanism 39 within the housing connects with the hands in a well-known manner. Suitably secured from the housing wall is a supporting block 40 of insulating material on which are mounted a plurality of contact springs 41^a, 41^b, 41^c and 41^d. Suitably pivoted between the clockwork and the contact springs is a shaft 42 on which is mounted a complete contact collar 43 permanently engaged by the contact spring 41. Adjacent the collar 43 is a segmental contact member 43^a, adjacent which contact member is a similar contact member 43^b, and adjacent which segment 43^b is another similar segment 43^a. Also secured to the shaft 42 is a pinion 44 which has gearing connection with the clockworks of the master clock. The contact segments 43^a, 43^b, 43^c are displaced 120 degrees, and each extends through an arc slightly greater than 120 degrees so that they will overlap, and so that one contact spring will make firm engagement with its contact segment before the preceding spring and contact segment become disengaged. Extending from the contact springs 41^a, 41^b and 41^c are the conductors 45^a, 45^b and 45^c, and extending from contact spring 41 is the conductor 45.

In Fig. 6 the simplest circuit arrangement is shown, in which the conductors 45^a, 45^b, and 45^c extend to one terminal of the field windings 3^a, 3^b and 3^c of the various indicating devices, which are connected in multiple. The other terminals of the windings of each indicating device are connected together through a common conductor 46, and these common conductors are all connected with conductor 45 leading from the common spring 41, said conductor 45 including the source of current such as a battery 47. The operation is apparent. With the various

parts in the position shown in the figures, the spring 41^a and contact 43^a are in connection, and in each indicating device the pole of the armature is opposite the field pole 2^a, whose energizing winding 3^a is energized through the circuit leading from battery 47, through conductor 45, through spring 41 of the contact collar 43, through shaft 42 to contact member 43^a, through spring 41^a, through conductor 45^a, through the field coils 3^a of the various indicating devices, through the common conductors 46, back to the conductor 45, and to the battery. The shaft 41 is driven in the direction as indicated by the arrow and before contact 43^a leaves spring 41^a, contact 43^b will come into engagement with spring 41^b, and the energizing coils 3^b of the indicating devices will become energized through the circuit which includes the conductor 45^b. The armatures, however, will not be rotated until contact 43^a leaves spring 41^a to open the circuit to conductor 45^a. When this circuit is broken the coils 3^b cause the adjacent poles of the armatures to be attracted, and the armatures rotate in a clockwise direction, and the rotation of the armatures is communicated through the various gearing mechanisms to the hour and minute hands. The armatures are, therefore, always under the control of their field frames and their movement in synchronism with each other and with the controlling contact mechanism of the master clock is assured. Before contact 43^b leaves the spring 41^b, contact 41^c comes into engagement with spring 41^c and coils 3^c become energized, and eventually cause the further rotation of the armatures. Any number of poles and energizing windings could be provided for each indicating unit, and each armature could have any number of projections. I find that three field windings cooperating with the armature of four polar extensions gives very satisfactory and efficient operation. The gearing relation between the master clock and the pinion 44 is preferably such that the shaft 42 is rotated 130 degrees each minute. The armatures are, therefore, given one advancement every minute, that is the armatures are advanced 30 degrees each minute. In order to have the minute hands of the indicating units moved a minute's space or 6 degrees for each advancement of the armatures, the gearing train between the armature sleeve 8 and the shaft 12 should be adjusted to have a gearing relation of 5 to 1. Also to give the hour hand the proper relative advancement the gearing train between the shaft 12 and sleeve 26 should be adjusted to have a gearing relation of 60 to 1, or in other words, the gearing relation between the armature sleeve 8 and the sleeve 26 should be 300 to 1. Each minute, therefore, one of the contact sets at the master clock

will close and the minute hands of the indicating units will advance one minute.

In Fig. 7 is shown a modified circuit arrangement which is preferably used where a great number of indicating units are used on a circuit, and where the current flow would have to be considerable. Instead of connecting the units directly with the contact members as in Fig. 6, relays intervene, which relays are controlled by the contact members, and which in turn control the circuit for the units. A source of current 48 connects the common conductor 49 with the common spring 41, and between the springs 41^a, 41^b and 41^c and this common conductor are bridged relays 50^a, 50^b and 50^c. The relays have the armatures 51^a, 51^b and 51^c and the conductors 52^a, 52^b and 52^c, these conductors being connected to a common conductor 53 connected with another source of current 54, which connects with the conductor 45. Each conductor, as shown in Fig. 6, connects with the common conductors of the field windings. Leading from the armatures 51^a, 51^b and 51^c are the conductors 45^a, 45^b and 45^c, which connect with the field windings as shown in Fig. 6. With this arrangement, the current flow at the contact mechanism is constant and need be sufficient only to cause proper actuation of the relays 50^a, 50^b and 50^c. Upon energization of a relay its armature is attracted and the circuit closed from the main supply battery 54 to the indicating units through the corresponding conductor.

It will thus be seen that by means of my system I can synchronously control any number of time indicating units from a master clock with a number of conductors equal only to the sum of the electro-magnet coils provided for each indicating unit, in addition to one common conductor. In the system illustrated four conductors will supply any number of indicating units. By means of the contact arrangement, the armatures are always held magnetically and absolutely in synchronism with each other and every minute are brought into synchronism with the master clock. This is a distinct improvement over systems of the prior art in which the indicating units are brought into synchronism perhaps only once every hour. The time indicating units, therefore, directly, at each instant, give the same time indication as the master clock.

I do not wish to be limited to the precise construction and arrangement of the parts shown, as changes and modifications can readily be made which will still come within the scope of my invention.

Having described one modification of my invention, I desire to secure the following claims by United States Letters Patent:

1. In a system of the class described, the combination of a master clock, a plurality of

time indicating units, time indicating mechanism for each unit, armatures for each unit connected with the time indicating mechanism, a plurality of electro-magnets arranged about the armature, contact mechanism driven by the master clock, and electrical circuits connecting said contact mechanism with said electro-magnets, said contacts and mechanism being driven by the clock mechanism to cause the circuits to be affected to cause successive energization of the electro-magnets of the units whereby the unit time indicating mechanisms are actuated to indicate time in accordance with the time indicated by the master clock.

2. In a system of the class described, the combination of a master clock, contact mechanism driven by said clock, a plurality of time indicating units, a time indicating mechanism for each unit, an armature for each unit connected with the time indicating mechanism thereof, a plurality of electro-magnets for each unit arranged at regular intervals about the armature so that successive energization of the electro-magnets will cause rotation of the armature and actuation of the time indicating mechanism, current supply conductors leading from the contact mechanism to the units, the electro-magnets of the units being connected in bridge of the said conductors, and means whereby said contact mechanism will control the current flow through said conductors to cause repeated successive energization of the electro-magnets at the units, whereby the armatures are driven simultaneously and synchronously, and whereby the time indicated by the indicating mechanisms will be in accordance with the time indicated by the master clock.

3. In a system of the class described, the combination of a master time indicating instrument, a time indicating unit, time indicating mechanism for said unit, an armature for said unit connected with the time indicating mechanism, a plurality of electro-magnets arranged about the armature in regular order to cause rotation of the armature upon successive energization of the electro-magnets, contact mechanism driven by the master instrument, contact sets for said contact mechanism, one for each electro-magnet, and circuits connecting said contact sets with said electro-magnets, said contact sets upon actuation of the contact mechanism by the master instrument causing the circuits to be affected to cause the electro-magnets to be repeatedly successively energized whereby said armature is rotated and the time indicating mechanism actuated to indicate time.

4. In a system of the class described, the combination of a master time indicating device, a time indicating unit, time indicating mechanism for said unit, an armature con-

5 nected with said indicating mechanism, a
plurality of electro-magnets surrounding the
armature, a series of electrical switch con-
tacts connected in groups with said electro-
10 magnets, a switch member driven by the
master time indicating device and cooperating
with said contact groups to control the
flow of current through said electro-magnets
to cause rotation of the armature and actua-
tion of the time indicating mechanism to in-
15 dicate time in accordance with the time indi-
cated by the master device.

5. In a system of the class described, the
combination of a master time indicating de-
15 vice, a time indicating unit, time indicating
mechanism for said unit, an armature con-
nected with said indicating mechanism, a
plurality of electro-magnets surrounding the
armature, a series of electrical switch con-
20 tacts connected in groups with said electro-
magnets, a switch member driven and con-
trolled by the master device to control the
flow of current through said electro-magnets
to cause cyclic energization of said electro-
25 magnets and therefore rotation of the arma-
ture and actuation of the time indicating
mechanism, and means for causing said time
indicating mechanism to indicate time in ac-
cordanance with the time indicated by the mas-
30 ter device.

6. In combination, a master indicating
mechanism, a plurality of indicating units, a
plurality of electro-magnets for each unit, an
armature for each unit associated with said
35 electro-magnets, indicating mechanism for
each indicating unit having connection with
the armature, a plurality of main circuits
leading from the master indicator to the in-
dicating units and of a number equal to the
40 number of electro-magnets per unit, and con-
tact mechanism controlled by the master in-
dicator for affecting said circuits in cyclic
succession, thereby causing cyclic operation
of the electro-magnets of the units and rota-
45 tion of the armatures to cause synchronous
actuation of the indicating mechanisms in
accordance with the indication of the master
indicator.

7. In combination, a master indicator hav-
50 ing indicator members, a plurality of indi-
cating units, three electro-magnets for each

unit, an armature associated with said elec-
tro-magnets, indicating mechanism connect-
ed with each armature, contact mechanism
controlled by the master indicator, three 55
main circuits leading from the master indi-
cator contact mechanism to the indicating
units, and with the electro-magnets thereat,
and means whereby actuation of the contact
mechanism by the master indicator will 60
cause said circuits to be effected in cyclic suc-
cession whereby electro-magnets at the units
will be synchronously energized in cyclic suc-
cession and whereby the armatures will be
rotated synchronously to cause the indicat- 65
ing mechanism of the units to indicate in
synchronism with each other and with the
master indicator.

8. In combination, a master indicator, a
plurality of indicator units, indicating mech- 70
anism for each unit, an armature for each
unit connected with the indicator mechan-
ism, three electro-magnets for each unit ar-
ranged about the armature, contact mechan-
ism controlled by the master indicator, three 75
conductors leading from said contact mech-
anism to the units, each conductor being con-
nected with one terminal of one of the elec-
tro-magnets of the units, the other terminal
of the electro-magnets at each unit being con- 80
nected together, a common conductor lead-
ing from the contact mechanism and connect-
ing with the other terminals of the electro-
magnets, a source of current for the cir-
cuits, and means whereby the contact 85
mechanism is operated by the master indi-
cator to cause said source of current to be
connected repeatedly in successive order
with the conductors to cause repeated cyclic
energization of the electro-magnets of the 90
units, thereby causing synchronous rotation
of the unit armatures and actuation of the
indicating mechanisms of the units in syn-
chronism with each other and with the mas-
ter indicator. 95

In witness whereof I have hereunto sub-
scribed my name, this 23rd day of June,
1908.

ALBERT A. RADTKE.

Witnesses:

CHARLES J. SCHMIDT,
GEORGE E. HIGHAM.