(No Model.) 2 Sheets—Sheet 1.

E. C. DICEY.

STEAM ENGINE VALVE.

No. 594,730. Patented Nov. 30, 1897.

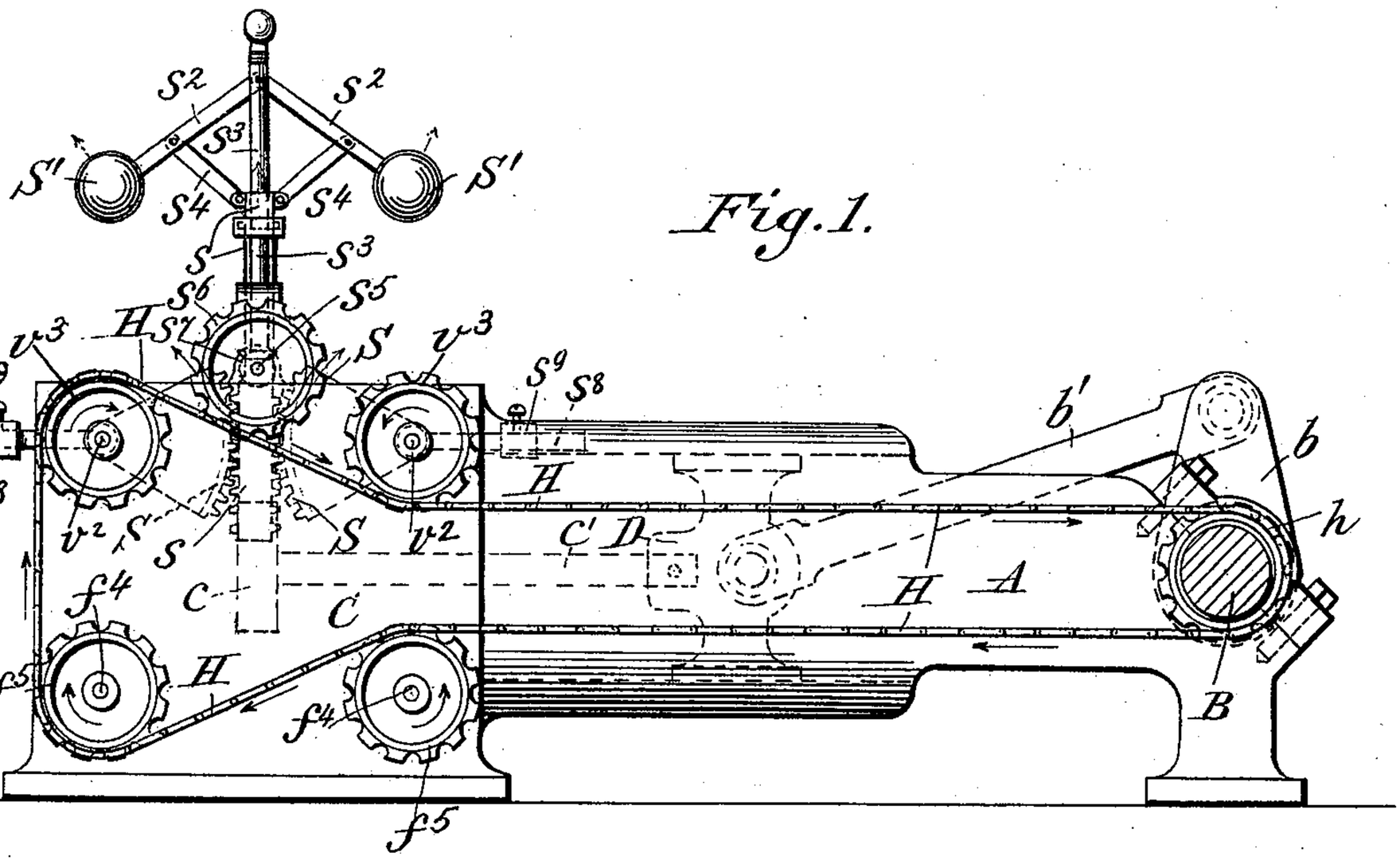
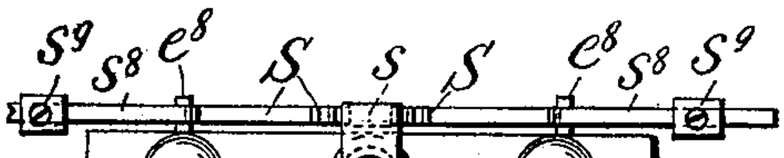


Fig. 1.



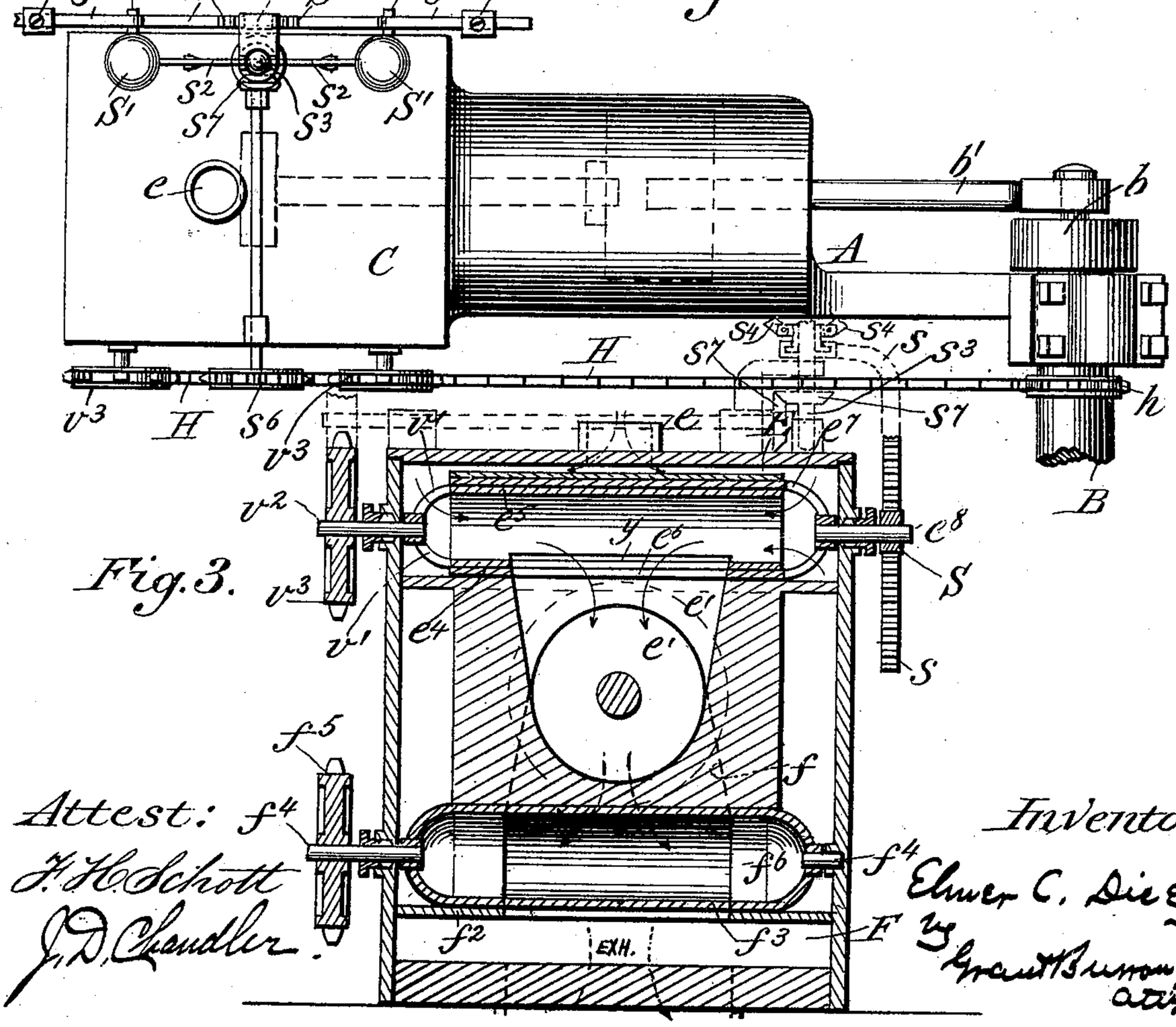


Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

E. C. DICEY.

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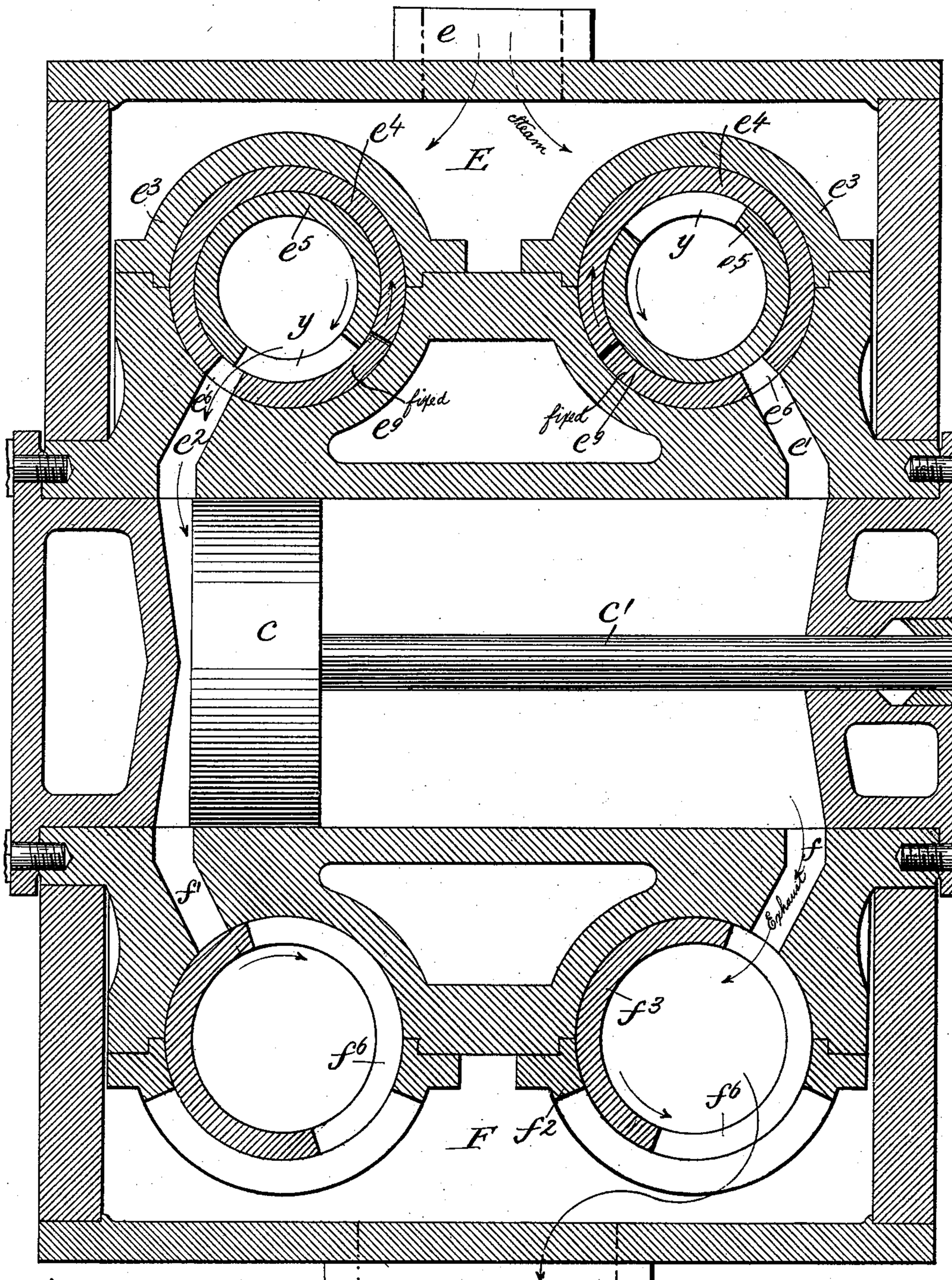

FIG. 4.

WITNESSES:
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INVENTOR:
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UNITED STATES PATENT OFFICE.

ELMER C. DICEY, OF CHICAGO, ILLINOIS.

STEAM-ENGINE VALVE.

SPECIFICATION forming part of Letters Patent No. 594,730, dated November 30, 1897.

Application filed March 7, 1894. Renewed August 22, 1896. Serial No. 603,647. (No model.)

To all whom it may concern:

Be it known that I, ELMER C. DICEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engine Valves, of which the following is a full, clear, and exact description, such as will enable those skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to improvements in steam-engines, especially to that class which are adapted to be run with a high pressure of steam.

It more particularly relates to the valves and regulators which control and regulate the induction and eduction ports leading to and from the cylinder; and it has for its object, primarily, the provision of such a valve and regulator which will not be affected in their respective operations by the comparatively high pressure of steam.

It consists of a cylindrical valve which is continuously rotated in one direction to supply steam to the cylinder at the proper intervals and also of a cylindrical regulator which will govern the amount of steam supplied to the cylinder, so that a steady and even movement of the piston can be obtained.

It also consists of a mechanism whereby the operation of the regulator can be controlled, so that it will operate with more or less sensitiveness, as may be desired, and of mechanism whereby the valves proper can be continuously rotated in opposite directions and also whereby the regulator can be partly rotated to lessen or increase the supply of steam, as the work of the engine may require.

The invention further consists in the novel construction, combination, and arrangement of parts, such as will be hereinafter more fully described, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the accompanying drawings, in which similar letters of reference designate corresponding parts, Figure 1 is a side elevation of an engine embodying the invention. Fig. 2 is a plan view of the same. Fig. 3 is a transverse vertical section through the cylinder, steam-chests, and the valves controlling the induction and eduction ports. Fig. 4 is a longitudinal vertical section through the same.

Referring to the drawings by letter, A designates the engine-frame, in one end of which is journaled the main driving-shaft B. In the opposite end is mounted the cylinder C. A cross-head D moves in suitable guides carried by the frame and is connected on one side with the piston c by the rod c' and on the other side with the crank-arm b of the main shaft by the rod b'. These several parts may be of any construction suitable in the premises.

Above and below the cylinder C are mounted the steam-chests E and F, respectively. One of these chests E is connected with a steam-generator by the pipe e and connects with the opposite ends of the cylinder C by means of the ports e' e^2, respectively. These ports are controlled by valves which allow the passage of steam into the cylinder at the proper intervals. They are also provided with regulators which automatically operate to govern the supply of steam passing through the same.

In the steam-chests bearings e^3 e^3 are formed, in each of which two cylinders e^4 e^5, one inside of the other, are journaled. The bearings are so formed and situated relatively to the ports that the openings of the latter will be covered by the cylinders journaled in the said bearings. These cylinders e^4 and e^5 form the regulator and valve governing and controlling each port, and as the construction of the mechanism connected with both induction-ports is the same only one will be described in detail.

By referring to Fig. 3 it will be seen that the port e' has considerable width, being wider at its outer end than the diameter of the cylinder and tapers toward the latter. The outer opening of the port abuts the outer periphery of the cylinder e^4. The latter is longer than the opening of the port and has formed in its side a longitudinal opening e^6, which normally registers with the opening of the port. By moving the cylinder to vary the registering of the two openings the amount of steam entering the cylinder can be regulated. The cylinder e^4 is hollow and it opens

at both ends into the steam-chest. Attached to one end of the said cylinder are arms e^7 e^7, which are connected to a shaft e^8, which is journaled in a suitable bearing formed in the side of the steam-chest. This shaft extends to the exterior of the steam-chest and has mounted on its projecting end the segmental lever S. The free end of this lever is provided with gear-teeth, with which the rack s meshes. This rack is connected at its upper end with a centrifugal governor adapted to raise or lower the rack as the speed of the engine varies. In the present instance the governor consists of the weights S′ S′, connected by the hinged arms s^2 s^2 with the shaft s^3. The upper end of the rack s is connected with the arms s^2 s^2 by the links s^4 s^4. The shaft s^3 is driven by the sprocket-chain H by means of the shaft s^5, passing through the steam-chest, which has a sprocket-wheel s^6 engaging with the said chain and miter-gears s^7 s^7, connecting it with the shaft s^3.

The normal position of the regulator is as it is shown in Fig. 4—that is, with its opening e^6 registering with the port--which allows a full passage of steam. If the speed of the engine should become too accelerated, the weights S′ S′ would raise the rack s, and consequently rotate the regulator e^4 through the intermediate connections and thereby close the port, more or less, and regulate the amount of steam passing into the cylinder C. The movement of the regulator is limited. This is secured by cutting away a portion of the cylinder forming the regulator and replacing it by the portion e^9, fixed to the bearing. The sensitiveness with which the governor will act is regulated by the arm s^8, attached to the pivoted end of the segmental lever S, on which is mounted an adjustable weight s^9. By moving the latter the governing mechanism can be more or less balanced, and consequently the quickness with which the same will act determined.

Inside of the cylinder or regulator e^4 is journaled a second cylinder e^5. This latter forms the valve proper which controls the induction-port. This cylinder also opens at its ends into the steam-chest and has formed in its side a longitudinal opening y, through which live steam passes into the port and cylinder C. The cylinder e^5 is provided with a mechanism for rotating the same at the rate of one complete rotation for each full stroke of the piston—that is, forward and back. The dimensions of the opening y in the cylinder e^5 are such that the said opening will be in register with the port during one-half the movement of the piston away from the said port, so that the piston will be propelled for one-half of its passage in one direction by the direct pressure of the steam and the remainder of the distance by the expansion of the steam which has passed into the cylinder C.

The valve e^5 has attached to an end, opposite to the end of the regulator provided with the arms e^7 e^7, with arms v' v', which are attached to the end of the shaft v^2. This shaft is journaled in the side of the steam-chest and extends beyond the said bearing to the exterior of the chest. On the projecting end of the shaft is mounted the sprocket-wheel v^3, with which the sprocket-chain H engages and thereby rotates the said valve.

In the lower steam-chest F is mounted the mechanism controlling the exhaust-ports f f'. In the said chest bearings f^2 f^2 are formed, one for each port and in the path of the same. A cylinder f^3 is journaled in each bearing and forms a valve. This cylinder is closed at both ends and has projecting from the same the shafts f^4 f^4, which are journaled in bearings formed in the sides of the steam-chest. One of the journals projects beyond its bearing and has mounted on the extended end the sprocket-wheel f^5, which meshes with the sprocket-chain H. The latter rotates the cylinder or valve once for each full stroke of the piston. The cylindrical valve is provided with a longitudinal opening f^6, which is of the same length as the width of its respective port, and its other dimension is substantially half the periphery of the valve. The bearing f^2, which forms a partition between the valve and the chamber connecting with the exhaust-pipe, is also cut away and is of such dimensions that the opening in the valve will register with the same and the exhaust-port during the return stroke of the piston.

The several valves and their adjuncts are driven by the sprocket-chain H. This chain is driven by the sprocket-wheel h, mounted on the main driving-shaft B. It successively meshes with the live-steam valves and the exhaust-valves. It also engages with the sprocket-wheel s^6, which drives the governor. In passing from the sprocket-wheel of one of the live-steam valves to the other, and also from one of the sprockets of one of the eduction-valves to that of the other, it passes between them, so as to drive them in opposite directions, the relative arrangement of the valves being such that they will work oppositely.

The operation of the device is as follows: Steam is admitted from a suitable generator into the steam-chest E. Assuming the piston to be at the rear end of the cylinder, as shown in Fig. 4, the rear port e' will be open and the front port e^2 will be closed. The front exhaust-port f' will be open and the rear one f will be closed. The steam will pass into the end of the cylindrical valve, through the opening in the side of the same, into the port e' and the cylinder C and thereby force the piston forward. All this time the valve e^5 is being rotated. While the piston is moving substantially one-half the distance of its forward stroke the opening in the valve e^5 will register with the port, and consequently the piston will be moved by the direct pressure of the steam. When it has passed one-half the distance, the rotation of the valve will close the port and the piston will be propelled the

remainder of its forward stroke by the expansion of the steam. During the forward movement of the piston the steam contained in the cylinder in front of the piston can escape through the exhaust-port *f'* into the chamber connected with the exhaust-pipe. The exhaust-port is open during the forward movement of the piston. The return stroke of the piston is made through the movements of the oppositely-acting valves at the opposite end of the cylinder.

The construction hereinbefore described is my preferred embodiment of the invention. It is obvious, however, that it can be departed from to a considerable extent without departing from the spirit of the invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by an induction-port, a regulator consisting of a cylindrical shell journaled in said steam-chest and having an opening in its side adapted to register with said induction-port, means for operating said regulator, a valve consisting of a cylindrical shell journaled in said regulator and opening at an end into said steam-chest and having an opening in its side adapted to register with said opening in the side of the regulator, a steam-chest connected with said cylinder by an eduction-port, a valve consisting of a shell journaled in said latter steam-chest and having an opening adapted to register with said eduction-port, and means for rotating said valves at the same rate of speed.

2. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by an induction-port, a regulator consisting of a cylindrical shell journaled in said steam-chest and having an opening in its side adapted to register with said induction-port, a governor, devices operated by said governor for automatically adjusting said regulator, a valve consisting of a cylindrical shell journaled in said regulator and opening at an end into said steam-chest and having an opening in its side adapted to register with said opening in the side of the regulator, a steam-chest connected with said cylinder by an eduction-port, a valve consisting of a shell journaled in said latter steam-chest and having an opening adapted to register with said eduction-port, and sprocket wheel and chain mechanism for rotating said valves controlling the induction-port and the said valves controlling the eduction-port in opposite directions respectively.

3. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by an induction-port, a regulator consisting of a cylindrical shell journaled in said steam-chest and having an opening in its side adapted to register with said induction-port, means for operating said regulator, a valve consisting of a cylindrical shell journaled in said regulator opening at an end into said steam-chest and having an opening in its side extending around substantially one-fourth of its periphery adapted to register with the said opening in the side of said regulator, a steam-chest connected by an eduction-port with said cylinder, a valve consisting of a shell journaled in said latter steam-chest and having an opening extending around substantially one-half its periphery adapted to register with said eduction-port, and means for rotating the valves at the same rate of speed.

4. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by an induction-port, a regulator consisting of a cylindrical shell journaled in said steam-chest and having an opening in its side adapted to register with said induction-port, a governor, devices operated by said governor for automatically adjusting said regulator, a valve consisting of a cylindrical shell journaled in said regulator opening at an end into said steam-chest and having an opening in its side extending around substantially one-fourth of its periphery adapted to register with the opening in the side of said regulator, a steam-chest connected by an eduction-port with said cylinder, a valve consisting of a shell journaled in said latter steam-chest and having an opening extending around substantially one-half its periphery adapted to register with said eduction-port, and sprocket wheel and chain mechanism for rotating said valves in opposite directions.

5. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected by a port with said cylinder, a regulator controlling said port consisting of a cylindrical shell opening at an end into said steam-chest and having an opening in its side adapted to register with said port, a governor, a lever connected with said regulator to operate the same, and mechanism connecting said governor with said lever.

6. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by a port, a regulator controlling said port consisting of a cylindrical shell opening at an end into said steam-chest and having an opening in its side adapted to register with said port, a rack, a governor connected with said rack to move the latter, and a segmental lever connected with said regulator and engaging with said rack.

7. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a steam-chest connected with said cylinder by a port, a regulator controlling said port consisting of a cylindrical shell opening at an end into said steam-chest and having an opening in its side adapted to register with said port, a rack, a governor connected with said

rack, a segmental lever connected with said regulator and engaging with said rack, and adjustable counterpoises mounted on said lever.

8. In a steam-engine, the combination of a cylinder, a piston mounted in said cylinder, a plurality of rotary valves controlling the admission of steam to said cylinder, sprocket wheel and chain mechanism for rotating said valves in opposite direction, cut-off for regulating the amount of steam admitted through said valves, a governor, and devices operated by said governor for automatically adjusting said cut-off.

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

E. C. DICEY.

Witnesses:
BRUCE S. ELLIOTT,
GRANT BURROUGHS.