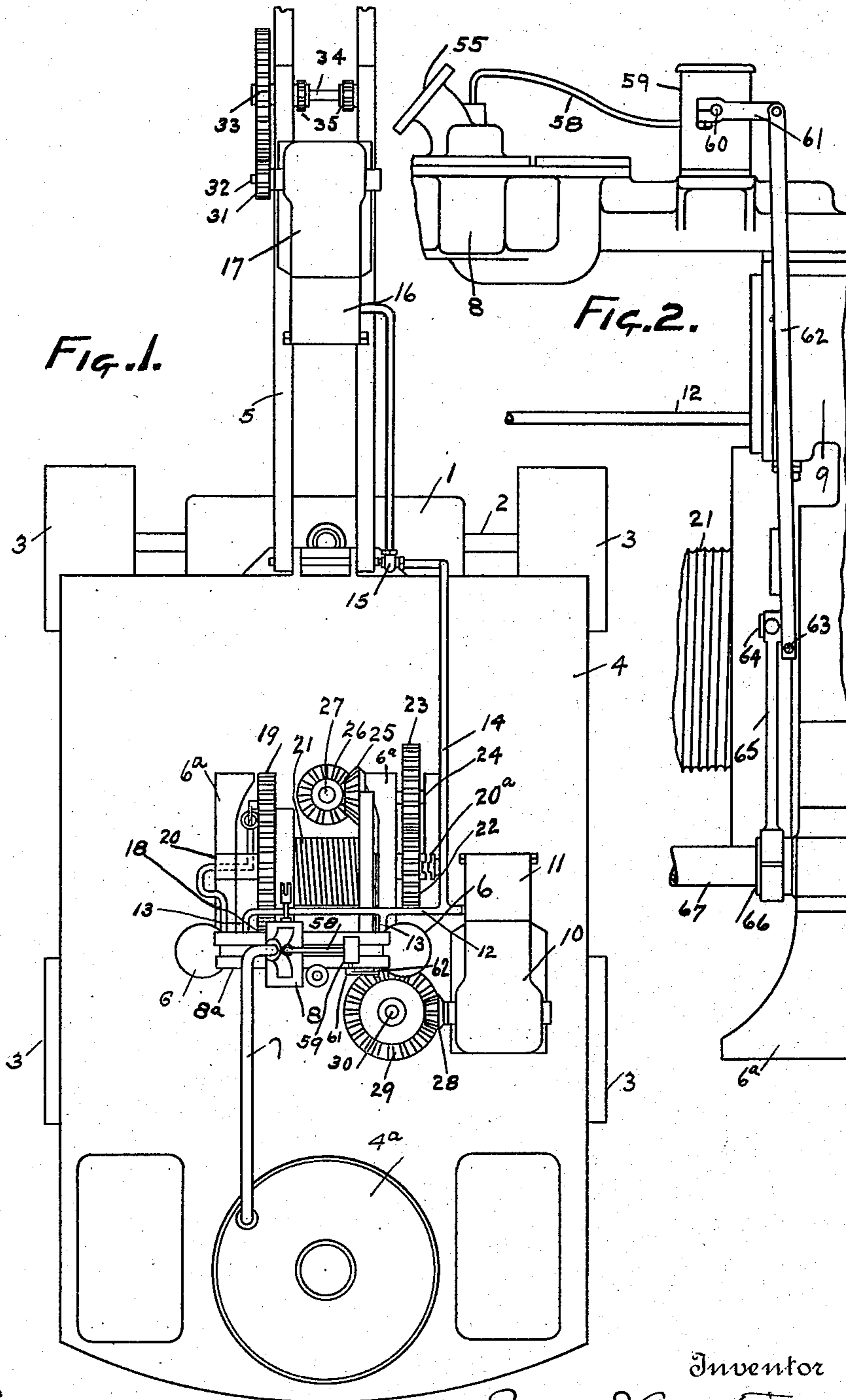


E. J. ARMSTRONG.
LUBRICATING SYSTEM FOR STEAM ENGINES.
APPLICATION FILED JAN. 20, 1915.

1,166,421.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.



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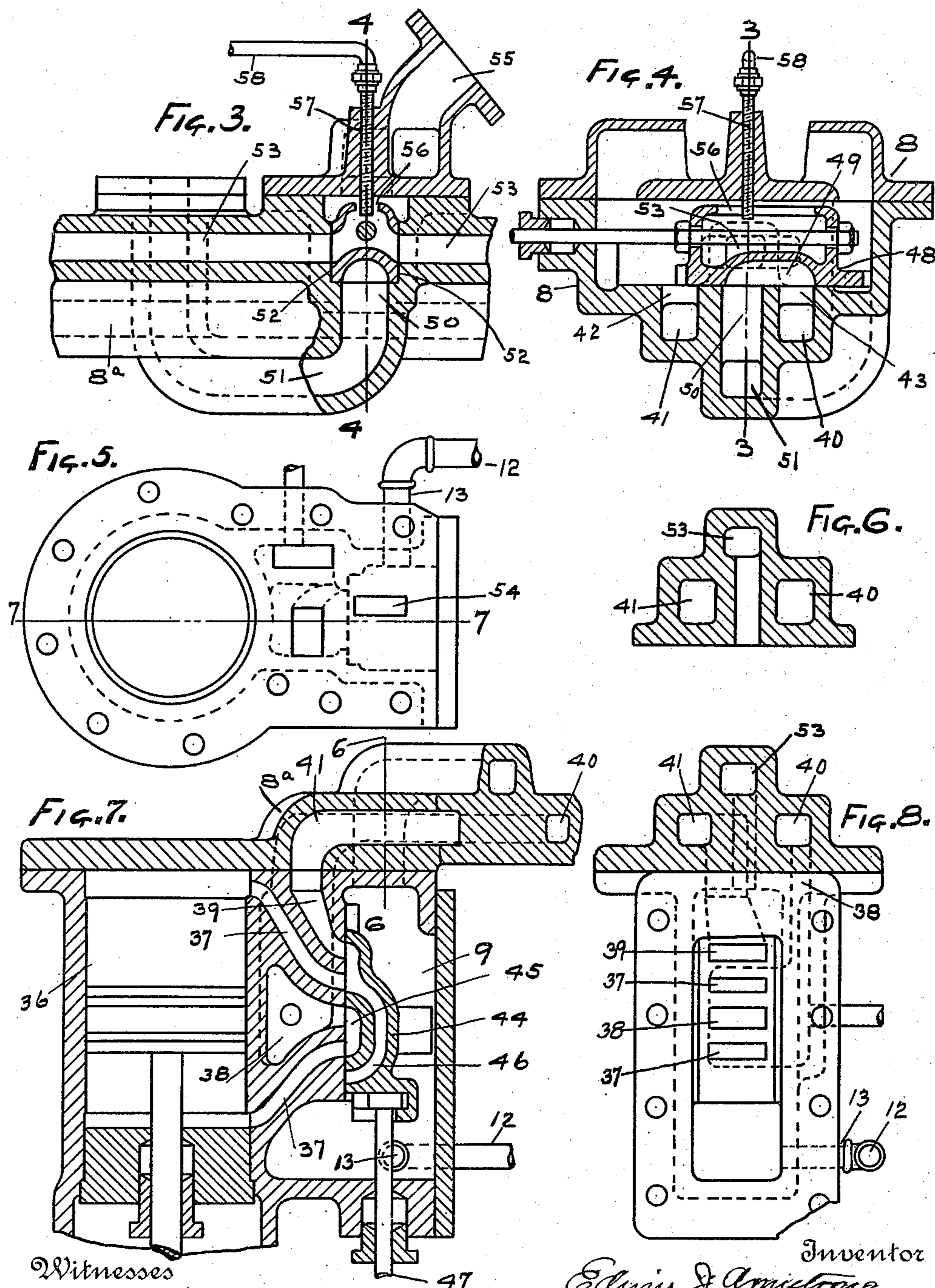
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UNITED STATES PATENT OFFICE.

EDWIN J. ARMSTRONG, OF ERIE, PENNSYLVANIA, ASSIGNOR TO BALL ENGINE COMPANY, OF ERIE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

LUBRICATING SYSTEM FOR STEAM-ENGINES.

1,166,421.

Specification of Letters Patent.

Patented Jan. 4, 1916.

Application filed January 20, 1915. Serial No. 3,373.

To all whom it may concern:

Be it known that I, EDWIN J. ARMSTRONG, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in Lubricating Systems for Steam-Engines, of which the following is a specification.

This invention relates to lubricating systems for steam engines and consists in certain improvements in the construction thereof as will be hereinafter fully described and pointed out in the claims.

More particularly the invention is designed for lubricating a plurality of steam engines and is exemplified herein as applied to a steam shovel in which is used a hoisting engine, swinging engine and crowding engine. These engines are used intermittently some of the time, simultaneously and some of the time independently.

The object of the invention is to simplify the lubrication of a plurality of engines receiving their steam from a common supply.

The invention is illustrated in the accompanying drawings as follows:—

Figure 1 is a plan view of a shovel. Fig. 2 a side elevation of the oil pump. Fig. 3 a section on the line 3—3 in Fig. 4. Fig. 4 a section on the line 4—4 in Fig. 3. Fig. 5 an end elevation of the cylinder and steam chest, the passage plate being removed. Fig. 6 a section on the line 6—6 in Fig. 7. Fig. 7 a section on the line 7—7 in Fig. 5. Fig. 8 an elevation of the steam chest, the cover and valve being removed, the passage plate being in section on the line of the face of the steam chest.

1 marks the shovel frame, 2 the axle, 3 the supporting wheels, 4 the swinging table, 4^a the boiler, 5 the boom, 6 the hoisting engine, 7 the steam pipe connecting the boiler with the controlling valve chest 8 from which steam is distributed to the hoisting engine, 9 the steam chests of the hoisting engines, 10 the swinging engine, 11 the steam chest of the swinging engine, 12 a pipe for supplying steam to the steam chest of the swinging engine, 13 branches from the pipe 12, connecting the pipe 12 with the steam chest of the hoisting engine, and 14 a steam pipe leading from the pipe 12 by way of the joint 15 along the boom 5 to the steam chest 16 of the crowding engine 17. The hoisting en-

gine operates a gear 18 which meshes the drum gear 19. The drum gear is carried by a shaft 20 in the frame 6^a of the engine. The drum 21 is arranged on the shaft 20 and operates in the usual manner. A gear 22 is arranged on the shaft 20 and meshes a gear 23 on the shaft 24. A beveled gear 25 is fixed on the shaft 24 and drives a gear 26. The gear 26 is arranged on the shaft 27 at the axis of the turn table. A connection is made with the shaft 27 for driving the wheels of the shovel so as to permit of the movement of the shovel from one place to another under its own power. When the hoisting engine is not being used for this purpose the driving mechanism is thrown out of action by means of the clutch 20^a. The swinging engine drives a beveled gear 28. This meshes a gear 29 on the shaft 30. The table 4 is swung through the movement of the shaft 30 in the usual manner. The crowding engine 17 drives a gear 31 on the crank shaft 32. The gear 31 drives a gear 33. The gear 33 is arranged on a shaft 34 and the gears 35 are arranged on the shaft 34 and are adapted to operate the dipper stick (not shown). The steam engines in a general way operate in the usual manner and the several engines perform their usual functions.

The hoisting engines have the cylinders (see Fig. 7). These are connected with the steam chests 9 by the ports 37. Steam passages 38 and 39 also lead to the valve surface of the steam chest 9. The passages 38 and 39 are connected with the passages 40 and 41 respectively in the passage plate 8^a. The passages 40 and 41 are connected by the ports 42 and 43 respectively with the controlling chest 8. The engine valve 44 is of the usual type and has the valve port adapted to couple the passage 38 with either of the ports 37 in the operation of the engine and also the port 46 adapted to couple the ports 37 with the passage 39. Steam is introduced through one of the passages 38 or 39 and exhausted from the other. By reversing the flow of steam in these passages, the engine may be reversed. This is a common method of accomplishing this in engines of this type. The valve 44 is driven through the valve rod 47.

The controlling valve 48 has the valve passage 49 adapted to couple either the port

42 or 43 with the exhaust port 50. The exhaust port is connected with the exhaust passage 51. The controlling valve 48 operates between the side walls 52 making a rather loose fit with said walls. Leading from these side walls are the passages 53 in the passage plate 8^a. These passages 53 connect with the passages 54 leading to the steam chest. The purpose of the steam delivered through the passages 53 to the hoisting engine is to hold the valve 44 to its seat. Steam, therefore, is in the passages 53 at all times when the steam is on the controlling chest. Steam is delivered to the controlling chest through the steam pipe 55.

The valve 44 has the opening 56 in its rear face and is also open at the sides so that steam may at all times pass from the controlling valve chest to the passages 53. A nipple 57 extends through the wall of the valve chest and into the opening 56 in position to deliver a lubricant on the interior of the valve 44. The nipple 57 is connected by a pipe 58 with an oil pump 59 (see Fig. 2). The pump is of ordinary construction being driven through a rock shaft 60. A rock arm 61 is arranged on the rock shaft 60. A link 62 connects the rock arm with a pin 63 on the valve rod 47. The valve rod has the pin 64. An eccentric rod 65 extends from the pin 64 to the eccentric 66 on the crank shaft 67 of the hoisting engine 6.

Oil is delivered at all times during the operation of the pump. With a steam shovel this is intermittently so that there is more or less oil at the interior of the valve at all times. There is no passage of steam practically through the passages 53 except when either the crowding or swinging engine is operated. There is, therefore, a pulsation of steam through the joint between the valve 44 and the side walls 52 and also around the ends of said valve as the hoisting engine is operated. This is sufficient to deliver a proper amount of lubricant from this source to the hoisting engine. It also prevents too great an accumulation of lubricant in the passages 53—53. When either the swinging or crowding engine is started steam passes through the passages 53 carrying with it the lubricant. This lubricant is carried through the valve chest 9 of the hoisting engine, thus leaving some of the lubricant in the chest for this valve in addition to what is carried to this chest with the steam going to the hoisting engine. The lubricant is carried with the steam to the swinging or crowding engine. In this way a single lubricating pump insures a perfect lubrication of all three engines.

What I claim as new is:

1. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; means for conveying steam to said first en-

gine; a second engine; mechanism connected with said means for supplying steam to the second engine by way of the steam chest of the first engine by passing the cylinder of said first engine; and devices for delivering lubricant to said means and retaining a portion of the lubricant delivered while the first engine is in motion for use in the second engine.

2. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; means for conveying steam to said first engine; a second engine; mechanism connected with said means for supplying steam to the second engine by way of the steam chest of the first engine by passing the cylinder of said first engine; a pump driven by one of said engines; and a connection between said pump and said means, said means having devices for retaining a portion of the lubricant delivered while the engine driving the pump is in motion for use with the other engine.

3. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; means for conveying steam to said first engine; a second engine; mechanism connected with said means for supplying steam to the second engine by way of the steam chest of the first engine by passing the cylinder of said first engine; a pump driven by the first of said engine; and a connection between said pump and said means, said means having devices for retaining a portion of the lubricant delivered while the first engine is in motion for use in the second engine.

4. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; a controlling valve chest connected with said engine; a controlling valve in said controlling chest controlling the steam passing to said first engine; a second engine; a connection between said controlling chest and said second engine; and devices for delivering a lubricant to said controlling valve chest and retaining a portion of the lubricant delivered to said chest while one engine is in motion for use with the other of said engines.

5. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; a controlling valve chest connected with said engine; a controlling valve in said chest controlling the steam passing to said first engine; a second engine; a connection between said controlling chest and said second engine; and devices for delivering a lubricant to said controlling valve chest adjacent to said controlling valve in the path of the steam to both of said engines, said devices being adapted to retain a portion of the lu-

bricant delivered while one of said engines is in motion for use with the second of said engines.

6. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; ports leading from the steam chest to the cylinder and a passage to the face of the valve adapted to be coupled with said ports by the valve; a controlling valve chest; a first connection between said controlling valve chest and said passage; a controlling valve controlling said connection; a second engine; a connection between said second engine and said controlling chest; and devices for delivering a lubricant to said controlling chest, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

7. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; ports leading from the steam chest to the cylinder and a passage to the face of the valve adapted to be coupled with said ports by the valve; a controlling valve chest; a first connection between said chest and said passage; a controlling valve controlling said connection; a second engine; a second connection between the controlling chest and the steam chest of the first engine; a connection between the steam chest of the first engine and the second engine; and devices for delivering a lubricant to the controlling valve chest, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

8. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest and engine valve; ports leading from the steam chest to the cylinder and a passage to the face of the valve adapted to be coupled with said ports by the valve; a controlling valve chest; a first connection between said controlling chest and said passage; a controlling valve controlling said connection; a second engine; a second connection between the controlling chest and the steam chest of the first engine; a connection between the steam chest of the first engine and the second engine; and devices for delivering a lubricant to the controlling valve chest adjacent to said controlling valve and in position to deliver lubricant through the movement of steam to both of said connections from the controlling valve chest, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

9. In a lubricating system for steam engines, the combination of a first engine; a

second engine; a controlling valve chest having side walls; a controlling valve arranged between said side walls; a first connection between the controlling valve chest and the first engine, said connection being controlled by said valve; a second connection leading from one of said side walls to said second engine and adapted to convey steam from the controlling valve chest to said second engine; and devices for delivering a lubricant to the controlling valve, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

10. In a lubricating system for steam engines, the combination of a first engine having a cylinder, steam chest, engine valve, ports between the cylinder and the steam chest and a steam passage leading to the face of the valve for delivering steam for actuating the engine; a controlling valve chest having side walls therein; a controlling valve arranged in said side walls; a connection between the controlling valve chest and said passage in the first engine; a second connection leading from a side wall in the controlling valve chest to the steam chest of the first engine; a second engine; a steam connection between the steam chest of the first engine leading to the second engine for supplying said second engine; and devices for delivering a lubricant to the controlling valve, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

11. In a lubricating system for steam engines, the combination of a first engine having two cylinders having steam chests, connecting ports, a steam passage and engine valves; a controlling valve chest having side walls; a controlling valve arranged between the side walls; a first connection leading from the controlling valve chest to said passages in the first engine; a second connection from each side wall leading to one of the steam chests of said first engine; a second engine; connections between the steam chests of the first engine leading to the second engine; and devices for delivering a lubricant to the controlling valve between the side walls, said devices being adapted to retain a portion of the lubricant delivered while one of said engines is in motion for use with the second of said engines.

12. In a lubricating system for steam engines, the combination of a first engine having two cylinders having steam chests, connecting ports, steam passages and engine valves; a controlling valve chest having side walls; a controlling valve arranged between the side walls; a first connection leading from the controlling valve chest to said passages in the first engine; a second connection from each side wall leading to each of the

steam chests of said first engine; a second engine; connections between the steam chests of the first engine leading to the second engine; and devices for delivering a lubricant 5 to the controlling valve between the side walls in position to be taken up by the steam currents and delivered to all of said connections, said devices being adapted to retain a portion of the lubricant delivered while one 10 of said engines is in motion for use with the second of said engines.

13. In a lubricating system for steam engines, the combination of a first engine; a second engine; means for supplying both en-

gines from a common source of supply; and 15 devices for delivering a lubricant in the path of the steam to both engines, said devices comprising means for retaining a portion of the lubricant delivered while one engine is in motion for use with the other of said 20 engines.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EDWIN J. ARMSTRONG.

Witnesses:

V. C. HESS,

B. M. HARTMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."