

We claim :

1. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means comprising a series of switching devices to establish cryptographic relationships between said sets of elements ; and means to cause said switching devices to perform cryptographic substitution functions and cryptographic control functions.

2. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said sets of elements being electrically interrelated ; means comprising a series of commutators to establish cryptographic relationships between said sets of elements ; means to cause said commutators to perform cryptographic substitution functions and cryptographic control functions ; and displacement mechanisms to effect displacements of the commutators when performing substitution functions, said mechanisms being electrically controlled by said commutators when performing control functions.

3. In a cryptograph, a keyboard comprising character elements, and a plurality of signaling devices, said elements and said devices being electrically interrelated ; means for establishing cryptographic relations between said devices and said elements, said means including a first set of commutators for performing cryptographic substitution functions, and a second set of commutators for performing cryptographic control functions.

4. An apparatus as claimed in claim 3, in which homologous commutators are interchangeable.

5. An apparatus as claimed in claim 3, in which said second set of commutators control the operation of the first set of commutators.

6. In a cryptograph, a keyboard comprising a set of character elements and a set of signaling devices ; means comprising a set of substitution commutators for establishing operative cryptographic relations between the said character elements and said signaling devices ; displacement mechanisms to effect angular displacements of the substitution commutators ; and means including a set of control commutators for controlling the displacement mechanisms.

7. In a cryptograph, a set of character elements constituting a keyboard and a set of signaling devices electrically interrelated with said elements ; means for establishing operative cryptographic relations between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said commutators, including a set of control commutators adapted to effect the displacement operations individually.

8. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relations between said elements and said devices, including a set of ciphering commutators ; displacement mechanisms to effect the angular displacements of said commutators ;

and means to control the said mechanisms comprising a set of control commutators adapted to act upon said mechanisms individually.

9. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means comprising a single set of commutators to establish operative cryptographic relations between said devices and said elements, including electrical means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions.

10. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a set of commutators ; means to vary said relationships; and means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions.

11. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a set of commutators ; means to vary said relationships ; and means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions, said means including separate contacts and associated conductors providing separate electrical channels through said commutators.

12. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a single set of commutators ; and means to vary said relationships, including electrical conductors associated with the commutators to cause the same set to perform both cryptographic substitution and cryptographic control functions, all commutators being interchangeable.

13. In a cryptograph, a set of character elements constituting a keyboard, and a set of signaling devices, said elements and said devices being electrically interrelated ; means comprising a series of commutators to establish cryptographic relationships between said elements and said devices ; and means to vary said relationships, including a plurality of self-controlled ciphering commutators arranged in cascade.

14. An apparatus as claimed in the preceding claim, in which all commutators are interchangeable.

15. An apparatus as claimed in Claim 13, in which homologous commutators are interchangeable.

16. In a cryptograph, a set of character elements constituting a keyboard, and a set of signaling devices ; means to establish cryptographic relationships between said elements and said devices, said means including a plurality of self-controlled ciphering commutators provided with a single series of ring contacts ; a circuit system interconnecting

said elements and said devices, and including said commutators ; and means operative with said circuit system and including therein a switch mechanism to permit the same commutators to function alternately as ciphering commutators and as control commutators.

17. In a cryptograph, a keyboard comprising a set of character elements, and a set of signaling devices, said elements and said devices being electrically interrelated ; means for effecting varying cryptographic relationships between said elements and said devices comprising a plurality of angularly displaceable commutators, said commutators being provided with a single series of ring contacts ; displacement mechanisms operative to effect the angular displacement of said commutators ; and circuit means including a switching mechanism operative to cause the same set of contacts to function alternately for purposes of cryptographic substitution and cryptographic control.

18. In a cryptograph, a keyboard comprising a set of character elements ; a set of signaling devices in electrical relation with said elements ; means for effecting varying cryptographic relationships between said elements and said devices, including a plurality of angularly displaceable commutators provided with a double series of ring contacts ; displacement mechanisms operative to effect angular displacements of said commutators ; means to provide electrical channels through one of the series of contacts to cause said commutators to perform functions of cryptographic substitution, and in sequential operations of said

mechanisms to provide electrical channels through the other of said series of contacts to cause said commutators to perform functions of cryptographic control.

19. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said sets of elements being electrically interrelated ; means to establish and vary cryptographic relationships between said sets of elements, said means including a set of self-controlled commutators.

20. An apparatus as claimed in the preceding claim in which said commutators are arranged in cascade.

21. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means to establish cryptographic relations between said sets of elements, said means including a plurality of self-controlled commutators arranged in cascade, said commutators being interchangeable.

22. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements ; a circuit system operatively connecting said sets of elements ; means to establish cryptographic relationships between said sets of elements, including a plurality of self-controlled commutators arranged in cascade; and means including a switch mechanism in said circuit system to cause said commutators to function alternately both as ciphering commutators and as control commutators.

23. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means to establish cryptographic relationships between said sets of elements, said means including a plurality of self-controlled commutators ; and means to cause said commutators to perform both cryptographic substitution functions and cryptographic control functions, said means including concentric rings of contacts on the obverse face and a corresponding number of concentric rings of contacts on the reverse face of each commutator, and conductors self-contained within each commutator for connecting the contacts on the obverse face with homologous contacts on the reverse face.

24. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means for effecting varying cryptographic relationships between said sets of elements, said means including a switching commutator bearing two or more concentric rings of contacts on the obverse face and a corresponding number of concentric rings of contacts on the reverse face, and conductors self-contained within each commutator and arranged irregularly for connecting the contacts on the obverse face of each commutator with homologous contacts on the reverse face.

25. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means for effecting varying cryptographic

relationships between said sets of elements, said means including a reversing commutator bearing two or more concentric rings of even numbers of contacts on one of its faces, and means for electrically coupling the individual contacts of each ring in pairs.

26. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means for effecting varying cryptographic relationships between said sets of elements, said means including a set of juxtaposed, double-ring-contact switching commutators, one of the two rings of contacts performing cryptographic substitution functions, and the other of said ring of contacts performing cryptographic control functions.

27. In a cryptograph, a keyboard comprising character elements and corresponding signalling devices, said elements and said devices being electrically interrelated ; means for varying the connections between said elements and said devices for the purpose of effecting cryptographic operations, said means including a set of juxtaposed, rotatable single-ring-contact switching commutators mounted upon a common shaft ; stepping mechanisms for effecting angular displacements of said commutators individually ; and electrical instrumentalities for controlling said stepping mechanisms whereby the same commutators are employed alternately for effecting cryptographic substitution functions and cryptographic control functions, respectively.

28. In a cryptograph, a set of character elements constituting a keyboard and a set of indicating elements ; a circuit system operatively connecting said sets of elements ; means for establishing cryptographic relationships between said sets of elements, including a plurality of self-controlled commutators, said commutators being interchangeable and being provided with a single row of ring contacts on the obverse and reverse faces, respectively; displacement mechanisms operative to effect angular displacements of said commutators ; and means including a switch mechanism in said circuit system and effective in sequential operations of said mechanisms to provide electrical channels through said contacts to cause said commutators to perform cryptographic substitution functions and cryptographic control functions alternately.

29. In a cryptograph, a set of character elements constituting a keyboard and a set of signalling devices electrically interrelated with said elements ; means for establishing operative cryptographic relationships between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said commutators, including a set of control commutators; and means operative with said control commutators to effect the displacement operations individually in single step displacements.

30. In a cryptograph, a set of character elements constituting a keyboard and a set of signalling devices electrically interrelated with said elements ; means for establishing operative cryptographic

relationships between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said ciphering commutators, including a set of control commutators ; and means operative with said control commutators to effect the displacement operations individually in plural step displacements.

31. In a cryptograph, a set of character elements constituting a keyboard and a set of indicating elements, said elements being electrically interrelated ; means comprising a set of substitution commutators for establishing operative cryptographic relationships between said sets of elements ; displacement mechanisms to effect angular displacements of the substitution commutators ; and means including a set of control commutators for permutatively effecting the displacement operations.

32. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relationships between said elements and said devices, including a set of ciphering commutators ; displacement mechanisms to effect the angular displacements of said commutators ; and means including a set of control commutators for effecting the displacement operations permutatively in single step displacements.

33. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relationships between said

elements and said devices, including a set of ciphering commutators ;
displacement mechanisms to effect the angular displacements of said
commutators ; and means to effect the angular displacements of said
commutators, including a set of control commutators ; and means operative
with said control commutators to effect the displacement operations
permutatively in plural step displacements.

We claim : -

1. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means comprising a series of switching devices to establish cryptographic relationships between said sets of elements ; and means ^{connected to} ~~to cause~~ said switching devices ^{for affecting} ~~to perform~~ cryptographic substitution functions and cryptographic control functions.

2. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said sets of elements being electrically interrelated ; means comprising a series of commutators to establish cryptographic relationships between said sets of elements ; means ^{connected to} ~~to cause~~ said commutators ^{for affecting} ~~to perform~~ cryptographic substitution functions and cryptographic control functions ; and displacement mechanisms to effect displacements of the commutators when performing substitution functions, said mechanisms being electrically controlled by said commutators when performing control functions.

3. In a cryptograph, a keyboard comprising character elements, and a plurality of signaling devices, said elements and said devices being electrically interrelated; means for establishing cryptographic relations between said devices and said elements, said means including a first set of commutators for performing cryptographic substitution functions, and a second set of commutators for performing cryptographic control functions.

4. An apparatus as claimed in claim 3, in which homologous commutators are interchangeable.

5. An apparatus as claimed in claim 3, in which said second set of commutators controls the operation of the first set of commutators.

6. In a cryptograph, a keyboard comprising a set of character elements and a set of signaling devices ; means comprising a set of substitution commutators for establishing operative cryptographic relations between the said character elements and said signaling devices ; displacement mechanisms to effect angular displacements of the substitution commutators ; and means including a set of control commutators for controlling the displacement mechanisms.

7. In a cryptograph, a set of character elements constituting a keyboard and a set of signaling devices electrically interrelated with said elements ; means for establishing operative cryptographic relations between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said commutators, including a set of control commutators adapted to effect the displacement operations individually.

8. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relations between said elements and said devices, including a set of ciphering commutators ; displacement mechanisms to effect the angular displacements of said commutators ;

and means to control the said mechanisms comprising a set of control commutators adapted to act upon said mechanisms individually.

9. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means comprising a single set of commutators to establish operative cryptographic relations between said devices and said elements, including electrical means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions,

said electrical means constituting means energized by the output of said commutators to energize said devices as well as to move said commutators irregularly according to the irregularities of the output of the commutators.

10. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a set of commutators ; means to vary said relationships; and means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions, *the last-named means comprising means driven by the output of the commutators for moving the commutators*

11. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a set of commutators ; means to vary said relationships ; and means to cause the same set of commutators to perform both cryptographic substitution and cryptographic control functions, said means including separate contacts and associated conductors providing separate electrical channels through said commutators.

12. In a cryptograph, a set of character elements constituting a keyboard, and indicating devices in electrical communication with said elements ; means to establish cryptographic relationships between said devices and said elements, comprising a single set of commutators ; and means to vary said relationships, including electrical conductors associated with the commutators to cause the same set to perform both cryptographic substitution and cryptographic control functions, all commutators being interchangeable.

13. In a cryptograph, a set of character elements constituting a keyboard, and a set of signaling devices, said elements and said devices being electrically interrelated ; means comprising a series of commutators to establish cryptographic relationships between said elements and said devices ; and means to vary said relationships, including a plurality of [^{cancel}self-controlled] ciphering commutators arranged in cascade.

14. An apparatus as claimed in the preceding claim, in which all commutators are interchangeable.

15. An apparatus as claimed in Claim 13, in which homologous commutators are interchangeable.

16. In a cryptograph, a set of character elements constituting a keyboard, and a set of signaling devices ; means to establish cryptographic relationships between said elements and said devices, said means including a plurality of [^{cancel}self-controlled] ciphering commutators provided with a single series of ring contacts ; a circuit system interconnecting

said elements and said devices, and including said commutators ; and means operative with said circuit system and including therein a switch mechanism to ^{cause} permit the same commutators to function alternately as ciphering commutators and as control commutators.

17. In a cryptograph, a keyboard comprising a set of character elements, and a set of signaling devices, said elements and said devices being electrically interrelated ; means for effecting varying cryptographic relationships between said elements and said devices comprising a plurality of angularly displaceable commutators, said commutators being provided with a single series of ring contacts ; displacement mechanisms operative to effect the angular displacement of said commutators ; and circuit means including a switching mechanism operative to cause the same set of contacts to function alternately for purposes of cryptographic substitution and cryptographic control.

18. In a cryptograph, a keyboard comprising a set of character elements ; a set of signaling devices in electrical relation with said elements ; means for effecting varying cryptographic relationships between said elements and said devices, including a plurality of angularly displaceable commutators provided with a double series of ring contacts ; displacement mechanisms operative to effect angular displacements of said commutators ; ^{means} ^{to provide} electrical ^{channels} ^{through} one of the series of contacts ^{means activated by said circuits} to cause said commutators to perform functions of cryptographic substitution, and in sequential operations of said

mechanisms to provide electrical channels through the other of said series of contacts to cause said commutators to perform functions of cryptographic control.

19. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said sets of elements being electrically interrelated ; means to establish and vary cryptographic relationships between said sets of elements, said means including a set of [self-controlled] commutators, *said means also includes means controlled by the output of said commutators for affecting movement of the commutators.*

20. An apparatus as claimed in the preceding claim in which said commutators are arranged in cascade.

21. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means to establish cryptographic relations between said sets of elements, said means including a plurality of [self-controlled] commutators arranged in cascade, said commutators being interchangeable *and including means related therewith for moving the same according to a law dependent on the output of the commutators.*

22. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements ; a circuit system operatively connecting said sets of elements ; means to establish cryptographic relationships between said sets of elements, including a plurality of [self-controlled] commutators arranged in cascade; and means including a switch mechanism in said circuit system to cause said commutators to function alternately both as ciphering commutators and as control commutators.

23. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means to establish cryptographic relationships between said sets of elements, said means including a plurality of ^{caused} [self-controlled] commutators ; and means to cause said commutators to perform both cryptographic substitution functions and cryptographic control functions, said means including concentric rings of contacts on the obverse face and a corresponding number of concentric rings of contacts on the reverse face of each commutator, and conductors self-contained within each commutator for connecting the contacts on the obverse face with homologous contacts on the reverse face.

24. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means for effecting varying cryptographic relationships between said sets of elements, said means including a switching commutator bearing two or more concentric rings of contacts on the obverse face and a corresponding number of concentric rings of contacts on the reverse face, and conductors self-contained within each commutator and arranged irregularly for connecting the contacts on the obverse face of each commutator with homologous contacts on the reverse face.

25. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated ; means for effecting varying cryptographic

relationships between said sets of elements, said means including a reversing commutator bearing two or more concentric rings of even numbers of contacts on one of its faces, and means for electrically coupling the individual contacts of each ring in pairs.

26. In a cryptograph, a set of character elements constituting a keyboard, and a set of indicating elements, said elements being electrically interrelated; means for effecting varying cryptographic relationships between said sets of elements, said means including a set of juxtaposed, double-ring-contact switching commutators, one of the two rings of contacts performing cryptographic substitution functions, and the other of said ring of contacts performing cryptographic control functions.

27. In a cryptograph, a keyboard comprising character elements and corresponding signalling devices, said elements and said devices being electrically interrelated; means for varying the connections between said elements and said devices for the purpose of effecting cryptographic operations, said means including a set of juxtaposed, rotatable single-ring-contact switching commutators mounted upon a common shaft; stepping mechanisms for effecting angular displacements of said commutators individually; and electrical ^{mechanisms} ~~connections~~ for controlling said stepping mechanisms whereby the same commutators are employed alternately for effecting cryptographic substitution functions and cryptographic control functions, respectively.

28. In a cryptograph, a set of character elements constituting a keyboard and a set of indicating elements ; a circuit system operatively connecting said sets of elements ; means for establishing cryptographic relationships between said sets of elements, including a plurality of self-controlled commutators, said commutators being interchangeable and being provided with a single row of ring contacts on the obverse and reverse faces, respectively; displacement mechanisms operative to effect angular displacements of said commutators ; and means including a switch mechanism in said circuit system and effective in sequential operations of said mechanisms to provide electrical channels through said contacts to cause said commutators to perform cryptographic substitution functions and cryptographic control functions alternately.

29. In a cryptograph, a set of character elements constituting a keyboard and a set of signalling devices electrically interrelated with said elements ; means for establishing operative cryptographic relationships between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said commutators, including a set of control commutators; and means operative with said control commutators to effect the displacement operations individually in single step displacements.

30. In a cryptograph, a set of character elements constituting a keyboard and a set of signalling devices electrically interrelated with said elements ; means for establishing operative cryptographic

relationships between said devices and said elements, including a set of ciphering commutators ; and means to effect the angular displacements of said ciphering commutators, including a set of control commutators ; and means operative with said control commutators to effect the displacement operations individually in plural step displacements.

31. In a cryptograph, a set of character elements constituting a keyboard and a set of indicating elements, said elements being electrically interrelated ; means comprising a set of substitution commutators for establishing operative cryptographic relationships between said sets of elements ; displacement mechanisms to effect angular displacements of the substitution commutators ; and means including a set of control commutators for permutatively effecting the displacement operations.

32. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relationships between said elements and said devices, including a set of ciphering commutators ; displacement mechanisms to effect the angular displacements of said commutators ; and means including a set of control commutators for effecting the displacement operations permutatively in single step displacements.

33. In a cryptograph, a set of character elements constituting a keyboard, and a set of signalling devices electrically interrelated therewith ; means for establishing cryptographic relationships between said

elements and said devices, including a set of ciphering commutators ;
displacement mechanisms to effect the angular displacements of said
commutators ; and means to effect the angular displacements of said
commutators, including a set of control commutators ; and means operative
with said control commutators to effect the displacement operations
permutatively in plural step displacements.

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} See Action July 27, 1942