

T. S. C. LOWE.

Process and Apparatus for the Manufacture of
Illuminating or Heating Gas.

No. 167,847.

Patented Sept. 21, 1875.

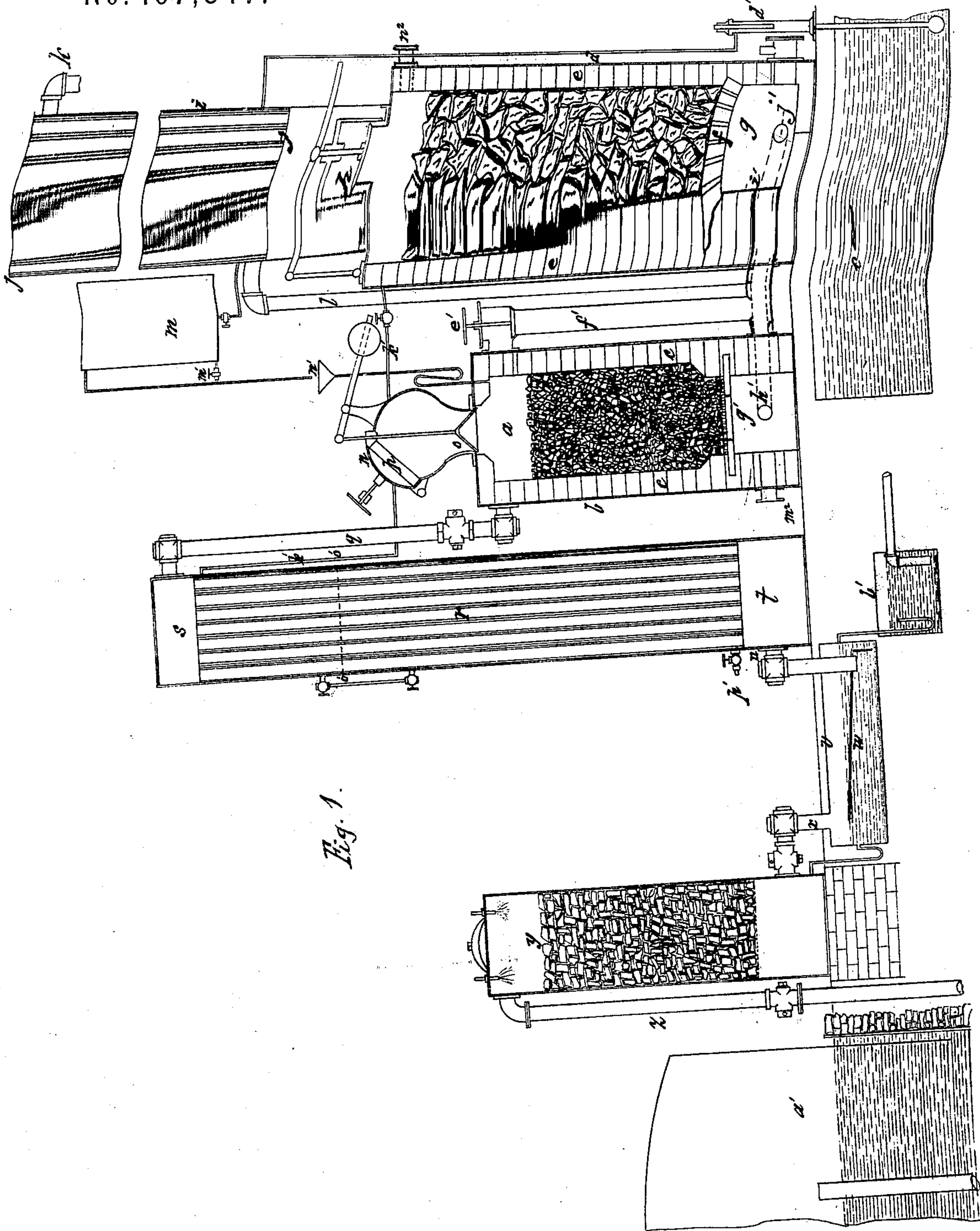


Fig. 1.

Inventor

Witnesses

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IMPROVEMENT IN PROCESSES AND APPARATUS FOR THE MANUFACTURE OF ILLUMINATING OR HEATING GAS.

Specification forming part of Letters Patent No. **167,847**, dated September 21, 1875; application filed March 10, 1875.

To all whom it may concern:

Be it known that I, THADDEUS S. C. LOWE, of Norristown, Montgomery county, Pennsylvania, have invented an Improvement in Processes and Apparatus for Producing and Using Hydrocarbon and other Gas for Heating and Illuminating Purposes, and other purposes, of which the following is a specification:

In the annexed drawings, which form a part of this specification, Figure 1 represents a vertical section of the complete apparatus, and Fig. 2 a plan of the same.

a is the primary gas-generator, which consists of a casing, *b*, made of boiler-iron, or other suitable material, and lined with fire-bricks *c*, or other suitable refractory materials. *d* is a superheater, for preparing steam for decomposition. This also consists of a casing of iron or other suitable material, lined with fire-bricks or other suitable refractory materials *e*, the inclosed space being filled with loosely-laid fire-bricks, or other suitable refractory materials, resting on a perforated arch, *f*, of like materials. At the bottom of the superheater *d* is a combustion-chamber, *g*. *h* is a tight-fitting valve, to be raised or lowered at pleasure. *i* is a heat-restorer, which forms the stack for carrying off the products of combustion. This consists of an ordinary iron stack of increased dimension, with heads *j* at top and bottom, in which heads are inserted ordinary boiler-tubes. *k* is a tube through which there is forced into the stack *i* atmospheric air, which circulates around the tubes in said stack, and issues out at the lower end of the stack in a heated condition, thence passing through tube *l* to support combustion in generator *a*, and in the combustion-chamber *g* of the superheater *d*. *m* is an elevated tank for holding petroleum or other hydrocarbon oils. The tank *m* is supported by a column, (not shown,) or in any convenient manner. *n* is a hopper, provided with a close-fitting bell or cone valve, *o*, and also a close-fitting lid, *p*. *q* is a tube for conveying gas from generator *a* to the boiler *r*, which is an upright tubular boiler, with chambers *s* and *t* at top and bottom, respectively. *u* is a tube for conveying gases from chamber *t* to

the washer *v*. *w* is a diaphragm, forming an inclined plane in the washer *v*. This inclined plane should be rough or corrugated on its under side. *x* is a tube for conveying gases from washer *v*. *y* is an ordinary gas-scrubber, filled with coke or other suitable materials. *z* is a tube for conveying gases into holder *a'*, or other points of storage, or directly to any place of consumption. *b'* is a well for catching condensed oils or tar, should any exist after leaving the generator. *c'* is a tank for holding petroleum or other hydrocarbon oils, and *d'* is a pump for forcing the same, as required, into the elevated tank *m*. *e'* is a closely-fitting valve, to be raised or lowered at pleasure for regulating the flow of carbonic oxide through the pipe *f'* into the combustion-chamber *g*. The generator *a* is also provided with a closely-fitting door, (not shown in the drawing,) communicating with the ash-pit *g'*.

When it is desired to put this apparatus into operation, I build a fire on the grate-bars in generator *a*, the valves *e'* and *h* being raised to allow of the free escape of the products of combustion through the open brick-work in superheater *d*, and up through the tubes in the heat-restoring stack *i*.

I now gradually introduce into generator *a* any desired solid carbonaceous substances, preferring either anthracite or bituminous coals, beside which, however, may be mentioned any kind of wood, all kinds of woody rubbish, finely-cut straw, coal-dust or slack, asphaltum, &c.

In the meantime a fan-blower or other suitable apparatus is caused to force air through the tube *k* into the heat-restorer *i*, from which a sufficient quantity of warmed or heated air is admitted through the tubes *l* and *h'* to cause moderate combustion on the grate-bars of the gas-generator *a*. As the thickness of fuel increases in generator *a*, and while it is being brought into an incandescent state, the carbonic acid which is caused by the union of oxygen and carbon, at the bottom of the generator, while passing up through the thickness of incandescent fuel, becomes recarbonized, and is thus converted into carbonic oxide. This highly-inflammable gas, in union with the sulphur of the coal and other impurities

The forms of apparatus which may be used in carrying out my above-described processes are various, and I have prepared many drawings of modified forms of apparatus for carrying out said process; but I prefer the form shown, it being in every respect simple and easy of management.

Instead of employing oil in the carbonizing process, as above described, other substances containing volatile carbon may be employed, such as rich bituminous coal, rosin, cottonseed, ordinary coal-tar, asphaltum, fats of all kinds, residuum from oil-refineries, &c. Care, however, should be taken when using any kind of solid carbon, that the same is evenly spread on the top surface of the heated fuel or material in the generator *a*, in such a manner that the hot gases, while emerging from the top of said hot fuel, will come in contact with such solid or lumpy carbon, and thereby assist in its volatilization.

In case of using bituminous coal, it would be desirable to use some additional volatile carbon oil, to add to the hydrogen being generated from the steam.

If impure carbons are used for carbonizing the hydrogen, the usual purifiers will be necessary; but when petroleum and other pure carbons are employed, a purifier is not required.

In many cases it will be found advantageous to admit the steam (preferably highly heated) through pipe *m*² at the bottom of generator *a*, causing it to pass up through the incandescent coals and mingle with the carbon gas in the top of the generator, as before described, and then to pass the mixed mass through connecting-flue *f'* to the bottom of superheater *d*, and up through the mass of heated brick-work therein contained, and to be discharged through opening *n*² at the top of superheater *d*, from which opening the gases may be conveyed to the washer *v*, either directly or after having been previously passed through the boiler *r*, for the purpose of utilizing its heat in the generation of steam, or after having been employed for superheating steam or air, or both.

The principal advantage gained by passing the mass of gases from generator *a* through the highly-heated fire-bricks in the superheater *d*, is a more thorough decomposition of the elements which, having been passed up through the incandescent coal in the generator for too long a time, might contain considerable undecomposed vapor, which would be converted into a fixed gas by being subjected to a higher heat, such as the superheater contains.

When it is desired to superheat the steam preparatory to its decomposition, and at the same time carry on the process of more permanently fixing the mixed gases evolved in the generator, it is necessary to use, in connection with the generator, two of the chambers described as superheater *d*—to wit, one for the superheating of the steam, and the

other for the fixing of the gases, both chambers being similar in construction, and similarly arranged with respect to the generator, and similarly heated by direct internal combustion of a portion of the gases from generator *a*, and, in this case, the mixed gases from the generator, instead of being led off to and through the tubes of boiler *r*, as described, or, instead of being led off from the generator directly to the washer, are first passed through the additional chamber or superheater last above referred to.

The heat-restorer *i* may, instead of serving to heat the air-blast, as before described, be used as a boiler for generating steam, and may either remain in its present position, or be set adjacent to the superheater, where the hot products of combustion may be conveyed to it in the proper manner.

In cases where gas extremely rich in carbon is desired, the same will be best produced by omitting the steam and generating the gas from oils alone, using the generator *a* either alone or in conjunction with the superheater.

I claim—

1. For the manufacture of illuminating and heating gas, the process which consists of dropping or otherwise admitting in limited quantities, continuously or intermittently, hydrocarbon oils or other carbonaceous substances, liquid or solid, onto the top of a thick mass of coal or other carbonaceous substance, in a state of incandescence, in a close chamber previously heated by direct internal combustion, with or without the introduction of steam, and then, for the purpose of superheating and fixing the gases of said chamber, passing them from said chamber into and through a second chamber, which also has been previously heated by direct internal combustion, substantially as set forth.

2. The process for producing an illuminating-gas, which consists of superheating steam, by passing it through a chamber previously heated by direct internal combustion, then causing said steam to pass through a mass of coal or other carbonaceous substance, in a state of incandescence, in a close generating-chamber, to decompose the steam, and afterward, for the purpose of still further heating the gases of said generating-chamber, and thereby producing a more fixed gas, passing the gases from said generating-chamber into and through another superheating-chamber, which has been previously heated by direct internal combustion, substantially as set forth.

3. The combination of the generator *a*, superheater *d*, the heat-restorer *i*, and means for forcing air through the pipe *k*, around the tubes of the heat-restorer *i*, through pipes *l*, *h'*, and *j'*, into the chamber *g*, for generating and securing intense combustion in said chamber *g*, substantially as set forth.

4. The combination of the generator *a*, superheater *d*, heat-restorer *i*, elevated oil-tank *m*, the upright tubular boiler *r*, with their several connecting-pipes and other appurtenant

parts, as described, constituting apparatus for rapidly evolving illuminating-gas, and fixing the same in its gaseous condition, substantially as set forth.

5. The combination of the generator *a*, superheater *d*, heat-restorer *i*, elevated oil-tank *m*, upright tubular boiler *r*, wash-box *v*, scrubber *y*, with their several connecting-pipes and other appurtenant parts, as described, consti-

tuting apparatus for rapidly evolving illuminating and heating gas, fixing the same in its gaseous condition, and purifying the same preparatory to storage or immediate use, substantially as set forth.

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Witnesses:

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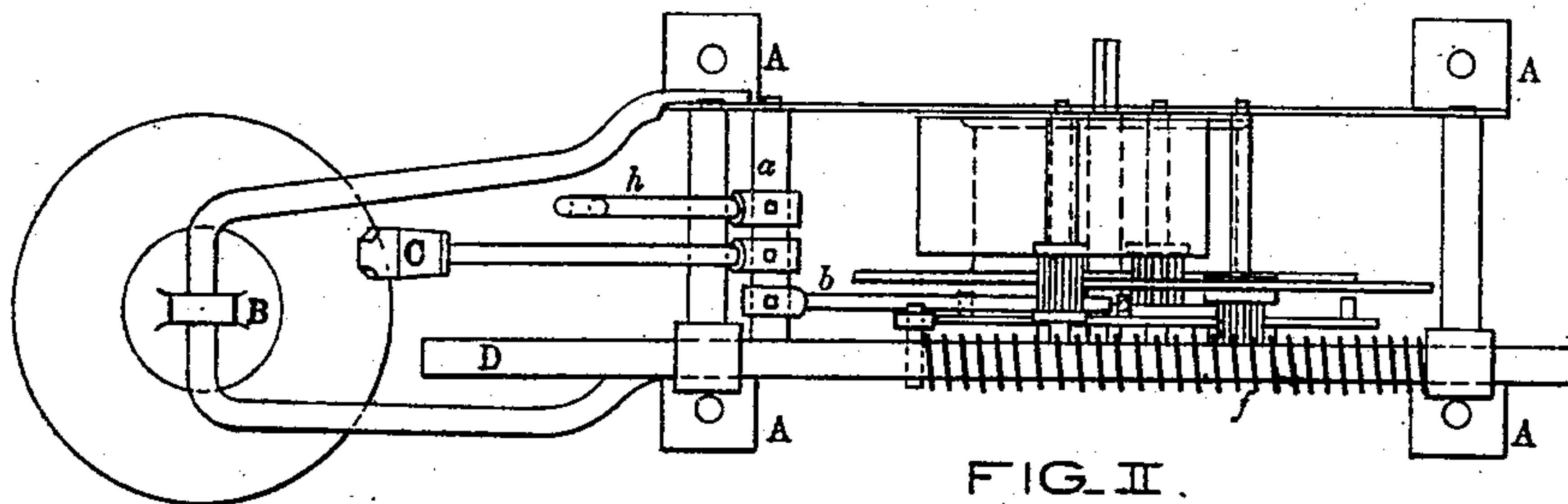
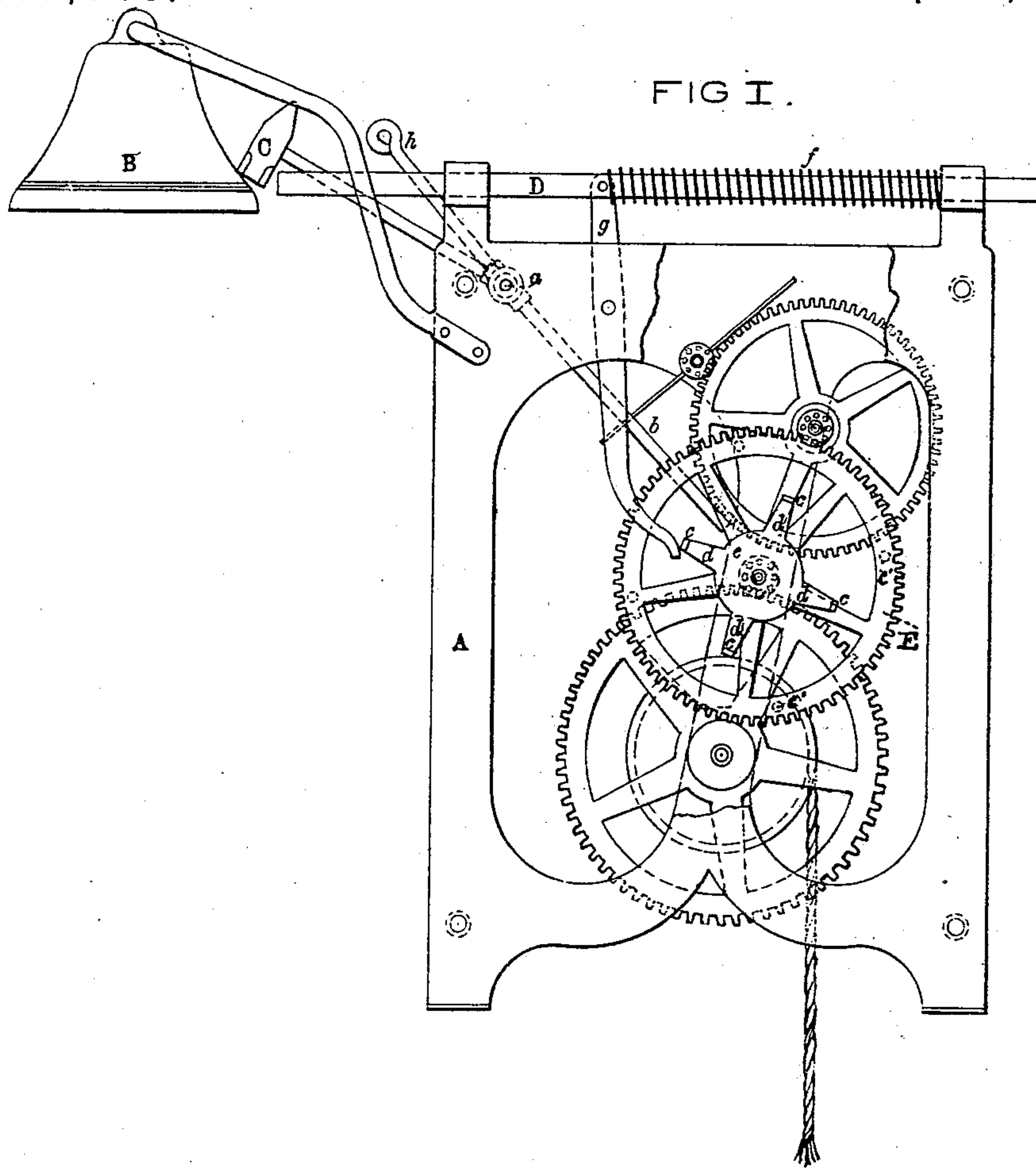
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words.

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WITNESSES.

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