

Jan. 19, 1937.

R. N. BURCKHALTER ET AL

2,068,394

FILTER AND HEAT EXCHANGER

Filed July 21, 1932

3 Sheets-Sheet 1

Fig. 1

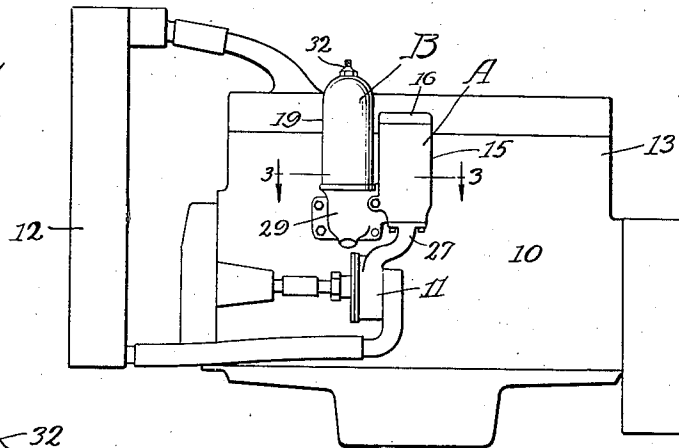
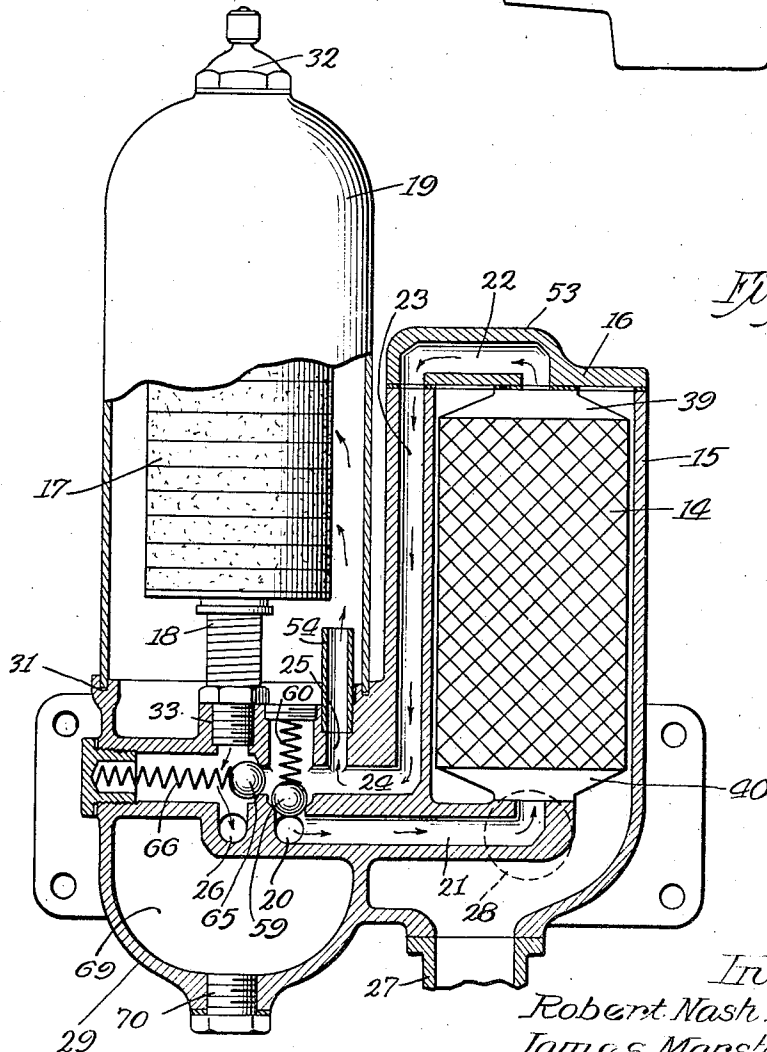


Fig. 2



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3 Sheets-Sheet 2

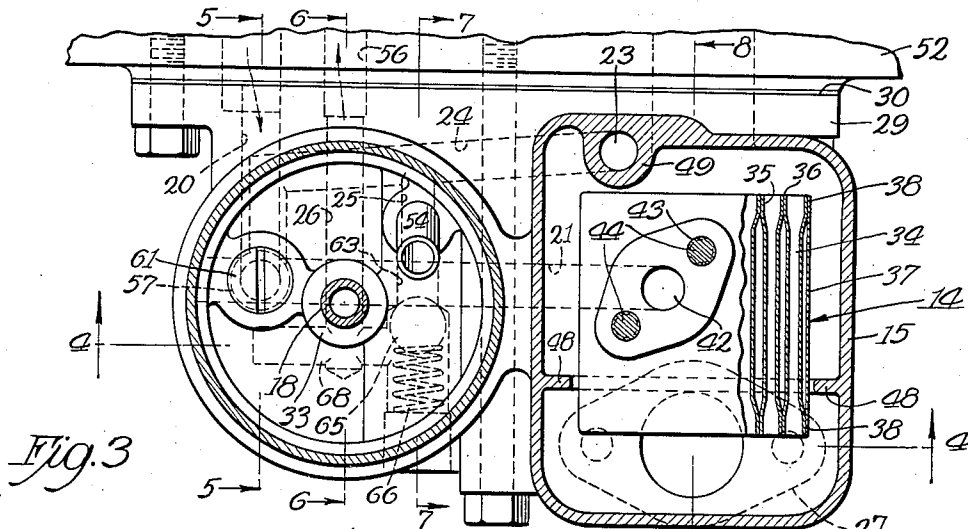


Fig. 3

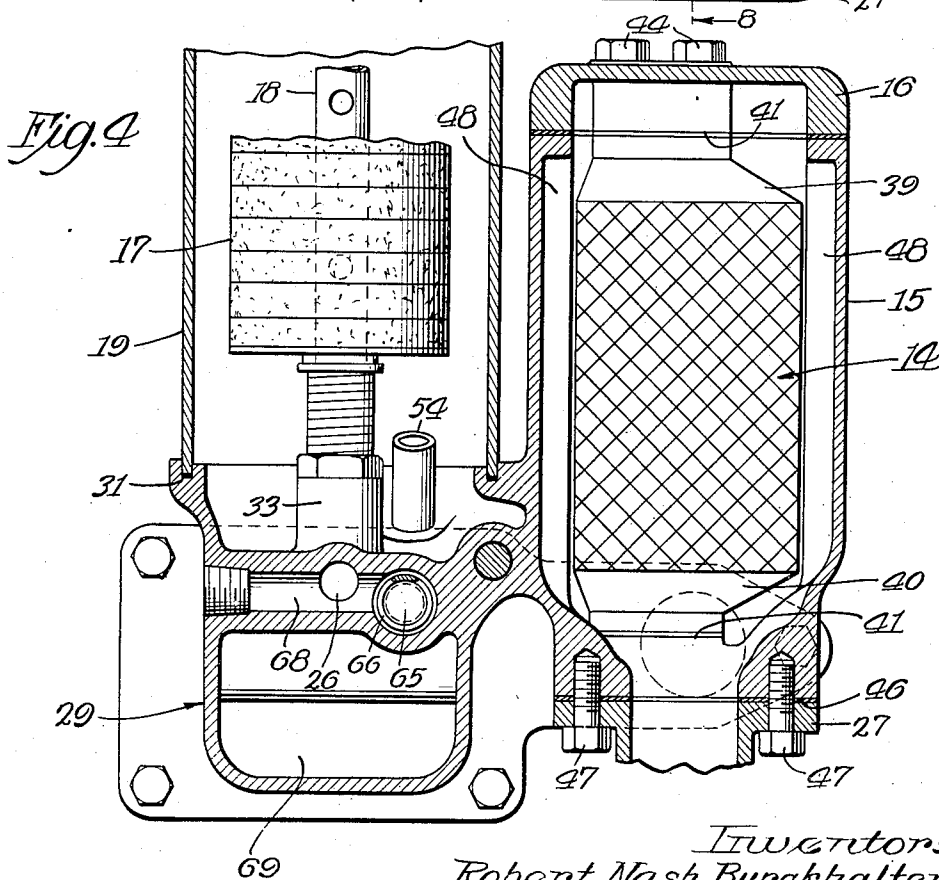


Fig. 4

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3 Sheets-Sheet 3

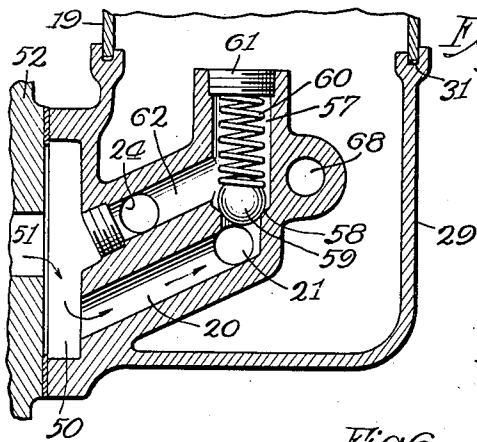


Fig. 5

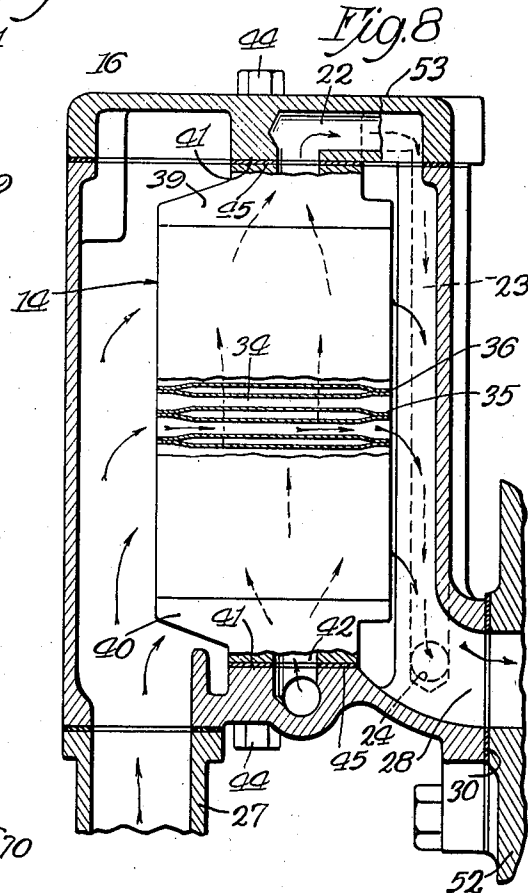


Fig. 8

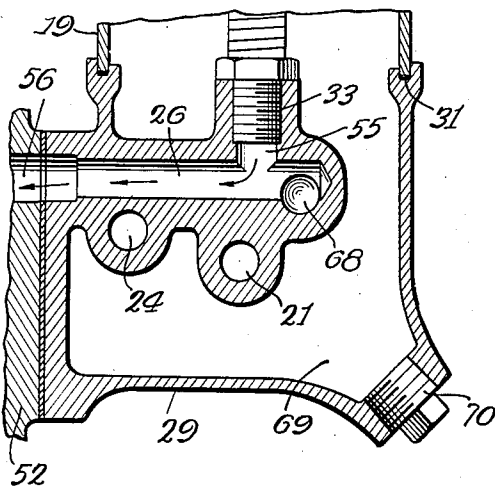


Fig. 6

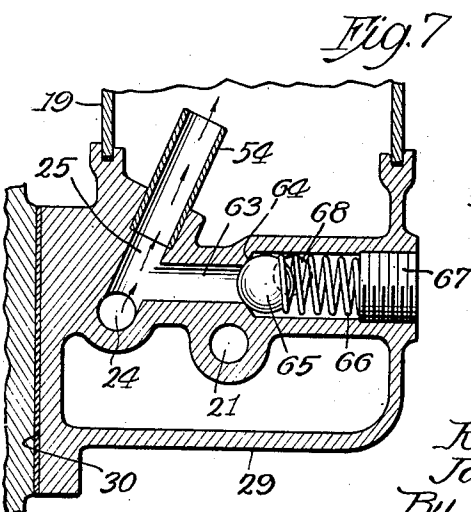


Fig. 7

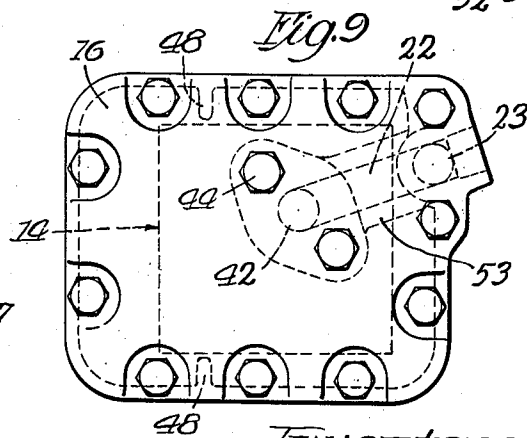


Fig. 9

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UNITED STATES PATENT OFFICE

2,068,394

FILTER AND HEAT EXCHANGER

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Application July 21, 1932, Serial No. 623,786

13 Claims. (Cl. 210—165)

The principal object of this invention is to combine a filter and a heat exchanger in one commercial unit especially adapted for connection with the lubricating and cooling system of an internal combustion engine.

The drawings show one form adapted to be bolted to the engine casing and connected to the oil and water passages without external piping other than the lead from the water pump.

Fig. 1 is a diagrammatic side elevation of a conventional internal combustion engine with the combined filter and heat exchanger at one side thereof, and connected with the water pump;

Fig. 2 is a vertical section through the combined filter and heat exchanger with some of the parts and passages distorted to illustrate them more clearly than they would appear in a true section;

Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3;

Figs. 5, 6, and 7 are vertical sections of fragments taken on the lines 5—5, 6—6, and 7—7, respectively, of Fig. 3;

Fig. 8 is a vertical sectional view taken on the line 8—8 of Fig. 3; and

Fig. 9 is a plan view looking at the top of Fig. 8.

But these drawings and the specific description are used for the purpose of disclosure only, for the substance of the invention may be embodied in many other forms.

General description

Fig. 1 shows the left side of an engine 10, equipped with a pump 11, connected to draw water from the bottom of a radiator 12, circulate it through the cylinder jackets 13, and return it to the top of the radiator.

The heat exchanger A (Fig. 1) comprises a heat exchanger element 14 (Figs. 2, 4, and 8), resembling the familiar honeycomb radiator, and mounted within a housing 15 before the cover 16 is secured in place. The filter B (Fig. 1) includes a hollow cylinder of felt 17, mounted on a perforated tube 18 within a shell 19.

Oil enters from the back through a passage 20 (Fig. 2), turns to the right through the passage 21, rises through the heat exchanger element 14, enters the passage 22 in the cover, turns down through the passage 23 in the wall of the housing, thence to the horizontal passage 24, thence to the passage 25 into the filter shell 19, where it surrounds the filter element 17, filters through it, enters the tube 18, descends and escapes to

the bearings through the back by a passage 26. The water enters the bottom of the heat exchanger through the pump connection 27, rises in the housing and passes through the tubes of the heat exchanger element 14 and descends and passes out to the cylinder jackets through the port 28.

Specific description

A body 29, which may be a single casting finished on the back at 30 to fit against a machined pad on the engine casing, forms the bases of both the filter and the heat exchanger, as well as the open top housing 15 of the latter. A groove 31 on the top, at the left of the body, receives the bottom of the shell 19, which is made fast by a cap nut 32 screwed on the top of the tube 18, and the bottom of the latter is threaded into the body at 33.

The heat exchanger is composed of a stack of small tubes 34, hexagonal in cross section, with their end portions 35 expanded and soldered together at 36. A jacket 37 is wrapped about the sides of the outer tubes of the stack and soldered at 38 to the enlarged end portions. This jacket is formed into headers 39 and 40, at the top and bottom respectively, of the stack, somewhat after the fashion of the tanks at the top and bottom of the familiar honeycomb radiators.

In the bottom of the housing 15, and on the underside of the cover 16, are similar pads 41, having a central opening 42 for communication with the corresponding header, and lateral openings 43 to receive studs 44 by which the heat exchanger unit is made fast in place. The joints are, of course, made tight by suitable gaskets 45. The bottom of the heat exchanger base has a machined face 46 to receive the pump connection 27, which is secured in place by studs 47.

The housing 15 has oppositely disposed internal flanges 48 (Fig. 3) slightly spaced from the jacket 37 of the heat exchanger unit. At the back the same housing has a thick rib 49 cored out to form the passage 23.

The inlet passage 20, appearing in end view, (Fig. 2), is shown as an upwardly inclined bore, leading from a cored pocket 50, which receives oil from the pump through a port 51 in the engine casing 52. The passage 21 is a horizontal bore (Figs. 2, 3, and 5), leading across the casting under the filter and heat exchanger to the bottom of the heat exchanger unit 14, and communicating with the opening 42. The passage 22 is a cored hole in a thickened portion 53 of the cover 16 and, as already indicated, 55

serves to pass the oil from the header 39 to the downwardly directed passage 23, which connects with the passage 24, shown as a horizontal bore (Figs. 2 and 3), inclining outwardly to the bottom of an upwardly inclined bore 25, fitted with a delivery tube 54, leading into the filter shell 19.

The hollow tube 18 delivers the filtered oil to a vertical bore 55 (Fig. 6) communicating with the outlet passage 26, which appears as a horizontal bore entering the back of the body, and which is connected with the bearing header by a port 56 in the engine casing 52.

In order to afford a by-pass across the heat exchanger the inlet passage 20 communicates with a vertical bore 57 providing a valve seat 58 cooperating with the ball valve 59, yieldingly held seated by a spring 60, compressed by a screw 61. When the resistance in the heat exchanger exceeds a selected amount the valve 59 will be lifted and the oil from the inlet port 20 will enter a downwardly inclined passage 62, leading to a prolongation of the passage 24 and, hence, is delivered immediately to the filter through the tube 54.

In order to provide a by-pass across the filter the passage 25 communicates with a horizontal bore 63 (Fig. 7), providing a seat 64 for a ball valve 65 yieldingly held seated by a spring 66, compressed by a screw 67. The bore 63 is connected with the outlet port 26 by a bore 68, hence, when the valve 65 is unseated, oil flows from the bore 24 to the outlet passage 26 without passing through the filter.

The resistance of the springs 60 and 66 is varied to make the pressure differentials on the filter and heat exchanger suit conditions.

The body 29 is hollowed out to form a sort of cup 69 below the filter, forming a sump to collect foreign matter eliminated from the oil, which may be drawn off from time to time by removing the plug 70.

In some installations the filter will be connected ahead of the heat exchanger, to the end that clean oil only will enter the latter.

The particular construction shown in the drawings and described above was designed for new engines with the special object to avoid cluttering up the side of the engine and to obtain utmost simplicity. But varying conditions of engine construction will make other forms necessary. For example, where the water connection to the jacket must be exposed the engineer may demand an outlet at some place other than the back of the heat exchanger housing, and it may facilitate manufacture to use separate castings for the bases of the filter and heat exchanger and bolt them together, because it is sometimes easier to machine two small castings than a single large one. An attempt to illustrate the many possible variations would unnecessarily enlarge the drawings and description.

We claim as our invention—

1. In a device of the class described, a body including a filter base, a heat exchanger base and an open housing on the latter base, a shell on the filter base, a filter element within the shell, a heat exchanger unit within the housing, a cover for the housing, oil connections including passages in the body whereby oil may flow upwardly through the heat exchanger, and downwardly through a wall of the housing to the filter.

2. In a device of the class described, a body including a filter base, a heat exchanger base

and an open housing on the latter base, a shell on the filter base, a filter element within the shell, a heat exchanger unit within the housing, a cover for the housing, oil connections including passages in the body whereby oil may flow through the filter and the heat exchanger in series, and water connections including passages in the body communicating with the interior of the housing.

3. In a device of the class described, a base adapted for attachment to a support, a heat exchanger unit and a separate filter unit mounted on the base, the base being ported to receive oil from a circulating system, to deliver it to one of the attached units, to receive oil from such unit and deliver it to the other unit, and to receive oil from the latter unit and deliver it to the circulating system.

4. A heat exchanger unit for oiling systems comprising a chambered body open at one end and having inlet and outlet ports at opposite sides for a cooling fluid, a heat transferring element housed within the body and constituting a partition between the named ports, such elements comprising a stack of parallel tubes having their end portions expanded to polygonal form and soldered together, lateral imperforate side walls and ported headers for admitting and discharging oil, the body having a ported seat for one of the headers, and a cover for the open end of the body and having a ported seat for one of the headers, and means for compressing the cover upon one of the headers and securing it to the body.

5. A device of the class described comprising a body having a face adapted to be attached to a pad formed on an engine and having a pair of base portions arranged side by side, a cover for each of the base portions, a filter unit mounted on one base portion beneath the cover therefor, a heat exchanger unit mounted on the other base portion beneath the cover therefor, passages for conducting oil in series through said units, and a water inlet and outlet for the heat exchanger.

6. A device of the class described comprising a body having a face adapted to be attached to a pad formed on an engine and having a pair of base portions arranged side by side, an independently removable cover for each of the base portions, a filter unit mounted on one base portion beneath the cover therefor, a heat exchanger unit mounted on the other base portion beneath the cover therefor, passages for conducting oil in series through said units, and a water inlet and outlet for the heat exchanger.

7. A device of the class described comprising a body having a face adapted to be attached to a pad formed on an engine and having a pair of base portions arranged side by side, an independently removable cover for each of the base portions, a filter unit mounted on one base portion beneath the cover therefor, a heat exchanger unit mounted on the other base portion beneath the cover therefor, passages in the body for conducting oil in series through said units, and a water inlet and outlet for the heat exchanger.

8. In a device of the class described, an integral casting adapted for attachment to a wall and comprising a filter base, an open housing having separate passages in heat exchange relation for oil and for a different fluid having a temperature different from that of the oil on said casting at one side of said base, a filter unit mounted on the base, a heat exchanger unit

within the housing, and a cover for the housing, the casting having ducts providing for the flow of oil in series through the named units.

5 9. In a device for filtering and changing the temperature of the lubricating oil of an internal combustion engine, in combination, a body having a face for direct engagement with an engine wall and bases for a heat exchanger and a filter unit, and oil inlet and outlet passages through
10 such face and connected with the bases, a water inlet passage leading to the heat exchanger base, and a water outlet leading from the last-named base and through the wall-engaging face.

10. The combination with an internal combustion engine having a cooling system including a
15 water jacket and a radiator and a pump for circulating water therethrough, of separate oil cooling and oil filtering units, such units being connected by an oil passage, a body upon which
20 such units are mounted, such body having a face for attachment to a pad formed on the wall of the water jacket, and a passage leading from the water chamber of the oil cooling unit through the named face of the body to an aperture in
25 the pad, connection between the pump and the receiving side of the water chamber of the last-named unit, and means for securing the body to the pad.

11. In a device of the class described, a body having a finished face to fit against an engine casing and including a filter base, a heat exchanger base and an open housing for the latter with a water outlet passage for the housing
5 through the finished face, and an oil outlet passage in the wall of the housing, a cover for the housing having an oil passage registering with that of the housing and a heat exchanger element connected between the cover and the base.
10

12. In a device of the class described, a body having a finished face to fit against an engine casing and including a filter base, a heat exchanger base and an open housing for the latter with a water outlet passage for the housing
15 through the finished face.

13. In a device of the class described, a filter unit and a heat exchanger unit, a body forming a base for each of the units, said body having a finished face to fit a machined pad on an engine
20 casing and having a water passage for the heat exchanger and oil passages for both the heat exchanger and filter units.

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CERTIFICATE OF CORRECTION.

Patent No. 2,068,394.

January 19, 1937.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, lines 71, 72 and 73, claim 8, strike out the words "having separate passages in heat exchange relation for oil and for a different fluid having a temperature different from that of the oil" and insert the same after "housing" and before the comma, page 3, first column, line 1, same claim; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of March, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.