E. G. AFFLECK.

FIRING TIMING DEVICE.

APPLICATION FILED MAY 31, 1910.

977,254. Patented Nov. 29, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

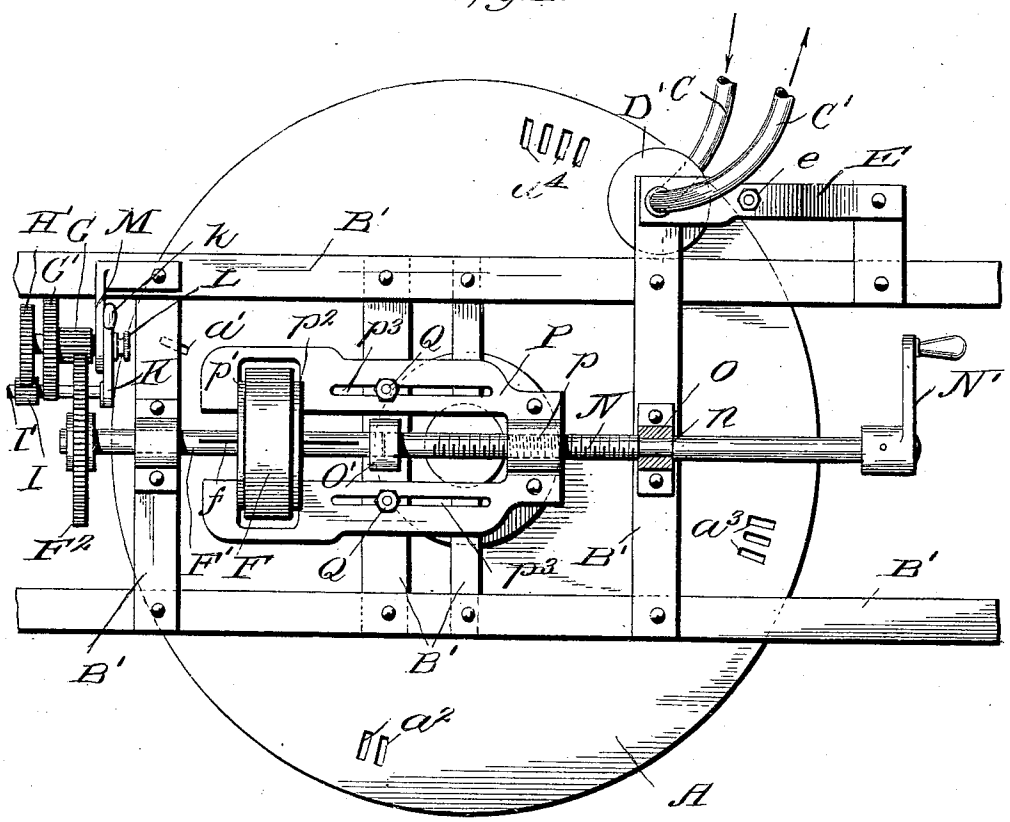
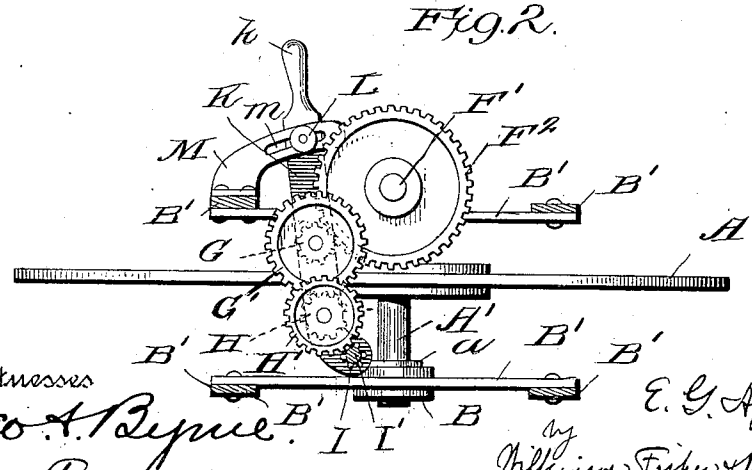


Fig. 2.



Witnesses

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2 SHEETS—SHEET 3.

Fig. 3.

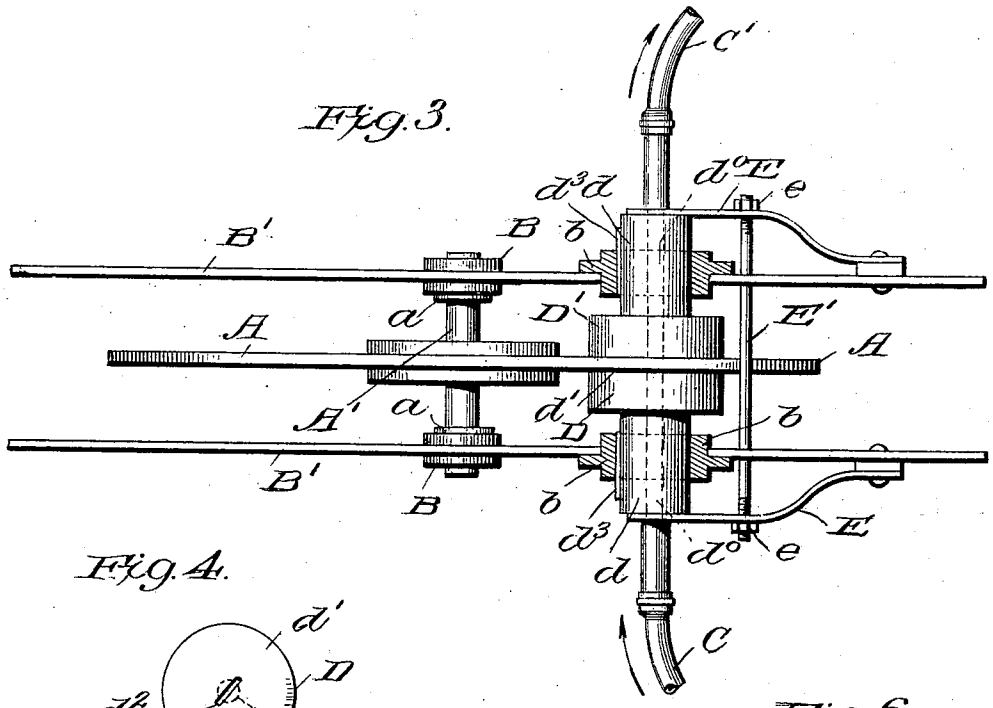


Fig. 4.

Fig. 5.

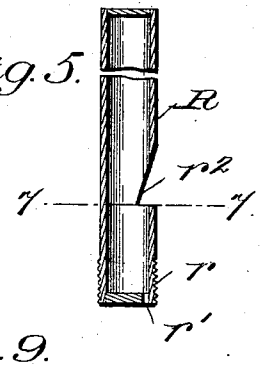


Fig. 6.

Fig. 8.

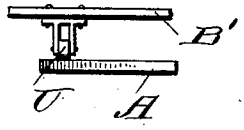
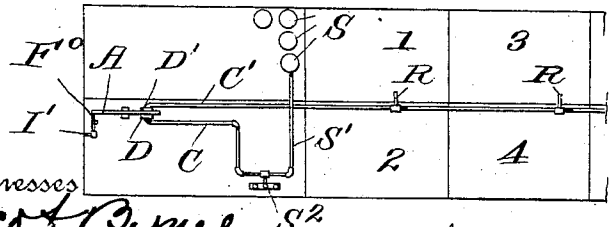


Fig. 7.

Fig. 9.



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UNITED STATES PATENT OFFICE.

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FIRING TIMING DEVICE.

977,254. Specification of Letters Patent. **Patented Nov. 29, 1910.**

Application filed May 31, 1910. Serial No. 564,317.

To all whom it may concern:

Be it known that I, EDWARD G. AFFLECK, a citizen of the United States, stationed on the United States steamship *Kansas*, Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Firing Timing Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to apparatus for automatically making a series of signals, which apparatus is actuated by a rotating part, such as a crank shaft, a propeller shaft, or any other part driven by the main engine or engines, and in which the rapidity with which the signals are produced depends upon the velocity of rotation of said shaft, and furthermore in which the relative frequency of the signals with regard to the rotation of said shaft may be varied at will.

My invention is specially intended for use in connection with the fire room or stoke-hole of steam ships, to signal the times at which additional fuel should be placed in the respective furnaces; in other words, to provide a firing timing device actuated by the revolution of the main engines.

To insure regular and steady firing of the several furnaces of one or more boilers, in marine work, there must be some signal from the engine room, some automatic "firing timing device". This signal must be in the engine room so that any changes in the speed of the engine, known only in the engine room, may cause a diminution or increase, as the case may be, of the rate of firing, and, consequently, in the amount of steam provided at the engine. Most of the signals at present in use consist of a complicated electrical device, operated by clockwork mechanism, showing a light in the fire-room on a numbered indicator, showing the several numbers of the furnaces. Now, this system is independent of the engines, and every time that there is a change of speed, on the engines, the rate of revolution of the revolving clockwork mechanism has to be changed by hand, otherwise there will be either over- or under-production of steam as long as the speed is altered. Besides, the showing of lights in the fire-room is not an entirely satisfactory method, as the lights are not apt to call attention as quickly as a sound signal. These difficulties are obviated by the form of firing timing device hereinafter described.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is an elevation of the rotary disk and the parts for driving and adjusting the same. Fig. 2 is an end view as seen from the left of Fig. 1, parts being omitted. Fig. 3 is a view as seen from the top of Fig. 1 and looking down, parts being omitted and parts being broken away, which view shows the air connections. Fig. 4 is a front view of one of the air valves. Fig. 5 shows a section through one of the whistles. Fig. 6 is an end view of the whistle. Fig. 7 is a section through the whistle, along the line 7—7, and looking down. Fig. 8 shows a modification for steadying the disk while rotating, and Fig. 9 is a diagram illustrating the operation of the entire apparatus.

A represents a disk mounted upon the shaft A′, journaled in bearings B in the frame B′, which frame is attached to the bulk-head, not shown, or to any convenient portion of the structure of the ship. This disk A is held against lateral play in its bearings by set collars *a*, shown in Fig. 3, or by a series of rollers such as U, shown in Fig. 8, or in any other convenient way. This disk A is provided with a series of radial slots arranged in groups symmetrically disposed near the periphery of the disk. I have shown four such groups, one, *a*′, consisting of a single slot; another, a^2, consisting of two slots; still another, a^3, consisting of three slots; and still another, a^4, consisting of four slots. These groups are intended to give four separate signals to the several fire-rooms, but the number of groups may be increased or decreased at will. For convenience of description, we will assume that there are four fire-rooms to be kept informed as to the proper times for firing.

C represents a pipe for carrying compressed air to these radial slots, and C′ shows a pipe for carrying the compressed air, after passing through these slots, to the series of whistles R, as shown in Figs. 3 and 9.

Connected to the pipes C and C′, respectively, are cups or nozzles D and D′, each

having a reduced portion d, splined as at d^3 in the bearing block b. Passing through each cup, is an air passage d^0, terminating in the ports d^2, of similar shape as the slots in the disk A and arranged to lie in a radial direction relative to the disk A. The front face d' of each of the cups D and D′ is pressed against the disk A by means of springs E drawn toward each other by the bolt E′ and the nuts e. By means of these nuts, the pressure on the springs may be adjusted so as to hold the cups' faces close against the disk A and prevent the escape of air between the faces of the cups and the face of the disk. F is a friction roller, splined as at f on the shaft F′, carrying the gear F^2, meshing in the pinion G fast on the same shaft with the gear G′, which gear meshes with the pinion H, fast on the same shaft with the gear H′. This gear H′ meshes with the pinion I, fast on the shaft I′, which shaft I′ is driven by gearing, not shown, connected to any part driven by the main engine or engines, such, for instance, as the main crank shaft, or the propeller shaft, or the like. Thus it will be noted that the main engine or engines drives the disk A, but at a greatly reduced angular velocity. In order to throw the driving gear for the friction roller F into and out of engagement, I provide the arrangement shown in Fig. 2, in which the shafts of the pinions G and H and the gears G′ and H′ are attached to the arm K, which arm is pivoted concentric with the shaft I′ and is provided with a handle k and a clamp screw L, engaging in the curved slot m in the bar M. By swinging this arm toward or away from the gear F^2, the driving gear for the friction roller F may be thrown into and out of engagement, and the said arm may be clamped in the desired position by means of the clamp screw L.

When the driving gear for the friction roller F is in engagement, it will be noted that this roller will be driven at a speed proportional to that of the main engine or engines, as will also the disk A.

In order to provide means for varying the speed of the disk relative to that of the engine, I provide suitable means for moving the friction roller toward and away from the axis of the disk, such, for instance, as the sliding plate P, having jaws p' and p^2 to engage opposite sides of the friction roller F, which plate is provided with a nut p, engaging with the screw-threads on the shaft N, which shaft is reduced as at n to be held against longitudinal motion by the bearing O, and is provided with a hand crank N′. The plate P is slotted as at p^3 to receive the guide bolts Q, fast to the framework B′. The end of this shaft N may be conveniently journaled in the same bearing O′ as the end of the shaft F′. It will be seen that by turning the hand crank N′ in one direction or the other, the plate P will be moved to the right or left, as the case may be, across the axis of the disk, and that the friction roller F will be moved axially along the splined shaft F′. It will be obvious that when the friction roller is moved toward the axis of the disk, the angular velocity of the disk will be increased, while when it is moved away from the axis of the disk, the angular velocity of the disk will be decreased.

Referring now to Fig. 9, R, R are whistles, shown in detail in Figs. 5 to 7, where r shows a screw-thread on the whistle for screwing the same into a union on the pipe C′. r' indicates the air inlet into the whistle, and r^2 indicates the usual whistle opening. S, Fig. 9, shows the air compressors, of any suitable type, connected by the pipe S′ to the accumulator S^2, which supplies air at any suitable pressure, such as 10 or 12 pounds per square inch, to the air supply pipe C and the valve D. From the valve D, the air passes through the disk A to the valve D′, and thence to the pipe C′ and whistles R. These whistles are arranged to blow in the fire-rooms indicated by 1, 2, 3, and 4, see Fig. 9. Instead of the compressors S and the accumulator S^2, any suitable source of compressed air may be used. In the diagram shown in Fig. 9, F^0 indicates diagrammatically the gearing for driving the disk A from the shaft I′.

The operation of the entire apparatus is as follows:—Suppose the driving gear from the shaft I′ to the friction roller F be in engagement, the air pressure to be turned on, and the main engine or engines of the ship to be running, the rotation of the friction roller F will cause the disk A to turn slowly, and the air connection between the pipes C and C′ will be cut off, except when one of the slots in the disk passes the corresponding slot in the face of the valves D and D′. At this time, owing to the shape of the slots, there will be a quick opening and a rapid flow of air through the air pipes C and C′ to the various whistles, and the whistles will be blown once for each slot in the group. Thus, for the group a', there will be only one blast; for the group a^2 there will be two blasts in quick succession; for the group a^3 there will be three blasts in quick succession, and so on. The firemen will understand when there is one blast on the whistles that furnace number 1 is to be fired, that two blasts mean to fire furnace number 2, that three blasts mean to fire furnace number 3, that four blasts mean to fire furnace number 4, and so on.

When the engine-room attendant sees that the steam is running down, he will know that the furnaces need more fuel, and by turning the hand crank N′ to move the friction roller in toward the axis of the disk A

he will cause the disk to rotate more rapidly and consequently will cause the interval between the firing signals to be made shorter. Similarly, where the pressure of steam is going up, he should move the friction roller F away from the axis of the disk, causing the disk to rotate more slowly and increasing the firing interval. This simple adjustment by hand of the speed of the disk A is specially desirable when changing from one grade of fuel to another, or when passing from warm to cold currents in the ocean, where the effect of the condensers on the low pressure engines is varied. It is also important to change the speed of the disk, and thus provide for varying the steam supply, if the engineer is advised in advance that the speed of the ship is to be increased or decreased for any length of time, and consequently whether more or less steam is to be required.

It will be noted that the device takes its motion from the main engines and is therefore sensitive to any and every change of speed thereof. It is positively driven, mechanical throughout, simply constructed, is not likely to get out of order, and needs practically no care in cleaning or preservation. It gives audible signals in the fire-room or other place or places desired, it is capable of adjustment for varying qualities of coal, change of draft, change of temperature of sea water supplied to condensers, or in anticipation of a material change of speed of engines, and this adjustment may be made instantaneously with great accuracy and with very little trouble.

It will be obvious that any suitable reducing gear may be provided between the shaft I′, driven by the main engines, and the shaft F′, carrying the friction roller F. It will also be evident that other signals than whistles, audible, or otherwise, may be controlled by the disk or rotary member. It will also be obvious that various modifications might be made in the construction and in the combinations and arrangement of parts without departing from the spirit of my invention.

I claim as my invention:

1. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, and means operated by the said engine or engines for driving said disk, substantially as described.

2. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, means operated by the said engine or engines for driving said disk, and independent means for varying the speed of rotation of said disk, substantially as described.

3. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, a friction roller engaging said disk, and means operated by the said engine for driving said friction roller at a reduced speed, substantially as described.

4. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, a friction roller engaging said disk, means operated by the said engine for driving said friction roller at a reduced speed, and hand operated means for moving said friction roller toward or away from the axis of said disk, substantially as described.

5. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of radial slots, a source of compressed air, and an air pipe provided with ports registering with said slots, whistles connected to said pipe, and means operated by the said engine or engines for driving said disk, substantially as described.

6. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of radial slots, a source of compressed air, and an air pipe provided with ports registering with said slots, whistles connected to said pipe, means operated by the said engine or engines for driving said disk, and hand operated means for varying the speed of rotation of said disk, substantially as described.

7. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of radial slots, a source of compressed air, and an air pipe provided with ports registering with said slots, whistles connected to said pipe, a friction roller engaging said disk, and means operated by the said engine for driving said friction roller at a reduced speed, substantially as described.

8. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of radial slots, a source of compressed air, and an air pipe provided with ports registering with said slots, whistles connected to said pipe, a friction roller engaging said disk, and means operated by the said engine for driving said friction roller at a reduced speed, with hand operated means for moving said friction roller toward or away from the axis of said disk, substantially as described.

9. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, gearing operated by the said engine or engines for driving said disk, and means for throwing said gearing into or out of engagement, as desired, substantially as described.

10. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, gearing operated by the said engine or engines for driving said disk, means for throwing said gearing into or out of engagement, as desired, and independent means for varying the speed of rotation of said disk, substantially as described.

11. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups of perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals connected to said pipe, a friction roller engaging said disk, gearing operated by the said engine for driving said friction roller at a reduced speed, and means for throwing said gearing into or out of engagement, as desired, substantially as described.

12. A firing timing device for steam engine furnaces, comprising a disk provided with a series of groups or perforations, a source of compressed air, and an air pipe provided with ports registering with said perforations, sound signals operated by said pipe, a friction roller engaging said disk, gearing operated by the said engine for driving said friction roller at a reduced speed, means for throwing said gearing into or out of engagement, as desired, and hand operated means for moving said friction roller toward or away from the axis of said disk, substantially as described.

13. In a firing timing device for steam engine furnaces, the combination with a rotary member, means for rotating same at a predetermined angular velocity relative to the speed of the said engine or engines, means for varying said relative angular velocity at will, and a series of audible signals controlled by said rotary member, substantially as described.

14. In a firing timing device for steam engine furnaces, the combination with a rotary member, means for rotating same at a predetermined angular velocity relative to the speed of the said engine or engines, means for varying said relative angular velocity at will, and a series of signals controlled by said rotary member, substantially as described.

15. In a firing timing device for steam engine furnaces, the combination with a rotary member, means for rotating same at a predetermined angular velocity relative to the speed of the said engine or engines, means for varying said relative angular velocity at will, and a series of whistles controlled by said rotary member, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

EDWARD G. AFFLECK.

Witnesses:
HARRY M. MCBURNEY,
J. L. BARNSERELL.