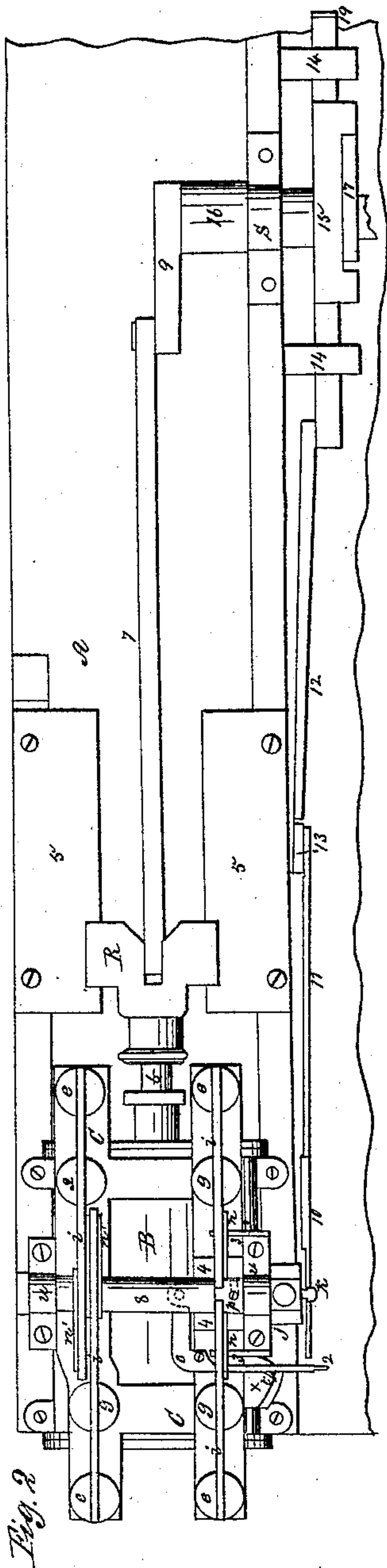
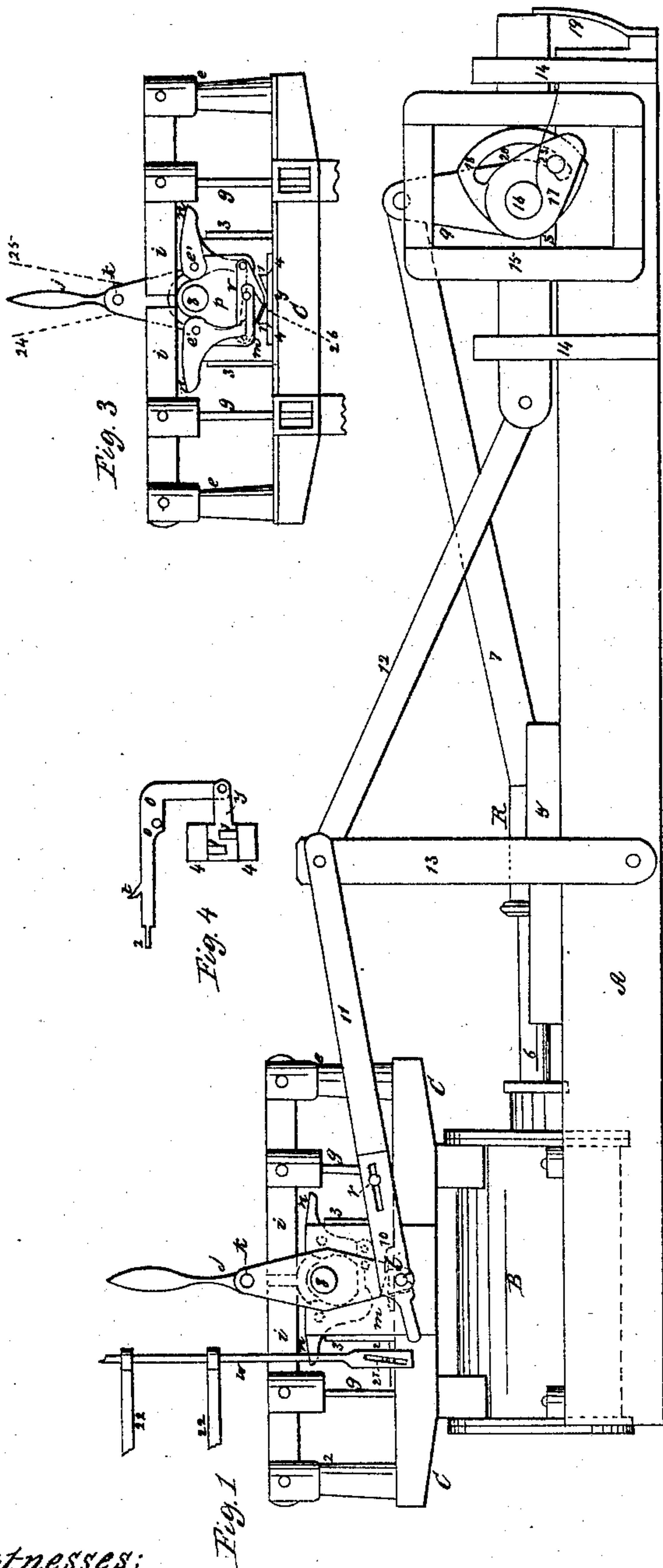


E. Sprague,

Steam-Engine Valve-Gear.

N^o 55,731.

Patented June 19, 1866.



Witnesses;
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UNITED STATES PATENT OFFICE.

EDWIN SPRAGUE, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN VALVE-GEAR FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 55,731, dated June 19, 1866.

To all whom it may concern:

Be it known that I, EDWIN SPRAGUE, of the city and county of Allegheny, in the State of Pennsylvania, have invented a new and useful Improvement in Steam-Engines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in the use of an adjustable point in connection with a cam, cam-yoke, cam-rod, and hinged lifters on the rocking shaft, which lifters are held in their working position by means of triggers which are operated by means of inclined planes, said adjustable point, cam, cam-yoke, cam-rod, hinged lifters, triggers, and inclined planes being used in connection with the valve-levers of steam-engines for the purpose of opening the steam valves or ports and closing them at any desired point in the stroke of the engine, the whole being constructed, arranged, and operating in the manner hereinafter described.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

In the accompanying drawings, Figure 1 represents a side elevation of an engine furnished with my improvement for operating the valves. Fig. 2 represents a plan or top view of the same. Fig. 3 represents the side pipe, and also represents the hinged lifters, triggers, inclined planes, and the relation these parts bear to the lever to which the valve-stems are attached. Fig. 4 represents a top view or plan of the inclined planes, their guide, and the lever for operating them.

In the drawings, A represents the base or bed for the engine. B represents the cylinder. C represents the side pipe. *e* represents the standards which act as the fulcrum for the levers *i*, to which the stems *g* of the valves are attached. 6 represents the piston. R represents the T-head, to which the pitman, marked 7, is attached. 9 represents the crank, which is secured on the end of the shaft 16. 15 represents the cam-yoke. 14 represents the guides for the cam-yoke. 5 represents the slides for the T-head R. 10, 11, and 12 represent the cam-rod, which is attached to the cam-yoke 15. 8 represents the rock-shaft, on the end of which

is placed the shifting-lever, marked *j*, which is furnished with wrists, marked *k* and *l*.

All of the parts above mentioned are of ordinary construction, and their arrangement and use are well understood. I will therefore proceed to describe the parts which constitute my invention and their relation to the parts as above mentioned.

The cam marked 18 is secured on the shaft 16, and is what is termed a "full-stroke" cam. This cam is furnished with a slot, marked 20. On the shaft 16 is also placed what I shall term an "adjustable point." This point is marked 17, and is arranged on the shaft 16, in close contact with the cam 18, and is so arranged on the shaft 16 and with relation to the cam that it can be secured to the cam 18 at any point desired by means of a set-screw, which can be moved back and forward in the slot 20 of the cam 18.

19 represents a spring which is used for holding the cam-yoke 15 in contact with the cam 18 and the adjustable point 17. The arrangement of this spring will readily be seen by a reference to Fig. 1 in the drawings, and it will readily be observed by the skillful mechanic that other arrangements of spring or other device can be substituted for holding the cam-yoke in contact with the cam and point.

On the rock-shaft 8 is secured a piece, marked *p*, to which are secured lifters, marked *n*, which are hinged at the point marked *e'*. To the piece marked *p* are also secured two triggers, marked *r*, which have two arms each. One of these arms on each of the triggers connects with the lower arm of the lifters *n*, and the other arms act on the inclined planes marked 1.

The form and arrangement of the lifters *n*, triggers *r*, and inclined planes 1, and the relation that they bear to each other, are clearly shown in Fig. 3. The inclined planes marked 1 are secured on a plate, marked *y*, which moves in a guide-plate, marked 4, or between guides, marked 4, as shown in Figs. 3 and 4. These guides 4 are secured on the side pipe, C, and are so arranged with relation to the plate *y* as to bring the inclined planes directly under the lower arms of the triggers *r*. To the plate *y* is attached a lever, marked *o*, which is secured to the side pipe, C, and has its fulcrum at *o'*. The lever *o* is furnished with an index-pointer,

marked *t*, which is used in connection with a scale, marked *x*, to show at what point the steam is cut off.

The lever *o* is used when a number of inclined planes of different heights are used, so that the cut-off may be used in connection with the governor of engines, as indicated by the parts marked *w*, which is attached to the governor so that it can move up and down with the rise and fall of the governor-balls. The part marked *w* moves in guides, as indicated by the parts marked 22, and the lower part of the part *w* is furnished with a slot, marked 21, which runs obliquely to the plane of the part marked *w*. In this slot is placed the point marked 2 of the lever *o*. Now, every change in the position of the governor-balls will change the position of the plate *y*, and thereby bring a different inclined plane under the lower arms of the triggers *r*, and thereby cause a difference in time of the triggers holding the lifters *n* in a lifting position. It will be observed that but two inclined planes are represented in the drawings—one for each trigger; but, as already stated, a number of these inclines may be placed side by side, so that each trigger shall have a series of inclines and all made operative through lever *o* and plate *y*.

The lever *o*, in connection with the plate *y*, is also used for the purpose of giving the engine full stroke. This is accomplished by so moving the lever *o* and plate *y* that the lower arms of the triggers *r* will not come in contact with the inclined planes 1.

The reverse action or motion is given to the engine by unshipping the cam-rod from off wrist *l* and shipping it on the wrist *k*.

The cam-rod can be made in one or more parts, as desired, and its length adjusted by any of the known means. In the drawings the cam-rod is represented in three parts—to wit, 10, 11, and 12—and the parts 11 and 12 attached to an upright, marked 13, which will have a vibrating motion when the engine is

working. The cam-rod is represented as being adjusted by means of a set-screw, marked *v*, which mode of adjustment will readily be understood by reference to Fig. 1.

The operation of my improvement is as follows: I set the adjustable point 17 on the cam 18, so as to get the desired stroke of the cam-rod which will give the desired movements to the lever *j* and rock-shaft 8, which will move the piece *p*, which will cause the lifters *n* to come in contact with the levers *i*, which will lift the valves and admit steam to the cylinder; and the lower arms of the triggers will come in contact with the inclines marked 1, which will cause the triggers to unship and let the lifters drop down on the pieces marked 3, which will close the valves by the dropping of levers *i*. As one of the triggers *r* becomes unshipped the other becomes shipped. The steam is exhausted in the ordinary manner.

Having thus described my invention, what I claim is—

1. The hinged lifters *n*, said lifters being operated by means of triggers *r* and inclines 1, or their equivalents, and one cam-rod made in one or more parts, said lifters, triggers, inclines, and cam-rod being dependent for their action upon the cam 18 and adjustable point 17, substantially as herein described and set forth.

2. The adjustable point 17, when used in combination with a cam and cam-yoke and a single cam-rod for working a full stroke, and used for operating the cut-off gear of steam-engines, as herein described and set forth.

3. The inclines 1 on plate *y*, said plate and inclines being operated by lever *o* through the medium of a governor or otherwise, substantially as herein described, and for the purpose set forth.

EDWIN SPRAGUE.

Witnesses:

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