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G. E. SWANSON

2,113,007

CYLINDER LOCK

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2 Sheets-Sheet 1

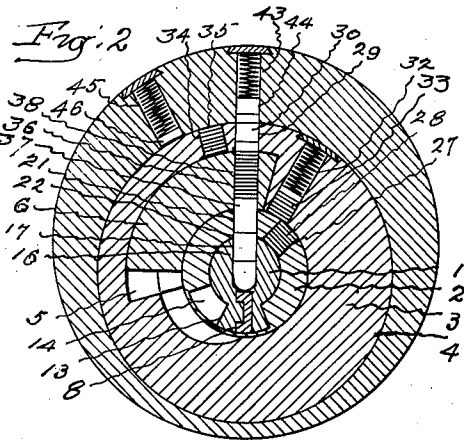
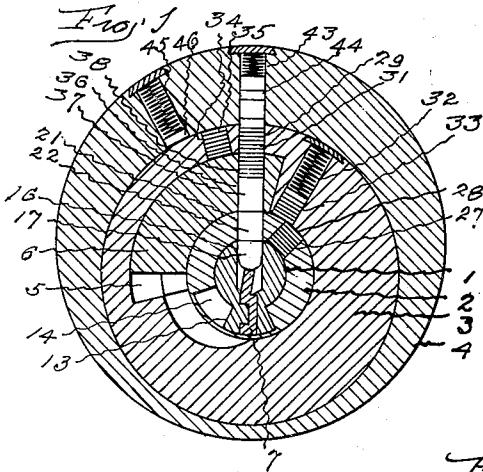


Fig. 3

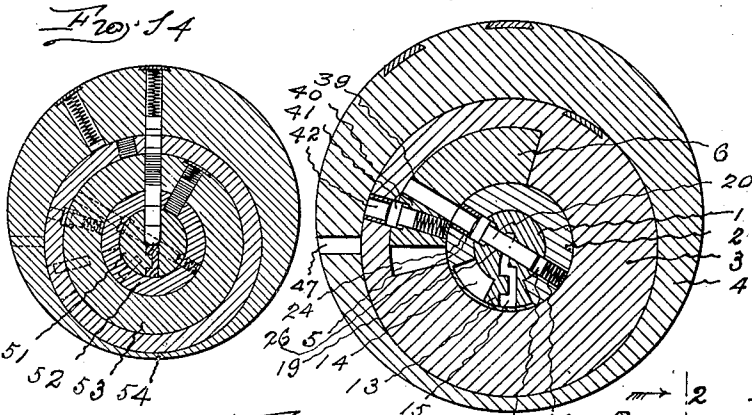


Fig. 4

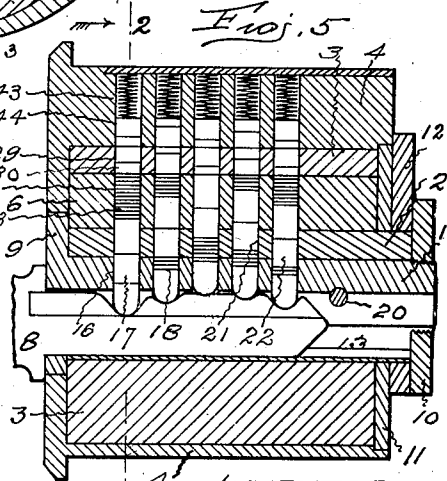


Fig. 5

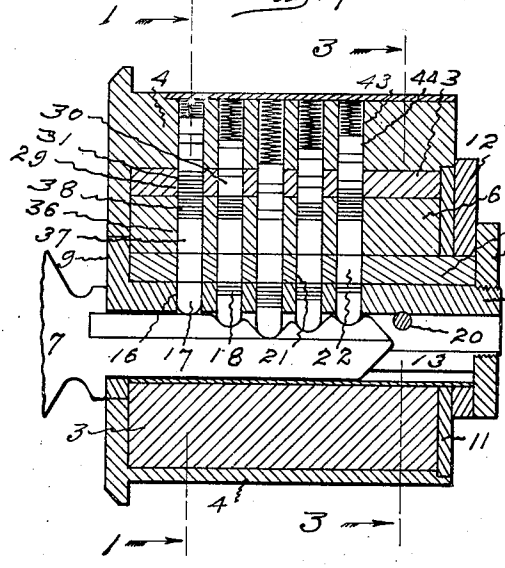


Fig. 4

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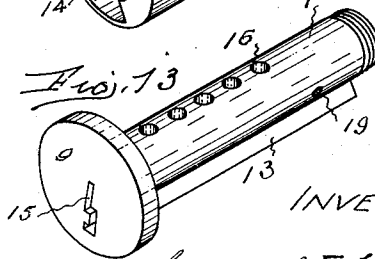
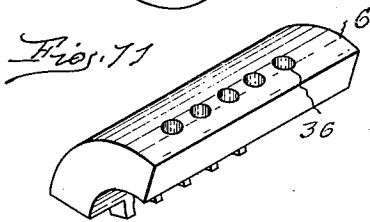
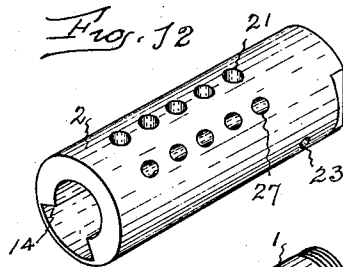
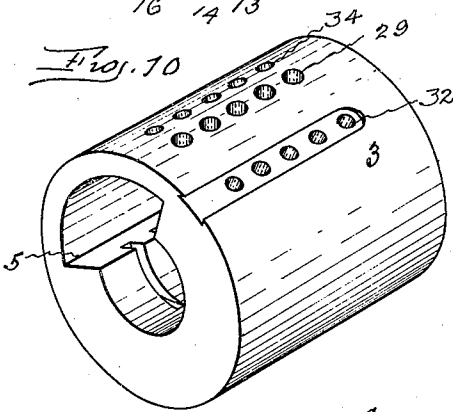
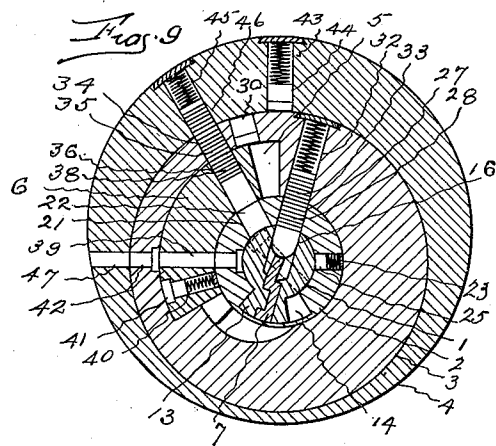
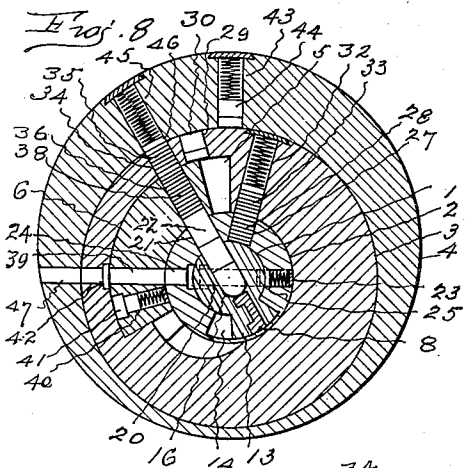
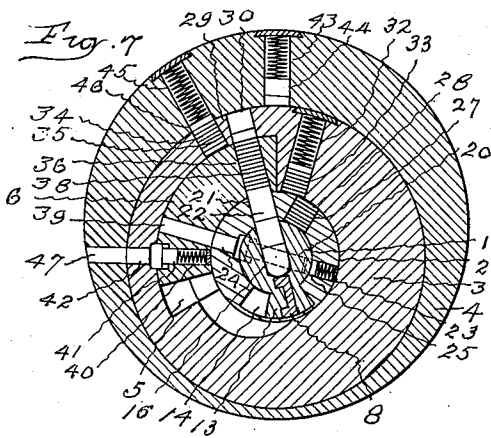
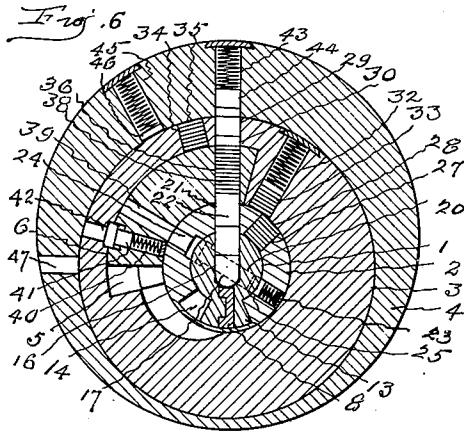
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CYLINDER LOCK

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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

2,113,007

## CYLINDER LOCK

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Application May 17, 1937, Serial No. 143,027

15 Claims. (Cl. 70—382)

Hotels, apartments, office buildings and safe deposit boxes have pluralities of cylinder locks with the locking pins of each lock set to be unlocked by a different service key, but all capable of being unlocked by a single master key. In some cases a series of locks are set so that while each is operable by a different service key and all operable by a single master key, certain locks of the series are operable by a sub-master key. Frequently a service key, and sometimes a master or sub-master key, becomes lost, stolen or duplicated and it is desirable to re-set the locking pins in new combinations.

The object of this invention is to construct a cylinder lock that is practically pick-proof, and which has locking pins and wafers so arranged that, when necessary, they may be easily and quickly re-set in new combinations for substituted service or master keys.

This object is attained by locating magazine bores for wafers in such relation to the cylinders, that on the manipulation of a member by simple means, the cylinders are free to be turned by keys to such positions that the bores containing the normal locking pins and wafers will automatically receive from or eject to the magazine bores the required numbers of wafers to operably set the normal locking pins to the contour of the key to be substituted.

The body of the lock first illustrated as an embodiment of the invention comprises a plug with a key-hole, an inner cylinder around the plug, an outer cylinder containing a segmental member, surrounding the inner cylinder, and a barrel encasing the outer cylinder, these parts having the required bores for retaining the necessary locking pins and wafers to accomplish the desired end.

In the accompanying drawings Fig. 1 is a transverse section of the lock taken on the plane indicated by the dotted line 1—1 on Fig. 4, showing the relations of the pins and wafers when a service key is inserted.

Fig. 2 is a transverse section on the plane indicated by the dotted line 2—2 on Fig. 5 showing the relations of the same pins and wafers with a master key inserted.

Fig. 3 is a transverse section on the plane indicated by 3—3 on Fig. 4.

Fig. 4 is a longitudinal section of the lock with a service key inserted.

Fig. 5 is a longitudinal section with a master key inserted.

Figs. 6, 7, 8, and 9 illustrate the various relative positions of the pins and wafers as the parts

are being manipulated for changing the setting for a new master key and service key.

Fig. 10 is a perspective view of the outer cylinder.

Fig. 11 is a similar view of the segmental piece that is movable in the outer cylinder.

Fig. 12 is a view of the inner cylinder.

Fig. 13 is a view of the plug.

Fig. 14 is, on smaller scale, a transverse section of a modified construction of the lock, with a master key inserted.

The plug 1 is fitted to turn in the inner cylinder 2 which is rotatably fitted in the outer cylinder 3 that is rotatable in the barrel 4. In a space 5 in the outer cylinder is a loose segmental member 6. These members have a row of bores containing the required combinations of normal locking pins and wafers, which bores are aligned when a service key 7 or a master key 8 is inserted or removed. The plug has a flanged head 9 at its outer end, and on the inner end of the plug is a nut 10, between which and the plate 11 that retains the cylinders in the barrel, is the bolt throwing or latch releasing lug 12 which projects from and turns with the inner cylinder.

The plug has an integral longitudinally extending section 13, capable of limited movement in a space 14 in the inner cylinder, and a suitably fluted key slot 15. In addition to the bores 16 containing the normal locking pins 17 and wafers 18, the plug is shown with a transverse bore 19 containing a loose pin 20.

The inner cylinder besides having the row of bores 21 containing the normal locking pins 22, has on one side a bore 23 and diametrically opposite has a bore 24, which bores normally align with the bore 19 through the plug. In the bore 23 is a spring pressed pin 25, and in the bore 24 is a socket 26 for receiving the head of the pin 20. The pin 20 and pin 25 normally lock the plug and inner cylinder so they will rotate as one element. The inner cylinder also has a row of magazine bores 27 that extend angularly with respect to the bores 21, and in these bores 27 are a supply of wafers 28 so located that they will not obstruct the rotatory movement of the inner cylinder in the outer cylinder.

The outer cylinder in addition to the bores 29 containing the normal locking pins 30 and/or wafers 31 has at one side of the bores 29 and angularly related thereto, magazine bores 32 in which are spring pressed wafers 33. The bores 32 are normally out of line with the bores 27 in the inner cylinder, but under conditions here-

after set forth the bores 27 may be turned into line therewith. The outer cylinder also has on the other side of the bores 29 angularly related magazine bores 34 containing wafers 35.

5 The loose segmental member 6 in addition to the bores 36 containing the normal locking pins 37 and/or wafers 38 has arranged angularly thereto a hole 39 that normally is in line with the bore 24 in the inner cylinder and with the head of the transverse pin 20 in the plug 1. The member 6 also has angularly related and adjacent to the hole 39 a bore 40 containing a pin 41 which is pressed outwardly so that normally its head enters the bore 42 of the outer cylinder and locks these members together.

10 The barrel in addition to the bores 43 containing the inwardly pressed normal locking pins 44 has angularly related magazine bores 45 containing inwardly pressed wafers 46. In the side of the barrel, in the transverse plane of the pin 20, is a hole 47.

15 With the construction described when the correct service key 7 is inserted in the keyhole in the plug the locking pins and wafers assume such relations that there is a break between the inner cylinder and the outer cylinder and loose member, and as the plug and inner cylinder are locked by the transverse pin 20 and pin 25, turning the key turns the plug and the inner cylinder with the attached bolt or latch lug 12. Under this condition locking pins bridge the joints between the loose member and the outer cylinder, and the outer cylinder and barrel, so that these members remain stationary. Figs. 1, 3, 4.

20 When the right master key 8 is inserted the locking pins and wafers assume such relations that the plug is locked to the inner cylinder, the inner cylinder is locked to the loose member, and the loose member is locked to the outer cylinder, leaving a break at the joint between the outer cylinder and the barrel, so that all of the members will turn in the barrel for throwing the bolt or latch lug, when the key is turned. Figs. 2, 3, 5.

25 If it is desired to change the setting of the locking pins of the above described lock for a different master key, the original master key is inserted in the key slot and turned counter-clockwise until the bores 34 in the outer cylinder coincide with the bores 45 in the barrel. This movement brings the hole 42 in the outer cylinder and the pin 41 in the movable member 6 into line with the hole 47 in the barrel, Fig. 7. A pin, nail or other implement (not shown) is inserted into the holes 47 and 42 and the pin 41 pushed back so as to unlock the movable member 6 from the outer cylinder. With the member 6 unlocked from the outer cylinder, the key is turned further in the same direction until the bores 36 in the member 6 align with the bores 34 in the outer cylinder and with the bores 45 in the barrel, Fig. 8. With the parts in this relation the original master key is removed and the key to be substituted is inserted. As the new key is pushed in the wafers in the bores automatically adjust themselves to the contour of the new key, that is, wafers are pushed out of the bores 35 in the member 6 into the magazine bores 34 in the outer cylinder, and from the magazine bores into the bores 45 in the barrel by the higher parts of the new key according to their heights, and wafers are received into the magazine bores 34 from the bores 45 and in the bores 36 from the magazine bores, according to the depths of the lower parts of the new key contour, leaving the required break between the outer cylinder and

barrel which permits the new master key to operate the lock. The implement which was used to press in the pin 41 is removed and when the new key is turned to initial operating position the pin 41 will spring out and again lock the member 6 to the outer cylinder. This is accomplished without altering the setting of the pins and wafers for the service key.

5 In order to change the setting for a new service key the master key is inserted in the keyhole and turned counterclockwise until the hole 42 in the outer cylinder aligns with the hole 47 in the barrel, a pin, nail or other implement is inserted in these holes and the pin 41 pushed in to unlock the member 6 from the outer cylinder as above set forth. The key is then turned further until the bore 24 in the inner cylinder and the hole 39 in the member 6 are in line with the hole 42 in the outer cylinder and hole 47 in the barrel. The pin, nail or other implement is then inserted through these holes and the pin 20 pushed back so as to unlock the plug from the inner cylinder.

10 The master key is then removed and the old service key inserted and the plug turned clockwise until the bores 16 in the plug are in line with the bores 27 in the inner cylinder and the bores 32 in the outer cylinder. The old service key is removed and the service key to be substituted is inserted. When the parts are in this relation the wafers 28 in the bores 27 and the wafers 33 in the bores 32 automatically adjust themselves according to the contour of the new key, the higher parts of the key pushing the wafers out and the lower parts of the key allowing wafers to be pushed in. Fig. 9. The plug is then turned to normal position and the lock is in condition to be operated by the service key for which it is set. The elements may then be manipulated, as previously described, and set for the master key to be used.

15 The pins 30 in the bores 29 in the outer cylinder, and the pins 44 in the bores 43 in the barrel are shown as made in sections of varying lengths. This permits the provision of sub-master keys which have contours that will so position these pins that breaks will occur between the outer cylinder and the barrel. The sections of the pins are of such length that the sub-master keys may be fitted without affecting the setting of the pins and wafers for the master and service keys.

20 The modified construction of lock shown in Fig. 14 operates in the same manner as the construction above set forth. The difference being that the plug 51 is circular in cross section instead of having the integral longitudinally extending section 13 movable in the space 14 of the construction described, and consequently the inner cylinder 52 does not have such a space, and in the modified form instead of having the member 6 movable in a space 5 in the outer cylinder 3 it is made as a complete cylinder 53 and turns between the inner cylinder 52 and the outer cylinder 54.

25 By having a hole through the escutcheon and door, preferably from the inside, in line with the hole 47 in the barrel, a wire or other means may be thrust in and the pin 41 which locks the member 6 to the outer cylinder and the pin 20 which locks the plug to the inner cylinder manipulated as above described, and the setting of the pins and wafers for a new master key or new service key effected without removing a lock from the door.

The invention claimed is:—

1. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key and a service key, yielding means locking the plug and the inner cylinder together, yielding means locking the intermediate member and the outer cylinder together, means permitting said yielding means to be manipulated from the exterior for unlocking the intermediate member from the outer cylinder and the plug from the inner cylinder, said barrel and outer cylinder having auxiliary wafer containing bores positioned to be aligned by a turn of a master key, and the intermediate member adapted to be turned by said key to align its normal bores with the auxiliary bores of the barrel and outer cylinder when said member is unlocked from the outer cylinder, the outer cylinder also having auxiliary wafer containing bores and the inner cylinder having auxiliary wafer containing bores positioned to be aligned by the turn of the master key when the intermediate member is unlocked from the outer cylinder, said aligned bores of the inner and outer cylinders also being positioned to align with the normal locking pin bores of the plug by a turn of a service key when the plug is unlocked from the inner cylinder.

2. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key, yielding means locking the intermediate member and the outer cylinder together, means permitting said yielding means to be manipulated from the exterior for unlocking the intermediate member from the outer cylinder, said barrel and outer cylinder having auxiliary wafer containing bores positioned to be aligned by a turn of a master key, and the intermediate member adapted to be turned by said key to align its normal bores with the auxiliary bores of the barrel and outer cylinder when said member is unlocked from the outer cylinder.

3. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a service key, yielding means locking the plug and the inner cylinder together, and a bore extending radially of the barrel with which bore the bores containing said yielding means may be aligned to permit said yielding means to be manipulated from the exterior for unlocking the plug from the inner cylinder, the outer cylinder having auxiliary wafer containing bores and the inner cylinder having auxiliary wafer containing bores positioned to be aligned with the normal locking pin bores of the plug by a turn of a service key when the plug is unlocked from the inner cylinder.

4. A lock comprising a barrel, an outer cylinder

rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key and a service key, said barrel and outer cylinder having auxiliary wafer containing bores positioned to be aligned by a turn of a master key, and the intermediate member adapted to be turned by said key to align its normal bores with the auxiliary bores of the barrel and outer cylinder, the outer cylinder also having auxiliary wafer containing bores and the inner cylinder having auxiliary wafer containing bores positioned to be aligned by the turn of the master key, said aligned bores of the inner and outer cylinders also being positioned to align with the normal locking pin bores of the plug by a turn of a service key.

5. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key and a service key, yielding means locking the plug and the inner cylinder together, yielding means locking the intermediate member and the outer cylinder together, and a single bore extending radially of the barrel with which bore the bores containing either of said yielding means may be aligned to permit said yielding means to be manipulated from the exterior for unlocking the intermediate member from the outer cylinder and the plug from the inner cylinder.

6. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key, yielding means locking the intermediate member and the outer cylinder together, and a bore extending radially of the barrel with which bore the bores containing said yielding means may be aligned to permit said yielding means to be manipulated from the exterior for unlocking the intermediate member from the outer cylinder.

7. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a service key, yielding means locking the plug and the inner cylinder together, and a bore extending radially of the barrel with which bore the bores containing said yielding means may be aligned to permit said yielding means to be manipulated from the exterior for unlocking the plug from the inner cylinder.

8. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member mov-

able between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said barrel and outer cylinder having auxiliary bores containing wafers at one side of their normal bores, means locking the intermediate member and the outer cylinder together, means permitting said locking means to be manipulated for unlocking the intermediate member from the outer cylinder and allowing the rotatable elements to be turned by said key to align the normal bores of the plug, inner cylinder and intermediate member with said auxiliary bores of the barrel and outer cylinder.

9. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said outer cylinder and inner cylinder having auxiliary bores containing wafers at one side of their normal bores, a spring pressed pin locking the plug and the inner cylinder together, and a bore extending radially through the barrel with which bore said pin may be aligned to permit it to be manipulated for unlocking the plug from the inner cylinder and allowing the rotatable elements to be turned by said key to align the normal bores of the plug, with said auxiliary bores of the inner cylinder and outer cylinder.

10. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said barrel having auxiliary bores provided with wafers at one side of its normal bores, said outer cylinder having auxiliary bores provided with wafers at each side of its normal bores, said inner cylinder having auxiliary bores provided with wafers at one side of its normal bores, means locking the intermediate member and the outer cylinder together, means locking the plug to the inner cylinder, means permitting said locking means to be manipulated for unlocking the intermediate member from the outer cylinder and the plug from the inner cylinder, and permitting the rotatable elements to be turned by said key to align the normal bores of the plug, inner cylinder and intermediate member with said auxiliary bores of the barrel and outer cylinder, and align the normal bores of the plug with auxiliary bores of the inner cylinder and outer cylinder.

11. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with

locking pins and wafers sized to permit the lock to be operated by a master key and a service key, said barrel and outer cylinder having auxiliary wafer containing bores positioned to be aligned with the normal bores of the intermediate member, inner cylinder and plug, by a turn of a key, and said outer cylinder and inner cylinder having auxiliary wafer containing bores positioned to be aligned with the normal locking pin bores of the plug by a turn of a key.

12. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a master key and a service key, means normally locking the plug and the inner cylinder together and normally locking the intermediate member and the outer cylinder together, means permitting unlocking said locking means, said barrel and outer cylinder having auxiliary wafer containing bores positioned to be aligned by one turn of a master key, and said outer cylinder and inner cylinder having auxiliary bores positioned to be aligned by an opposite turn of said key.

13. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said barrel having auxiliary bores containing wafers at one side of its normal bores.

14. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said barrel having auxiliary bores provided with wafers at one side of its normal bores, and said outer cylinder having auxiliary bores provided with wafers each side of its normal bores.

15. A lock comprising a barrel, an outer cylinder rotatable in the barrel, an inner cylinder rotatable in the outer cylinder, a plug rotatable in the inner cylinder, an intermediate member movable between the inner cylinder and the outer cylinder, said elements having rows of bores that normally are in alignment and provided with locking pins and wafers sized to permit the lock to be operated by a key, said barrel having auxiliary bores provided with wafers at one side of its normal bores, said outer cylinder having auxiliary bores containing wafers at each side of its normal bores, and said inner cylinder having auxiliary bores provided with wafers at one side of its normal bores.

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