A. HANSON.

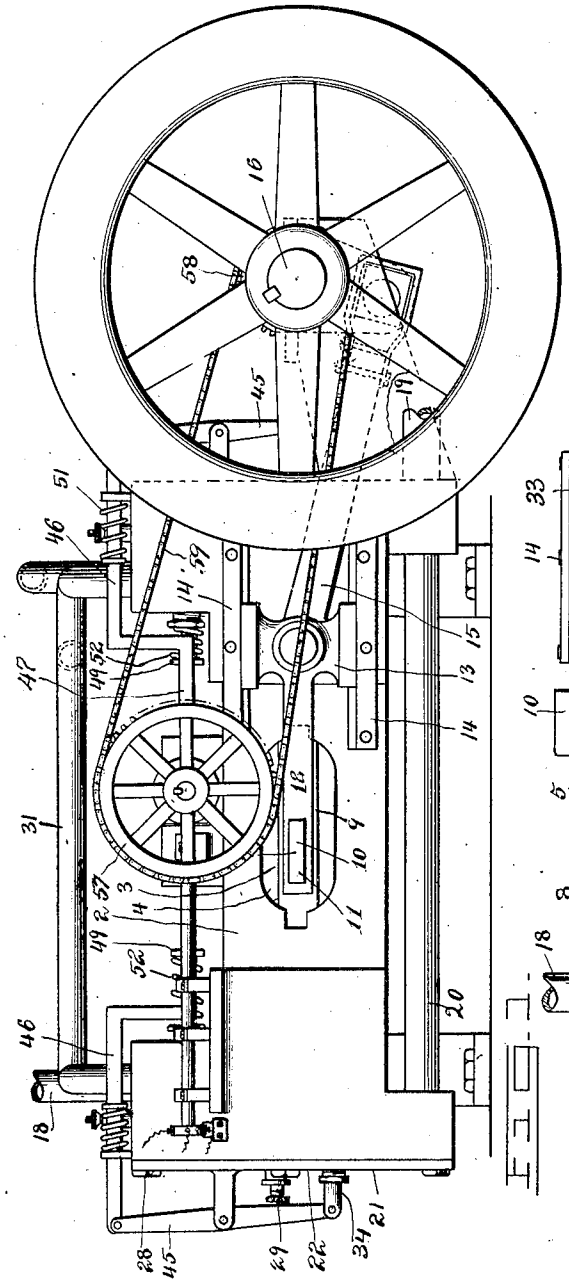
EXPLOSIVE ENGINE.

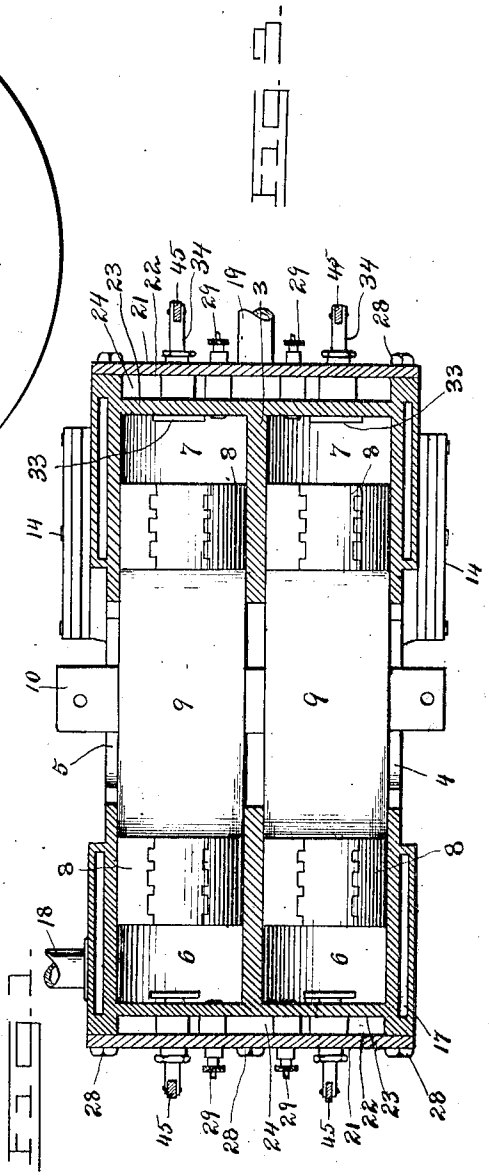
APPLICATION FILED DEC. 17, 1910.

1,020,819.

Patented Mar. 19, 1912.

3 SHEETS—SHEET 1.





Witnesses

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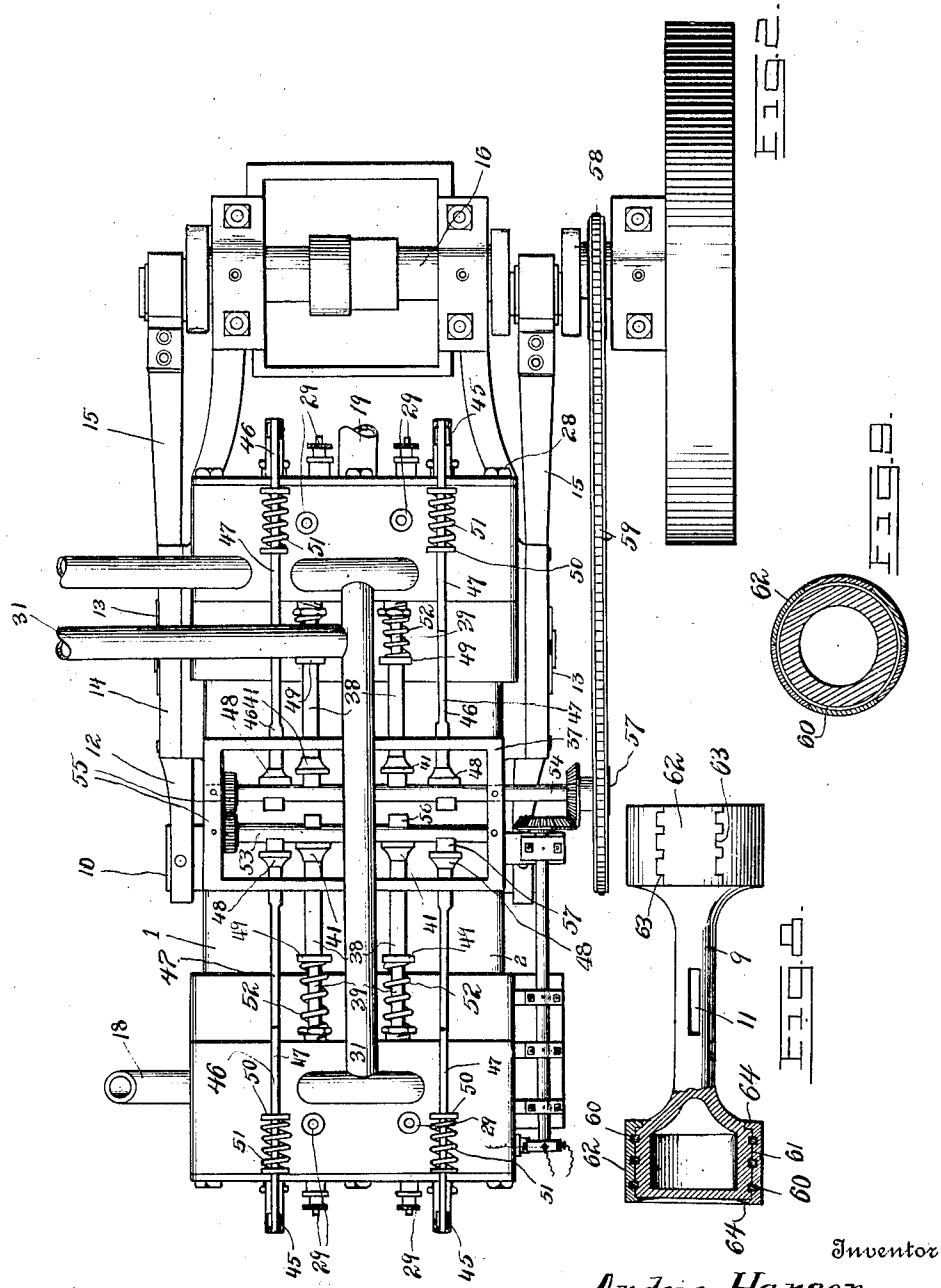

FIG. 2.

FIG. 3.

FIG. 4.

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3 SHEETS—SHEET 3.

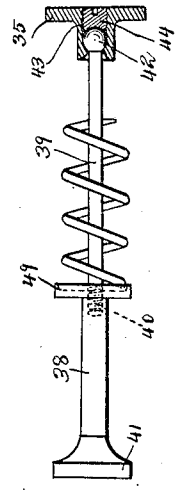

Fig. 7.

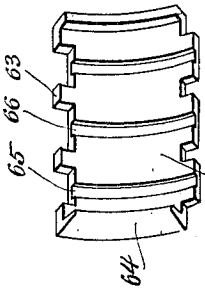

Fig. 10.

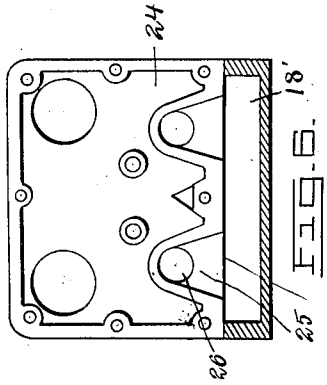

Fig. 6.

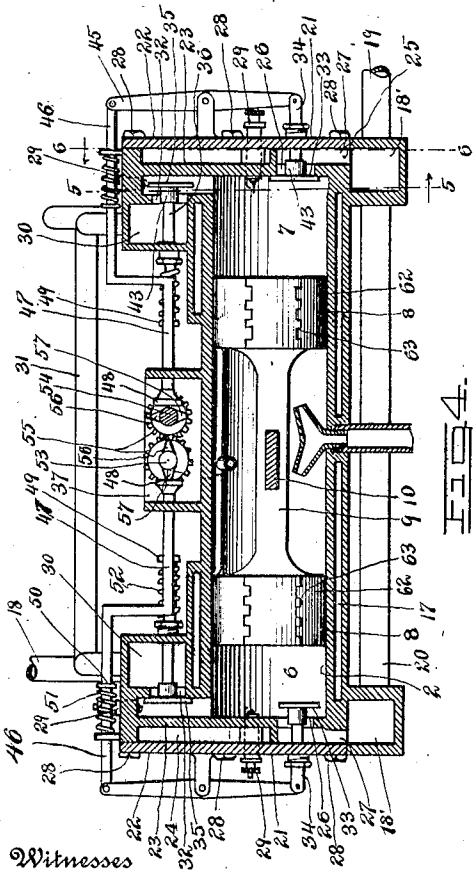

Fig. 4.

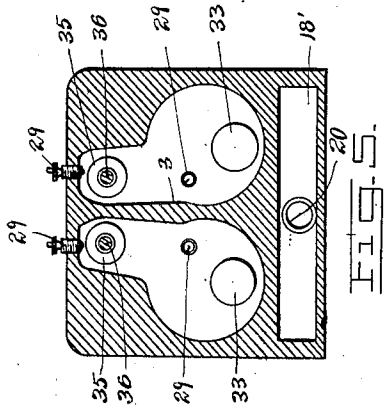

Fig. 5.

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UNITED STATES PATENT OFFICE.

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EXPLOSIVE-ENGINE.

1,020,819. Specification of Letters Patent. Patented Mar. 19, 1912.

Application filed December 17, 1910. Serial No. 597,806.

To all whom it may concern:

Be it known that I, ANDERS HANSON, a citizen of the United States, residing at Butler, in the county of Day and State of South Dakota, have invented new and useful Improvements in Explosive-Engines, of which the following is a specification.

This invention relates to explosive engines of that type comprising a plurality of cylinders, each containing a piston receiving an operative impulse at each end of the cylinder, and in which the pistons of the cylinders are connected for movement in unison for the conjoint transmission of power to the engine shaft.

The object of the invention is to provide an engine of this type embodying certain novel and improved features of construction, combination and arrangement of parts, as hereinafter fully described and claimed, whereby increased efficiency of operation is secured.

In the accompanying drawings:—Figure 1 is a view in side elevation of an explosive engine constructed in accordance with my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a horizontal section through the engine cylinders. Fig. 4 is a vertical longitudinal section through one of the engine cylinders. Figs. 5 and 6 are cross sections on the lines 5—5 and 6—6 of Fig. 4. Fig. 7 is a detail view of one of the admission valves and its actuating rod or stem. Figs. 8 and 9 are detail longitudinal and transverse sectional views through one of the pistons. Fig. 10 is a detail view of one of the sections of the piston casing.

Referring to the drawings, 1 and 2 designate two parallel cylinders, preferably, but not necessarily, formed in a single casting, said cylinders being separated by a partition wall 3, the partition wall and sides of the respective cylinders being provided intermediately of their length with longitudinal guide slots 4 and 5. Each cylinder is provided at its opposite ends with explosion spaces or chambers 6 and 7.

Arranged for operation in each cylinder is a double or duplex piston, comprising a pair of heads 8 and a connecting stem 9, the two pistons being coupled to reciprocate as a unit by a transverse bar 10 extending through and movable within the slots 4 and 5 and passing through suitable openings 11 in the piston stems. The ends of the bar 10 project beyond the sides of the cylinders and are connected by rods or bars 12 with cross heads 13 operating in suitable guides 14, said cross heads being coupled by the usual connecting rods 15 to the cranks of the engine shaft 16 journaled in suitable bearings at one end of the engine structure. Each cylinder is provided with a water space or jacket 17 for the circulation of the cooling water, which space or jacket is in communication with a water supply pipe 18, said pipe being provided with branches connecting with the jackets of the respective cylinders. Each cylinder is also provided at its opposite ends with an exhaust chamber 18′, one having an exhaust outlet 19, the two chambers being connected by an exhaust pipe 20.

The bores of the respective cylinders are closed by counterpart end heads 21, each including an outer wall 22 and inner wall 23. In these are formed water spaces 24 communicating with the respective jackets, and exhaust passages 25 communicating with the adjacent explosion chamber and adjacent exhaust chamber 18′, respectively, through ports 26 and 27. The walls of each head are provided with suitable openings for the passage of securing bolts 28 and also for the reception of spark plugs 29, which may be connected with any suitable time-controlled electrical spark circuit, not shown.

At the end of the cylinder is provided an admission chamber 30 communicating with the fuel mixture supply pipe 31 and with the adjacent explosion chamber through a port 32. The exhaust port 26 is controlled by an inwardly movable exhaust valve 33 provided with an outwardly extending sliding stem 34, while the admission port 32 is controlled by an outwardly movable valve 35 carried by a sliding stem 36. The stem 36 is mounted in suitable guides for longitudinal sliding motion above its cylinder and extends at its inner end into a suitable casing 37. Said stem 36 consists of two sections 38 and 39, having a threaded engagement as at 40, the inner end of the inner section 38 being provided with a contact piece 41, while the outer end of the outer section 39 is provided with a head or enlargement 42 on which is fitted an internally threaded socket 43 receiving a screw 44 which passes through the valve 35 and, through the described connections secures said valve to the stem. The exhaust valve stem 34 is pivot-

ally connected to one end of a transmission lever 45 intermediately pivoted upon the adjacent head 21 and connected at its opposite end by an arm 46 with a sliding stem 47 projecting into the casing 37 and carrying a contact member 48. Heads 49 and 50 are provided upon the respective stems 36 and 47 and are engaged by springs 51 and 52, respectively, which springs operate to hold the exhaust and admission valves normally closed.

Valve-operating shafts 53 and 54 are journaled in parallel relation in the casing 37 and extend transversely across the top of the cylinders, said shafts being connected at one end by intermeshing gears 55 to revolve in unison at the same rate of speed. The said shafts are respectively provided with wipers or cams 56 and 57 to respectively engage the heads 41 and 48 of the respective stems 36 and 47, the wipers of one shaft controlling the stems of and operating the valves at one end of the cylinders, while the wipers upon the other shaft operate the stems controlling the valves at the opposite ends of the cylinders. The wipers or cams are so arranged as to operate the valves in timed accord for the admission of the explosive mixture and exhaust of the spent gases at the proper periods. The shaft 54 extends at one end beyond the casing and carries a sprocket wheel 57 connected with a sprocket wheel 58 on the engine shaft by a sprocket chain 59, whereby the valve operating shafts are driven.

The operation of the engine will be apparent to those versed in the art without further description, and it will be seen that a durable engine is provided in which each cylinder is formed with an explosion chamber at each end and the duplex pistons operate within said cylinders to move as a unit in the same direction and receive impulses at each end of their stroke, whereby an impulse is also transmitted to the crank shaft at the end of each piston stroke. It will also be seen that a simple and effective valve mechanism is provided for controlling the admission and exhaust. By the mode of connecting the pistons and that of coupling the same through the extended ends of the bar 10 with the cross heads and crank shaft a simple method of transmitting power is also provided, and one in which the result is secured without complication of parts. In practice, the piston heads are preferably of the novel construction disclosed in order to decrease their wear upon the surfaces of the cylinders. Each piston head is provided with the usual expansible packing rings 60 and is formed with intervening annular ribs 61. Inclosing the head is an expansible casing, consisting of an annular series of segmental sections 62, said sections being provided with interfitting fingers 63 adapted to permit said sections to have relative movement for expansion and contraction. The ends of the segmental sections are formed with flanges 64 to engage the ends of the head, and said sections are provided with internal grooves 65 and 66 to receive the rings and ribs upon the cylinder. The sections of the casing, which may be made of any suitable material, have smooth outer faces adapted to contact with the wall of the cylinder, said sections being pressed out by the packing rings so as to always maintain a close joint between the piston and cylinder. By the use of a sectional casing the packing rings may be utilized to afford bearing pressure, while at the same time said rings are prevented from bearing directly upon and cutting the surfaces of the cylinder, the sectional casing affording a practically uniform surface, whereby liability of cutting the wall of the cylinder is reduced to a minimum.

Having thus described the invention, I claim:—

1. An engine of the character described embodying a pair of parallel cylinders separated by an intervening partition, said partition and the outer walls of the cylinders being provided with central longitudinal guide slots, each cylinder being further provided at its opposite ends with explosion chambers and admission and exhaust chambers communicating therewith, heads closing the ends of the cylinders, admission and exhaust valves controlling communication between the cylinders and the sets of admission and exhaust chambers, sliding stems carrying said valves, operating stems for the exhaust valves, levers connecting said operating stems with the sliding carrier stems of the exhaust valves, rotary shafts in gear with each other and provided with cams to engage and operate the carrier stems of the admission valves and operating stems of the exhaust valves at timed intervals, a double piston operating in each cylinder, each piston comprising a pair of heads and a connecting stem, guides upon the outer sides of the cylinders, a crank shaft, a bar carried by the piston stems and extending through the said guide slots in the partition and outer walls of the cylinders, cross heads movable in said guides in the outer sides of the cylinders, connecting rods between the cross heads and crank shaft, and connections between the cross heads and the projecting ends of the bar.

2. An engine of the character described comprising a pair of cylinders having explosion chambers at each end thereof, duplex pistons operating in said cylinders and connected for movement in unison, admission valves at the ends of the cylinders, operating stems directly connected with said valves exhaust valves at the ends of the cylinders

levers connected with said exhaust valves, operating stems connected with the levers, springs acting upon the operating stems of the admission and exhaust valves for normally holding said valves closed, a pair of parallel shafts geared to rotate in unison, cams carried by the respective shafts for shifting the operating rods of the valves at the opposite ends of the cylinders to open said valves against the resistance of their springs, a crank shaft, connections between the pistons and the crank shaft, and drive gearing between the crank shaft and one of said parallel shafts.

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

ANDERS HANSON.

Witnesses:
N. E. BJERKE,
IDA E. BJERKE.