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APPARATUS OR TOOL FOR APPLYING COATING

Filed June 6, 1924

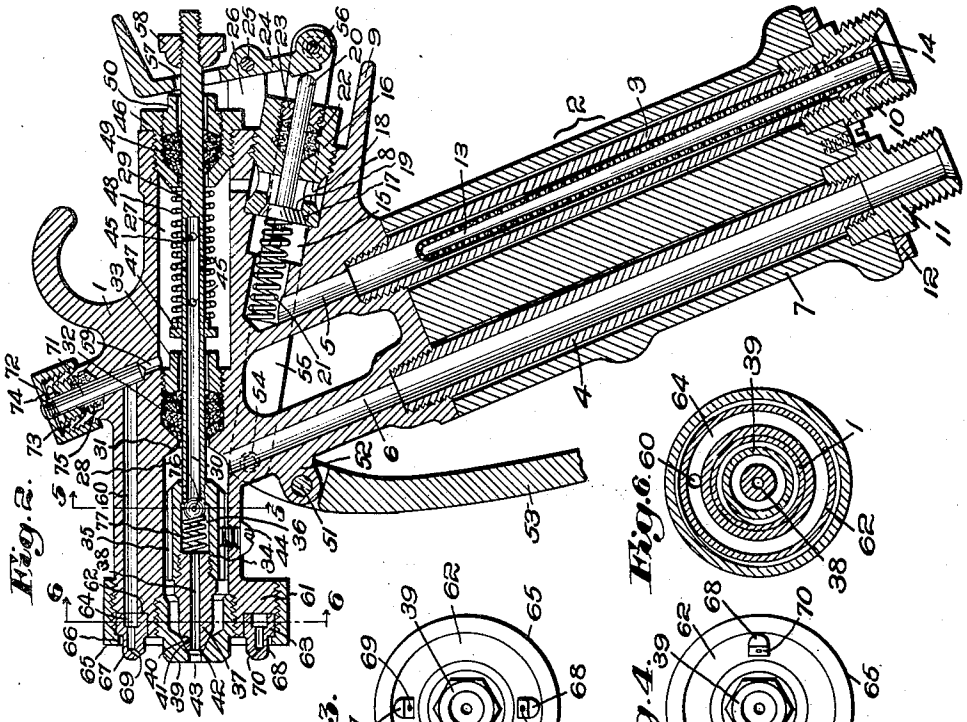


Fig. 2.

Fig. 6.

Fig. 3.

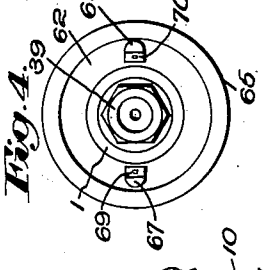


Fig. 4.

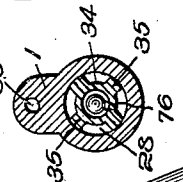


Fig. 5.

Fig. 1.

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UNITED STATES PATENT OFFICE

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APPARATUS OR TOOL FOR APPLYING COATING

Application filed June 6, 1924. Serial No. 718,278.

The present invention relates to apparatus or tools for applying coating material, and more particularly to air brushes or spray guns.

Heretofore it has been proposed to eject coating material from the air brush or spray gun under air pressure and to change its formation after ejection by directing diametrically opposed and converging jets of air thereagainst to effect the flattening, spreading or fan-shaping thereof. For the best results it is essential for the jets of supplemental air to converge at a point in the extended longitudinal axis of the inner nozzle. This point of convergence is called the focus of the supplemental jets. Usually it is only necessary to flatten the discharged coating material in either a vertical or a horizontal plane as a slight twist of the operative's wrist takes care of intermediate planes although for general utility it is desirable to provide for the flattening of the discharged material in any plane throughout a full circle. But, whether the discharged coating is flattened in one of two planes or in one of an infinite number of planes, it is essential that the focus of the supplemental air jets remains constant throughout the angular adjustment thereof to vary the plane of the flattened discharge of the coating material.

The principal object of the present invention is to produce an apparatus or tool for applying coating providing with a front face which will support the supplemental air jets so as to provide the proper focus therefor and which will permit the angular adjustment of the supplemental air jets to vary the plane of the flattened discharge without variation in said focus.

To the accomplishment of this object, and such others as may hereinafter appear, the features of the present invention relate to certain devices, combinations and arrangements of parts hereinafter described and then set forth broadly and in detail in the appended claims which possess advantages which will be apparent to those skilled in the art.

In the drawings wherein we have disclosed one illustrative embodiment of our invention,—

Fig. 1 is a side elevation of an apparatus or so-called spray gun embodying one form of our invention;

Fig. 2 is a vertical, longitudinal section through the apparatus shown in Fig. 1;

Figs. 3 and 4 are front elevations of the discharge portion of the spray gun showing two adjusted positions of certain of the parts;

Figs. 5 and 6 are transverse sections upon the lines 5, 5 and 6, 6 respectively of Fig. 2.

The apparatus, tool, or device may be of any suitable material but at least the body portion is preferably metallic, any suitable metal being employed, an aluminum alloy being particularly useful in this connection. As shown, it comprises a body 1 and a handle or extension indicated as a wall at 2. In the present embodiment of our invention the coating material is supplied under pressure and the motive agent is a suitable fluid such as air under pressure, said material and air, both under pressure, desirably being introduced into the body 1 through the handle 2.

Accordingly we have represented an air or other motive agent supply duct or pipe 3 and a substantially parallel material supply pipe 4, both of which may be of brass or other suitable material. Said air and material supply pipes 3 and 4 respectively are tapped at their upper ends into the body portion 1 and are in communication with the air inlet passage 5 and the material inlet passage 6 respectively the same preferably being in axial alignment with the pipes 3, 4 and being drilled or otherwire formed in the tool body.

Enclosing said pipes 3, 4 and providing a grip for the tool is a handle member 7 preferably of hard rubber, Bakelite or other suitable material of a shape to fit the hand of the operator. The rear portion of the body 1 adjacent the upper part of said handle member 7, if desired, is provided with a smooth under face 8 formed partly on a lip or extension 9 and which is adapted to seat upon the hand of the operator grasping the handle to assist him in supporting the tool. Said handle member 7 is retained in its assem-

bled position as shown by means of the air hose connection 10 and the material hose connection 11 received in countersunk portions of the handle member and in alignment with the air and material pipes 3, 4 respectively, said connections being internally threaded to receive external threads at the lower end of said pipes. If desired, a handle plate 12 or other base member may be provided at the lower end of the handle, the same being held in place as by screws or the like.

To remove particles of dirt or other foreign matter from the inflowing motive agent and prevent their entrance into the body of the tool suitable straining means is provided carried by the spray gun, preferably in the handle thereof, and we have shown for this purpose an air strainer 13 having a large total area which will not readily be wholly obstructed by accumulation of dirt or the like and will at all times afford passage for the air. Said strainer as illustrated comprises an elongated and slightly tapering or conical member preferably formed of perforated copper sheeting or the like. Said air strainer is mounted at its lower end in a bushing 14 threaded axially into the air hose connection 10, said bushing and air strainer being readily removable as a unit for cleaning.

At its upper or leading end the air passage 5 communicates with a passage 15 at an angle thereto and in an enlargement of which is suitably secured a valve casing or plug 16 as by threading into the body portion. Said valve plug is provided with a longitudinal opening forming a valve seat 17, and with transverse openings or air passages 18. Said valve seat 17 is adapted to receive and seat a suitable air valve 19 having a spindle 20, the inner end of the latter extending slightly beyond said valve to provide a guide for a valve spring 21 shown as a coil spring bearing intermediate said valve and the inner end of said passage 15 and tending always to keep said air valve closed upon its seat. Near its outer end the spindle 20 passes through suitable packing shown as the gland packing 22, the latter retained by a gland or like member 23 threaded into the valve plug 16. The outer end of said spindle 20 is adapted to bear against the inner face of a rocker or lever 24 pivotally supported as at 25 between ears 26, 26 or the like formation, preferably integral with the body 1.

The motive agent, such as air under pressure entering through the passages 5, 15 passes the air valve 19 when open and through the openings 18 in the valve plug and enters a relatively large chamber 27 within the body 1. The coating material, such as paint or the like, admitted through the pipe 4 passes through the material passage 6 and thence preferably directly into a forward or material chamber 28 formed in the tool body 1 preferably in alignment with and in advance of the air chamber 27 and wholly out of communication with the latter under normal operation of the spray gun.

Extending longitudinally through the body 1 and within said chambers 27, 28 and substantially axially thereof is a needle or spindle 29 shown as a rod having a pasage 30 drilled or otherwise formed longitudinally therein from its forward end, said tubular portion of the spindle being of a length to extend from the material chamber 28 into said air chamber 27. The said spindle is longitudinally movable, being seated with a sliding fit in an annularly shouldered portion 31 of the body, suitable packing shown as a series of leather or other flexible washers 32 being provided at the rear of said shoulder portion 31 and adjustably held in place as by a packing plug or member 33 threaded into the tool body. In the disclosed embodiment of our invention said spindle is secured at its forward end, as by sweating, in a slidable guide or aligning member 34 illustrated as a tubular piece having integral and substantially radial guide ribs 35 and an axial chamber 36.

Removably mounted at the forward end of said guide 34, as by threading therein, is a nose-piece 37 having an axial passage 38 which forms with the chamber 36 a continuation of the passage 30 in the spindle or needle.

The forward or discharge end of the body 1 is internally threaded to receive the threaded cap-plug or nozzle member 39 having a somewhat inclined inner surface 40. The nose piece 37 at its forward end is provided with a similarly formed outer surface 41 adapted to seat against said surface 40 and in such position cut off the supply of coating material or to be sufficiently removed rearwardly from said surface 40 of the cap-plug to afford an annular space for the passage of the coating material and for the temporary deposit or accumulation of said material as a layer or film upon the said outer surface 41 of the nose piece and between it and said inner surface 40 of the cap or nozzle member 39 and across the orifice of said nose-piece.

The described construction provides a substantially parallel-sided circumferential or annular passage or space surrounding the passage through which the air stream is supplied. Herein the plane occupied by the walls of said passage approaches parallelism with the axis or line of the air stream so that both the material under pressure and the air under pressure are supplied along lines approximating as nearly as practicable the same direction while still permitting the formation of a film or layer of material for disruption and discharge by the central air stream, the material being supplied exteriorly of and surrounding the air stream. Said inclined inner surface 40 of the nozzle

member 39 terminates in a forwardly tapering mixing chamber 42 formed in said nozzle member immediately to the rear of the axial discharge orifice 43 of the latter, and into which mixing chamber the layer of film of material is first discharged.

Both said nose-piece 37 and the cap plug or nozzle member 39 are readily movable by unscrewing them and are interchangeably replaceable by other similar members having different sized passages and orifices. By providing a plurality of such interchangeable parts any desired combination of sizes of air passage 38 and discharge orifice 43 is obtainable to suit the particular requirements of the work in hand and of the material to be used, larger or smaller orifices and passages being employed if desired accordingly as the material is of greater or less density or of more or less viscosity, or where greater or less speed of application of material is desired. Interchangeable supplemental jet delivery members 63, more fully described hereinafter, having different sized orifices may also be provided in combination with said interchangeable nose-pieces 37 and cap plugs or nozzle members 39. When removing the nose-piece 37 the remainder of the spindle or needle 29 to the rear thereof is prevented from turning by any suitable means such as the stop screw 44 in the tool body, and extending into a position between two ribs 35 of the guide member 34.

The longitudinal air passage 30 of the spindle 28 extends rearwardly into the air chamber 27 and at some point or points within said chamber an opening, or preferably a plurality of openings 45, 45, are formed in said spindle to permit the air to enter said longitudinal passage 30. The construction is such that when the air valve 19 is opened the air under pressure may pass through the supply pipe 3, the passages 5, 15, the openings or ports 18, the chamber 27, the openings 45 into the longitudinal passage 30 of the spindle.

The tool body 1 is threaded internally at its rear end to receive an externally and internally threaded needle-packing plug or nut 46 between the inner end of which and a collar 47 fixed on the needle is a coil spring 48 tending normally to move the spindle 29 forwardly against the cap-plug 39 and thereby to cut off discharge of coating material, in the position shown in Fig. 2. Within said packing plug 46 which also constitutes a bearing for slidably supporting the rear portion of the spindle, is received suitable packing for said spindle shown as a series of leather or other flexible washers 49 adjustably retained by a gland or like piece 50. The rear end of the air chamber 27 is thus closed against any escape of air in a rearward direction, at the same time affording axial support for the spindle while permitting longitudinal movement of the latter by any suitable means.

Referring to Figs. 1 and 2, there is pivotally mounted upon the tool body as at 51, upon a suitable lug 52, or between ears, an operating member shown as a trigger 53 by means of which the spindle valve 29 may be operated and also desirably the air valve 19. At its upper end said trigger 53 has pivotally connected to it as at 54 the forward ends of a pair of links 55, 55 one at each side of the gun, the latter being pivotally connected at 56 to the lower portion of the rocker 24. Near its upper end said rocker 24 has an opening 57 through which passes the rear end of the spindle, the latter being threaded to receive an adjustable nut 58 constituting an abutment against which takes the rear face of said rocker.

Desirably the construction and arrangement of said operating mechanism is such that movement of the trigger or lever 53 to the right in the figures will effect first an opening of the air valve and at a suitable and predeterminable time thereafter will effect movement of the spindle 29 to permit passage of the material from the chamber 28 into the mixing chamber 42. As illustrated the air valve opens first and continued movement of the trigger 53 then opens the material passage; when the trigger is subsequently released the material passage is first closed and then the air valve. It will be observed that a substantial pocket or volume of air under full pressure is provided in advance of the air valve 19 and which will insure the complete discharge of any possible material remaining in the mixing chamber 42 after the closing of the material passage. By adjusting the position of the nut 58 longitudinally of the spindle the extent to which said material passage will be opened may be regulated as desired and also the time interval between the operation of the two valves. Inward movement of the trigger 53 is preferably limited by a suitable stop such as the nub 53*a* upon the tool handle, said trigger desirably being of a length to receive all or a plurality of the fingers of the hand of the operator grasping the tool handle and having a conveniently located finger rest and positioning member 53*b*.

The spray gun embodying our present invention preferably includes means for supplementally discharging air under pressure upon the discharged mist or cloud of material and the main discharged air to effect the flattening, spreading or fan-shaping thereof when desired and accordingly we have illustrated spreader means. Referring to Fig. 2 there is formed in the body 1 a passage 59 shown as parallel with the inlet passages 5 and 6 and in communication with the air chamber 27. Said passage 59 also communicates with a longitudinal passage 60

formed in the gun body and preferably parallel with the longitudinal axis thereof.

The forward or discharge end of the body is provided with a head 61 shown as circular in cross section and in which the cap-plug or nozzle member 39 and the nose piece 37 are concentrically positioned. Said longitudinal supplemental air passage 60 terminates at its forward end within the periphery of said head. Upon the forward end face of said head is a cylindrical concentric projection or portion of slightly reduced diameter providing a shoulder 62 to receive the spreader or supplemental jet delivery member or element 63 illustrated as a ring-like member the outer diameter of which equals that of the head 61. In the rear end face of said supplemental jet delivery member 63 is a continuous annular groove 64 constituting, with the adjacent portion of the body, an air passage, the construction being such that some portion of the latter always lies opposite the forward end of the supplemental air passage 60 irrespective of the angular positions of the member 63 with relation to the axis of the tool body.

Said spreader member 63 is adjustably held in place flatwise against the forward end face of the tool body by a suitable locking means shown as an internally threaded collar or nut 65 having an inturned flange 66 to engage the outer face of the spreader member, the latter also desirably being threaded in continuation of the threads on body head 61. On the outer face of said spreader member is formed a pair of diametrically opposed supplemental jet members 67, 68 respectively provided with inwardly directed orifices 69, 70 in communication with the annular groove 64 and consequently with the air passage 60 in any position of angular adjustment of the spreader. Said spreader is assembled with the body merely by placing it flatwise against the shoulder 62 of the head and screwing on the spreader lock. When it is desired to adjust the plane of the sprayed material this may be readily effected merely by backing off the spreader lock slightly, turning the spreader to the desired position, and again tightening the spreader lock.

Two possible positions of the supplemental jet or spreader member are shown in Figs. 3 and 4. Fig. 3 illustrates the spreader in position to effect flattening or fan-shaping of the spray horizontally while as shown in Fig. 4 the spreader will effect a spray flattened vertically. It will be understood that flattening in any desired intermediate plane may be obtained. The seating of the supplemental-jet delivery member upon the cylindrical seat projecting from the front face of the gun body with the rear-end face of said member positioned flatwise against the vertical shoulder 62 on said front face insures the positioning of the focus of the supplemental jets on the longitudinal axis of the inner nozzle, as the inner nozzle, the outer nozzle, and the cylindrical projection are concentric. Moreover, this construction permits the angular adjustment of the supplemental-jet delivery member upon the cylindrical projection without variation of the focus of the supplemental jets.

To control the supplemental air discharge we have provided a supplemental air valve 71, see Fig. 2, supported in a continuation of the passage 59 and adapted to control or shut off the flow of air therefrom to the supplemental air passage 60. At its outer end is secured a thumb nut or cap 72 preferably having a roughened or knurled exterior and threaded interiorly to engage outer threads on an annular boss or extension 73 of the body 1. Said boss is also interiorly threaded to receive a valve gland or like threaded piece 74 securing in place suitable gland or other packing 75.

At times it is desirable to "blow back" the gun in order to remove any possible undesired accumulation of paint or material in the material passages or in the material supply hose. This may be effected by removing the pressure upon the material and by blocking the gun discharge orifice 43 as by passing a finger over it and then pulling the trigger. The air will then pass in the usual manner into the mixing chamber 42, but, since the discharge orifice is blocked, it will pass back into the paint chamber 28 and blow back the paint into the container freeing the paint line. In order to prevent material from being carried into the air passages when "blowing back" the gun, as might inadvertently occur if the pressure upon the material were not first released and also exceeded the air pressure, suitable check means is preferably provided. Herein we have accordingly shown a check valve illustrated as the ball 76 positioned in the chamber 36 of the guide member 34 and held in position against the forward end of the tubular portion of the spindle by means of a light spring 77. During normal operation of the tool said check ball 76 is readily pressed from its seat and offers no obstruction to the flow of the air.

In accordance with the disclosed form of our invention it will be observed that the material, which is supplied exteriorly or circumferentially of the centrally supplied air, forms a film or layer of variable thickness intermediate the inner surface 40 of the cap or nozzle member 39 and the adjacent surface 41 of the spindle nose and across the forward end of the latter. The coating material is conducted into said annular space by reason of its being under pressure, and as in said copending application of Day, and in part by the ejector-like effect of the centrally applied air under pressure particularly when the orifice in cap 39 is larger than that in nose 37.

Said air thus is not only effective to disrupt the film or layer of material, which is constantly reformed, but assists in causing the flow of material for discharge. Before final discharge from the spray gun the material is broken up and thoroughly mixed in the mixing chamber 42. When finally discharged the resulting spray is completely atomized as a mist or cloud. Such spray has a velocity derived from the velocity of the air stream and is thereby discharged on to the surface to be coated in said completely atomized condition.

From the foregoing description it will also be noted that we have provided supplemental air discharging or spreader means whereby the spray may be flattened when and to the extent desired, the flattening being controllable by the valve 71, as well as by the size of orifices 69 and 70 in the interchangeable spreader members. Said spreader means is readily adjustable rotatively to vary the plane of the flattened spray angularly through 360° if desired and at the same time is readily removable for cleaning or other purposes and if desired a plurality of interchangeable spreader members similar to the member 63 may be provided having supplemental jet orifices of different diameters thus affording further control of the flattening effect. Numerous combinations of nose piece, cap-plug and spreader may be obtained through the provision of interchangeable parts. The spreader unit is removable as a whole and may be quickly replaced and locked or clamped by the simple but efficient means disclosed. Desirably the apparatus of our invention includes air straining means which is self contained within the tool proper and which also is readily movable, or when not required may be omitted.

The tool or appliance embodying our invention is extremely efficient and at the same time is rugged in construction and readily manufactured. It will be observed that with the single exception of the passage 15 all the passages in the tool body are parallel along one or the other of two lines. It is therefore necessary that in forming said passages the body be jigged or otherwise held in only two different positions thereby decreasing the expense of manufacture and making for speed in production. All parts are readily assembled or disassembled for cleaning or replacement purposes, while the form and balance of the tool render the same easily and quickly manipulated for the purpose set forth.

It will be apparent to those skilled in this art that changes may be made in the details of construction, the described and illustrated embodiment of the invention being intended as an exploitation of its underlying essentials, the features whereof will be definitely stated in their true scope in the claims hereto appended.

What is claimed as new, is:—

1. An apparatus or tool for applying coating material comprising a body having means to admit coating material and a motive agent for discharge therefrom, means for supplementally discharging motive agent upon the main discharge to flatten or spread the same including a supplemental motive agent passage in said body, a hollow element having a continuous annular groove in one end face and adapted to communicate with said supplemental passage, a pair of opposed jet members upon its opposite face and communicating with said groove, and locking means for said hollow element.

2. An apparatus or tool for applying coating material comprising a body having means to admit coating material and a motive agent for discharge therefrom, means for supplementally discharging motive agent upon the main discharge to flatten or spread the same including a supplemental motive agent passage in said body, a rotatively adjustable member positioned flatwise against the forward face of the tool body, opposed jet delivery means thereon, and means to secure said member in the desired position of adjustment.

3. An apparatus or tool for applying coating material comprising a body having means to admit coating material and a motive agent for discharge therefrom including a main passage for the motive agent, means for supplementally discharging motive agent upon the main discharge to flatten or spread the same including a supplemental motive agent passage in said body, a rotatively adjustable member positioned flatwise against the forward face of the tool body, opposed jet delivery means thereon, means to secure said member in the desired position of adjustment and valve means independent of the main motive agent passage and of said member to control or shut-off the supply of motive agent through said supplemental passage in the body.

4. An apparatus or tool for applying coating material comprising a body having two non-communicating chambers, means to introduce coating material and a motive agent into said chambers respectively for discharge from the tool, said body having a supplemental motive agent passage extending forwardly from said motive agent chamber, an angularly adjustable hollow element having a continuous annular groove in one end face said element adapted to be applied to the forward end of said body whereby said groove forms with the latter a passage for motive agent in communication with said supplemental passage in any adjusted position of said ring-like element, and a pair of opposed jet orifices in said element and communicating with said groove.

5. An apparatus or tool for applying coat-

ing material comprising a body having two non-communicating chambers, means to introduce coating material and a motive agent into said chambers respectively for discharge from the tool, said body having a supplemental motive agent passage extending forwardly from said motive agent chamber, an angularly adjustable hollow element having a continuous annular groove in one end face said element adapted to be applied to the forward end of said body whereby said groove forms with the latter a passage for motive agent in communication with said supplemental passage in any adjusted position of said hollow element, a pair of opposed jet orifices in said element and communicating with said groove, and a locking member for releasably securing said element in the desired adjusted position.

6. An apparatus or tool for applying coating material comprising a body having two non-communicating chambers, means to introduce coating material and a motive agent into said chambers respectively for discharge from the tool, said body having a supplemental motive agent passage extending forwardly from said motive agent chamber, an angularly adjustable hollow element having a continuous annular groove in one end face said element adapted to be applied to the forward end of said body whereby said groove forms with the latter a passage for motive agent in communication with said supplemental passage in any adjusted position of said hollow element, a pair of opposed jet orifices in said element and communicating with said groove, and valve means to control or shut off the supply of motive agent through said supplemental passage in the body.

7. A spray gun having, in combination, a body portion having means to admit coating material and a motive agent for discharge therefrom, means for supplementally discharging motive agent upon the main discharge to flatten or spread the same including a supplemental motive agent passage in said body terminating on the forward face thereof, a hollow element having a continuous annular groove in one end face and adapted to be positioned flatwise against the forward face of the tool body and to communicate with said supplemental passage, a pair of opposed jet members upon its opposite face and communicating with said groove, and locking means for said hollow element.

8. A spray gun having, in combination, a body having a cylindrical seat on its front face, means to supply coating material, means to subject the same to the action of a motive agent thereby effecting the discharge of the coating material including a main passage for the motive agent, means for supplementally discharging motive agent upon the discharged coating material to flatten or spread the same including a member having at least one supplemental motive agent passage therethrough rotatably mounted upon said seat and face, valve means independent of the main motive agent passage and of said member to control or shut-off the discharge of motive agent from the passage in the said member, and means for retaining said member in a fixed position upon said seat and face.

In testimony whereof, we have signed our names to this specification.

JAMES JARVIS PREBLE.
WAYNE B. THOMPSON.