

Sept. 26, 1933.

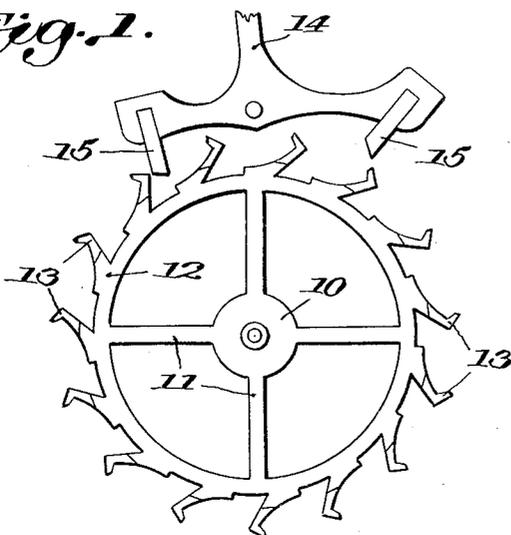
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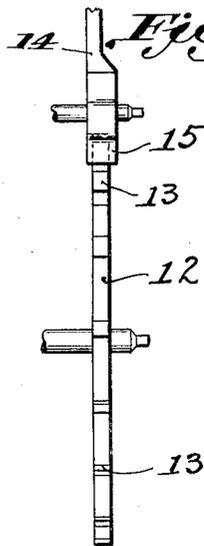
ESCAPE WHEEL

Filed Dec. 27, 1929

*Fig. 1.*



*Fig. 2.*

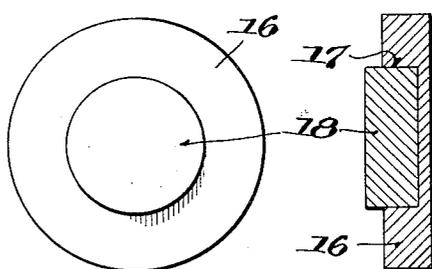
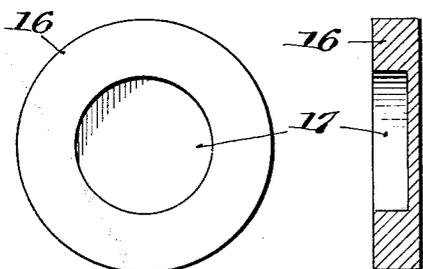


*Fig. 3.*

*Fig. 4.*

*Fig. 5.*

*Fig. 6.*

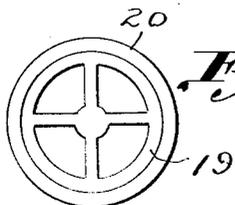
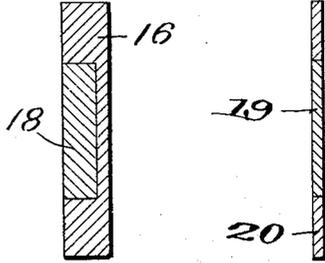
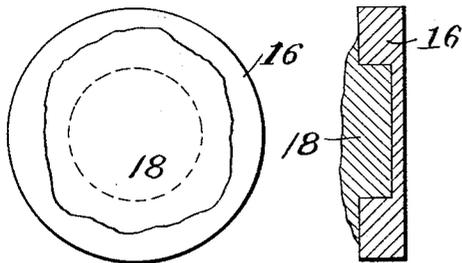


*Fig. 7.*

*Fig. 8.*

*Fig. 9.*

*Fig. 10.*



*Fig. 11.*

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# UNITED STATES PATENT OFFICE

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## ESCAPE WHEEL

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Application December 27, 1929  
Serial No. 416,953

5 Claims. (Cl. 58—116)

As is well-known, a watch mechanism, or movement, containing parts of magnetic material, or which are sensitive to magnetism, or a magnetic field to which the movement is exposed, may have its accuracy impaired, or indeed under some conditions, its running may be stopped. Magnetic influences are especially hurtful in the case of the escape wheel, for in a strong magnetic field it may be stopped, or held from running, and even after removal from the magnetic field, the permanent magnetism retained by the wheel may cause a variation in the rate of the watch. Steel escape wheels are used in all high grade watches and, of course, it is of especial importance in high grade watches to eliminate or prevent any disturbing factors in the running of the watch. Steel is desirable because of its ability to withstand wear of the escape wheel teeth under the impact and friction of the pallet. The problem presented therefore is the provision of an escape wheel which will be free from magnetic influences that would impair the accurate or proper running of the watch, and which will be able to withstand wear from the action of the pallet thereon. Brass is a non-magnetic material, but it is not hard enough to resist wear so that while its use for an escape wheel would eliminate the effect of magnetic influences, it would fail for want of wear resisting properties. Of course important considerations to be taken into account in the solution of the problem are matters which affect manufacturing such as commercial feasibility from the manufacturer's standpoint and the relation of an escape wheel constructed to eliminate or withstand magnetic influences and resist wear to other parts or members of the movement, and which for example, involve thermal or temperature effects on the watch parts. An escape wheel might be produced which would remove magnetism as a disturbing cause, and which would take care of the question of wear, but might be a failure from the commercial and other considerations just mentioned. I have had all these considerations in mind in producing my invention, and by my invention I have produced an escape wheel which meets all of the conditions involved.

My invention consists of the escape wheel and a method of making the same having the characteristics defined by or included within the terms or scope of the appended claims.

In what I now consider the best embodiment of my invention, and which I will use in exemplification of an embodiment of my invention, I construct the escape wheel so that it has a main or

body part of wheel-form, that is to say, a hub, spokes and rim or circumference, of a non-magnetic material, such as brass, and teeth of steel. I have found that by making the teeth or those portions (which I shall term for convenience "tips") with which the pallet stones have contact, of steel, that the quantity of the steel is so small as to render the effects of magnetism negligible. Besides the elimination of magnetism as a disturbing influence, an escape wheel so constructed has or may have its change under thermal changes similar or substantially similar to that of the metal plates in which the escapement is mounted, and thus avoid or prevent any change of depth of the pallets in the escape wheel teeth. With the escape wheel and the movement plates supporting the escapement made of steel, and brass or German silver, respectively, the different coefficients of expansion of the different metals should result in change in depth of the pallets on the teeth. Such an escape wheel may be easily and, therefore, cheaply manufactured. A satisfactory method of manufacture is the production of a composite disc-form blank of brass and steel brazed together which by subtraction to certain operations is converted into an escape wheel having body and teeth tips with the characteristics above set forth.

In the drawing:—

Fig. 1 is a plan view of an escape wheel made in accordance with my invention, shown in operative relation to the pallet;

Fig. 2 is an edge view thereof;

Figs. 3 and 4 are, respectively, a top plan view and a cross section of the steel member used in forming the blank from which the final wheel is made;

Figs. 5 and 6 are similar views showing the assembled brass and steel members previous to brazing;

Figs. 7 and 8 are view similar to Figs. 5 and 6 showing the stage after brazing;

Fig. 9 is a cross section showing the composite blank after the removal of the surplus brass following the brazing operation;

Fig. 10 is a cross section of the disc-form blank reduced to the thickness of the finished escape wheel and consisting of a central disc of brass and a rim of steel;

Fig. 11 is a top plan view of the blank as shown in Fig. 10 after the punching operation for forming the hub, spokes and rim of the wheel.

Describing first what is shown in Figs. 1 and 2, the escape wheel is of accepted form and comprises the main or body wheel part which consists

of a hub, 10, spokes, 11, a circumference or rim, 12, all of brass, and teeth portions or tips, 13, of steel. The teeth, 13, as I have already explained, are joined to the wheel body by brazing, so that they are as much a part of the wheel as if homogeneously integral therewith. The pallet, 14, is of customary construction and includes teeth-engaging jewels, 15.

Describing now by reference to Figs. 3 to 11, a method for producing my escape wheel, I provide a disc, 16, of steel with a central circular cavity, 17, in one side in which I place a solid disc, 18, of brass of a diameter corresponding to the external diameter of the finished wheel rim, 12. The brass disc, 18, is thicker than the depth of the circular recess, 17, in the steel cup so that as shown in Fig. 6, it projects slightly above the adjacent surface of the cup. A suitable brazing flux is applied to the brass and steel assembled members and by means of a furnace which subjects the brass to a melting temperature, the brass and steel are brazed together in a solid, permanent union, the product of this treatment being illustrated in Figs. 7 and 8. The excess brass appearing in Figs. 7 and 8 is then removed by a facing operation and if desired, to enable hardness measurement to be made. The next step is to face the composite blank on the reverse side to remove the bottom of the steel cup and to produce the blank shown in Fig. 10 which consists of the central disc, 19, of brass and the annular rim, 20, of the proper thickness for the finished wheel. In this stage, or previously, if desired, the steel can be hardened and drawn to the proper temperature required for the final or finished escape wheel teeth. Next, as shown in Fig. 11, by punching the disc shown in Fig. 10, the hub or center, spokes and rim of the brass disc, 19, are formed and to give the external diameter to the steel rim, 20, proper for the teeth. The blank in the stage shown in Fig. 11, can be

placed in the standard machines for cutting escape wheels and the teeth cut and polished in the standard or usual manner, so that the final operations require no new or unusual machines, but may be performed by the standard or customary machines.

Should it be desirable to temper the material from which the body part of the escape wheel is made, this can be done by hammering or swaging the spokes, center and rim after the punching operation and the product of that treatment then shaved to the proper size.

It is possible in producing an escape wheel in accordance with my invention to have teeth of such hardness or wear resisting properties as to enable steel pallet stones to be used instead of jewels.

What I claim is:—

1. An escape wheel having a main or body portion of non-magnetic material and teeth of different, harder and wear-resisting material.

2. An escape wheel having a main or body portion of non-magnetic material and teeth of different, harder and wear-resisting material, the body and teeth being brazed together.

3. An escape wheel having a main or body portion of non-magnetic material and teeth portions of different, harder and wear-resisting material, the teeth being of steel.

4. An escape wheel having a main or body portion of non-magnetic material and teeth portions of different, harder and wear-resisting material, the body being of brass and the teeth of steel.

5. An escape wheel having a main or body portion of non-magnetic material and teeth of different, harder and wear-resisting material associated with movement plates, the body portion having a coefficient of expansion the same or substantially the same as the movement plates.

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