ESCAPEMENT TERMINOLOGY

1. **Function of an Pallet** is to change the rotary motion of the escape wheel into the vibrating motion of the balance wheel assembly.

2. **Sequence of Events** in an escapement during one vibration of the balance wheel assembly. Starting from a condition of total lock, the sequence is as follows:
    1. Jewel pin enters the fork slot.
    2. Escape wheel tooth unlocks.
    3. Impulse takes place.
    4. Drop.
    5. Lock.
    6. Slide.

3. **R or Receiving Stone** is that pallet stone which first receives or locks with a given escape tooth in an escapement action.

4. **L or Let-off Stone** is that pallet stone which last makes contact with the given escape tooth.

5. **Pallets** designate the assembly of R and L stones together with the metal arm which joins them.

6. **Pallet lever** is the metal rod that joins the pallet assembly with the pallet fork. The pallet lever is sometimes called the Shank.

7. **Fork** is that part located at the tail of the pallet lever. It consists of two horns and a slot. It is the sides of the fork slot which alternately receives the unlocking blow from the roller jewel and delivers the impulse to the roller.

8. **Horns** are projections on each side of the fork slot which provide safety action from the movement of let-off until the guard pin is along side of the rounded portion of the safety roller.

9. **Jewel Pin.** Also called roller jewel. It is vertically supported by the impulse roller. The jewel pin is the connecting link between the pallet and balance wheel and its purpose is to deliver the unlocking blow and to receive the impulse.

10. **Impulse Roller** is a flat circular disk to which the roller jewel is attached.

11. **Safety Roller** is also a flat circular disk. A portion of it is cut out which is called the crescent. The safety roller together with the guard pin provides additional safety action.

12. **Single Roller** is a roller which consists of a single metal disk serving both as the safety and impulse roller.

13. **Double Roller** is a roller consisting of two metal disks. The upper and larger disk supports the roller jewel and is called the impulse roller. The lower and smaller disk contains the crescent and is called the safety roller.

14. **Crescent** is the notch in the safety roller which permits the guard pin to pass freely across the line of centers.

15. **Guard Pin.** The function of the guard pin is to prevent the escapement from unlocking when the watch receives a jar. It is a small brass pin located below the fork. Because of the safety action that it provides the pallet fork will be on the correct side of the line of centers ready to receive the jewel pin on its return trip.

16. **Guard Pin Shake.** This check is made when the jewel pin is turned completely away from the fork. This shake is the freedom of movement existing between the banking pin and the safety roller. The pallet shank stops on the banking pin and the guard pin stops on the safety roller.

17. **Line of Centers.** This is the imaginary straight line that joins the balance staff, pallet arbor, and escape wheel staff. It is conveniently used as a basic reference line in escapement adjusting.

18. **Toe** of an escape wheel tooth is that part that engages the pallet stone when the escapement is locked.

19. **Heel** of an escape wheel tooth is the corner of the tooth that last makes contact with a pallet stone.

20. **Impulse Face** of an escape wheel tooth is that part between the toe and the heel.

21. **Locking Face** of a pallet stone is that part which engages with an escape wheel tooth when the escapement is locked.

22. **Locking corner** of a pallet stone is that corner separating the locking face and the impulse face of a pallet stone.

23. **Let Off Corner** of a pallet stone is that part which last makes contact with an escape wheel tooth in an escapement action.

24. **Impulse Face** of a pallet stone is the inclined plane between the locking and let-off corner. When an escape wheel tooth sweeps across this face it delivers an impulse that throws the pallet lever to the opposite side of the line of centers. Because of these impulse faces the rotary motion of the escape wheel is changed into the vibrating motion of the balance wheel assembly.

25. **Impulse.** The impulse begins right after tooth and stone are unlocked. As the tooth sweeps across the impulse face of the stone, the entire pallet turns about its arbor. This causes a side of the fork to strike the jewel pin thus providing it with the force that causes the balance wheel assembly to vibrate.

26. **Banking Pins** limit the amount of angular swing of the pallet lever from each side of the line of centers.

27. **Draw.** Sometimes called draft. It is a force exerted by an escape wheel tooth against the locking face of a pallet stone together with the draft angle of the stone. This draws or pulls the pallet lever against the banking pins and holds it there.

28. **Slide.** Slide is caused by the draw. It is the distance a pallet stone travels downward on an escape wheel tooth immediately after lock occurs. Sliding stops when the pallet lever comes up against a banking pin.

29. **Drop** is the free motion of the escape wheel from let-off to lock. Or it may be spoken of as the distance from the let off corner of a pallet stone to the heel of the tooth that has just let off.

30. **Close Outside.** Always refers to the L stone. This condition exists when the distance between the L stone and the heel of the escape tooth just let off is too small to permit the R stone to unlock.

31. **Close Inside.** Always refers to the R stone. This condition exists when the distance between the R stone and the heel of the escape tooth just let off is too small to permit the L stone to unlock.

32. **Jewel Pin Freedom.** The difference between the diameter of the jewel pin and the width of the fork slot.

33. **Lock.** This is the amount of overlap that exists between tooth and stone right after drop. Sometimes referred to as drop lock or lock at the instant of drop.

34. **Total Lock.** This lock consists of the lock at the instant of drop plus slide.

35. **Jewel Pin Shake.** The escapement is checked for jewel pin shake at the exact instant of drop. It is the amount of angular movement of the pallet lever permitted at this point. Jewel pin shake is used to determine if the swing of the pallet from the line of centers up to the bank to the drop point is the same on both sides or not.

36. **Jewel Pin Clearance.** The jewel pin must be permitted to pass freely toward and away from the fork slot. Without some distance (clearance) between the jewel pin and the fork horn the watch would stop. If the jewel pin clearance is too much, due to a short fork condition, premature unlocking would result.

37. **Long Fork.** This condition exists when the jewel pin cannot pass out of the fork slot when the escapement is banked to the drop. Caused by the jewel pin being tilted away from the balance staff or by the pallet shank being too long.

38. **Short Fork.** If the jewel pin shake is so great as to allow the pallet stone to unlock when the escapement is banked to a drop then the condition of short fork is present. Caused by a short shank or by the jewel pin being tilted toward the balance staff.

39. **Banking to a Drop.**
    1. Fixed pins. By manually moving the pallet lever with or without the aid of the balance wheel until an escape wheel tooth just lets off a pallet stone - we bank to a drop.
    2. Movable pins. An escapement may also be banked to the drop by first turning the pins in toward the line of centers then away again until an escape wheel tooth can just let off a pallet stone.
    It is when the escapement is banked to the drop that we examine for lock and jewel pin shake.

40. **Overbanked.** This fault is due to a short or a bent guard pin or possibly a low fork. Under this condition a tooth will unlock from a stone prematurely and depending on the amount of the error the pallet lever may move over to the opposite banking pin relative to the return of the jewel pin. Can also be caused by a short roller jewel or excessive end shake in either the balance staff or pallet arbor.

41. **Banking** because of too strong a mainspring, the balance wheel develops too much motion which causes the jewel pin to hit on the back of the fork horns. This is also called knocking, racing and rebanking.

42. **Train Reversal.** There is a slight train reversal which occurs during the unlocking stage.

43. **Two basic classifications of the escapement.**
    1. Frictional
        a. Cylindrical
        b. Duplex
    2. Detached
        a. Lever
            1. Circular
            2. Equidistant
            3. Semitangental
        b. Chronometer

44. **Circular pallet escapement.** In this type of escapement the center of the impulse face of each pallet stone is at an equal distance from the pallet arbor.

45. **Equidistant escapement.** In this type of escapement the locking corner of each pallet stone is the same distance from the pallet arbor.

Effects Of Moving Pallet Stones
(Assuming a perfectly adjusted escapement)

1. **Pull R Only**

R Lock increases	R JPS remains the same	R slide same
L Lock increases	L JPS increases	L slide decreases

2. **Push R Only**

R Lock decreases	R JPS remains the same	R slide remains the same
L Lock decreases	L JPS decreases	L slide increases

3. **Pull L Only**

R Lock increases	R JPS increases	R slide decreases
L Lock increases	L JPS remains the same	L slide remains the same

4. **Push L Only**

R Lock decreases	R JPS decreases	R slide increases
L Lock decreases	L JPS remains the same	L slide remains the same

5. **Pull Both Stones Same Amount**

R Lock increases	R JPS increases	R slide decreases
L Lock increases	L JPS increases	L slide decreases

6. **Push Both Stones Same Amount**

R Lock decreases	R JPS decreases	R slide increases
L Lock decreases	L JPS decreases	L slide increases

7. **Pull R and Push L Same Amount**

R Lock stays same	R JPS decreases	R slide increases
L Lock stays same	L JPS increases	L slide decreases

8. **Push R and Pul L Same Amount**

R Lock stays same	R JPS increases	R slide decreases
L Lock stays same	L JPS decreases	L slide increases

TYPES OF PALLET STONE ERRORS AND THEIR SOLUTION

Object: To obtain a satisfactory lock and equal jewel pin shakes

1. If the locks are light and the jewel pin shakes are unequal?
   Solution: Pull the stone opposite the lesser jewel pin shake.

2. If the locks are heavy and the jewel pin shakes are unequal?
   Solution: Push the stone opposite the greater jewel pin shake.

3. If the locks are light and the jewel pin shakes are equal?
   Solution: Pull both stones the same amount.

4. If the locks are heavy and the jewel pin shakes are equal?
   Solution: Push both stones the same amount.

5. If the locks are satisfactory and the jewel pin shakes are unequal?
   Solution: Pull the stone opposite the lesser jewel pin shake, and push the stone opposite the greater jewel pin shake by the same amount.