J. B. OPSAHL.

OIL SWITCH.

APPLICATION FILED SEPT. 26, 1907.

908,123.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

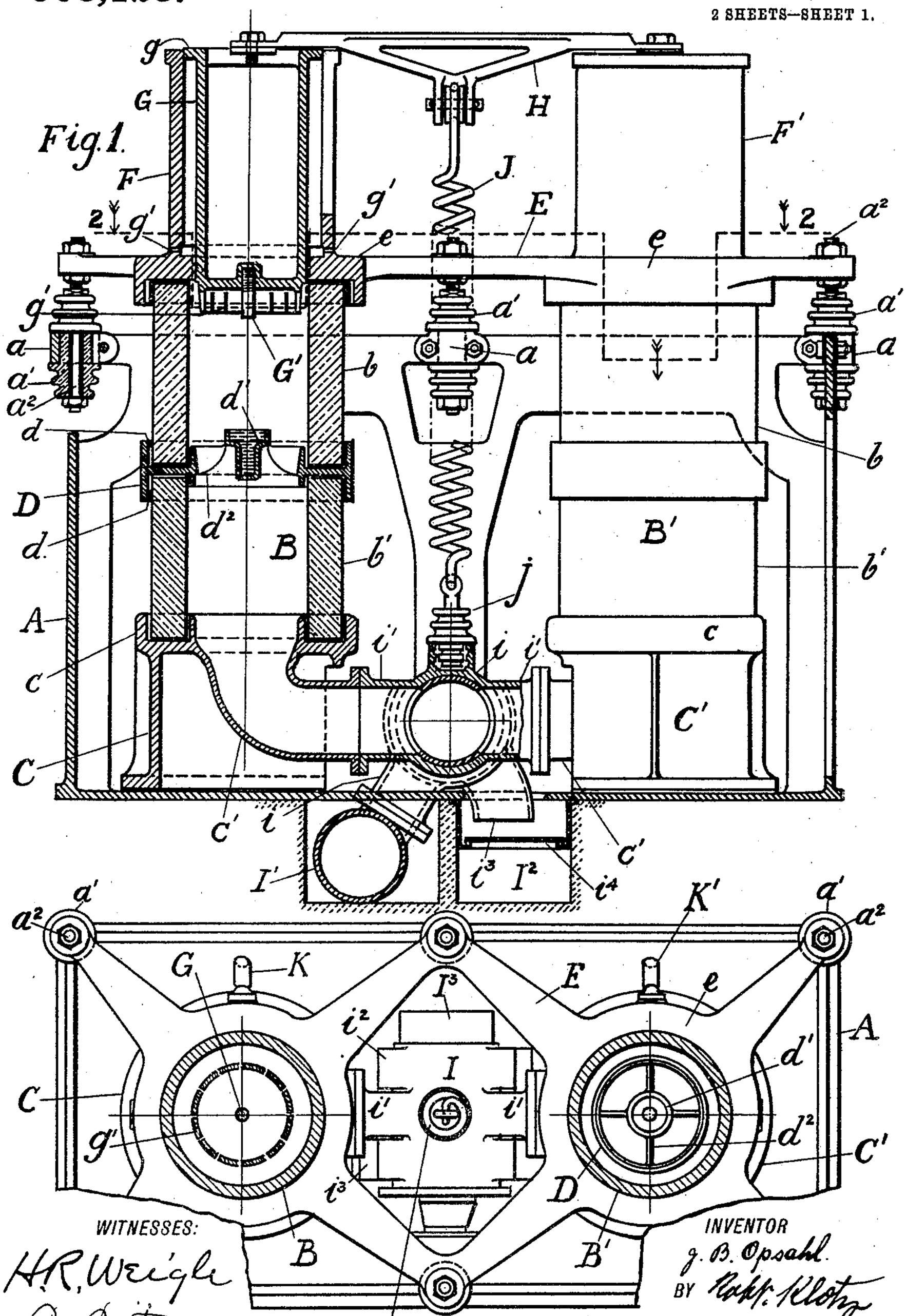

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

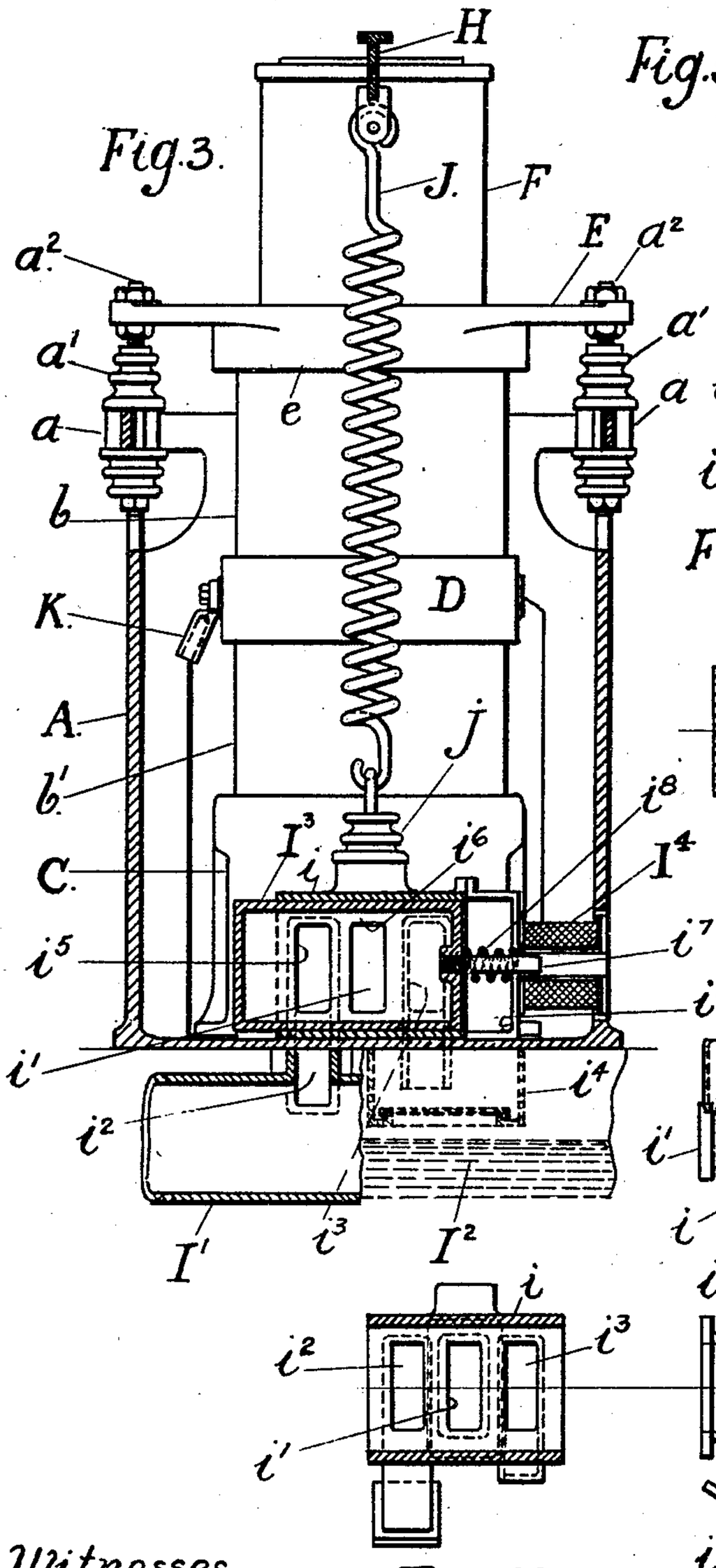


Fig. 5.

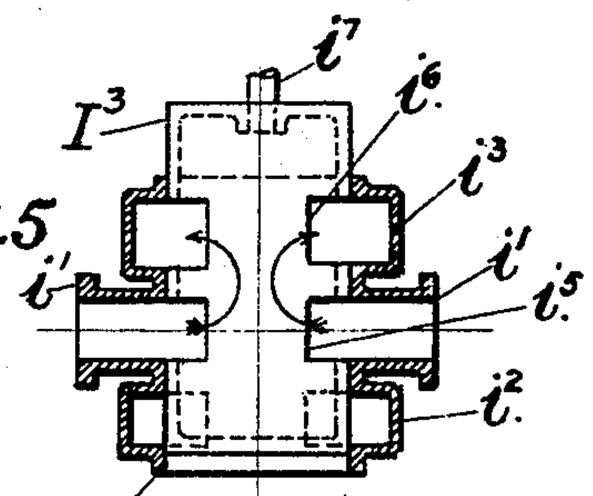


Fig. 4.

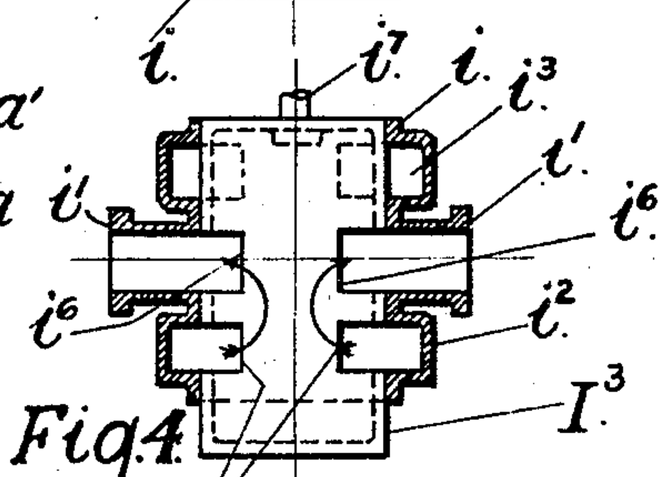


Fig. 6.

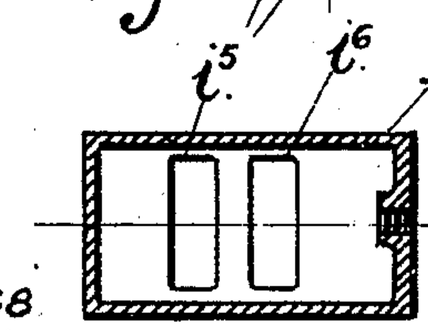


Fig. 7.

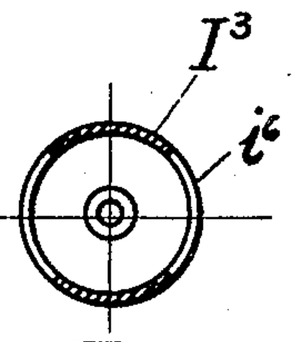


Fig. 8.

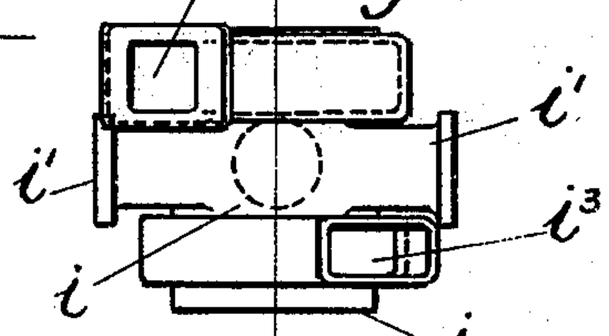
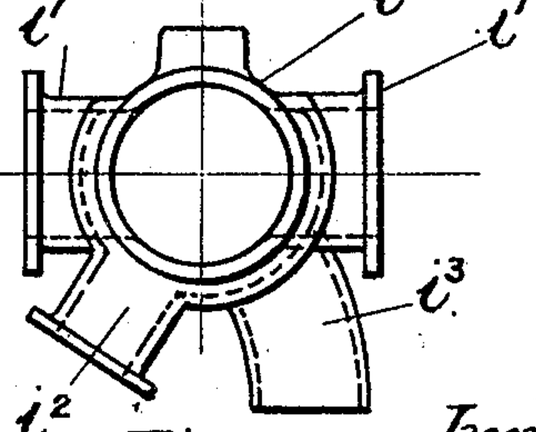


Fig. 10.

Fig. 9.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHAN BURCHARDT OPSAHL, OF CHICAGO, ILLINOIS.

OIL-SWITCH.

No. 908,123. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed September 26, 1907. Serial No. 394,637.

To all whom it may concern:

Be it known that I, JOHAN BURCHARDT OPSAHL, a subject of the King of Norway, and residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Oil-Switches, of which the following is a complete specification.

This invention relates to improvements in oil switches and more particularly to an oil switch of that class adapted to prevent a spark when breaking an electrical current of high potential. Heretofore devices of this class have been employed but the oil therein has been kept at atmospheric pressure so that it has not been subjected to a forced movement when the switch is operated, other than that due to gravity. The result in such devices is that the oil moves too slowly to completely fill the space caused by the rapidly moving contacts and a spark is allowed to form, ofttimes causing considerable damage.

One of the objects of this invention is to provide a device in which the oil employed to immerse the contacts is subjected to heavy pressure and acts directly upon the movable contact to operate it.

In other words it is an object of the invention to provide a switch adapted to be opened by hydraulic pressure.

It is a further object of the invention to provide a switch in which the immersing fluid at all times completely fills the space around and about the contacts so that when the current is broken the spark, if any, must necessarily travel through it.

It is also an object of the invention to provide a device in which a clean supply of the oil is inserted each time the current is broken, thereby providing a proper circulation of the oil and making it possible to provide sufficient filtration for the same to thoroughly remove therefrom any particles of carbon which have been formed by the breaking of the current.

It is a further object of the invention to provide a device in which the safety of both the plant and the employees is greatly enhanced for the reason that the liability of spark formation is greatly reduced, and because the necessity of removing the fluid for filtration having been removed, it does away with the necessity of tampering with the device.

The invention consists of the matters hereinafter described in the specification and more particularly pointed out and defined in the appended claims.

In the drawings: Figure 1 is a view partly in side elevation and partly in vertical section, of a device embodying my invention. Fig. 2 is a section taken on line 2—2 of Fig. 1. Fig. 3 is a central section taken between the cylinders and showing the outlet in dotted lines. Fig. 4 is a horizontal section of the slide valve, showing the valve slide in plan view and in the inlet position shown in Fig. 3. Fig. 5 is a view similar to Fig. 4 but showing the valve slide in reverse or discharge position. Fig. 6 is a longitudinal section of the valve slide. Fig. 7 is a transverse section of the same. Fig. 8 is a bottom plan view of the valve casing. Fig. 9 is an end elevation of the same. Fig. 10 is a central vertical section of the valve casing.

As shown in said drawings: The device is embodied in a double series switch, though obviously a single switch having but one cylinder and one piston, or any other desired number of connected units may be employed.

A indicates a frame of any desired construction and material and adapted to support the working parts of the device. Within this frame are two cylinders B and B′, which are spaced a distance apart and are mounted upon suitable bases C and C′ of cast metal or other preferred material. Said cylinders may be of any suitable insulating material, such as glass or porcelain, and are constructed of an upper section *b* and a lower section *b′*, the latter of which is seated and properly cemented, or otherwise secured to afford a tight joint, in a groove or channel *c* in the top of the base piece. Between said sections is a contact ring D, having the adjacent ends of said cylinder sections cemented in channels *d* in its top and bottom.

At the upper corners of the frame A and at suitable points therebetween, said frame is provided with insulator sockets *a* in which are supported suitable insulators *a′*, carrying attaching bolts a^2. A double spider or frame E is engaged on said bolts and is provided over each cylinder with an annular cap *e*, in which the upper ends of the sections *b* are engaged. Extending upwardly from said caps and in axial alinement therewith are the guide cylinders F and F′ in which are slidably engaged the plungers or pistons G. As shown the cylinders F and F′ are slotted in their adjacent sides and are of larger bore

than the caps, and the pistons are each provided at their tops with a peripheral flange *g* fitting closely therein which act to guide them. A cross bar or yoke H is engaged on said pistons at its ends and is adapted to travel in the slots in said cylinders F and F'.

A controlling valve I of any desired construction is provided and is adapted to control the flow of oil to and from the cylinders B and B'. Said valve as shown however, is a slide valve, the valve casing *i* of which is provided on each side thereof with a port *i'* which are connected with ports *c'* opening through the bases C and C' into the bottoms of the cylinders B and B'. At one end of said valve casing is an inlet port i^2, to which is connected an inlet pipe I' and at the other end of said casing is an outlet port i^3 which opens through a filter i^4 of any preferred construction into a filtration tank I^2 beneath the frame. Said filtration tank is connected with any suitable supply tank or reservoir, not shown, and from which the inlet leads.

Any preferred means may be employed to force the oil to and from the supply tank. For instance an electrically operated force pump may force the oil from the filtration tank into the pressure tank or cylinder and acting automatically when the piston or plunger in the pressure cylinder sinks below a certain level. The pressure on said cylinder may be exerted by springs or weights.

Slidably engaged in said casing is a hollow, cylindrical valve slide I^3, having ports i^5 and i^6 therein adapted to register with the ports in the valve casing. Any preferred means may be employed to operate said slide but, as shown, a solenoid I^4 is supported on a bracket i^9 on the valve casing and a rod i^7 is engaged to said slide and projects into said solenoid, forming the core therefor. A coiled spring i^8 is carried on said rod and engages at one end the slide and at the other end the bracket i^9, and acts to hold the slide normally at the inner limit of its movement.

The ring D is provided with a mercury cup *d'* supported at its axis upon radial arms d^2 and affording a bead contact. The piston G is provided on its lower end with a contact ring *g'* which is slotted vertically to provide a plurality of flexible tongues adapted to fit closely in the ring D. A contact G' has threaded engagement in the bottom of the piston G, axially thereof, and extends downwardly and is adapted to enter the mercury cup *d'* when the piston is lowered. A coiled spring J is engaged at one end to the cross bar H and at the other end to the insulator *j* engaged to the valve casing *i* and acts to normally hold the pistons at the lower limit of their movement, with the contacts in electrical engagement.

K and K' are cable sockets connected with the rings D of the cylinders B and B' respectively and afford means for connecting the switch in the circuit.

The operation is as follows: When the current is turned off the solenoid the valve slide is held by the spring i^8 in the position shown in Fig. 3, thereby permitting the oil to be forced from the source of supply to the cylinders B and B'. The pressure of the oil acts to force the pistons G upwardly against the tension of the spring J and break the connection between the contacts. Owing to the fact that the oil is under pressure it at all times fills the space in the oil cylinders beneath the pistons.

When current is turned into the solenoid the valve slide is moved to the position shown in Fig. 5, thereby bringing the ports i^5 and i^6 into register with the ports *i'* and i^3 respectively of the valve casing, and permitting the escape of the oil from the cylinders to the outlet channel I^3 and back to the supply tank or reservoir. The pressure being released beneath the pistons the spring J acts to lower them and bring the contacts into engagement, thereby completing the circuit. As the pistons near the lower limit of their movement air is encaged in the bottoms of the guide cylinders F—F', when the flanges *g* pass beneath the slots in said cylinders, and acts as a buffer for said pistons. Apertures *g'* are provided at the lower ends of said guide cylinders which permit the air to slowly escape and gently seat the pistons. Owing to the fact that the cup *d'* is flaring there is always oil enough left on the mercury to prevent oxidation. As the oil escapes from the cylinders it passes through the filter i^4 where any particles of carbon which may have been formed are removed, thereby keeping the oil clean.

Obviously the valve slide may be operated by any preferred mechanical means and any preferred means may be employed to force the oil into the cylinders. Obviously, also many details of construction may be varied without departing from the principles of my invention.

I claim as my invention:

1. In an oil switch, the combination with a cylinder of a stationary contact therein, a mercury cup on said contact, a pressure controlled movable contact adapted to coact with the stationary contact, adjustable means thereon adapted to engage in said cup and means for admitting and releasing oil under pressure to and from said cylinder.

2. In a device of the class described the combination with a cylinder of a mercury cup therein affording a contact, a piston in said cylinder, a contact on the bottom thereof, adapted to engage in said cup, a valve adapted to admit oil under pressure to said cylinder and release it therefrom,

and means for filtering the oil as it escapes from the cylinder.

3. In a device of the class described the combination with a cylinder of insulating material, of a contact ring supported therein, a mercury cup supported on said ring, a piston, a plurality of flexible tongues thereon adapted to engage said ring, a removable contact adapted to engage in said cup and means for admitting oil under pressure to said cylinder.

4. In a device of the class described the combination with a cylinder of insulating material, of a contact ring therein, a mercury cup supported on said ring axially of the cylinder, a piston, flexible means on the bottom thereof adapted to engage said ring, a removable contact on said piston adapted to engage in said cup, means for admitting oil under pressure to said cylinder and raising the piston, means for returning said piston and means affording an air cushion therefor.

5. In a device of the class described the combination with a receptacle of a stationary contact therein, an axially disposed mercury cup on said contact, a movable contact adapted to be moved into and out of engagement with the stationary contact means adapted to engage in said mercury cup and means adapted to admit oil under pressure to said receptacle and force the movable contact away from the stationary contact.

6. In a device of the class described the combination with a plurality of cylinders of insulating material and each having an inlet port, of a stationary contact in each cylinder, a piston in each cylinder, a contact on each piston adapted to engage the stationary contacts when the pistons are at the lower limits of their movement, a valve controlling said ports and adapted to admit fluid under pressure to said cylinders and raise the pistons, a cross bar connecting said pistons, a spring connecting said cross bar with said valve and adapted to lower the pistons, a discharge port in said valve and a filter into which said port opens.

7. In a device of the class described the combination with a plurality of oil cylinders having inlet ports in their lower ends, of a contact ring in each cylinder, a mercury cup supported on each ring axially of the cylinder, a guide cylinder above each oil cylinder, a flanged piston therein projecting downwardly into the oil cylinder, a flexible contact on each piston adapted to engage in said rings when the pistons are at the lower limit of their movement, an axial contact on each piston adapted to seat in said cups, a cross bar on said pistons, a valve controlling said ports, means for operating the same, a spring connecting said bar and said valve and adapted to lower the pistons, an inlet pipe adapted to admit oil under pressure to the oil cylinders from a source of supply, an outlet port in said valve, a channel leading therefrom to the source of supply and a filter therein through which the oil passes after leaving the cylinders.

8. In a device of the class described the combination with a pair of cylinders, of a stationary contact in each cylinder, a piston in each cylinder, a contact on each piston adapted to engage with the stationary contacts, a cross bar connecting said pistons, a valve adapted to control the admission of fluid under pressure to said cylinders, and a spring connecting said cross bar with the valve casing.

9. In a device of the class described the combination with a pair of cylinders, of a pipe communicating with each, a valve controlling said pipe and having an outlet and an inlet port, a supply pipe connected with the inlet port, a tank connected with the outlet port, a filter therein, a piston in each cylinder, contacts on said cylinders and pistons, a cross bar connecting said pistons and a spring connecting said bar with the valve casing and adapted to lower the pistons.

10. In a device of the class described the combination with a pair of cylinders of a stationary contact in each cylinder, a piston in each cylinder, a slotted guide cylinder for each piston, a contact on each piston each adapted to engage one of the stationary contacts, a cross bar connecting said pistons and adapted to travel in the slots in the guide cylinders, means for admitting fluid under pressure to said cylinders to raise the pistons, and a spring acting on the cross bar to return the pistons.

11. In a device of the class described the combination with a frame, of a pair of apertured bases therein, a cylinder on each base, a stationary contact on each cylinder, a mercury cup supported on each contact, a piston in each cylinder having a serrated flange thereon adapted to engage with one of the contacts, a contact on the bottom of each piston adapted to seat in the mercury cup, a two way valve adapted to control fluid under pressure in said cylinders, a cross bar connecting said pistons and a spring connecting said bar with the valve casing.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

JOHAN BURCHARDT OPSAHL.

Witnesses:
H. R. WEIGLE,
B. ZEITZ.