April 8, 1930. F. W. GAY 1,753,650

ELECTRIC SWITCH

Filed Sept. 10, 1927 2 Sheets-Sheet 1

Fig. 2

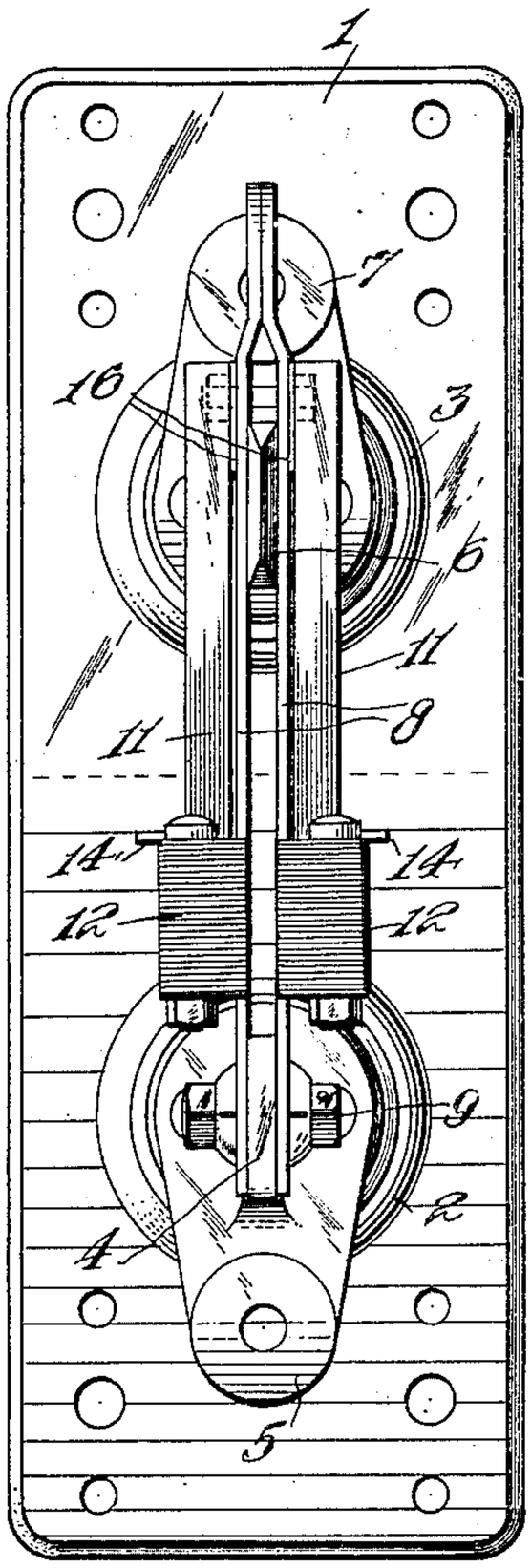
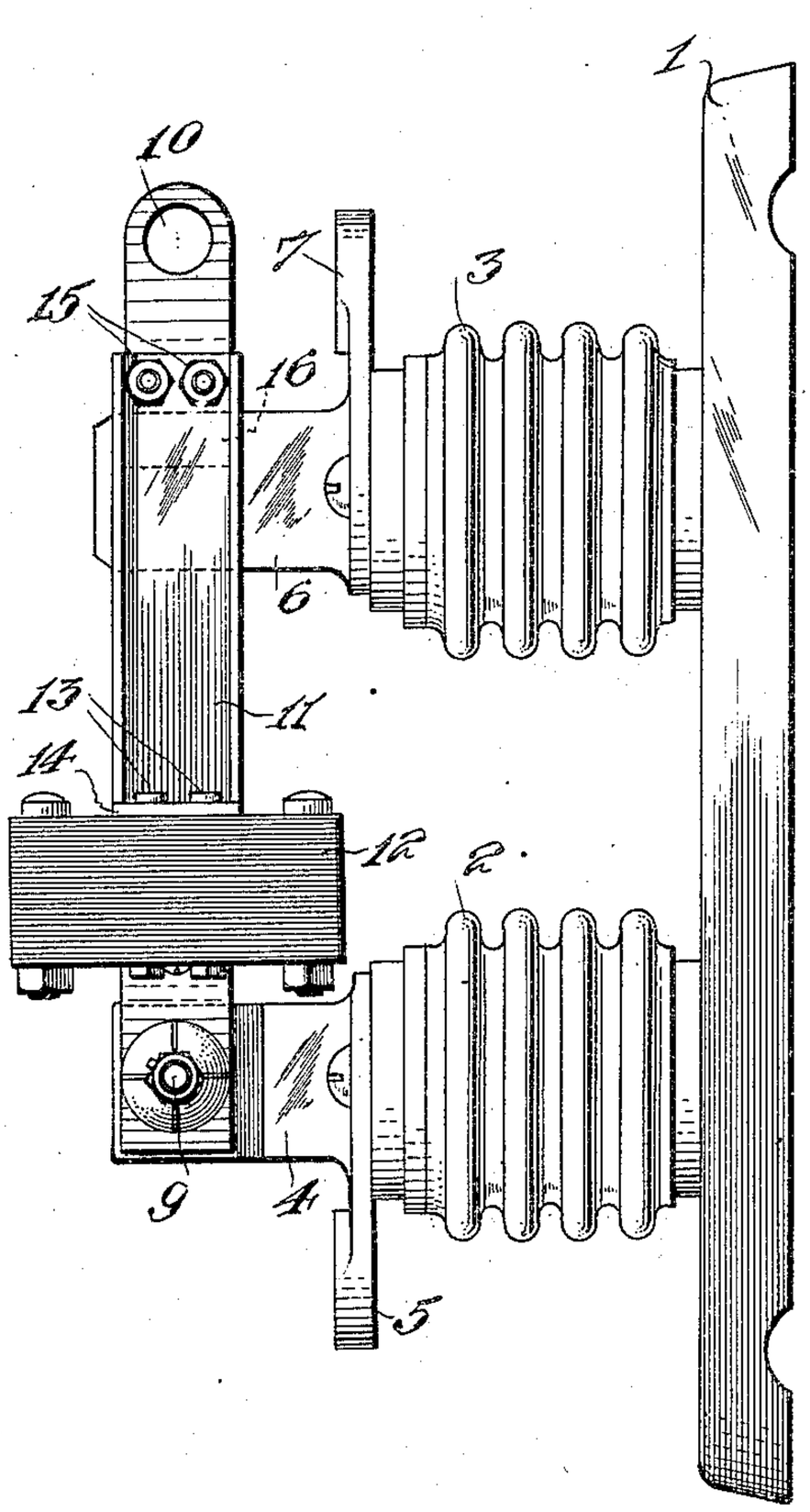


Fig. 1



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Fig. 4

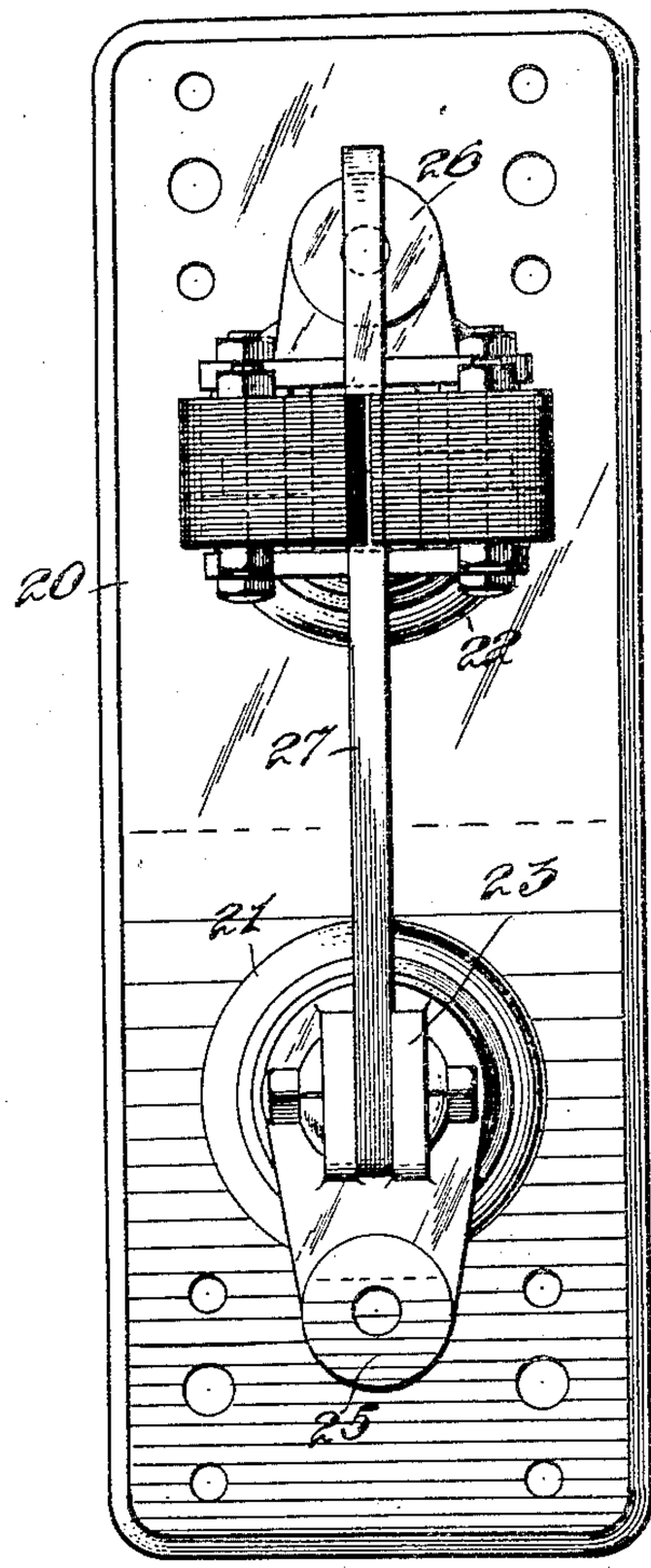
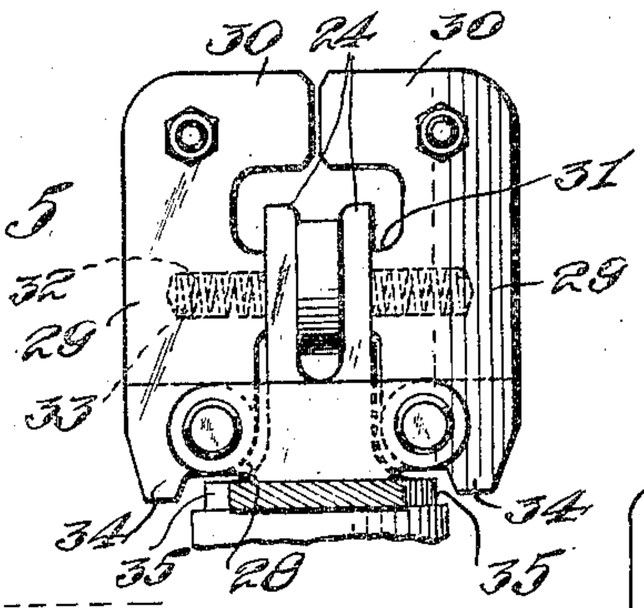


Fig. 5



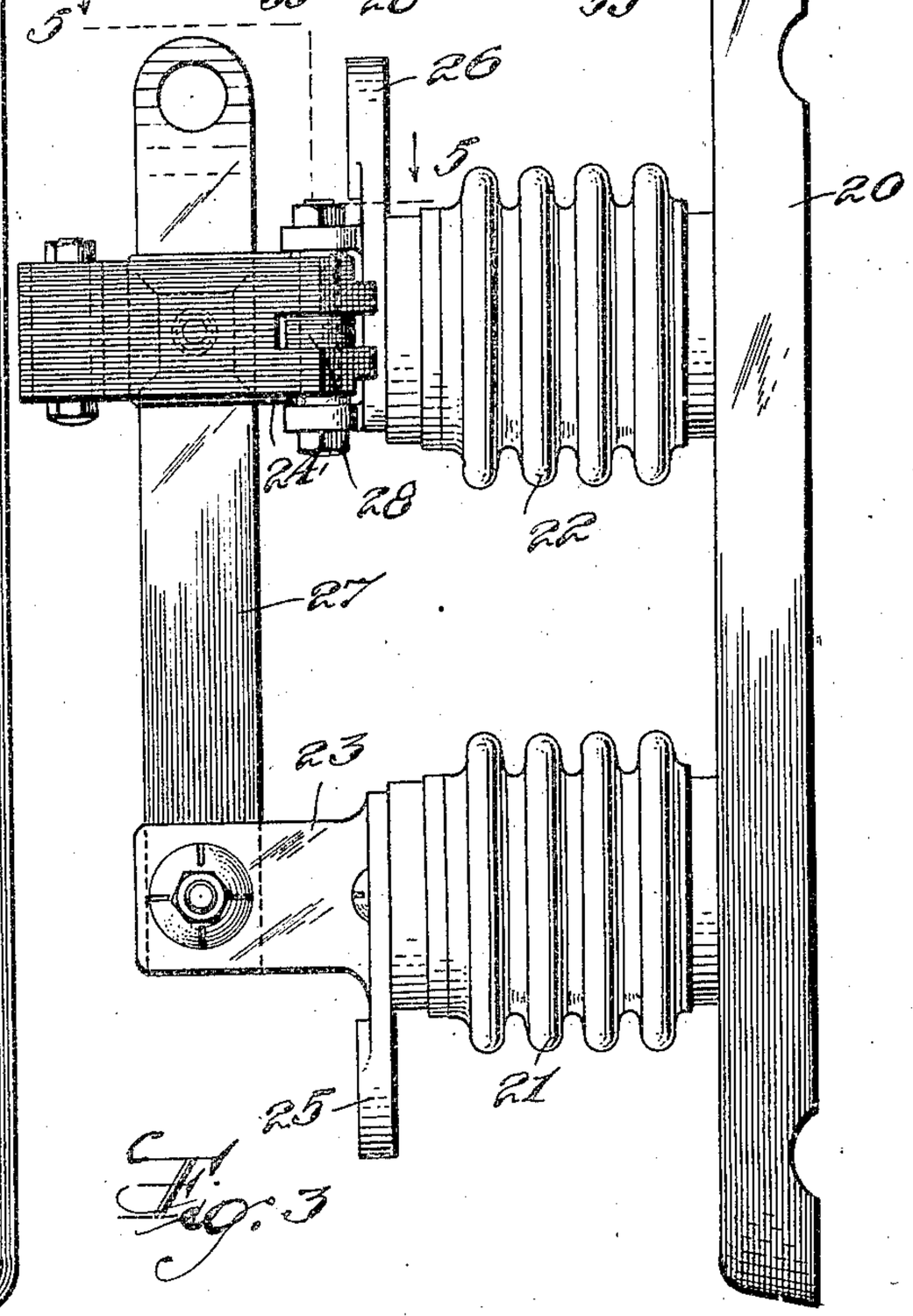


Fig. 3

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed September 10, 1927. Serial No. 218,643.

The present invention relates, generally, to improvements in electric switches; and the invention has reference, more particularly, to a novel construction and arrangement of electric circuit making and breaking contacts which have associated therewith, as a component part of the structure of the invention, an electromagnet adapted to exert a force to press the contacts of the switch against each other for the purposes of lowering their contact resistance and also for locking the contacts tightly together in frictional engagement to resist movement, the arrangement being characterized further by the fact that the electromagnet is energized by current which flows through said contacts when circuit is closed through them.

This invention has for its principal object to provide a simple, compact and light switch structure of the cut out type which generally are not opened when potential is on the line but which are opened only after the circuit has been broken by other means such as, for example, by an oil switch, the present invention providing means energized by current flow through the switch for resisting or preventing the opening of the switch when current is flowing therethrough.

The invention has for a further object to provide a switch for high currents which has means associated therewith for pressing the contacting members thereof against each other to reduce the contact resistance thereat to a minimum.

Another object of the invention is to provide a switch having electromagnetic pressure exerting means for the contactors thereof which means becomes inoperative and releases the contactors for separation from each other when no current is flowing therebetween.

Other objects and advantages of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in accompanying drawings, in which:—

Figure 1 is a longitudinal elevation view of one embodiment of the switch of the invention; Figure 2 is a plan view of the switch of Figure 1; and Figures 3, 4, and 5 are respectively a longitudinal elevation view, a plan view and an end elevation view of an alternate embodiment of the invention.

Similar characters of reference are employed in all the hereinabove described views, to indicate corresponding parts.

Referring now to Figures 1 and 2 of said drawings the reference character 1 indicates a suitable base member of iron, slate or other material, which carries the two spaced apart support members 2 and 3, respectively, which are of insulating material such as porcelain and are fixed to said base 1. Said support member 2 at its outer end carries a conductor stud 4 which is preferably of copper and has attached to it the lug or ear 5 which is for the purpose of attaching or connecting a bus bar or other conductor thereto. Said insulating member 3 also carries a conductor stud 6 which has attached thereto the connecting ear or lug 7. Said stud 6 is slightly higher than said stud 4 and has its outer end beveled off to permit the ready and easy sliding of a switch blade into position along the sides of it. Pivoted to said stud 4 is a double or bifurcated switch blade comprising two blades 8, 8 held one on each side of said stud 4 by the pivot bolt 9. Said blades 8, 8 are of a length to extend past said stud 6 and are spaced apart to make wiping contact therewith one on each side thereof. At their outer ends said blades curve inwardly toward and against each other, where they are joined together by rivets or spot welds, and they have formed therethrough at the end of the opening 10 for the insertion of a hook used in opening or closing the switch. The blades 8, 8 are of bus bar copper, of the type well known, which while being comparatively rigid and strong are capable of some degree of lateral flexure. This degree of lateral flexure is utilized in applying pressure of said blades against said stud 6 to lock them in position against it and to reduce contact resistance, by parts hereinafter fully described.

Pivoted to each of said blades 8, 8 between the part which contacts with said stud 6 and said opening 10 is an arm 11 which extends

backwardly along its respective blade 8 and terminates near said stud 4 at which point each carries fixed thereto a U shaped magnetic armature 12 by means of bolts 13, 13 which extend through a respective armature and a flange 14 which extends out laterally from a respective arm 11. Said arms 11, 11 are held to and pivoted to their respective blade 8 by means of the bolts 15, 15, with a shim 16 mounted on each of said bolts 15 between a blade 8 and its respective arm 11. Said bolts 15, 15 are left incompletely tightened so as to allow a slight lateral play of each of said arms 11, 11 laterally toward and from each other, and said shims 16, 16 are of such dimension along their respective blades as to terminate at a point intermediate the edges of said stud 6 when said switch blade 8—8 is in the closed position. The arm of each of said U shaped magnets 12, 12 extends toward those of the opposite magnet in opposed alignment and when the switch is closed and current of a given value is passing therethrough said armatures 12, 12 will be drawn toward each other by the magnetic lines of force induced therein by said current. The thickness and length of said shims 16, 16 and the play allowed by said bolts 15, 15 are predetermined so that when said magnets 12, 12 are moved toward each other the leverage of said arms 11, 11 on said bolts 15, 15 and over the inner edges of said shims 16, 16 will produce a clamping of said blades 8—8 against said stud 6 one on each side thereof. The proportionate lengths of the distances of the inner edge of said shims 16, 16 and of said magnets 12, 12 from said bolts 15, 15 give a comparatively great leverage at a considerable increase of pressure on said stud 6 when said magnets 12, 12 are drawn toward each other. The lateral flexibility of said blades 8—8 permits this pressure to hold the sides of said blades 8—8 firmly against the sides of said stud 6 to reduce the contact resistance therebetween to a minimum and also to lock said blades 8—8 in place and hold them in place by frictional contact between the blades and said stud 6. When current is cut off from the switch the pressure on said stud 6 is released and said blades can easily be opened in the usual manner.

Referring now to the alternate embodiment as illustrated in Figures 3, 4, and 5 of the drawings the base 20 supports two insulating support members 21 and 22 which are spaced apart and which carry respectively the terminal clips 23 and 24. To said clips 23 and 24 are affixed respectively the terminal lugs 25 and 26 and a switch blade 27 pivoted in said clip 23 is movable thereon into and out of circuit closing position in said clip 24. Extending around said clip 24 laterally and at the bottom thereof is the magnetic bar 28, to the opposite ends of which are pivoted the outwardly extending armatures 29, 29, each of which terminates beyond the outer extremity of said clip 24. From the outer end of each of said armatures 29, 29 there extends inwardly one toward the other the extensions 30, 30 and between the pivot of each of said armatures 29 and its respective extension 30 is an inward projection 31. Said bar 28 and said armatures 29, 29 and extensions 30, 30 form an almost complete magnetic path about said switch blade 27 when said blade is in the closed circuit position in said clip 24; and current flow through the switch, when in this position, will induce a magnetic flux in said magnetic path and said armatures 29, 29 will be drawn toward each other. On each of said armatures 29, 29 between its pivot and its respective extension 30 is a projection 31 which, when current flow through blade 27 causes said armatures 30, 30 to be drawn toward each other, will be pressed against the sides of said clip 24 which, in turn, will be pressed against opposite sides of said switch blade 27 thereby locking said blade 27 against movement from the closed circuit position and also thereby reducing the contact resistance between said clip 24 and said switch blade 27.

In each of said armatures 29, 29 is formed a bore 32, which extends inwardly from the inner surface of the respective projections 31 and carries a compression spring 33 which presses at one end against the respective side of said clip 24 and at its other end against the bottom of the respective bore 32. Adjacent its pivot, each of said armatures 29, 29, carries a downwardly extending spur 34. Said springs 33, 33 tend to move said armatures 29, 29 and their lateral extensions 30, 30 outwardly and serve to separate the ends of said extensions 30, 30 sufficiently for the blade 27 to pass thereby without striking when the blade 27 is moved into and out of the closed circuit position. Said spurs 34—34 serve by striking against lateral projections 35, 35 at the bottom of said clip 24 to limit the angle of movement of said armatures and extensions so that in their outermost position they will be close enough to each other, when the blade is closed and current is passing therethrough, for the magnetic flux to draw them together and close them into compressive relation against the sides of said clip 24. The said extensions 30, 30, in the preferred form, are further characterized by the fact that their length is such that they will not quite meet when the full compressive force is on, this arrangement being made to provide that full and positive compression is at all times exerted to press the sides of said clip 24 against said blade 27 when the switch is closed and current is on.

In the use and operation of this embodiment of my invention and starting from a position where the blade 27 is opened wide and said springs 33, 33 are holding said ar-

matures 29, 29 away from each other at the position determined by said spurs 34, 34 and current being cut off from the switch by other switching means, the blade 27 is closed by moving it into position between the sides of said clip 24. Current path is then completed by means of an oil switch or other suitable means and upon flow of current through said blade 27 the magnetic flux induced in said bar 28, armatures 29, 29 and extensions 30, 30 said armatures 29, 29 will be drawn together and the sides of said clip 24 will be pinched together against said blade 27 to lock it in position and to secure maximum contact between said blade and said clip. The dimensions of the parts of the pressure locking and contacting arrangement of the invention can be proportioned to secure maximum leverage and pressure within limits determined by the limit in value of the current which flows in the blade of the switch.

I am aware that some changes may be made in the general arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, without departing from the scope of this invention as described in the foregoing specification, and as defined in the appended claims. Hence, I do not limit my invention to the exact arrangements and combinations of the devices and parts as set forth in the foregoing specification, nor do I confine myself to the exact details of the construction of said parts as illustrated in the accompanying drawings.

I claim:

1. In an electric switch structure, in combination, cooperating make and break contact members and an electromagnet in operative relation to said contact members to become energized by current therethrough and also to exert force, and mechanical means for multiplying said force to firmly press said contact members one against the other when said electromagnet is so energized.

2. In an electric switch structure, in combination, an electromagnet having parts movable one toward the other and adapted when a magnetic field is induced therein to exert a force tending to move said movable parts toward each other, circuit making and breaking contact members, and means for multiplying the force of said magnet parts and adapted to apply such multiplied force to said contact members to press them firmly against each other.

3. In an electric switch structure, in combination, an electromagnet having parts movable toward each other and adapted when a magnetic field is produced therein to exert a force tending to move said movable parts toward each other, circuit making and breaking contact members, movable in relation with each other and means in operable relation to said magnet parts and said contact members for transmitting force from said magnet parts to said switch parts when in the circuit making position at substantially right angles to the direction of movement of said contact members relative to each other, to press them against each other.

4. In an electric switch structure, in combination, a contact member having the form of a projection, a second contact member comprising somewhat resilient parts in side by side relation, one of said contact members being movable into and out of circuit making contact with the other, first said contact member being positioned between said parts of said second contact member when they are in closed contact relation, and electromagnetic means in inductive relation to current carrying parts of said switch adapted when energized to apply force to press said parts of the second contact toward each other and against first said contact member.

5. In an electric switch structure, in combination, a knife switch having a contact stud and a double blade contact pivoted for movement into and out of contact with said stud, the double blade comprising bars which contact one on each side of said stud in closed position of the switch, levers mounted one on each side of said blade and pivoted at a place outwardly beyond the contacting portions of the blade and terminating intermediate the pivot and the contacting portion of said blade, magnetic members carried one at the end of each of said levers and in operable relation to each other to be drawn together by magnetic flux induced therein when current is passing through said blade, and a pressure applying member between each of said bars and its respective lever at a point adjacent the contacting portion of the respective bars.

6. In an electric switch structure, in combination, a knife switch having a contact stud and a double blade contact pivoted for movement into and out of contact with said stud, the double blade comprising bars which contact one on each side of said stud in closed position of the switch, levers mounted one on each side of said blade and pivoted at a place outwardly beyond the contacting portions of the blade and terminating intermediate the pivot and the contacting portion of said blade, magnetic members carried one at the end of each of said levers and in operable relation to each other to be drawn together by magnetic flux induced therein when current is passing through said blade, and a pressure applying member between each of said bars and its respective lever at a point adjacent the contacting portion of the respective bars, said levers being capable of but a small angle of movement from said blade.

7. In an electric switch structure, in combination, a knife switch having a contact stud and a double blade contact pivoted for move-

ment into and out of contact with said stud, the double blade comprising bars which, in the closed circuit position of the blade, contact one on each side of said blade; levers mounted one adjacent each side of said blade and pivoted thereto at a place outwardly beyond the stud contacting portions of the blade by means of bolts extending through said levers and said blade and not completely tightened thereagainst whereby said levers are free to move therein through a small angle from the sides of said blade, and a shim mounted on said bolts one between each of said levers and its respective side of said blade, each of said shims terminating adjacent the stud contacting parts of said blade.

In testimony that I claim the invention set forth above I have hereunto set my hand this 26th day of August, 1927.

FRAZER W. GAY.